HARDWARE AND SOFTWARE CO-DESIGN ISSUES IN H.264 DECODER

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Abstract - In this paper we talk about mixed architectures of a H.264/AVC video decoder. Here software part of decoder was implemented in NIOS II processor on a FPGA prototyping board (Stratix III). Software and hardware architectures was proposed to increase the decoder output performance. Based upon the time execution parameters, data dependency constraints, the decoder partitioning is applied. Here the inverse 4x4 Intra process is implemented with hardware accelerator. It consists of inverse 4x4 Intra prediction, inverse transformation and inverse quantization. By implementing inter prediction as a hardware module the decoder through can be increased

Keywords
H.264 decoder, software-hardware architectures , inverse 4x4 intra prediction, inverse transform, inverse quantization ,inter prediction

INTRODUCTION

H.264/ AVC codec is a multimedia application produces high-quality video contents with low binary rate. In H.264 encoder video quality performances is obtained by video coding tools and techniques. Many algorithms were proposed for improving in term of quality and bitrates. For providing a perfect high quality image H.264/AVC should process the video in reduced time. The design realizes a multimedia system on the chip can be partitioned into three types pure software designing, pure hardware designing and mixed software and hardware implementation. Software architectures implementation in [2], are flexible and of high design level. It is mainly based on processor like RISC based CPU or a Digital Signal Processor. However, the hardware implementation, [3] and [4], is high efficient because it provides multiple task executions in parallel. But design time is more. With respect to software design, it is less flexible. Examples of hardware prototyping boards are FPGA and ASIC. Due to the software and hardware implementation [5-6-7], fast development and high performance throughput can be achieved.

In this paper combined architecture is proposed to implement H.264 decoder on FPGA. NIOS II is the processor. The inverse 4x4 intra prediction and inter prediction is hardware accelerator.

H.264 DECODING PROCESS

Fig 1: H.264 decoder block diagram
After decoding the Network Abstraction Layer parameters, the data is entropy decoded by two ways: Context-based Adaptive Variable Length Decoding and Exp-Golomb. CAVLD produces quantized coefficient array but it is more time consuming. Exp-Golomb is used for others syntax elements It is used to reconstruct and reorder the data Inverse quantization produces a set of coefficients .inverse quantization reconstructs data. On input according to Qp value. Qp is the quantization parameter fixed by the encoder. In previous video coding standard, Inverse Discrete Cosine Transform was used. H.264/AVC use a separable Inverse Integer Cosine Transform. It has 4x4 inverse Discrete Cosine Transform. Inverse transform is applied on each 4x4 block. DC coefficients of each 4x4 block are assembled in a matrix and applied inverse Hadamard transform .The 4x4 intra prediction modes are suitable for significant information
within a frame. Each 4x4 block is predicted independent from spatially neighboring coefficients. One of nine prediction modes are applied to each Macro block. In inter prediction motion vector is extracted from bit stream. Then, motion compensation module is applied. It consists of adding motion vector coordinates to a corresponding block in reference frame. Result is a reconstructed block. Block size can changes from one motion vector to other. The de-blocking filter perform an in-loop filtering to reduce blocking artifacts generated by image partitioning and quantization. After inverse quantization and inverse transform, the de-blocking filter compare the edge values of each 4x4 block with adjacent block to select the level of filtering.

SOFTWARE IMPLEMENTATION

Software implementation is necessary before going to the mixed implementation to evaluate time executions of each modules in decoder. This profiling can give an idea about module complexity. De-blocking filter consumes 30% of overall decoder time execution. Then inverse quantization and inverse transform have second place by 21%. The aim of our research is to define software and hardware solution of H.264 decoder. All decoder modules will be designed as hardware IP and for only control operations will be done on the software part of architecture. To attain this purpose, de-blocking filter was first implemented as hardware IP in previous work [18] using ESL tools. The second IP is subject of this proposed work. In order to have a better partitioning between software and hardware, most demanding modules in term of time execution need to be transformed on hardware accelerator. Despite importance of time execution, it is not only constraint to be used to define block that need to be accelerated. Data dependency and possibility of parallelization in algorithm are also a major factors. In fact, inverse quantization, inverse transform and inverse prediction presents a good tradeoff between the time execution and algorithmic constraints.

HARDWARE ARCHITECTURE OF INVERSE 4X4 INTRA PROCESS AND INTER PREDICTION

Inverse 4x4 intra prediction, inverse quantization, inverse transform and inter prediction are decoder modules. Enclosing them on one IP is a way to minimize data transfer between hardware and software architecture part. Architecture of inverse 4x4 Intra prediction and Inter prediction is given by Figure 7. Accelerator input are inverse quantization inputs, prediction modes and macroblock position. Output is only reconstruct macroblock. To calculate the equations of prediction mode, the inverse 4x4 intra prediction module needs 16 prediction modes and the macroblock position within a frame (MBX, MBY).

Inverse quantization process inputs include CAVLC outputs coefficients of 16 blocks. First coefficients are organized in a 16 coefficients buffer. Then they are sending to inverse quantization component with a control signal. After 16 transfers of 16 coefficients each time, all inputs coefficients of inverse quantization are ready to start execution. For IP output, a buffer is used to put coefficients by set of 16. This Memory model is used for input and output to minimize memory size. Instead of putting all 256 coefficients in memory wait bus transfer, only 16 coefficients are in wait state. In addition to this option doesn’t affect execution time or transfer time.

Motion Estimation finds the best matching candidate block between a current macroblock and its reference frames in a search window. It can efficiently reduce the temporal redundancies. With motion estimation, we can promote the bit rate effectively by transferring the motion vectors of a MB. Thus, motion estimation is one of the most important functions in many video coding standards. In H.264/AVC, The standard supports multiple reference frames in order to find the objects which appear suddenly. Besides, it also supports variable block sizes coding in matching blocks. Although these two functions indeed increase the coding gain, both of them will greatly increase computational complexity with the comparison of previous standards which only support one or two reference frames and only one fixed MB size.

The selected frames for prediction are indicated by a reference index which is associated with the frame index in the buffer. The process of encoding which is based on the values predicted to form the best matching candidate blocks is called Motion compensation. When the best matching candidate blocks is found, it will be used to form a reference frame to be pasted on the current frame. Then, a vector called motion vector can be drawn from the reference frame. If an encoder wants to transfer a block data in Frame t, there are two ways to
get it. Let the encoder transfer all pixels of this block to decoder. Since there is not much difference between Frame \( t \) and Frame \( t-1 \), and the data of Frame \( t-1 \) had already reconstructed by a decoder and is stored in the buffers, we can take Frame \( t-1 \) as a reference and exploit the data of Frame \( t-1 \) in the decoder buffer. Thus, we just need some information, the motion vector, to construct the Frame \( t \) there are many criteria used to judge the best matching block. One of the most Widely used criteria is sum of absolute differences (SAD). The function of SAD is

\[
SAD(m, n) = \sum_{i=0}^{N-1} \sum_{j=0}^{N-1} |C(i, j) - R(i + m, j + n)|
\]

Where \((m, n)\) is the distance of the candidate block corresponding to coding block C at position \((i, j)\), and \(N\) is the macroblock size. H.264/AVC defines the maximum of \((m, n)\) as search range for different levels. The motion vector \(MV\) is defined as:

\[
MV = \arg \min_{(m, n) \in \text{search range}} SAD(m, n).
\]

CONCLUSION

In this paper, mixed architecture of H.264 decoder was developed. Hardware accelerator is inter chain and 4x4 intra chain. It contains an inter prediction, 4x4 intra prediction, inverse quantization and inverse transform. Hardware design is optimized to overcome tradeoff between video time constrain and hardware on chip area. As results, accelerator speed is greater than 20% of software speed

REFERENCES


A NOVEL SYSTEM TO PROVIDE CAB SAFETY FOR WOMEN
AND IMPLEMENTING WITH INTERNET OF THINGS

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ABSTRACT: Constructing an intelligent traffic monitoring system which depends on automatic identification of vehicles. Presently, automatic identification technology supported image and vehicle tracking falls within the lure due to its low recognition rate. Thus it is necessary to use new technologies supporting Internet of Things give a new approach for it. During this paper we tend to explore this issue and propose a possible theme. Firstly RFID technology is used. Secondly, we tend to obtain positioning information of vehicles by victimization GPS technology. Thirdly, as GPRS provides high-speed wireless IP services for mobile users, totally supporting the TCP/IP, we choose wireless GPRS theme to transmit knowledge of mobile objects. The automatic detection and transmission of knowledge provided a basic guarantee for constructing an intelligent vehicle tracking system.

Index terms--intelligent vehicle tracking, Internet of Things, RFID, GSM/GPRS, GPS

I. INTRODUCTION
Intelligent vehicle tracking system plays an important role especially for the safety of women. An efficient vehicle tracking system is designed and implemented for tracking the movement of any equipped vehicle from any location at any time. This application is targeted to a person who in emergency. Heart rate monitoring device is embedded with our application which senses the heart beat of a person driving the vehicle and if there are any abnormalities in the heart beat, then our application performs a dual role. One of the applications uses a GPS to track the location information of the user and send this location information via SMS, email simultaneously, an emergency signal is sent to Microcontroller. The in-vehicle device design works using Global Positioning System (GPS) and Global system for mobile communication / General Packet Radio Service (GSM/GPRS) technology. The device is embedded inside a vehicle whose position is determined and tracked in real-time. A microcontroller is useful here to control the GPS and GSM/GPRS modules. The vehicle tracking system uses the GPS module to get geographic coordinates at regular time intervals. The GPRS module is used to transmit and update the vehicle location to a database. A smart phone application is also developed for continuously monitoring the vehicle location. To provide security for the information provided in internet we use an RFID-based electronic identity security platform of the internet of things to realize the efficient security administration of personal network identity.

II. MATERIALS AND METHODS

2.1 INTERNET OF THINGS:
Internet of Things (IOT) semantically suggests that “a worldwide network of interconnected objects unambiguously addressable, supporting
common place communication protocols”, which may be a paradigm that is quickly gaining ground in the state of affairs of contemporary wireless telecommunications. The basic plan of this idea is that the pervasive presence around us of a range of things or objects – like (RFID) tags, sensors, actuators, mobile vehicles, etc. – which, through unique addressing schemes, area unit ready to act with every other and join forces with their neighbours to achieve common goals. Potentialities offered by the IoT change the development of an enormous variety of applications, of which can be sorted into the subsequent domains: 1. Traffic transportation and provision domain 2. Healthcare domain 3. Sensible atmosphere (home, office, plant) domain. 4. Personal and social domain. The three-tier design of the Internet of Things is as shown in Figure 1.

![Three-tier architecture of internet of things](image)

**Fig 1.** Three-tier architecture of internet of things

The lowest layer is associate object-object network, namely a network that takes use of a range of sensors, RFID to create object identification and information reading and writing between objects. This layer is information acquisition layer whose supporting technologies area unit principally EPC, RFID, etc. When data pools along, it wants transmission, wherever a second layer is forms, that is termed information transport layer. The network formation of knowledge transport layer contains wired network and wireless network, its supporting technology mainly includes GPS, GPRS, the net so on. The top layer of the net of Things is processing and data exchange layer, whose task is to complete information exchange and processing, information calculation, information storage and alternative functions. Actualization of the IoT thought into the real time is possible through the integration of many useful technologies, like EPC, RFID, GPS, GPRS, Internet, WSN etc. the subsequent is that the more introductions for the principles of those key technologies.

### 2.2 RFID and EPC

Radio Frequency Identification (RFID) systems give direct object identity sensing. They use a device (RFID tag) to receive and send remote commands. RFID systems contain tags, readers, hosts and antenna. There is a small inexpensive tag in every RFID object that has every product a novel identity. Once Associate in Nursing RFID reader sends missive of invitation signal, the RFID tag responds to the reader’s reading and writing request. RFID offers wireless communication between the tags and readers with non-line-of-sight readability, which eliminates manual information assortment and introduces the potential for automatic identification method.

### 2.3 GPRS:

The general packet radio service (GPRS), a data extension of the mobile telephone normal GSM, is emerging because the 1st true packet-switched design to allow mobile subscribers to profit from high-speed transmission rates and run information applications from their mobile terminals. it’s a GSM-based wireless packet switching technology, providing finish to finish and wide-area wireless science property, whose purpose is to supply packet-based sort of information...
services for GSM users. GPRS provides high-speed wireless science services for mobile users, fully supports the TCP/IP, dynamically allocates science addresses for the mobile sites and achieves mobile net functions. Any kind of business within the fastened net will be able to be achieved through GPRS mobile networks.

![Vehicle Tracking System]

**Fig 2.** Vehicle tracking using GPRS

**C. GPS**

GPS works as shown in Figure 3. Ground management station consists of master management station, observance station and injecting station. Master management station performs calculation of satellite annual and correction parameters of satellite clock, and injection of those information into the satellites. Furthermore it controls the satellite and issue a directive to that, and it conjointly has constant perform as a monitoring station. Observance station performs receiving satellite signals; observance the operating standing of satellites; injecting station performs injecting satellite annual and correction parameters of satellite clock.

![Diagram of GPS system]

**Fig 3.** Diagram of GPS system

**III. RESULTS**

The objective of intelligent vehicle tracking system is to actualize automatic watching for traffic vehicles. In order to succeed in this objective, we should always first solve problems. The primary one is the way to establish and find these mobile objects. Future one is the way to acquire the positions of them. At last, detected information of those mobile objects should be transmitted from outside to watching center for processing and calculation, and once mobile vehicles area unit far from cities on the far side the vary coated with web, how to carry the information for them? To solve these issues, we've designed a unique network architecture for intelligent traffic watching as shown in Figure 4.

![Network architecture]

**Fig 4.** Network architecture
IV. CONCLUSIONS

From the higher than style and analysis, we will acquire the following conclusions. Using RFID, GPS, GPRS and network technologies Internet of Things is found to construct associate intelligent traffic monitoring system, that makes the latter as a section of the former. Secondly, intelligent vehicle tracking system based on internet of Things. Thirdly, the technologies of internet of Things makes it potential that a complete automation in observation system from information observe to information transmission, and to intelligent decision-making, from vehicle management to main road congestion management.

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DEVELOPMENT OF SMALL WIRELESS SENSOR NETWORK
FOR WATER MANAGEMENT USING XBee BASED TECHNOLOGY

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Abstract: Now a days the development of contribute to unbalance of natural ecological system which leads to changes of climate condition & natural resources such as water quality & quantity. For this we use a wireless sensor network (WSN) to monitoring the quality and quantity of water. Wireless sensor networks have been achieving widespread applicability in water quality monitoring. The purpose of water quality like PH level, temperature, salinity, conductivity, fluoride, turbidity, dissolved oxygen etc is measured and sends the data to the base station or control / monitoring room. The main objective of this paper is the development of the suitable model for online monitoring the both quality & quantity of water at different water resources such as rivers, lakes, canal etc. In this paper, the essential design and realization of wireless sensor network featuring a low power consumption of the XBee primary based technology is used for transmission & reception. XBee primary based communication technology is the most recent version for zigbee. Transmission range of Zigbee technology using XBee to be improved by using XBee-PRO and 9XTend OEM RF Module. XBee used the zigbee protocol the only variation is lower cost, high power and easy to use.

Index Term— wireless sensor network, water quality & quantity monitoring, XBee technology

I. INTRODUCTION

To develop an local, intelligent support system for online monitoring of the water flow, water quality & quantity across the wireless sensor networks to generate a data pertaining to utilization of water and raising alerts in terms of alarm/messages/mails following any destruction in the safety norms for the drinking water quality and usage of amount of water. The estimated outcome shall be a new model for online, real time water monitoring system that should be used to improve efficiency of the water supply distribution network. The determination of water quality such as PH level, temperature, salinity, conductivity, fluoride, turbidity, dissolved oxygen etc is measured and sends the data to the base station or control / monitoring room. The main objective of this paper is the development of the suitable model for online monitoring the both quality & quantity of water at different water resources such as rivers, lakes, canal etc.

A currently becoming popular and widely used technology based on wireless sensor network is extensively used in this project as it is able to provide flexibility, low cost implementation and reliability. A high power transmission with a relatively low power consumption XBee PRO based wireless sensor network technology is applied in this work. XBee PRO is a communication standard for use in the wireless sensor network defined by the XBee PRO that adopting the Digi international standard for its reliable communication. It is preferred due to its features that fulfill the requirement for an inexpensive, easy to use, low power consumption and reliable data communication between sensor nodes. The GPS/GPRS are used for sending the messages/alerts/mails to the base stations.
The development of graphical user interface (GUI) for the monitoring purpose at the base monitoring station is another main component in the project. The GUI should be able to display the various parameters being monitored continuously in real time. Several measurement and performance analysis to evaluate the reliability, feasibility and effectiveness of the proposed monitoring system are also presented.

II. LITERATURE SURVEY:

Recent advances, through in wireless sensor networks have provided researchers with an easily deployable, scalable, flexible and relatively inexpensive for real time distributed data monitoring. Adhoc wireless sensor networks are self organized networks composed of a large number of sensor nodes that interact with their environment and communicate in a wireless fashion. IN the previous paper A high power transmission with a relatively high power consumption Zigbee based wireless sensor network technology is applied in this work. Zigbee is a communication standard for use in the wireless sensor network defined by the Zigbee Alliance. In this paper, the essential design and realization of wireless sensor network featuring a low power consumption of the XBee based technology is used for transmission & reception. XBee based communication technology is the most recent version for zigbee.

WIRELESS SENSOR NETWORK:

Wireless sensor network is the wide range platform due to its low cost, small size, low power consumption, flexibility, portability, scalability features. WSN’s (wireless sensor network)with advantages arrangements, collection of variety of parameters high detection accuracy and high accountability of the monitoring network etc. A wireless ad hoc sensor network consists of a number of sensors spread across a geographical area. Each sensor has wireless communication capability and some level of intelligence for signal processing and networking of the data. A WSN’s is a Ad-hoc network composed of great number of tiny low cost and low power consumption sensing nodes which are capable of sensing, calculating and communicating data. This paper develops water quality and quantity monitoring system based on wireless sensor network which is applied to artificial lake to realize remote and automatic online monitoring of temperature, turbidity, water level, and pH of lake water.

III. SYSTEM FLOW:

Master design:

Here we designed a network; under that network we connected two slaves. Two slaves are used for different base stations. These Slaves are implemented using XBee PRO and ARM 7 combination. It will work as wireless sensor networks. Various Sensors are connected to Arm 7 via inbuilt ADC and output of sensor is nothing but the measured parameters from respective slaves. Both slaves placed inside the water to acquire the different parameters.

The arm 7 is connected to the XBee PRO module through RS 232. The XBee PRO module have its range 30 meter from the slaves. By selecting the different XBee PRO module we can increase the distance between Master and the Slaves.

Entire system contains four sensors to measure four parameters of water. Temperature, turbidity, salinity & water level. These sensors are installed at each node in target area. Measured parameters are analog in nature we converted it in digital form by using inbuilt ADC. A temperature sensor LM35 was used to measure the temperature. Measured Temperature is transmitted to the XBee terminal using two Xbee modules. A ARM microcontroller handles coordination of various modules in the circuit. It can perform control in either open loop or closed-loop fashion. In open-loop control, one can adjust the frequency, the duty cycle, and the polarity (for turning purposes) of the actuation pulses remotely on a PC. In closed-loop control, the actuation voltage will be computed. The microcontroller also interfaces with the sensor. Through the Xbee PRO module, the ARM
microcontroller establishes communication with the PC.

Slave Design:

2.3 SENSOR UNIT:

A sensor unit is basically consists of several sensors used to detect the predetermined parameters that indicate the quality of water. In this work, three types of sensor; pH sensor that senses the acidity of basicity of the water, temperature sensor and turbidity sensor based on phototransistor are used. All the sensors use battery for its operation. The information being sensed by the sensors are then converted into electrical signal and go through the signal conditioning circuit that functions to make sure the voltage or current produced by the sensors is proportional to the actual values of parameters being sensed. Then it is passed to a ARM 7 microcontroller or microprocessor that processes it to the value understandable by human.

The sensor node consists of various sensors to measure the water quantity parameters like flow, velocity, pressure. These parameters which are crucial to determine the quantity & quality of potable water are logged in a central server through a gateway node.

2.4 XBee PRO UNIT:

The XBee and XBee-PRO RF Modules were engineered to meet IEEE 802.15.4 standards and support the unique needs of inexpensive, low-power wireless sensor networks. The modules require less power and provide reliable delivery of data between devices. In this paper, the fundamental design and implementation of wireless sensor network featuring a high power consumption of the XBee based technology is used for transmission & reception. XBee based communication technology is the latest version for zigbee. XBee used the zigbee protocol the only difference is lower cost, high power and easy to use. Here different sensors are used for the sensing different parameters like temperature, PH, turbidity.

The XBee-PRO900 RF module is ideally suited for low-latency point-to-multipoint networking applications. Capable of point-to-point, peer-to-peer and point-to-multipoint networking, the XBee-900 is best solutions where RF saturation and absolute transmission distance are dominant to the application.

The features of the XBee PRO 900 RF module is: The frequency band is 900 MHz The interference immunity is used the frequency hop spread spectrum (FHSS). The data rate is up to 250 Kbps. The distance is Up to 1 mile (1600 m), up to 2500 ft (750 m) international variant. The voltage level is up to 3.6 V DC.
IV. SYSTEM CONFIGURATION

The examined system is a wireless sensor network deployed for monitoring of a water distribution and supply system. The sensor network consists of 520 plus sensor nodes monitoring flow and pressure of a nodes system. These nodes are distributed with in roughly 50sq.km. The majority of the sensor nodes are deployed water lakes, rivers, seas etc. All nodes including their sensors, radios and loggers are commercially manufactured and are designed to be water proof. Electronics within these were custom made with the possibility for minor imperfections. Each sensor node is equipped with a GSM modem capable of GPRS data connectivity. Data collected by individual sensor nodes are relayed via a public GSM/GPRS network. Sensor nodes are powered using a battery pack with an estimated lifetime of approximately twenty four months.

GPS is a positioning service, while GPRS is a data service used in mobile phones. GPS is used to identify your location on earth, while GPRS is used to access emails, and to browse the internet. GPS communicates with a collection of satellites that orbit the earth, while GPRS communicates with a terrestrial tower. GPS requires three or more stations to work, while GPRS requires just one.

2.6 SOFTWARE DESIGN:

GUI (graphical user interface) software is employed to get the stable remote access to observance the real time control and monitoring the variable rate irrigation controller. GUI is the most developed software is a kind of interface that enables user to interact with electronic device through graphical icons and visual indicators. It’s accustomed to interface the hardware and software modules to the wireless sensor nodes. It’s associate to interface for logging data from the different sensor nodes.

The actions in a GUI are usually performed through direct manipulation of the graphical parts. additionally to computers, GUIs are often found in hand-held devices like MP3 players, media players, gaming devices office and industry devices. The term "GUI" tends to not be alternative low-resolution kinds of interfaces with slow resolutions, such as video games (where HUD is preferred), it is with in the tradition of the pc science research at the PARC (Palo Alto Research Center). Here, for monitoring the water quality and quantity while taking the different inputs from sensors nodes.

V. CONCLUSION

Overall, the proposed in this paper, implementation of high power XBee PRO based WSN for water quality and quantity monitoring system offering low power consumption with high reliability is presented. The utilization of high power WSN is suitable for activities in industries involving large area monitoring such as built-up, construct, mining etc. Another important fact of this system is the simple installation of the system where the base station can be placed at the local residence close to the target area and the monitoring task can be done by any person with minimal training at the beginning of the system installation. Performance modeling is completely different environment is one important aspect to be studied in the future as different kind of monitoring application requires different configuration during system installation and techniques.

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HANDLING LOCK HOLDER PREEMPTION FOR COEXISTING GPOS&RTOS ON EMBEDDED VIRTUALIZATION LAYER

ABSTRACT

The real time resource management with in the Linux kernel is dramatically improving as a result of the real time Linux community. The development of the commercial products involves the reusing of existing real time applications in embedded systems without increasing their cost because the real time applications run on real time OSes who’s OS API is completely different from the POSIX interface. A VMM that executes multiple operating systems at the same time is the promising solution, but presently existing virtual machine monitors such as Xen and KVM are firm to be used for embedded systems due to their through put oriented design and complexities. vlk, which is a light weight processor abstraction layer it provides the virtual CPU’s for the guest operating systems and schedules them according to their priorities. Sometimes vlk schedules Linux with a low priority and RTOS with a high priority. The performance degradation problem caused by LHP is common every virtualization layer. Delayed preemption mechanism is used to resolve LHP. DPM mostly based on the Para-virtualization technology because it does not waste the CPU time and also implement with less effort. Well at all introduced the hardware based solution called spin detection buffer for detecting the meaningless spin of vCPUs produced by LHP. Some earlier proposals can avoid this problem, but none of them cares about the real-time responsiveness of guest OSes. So the approaches are not suitable for embedded systems. We have developed a new method for avoiding the LHP problem. The approach can ensure both the real time responsiveness of RTOS and the high through put of GPOS that supports shared memory multi processors.

INTRODUCTION

Real-time embedded systems like smart phones become highly efficient along with the enhancements of CPUs target in their market. But their worthless features introduced substantial engineering cost. The key difficulty in the expansion of such devices comes from the incompatible requirement of them: low latency and high throughput must be established in one system. This requirement is tough to satisfy with existing OSes, because all of them are considered as either Real-Time Operating System (RTOS) or General Purpose Operating System (GPOS). RTOSes, like eCos TOPPERS1, are designed and developed for executing real-time tasks such as processing wireless communication protocols. In a distinctive case, these tasks run periodically for short time. The feature of executing such deadline sensitive tasks depends on on the limitation to RTOSes. For example, most RTOSes cannot change the number of tasks vigorously. On the other hand GPOSes, like Linux, are designed and developed for executing tasks which contain of major amount of computation. Some of them in desktop computers are latency sensitive is offering the comfortable experience to users, but missing deadlines is not deadly for them. The impact from the real time Linux community has significantly improved the real-time resource management capability of Linux. However, there is always a compromise between satisfy in real-time constraints and achieving maximum throughput .In order to develop such a modern real-time embedded system which needs to fulfill conflicting
requirements, combining multiple OSes on a virtual machine monitor can be an effective approach. Virtual machine monitors, e.g. KVM, Xen and VMware, are traditionally used in the area of data center or desktop computing for executing multiple OS instances in one physical machine. Their ability of executing multiple OSes is also smart for embedded systems because they make it possible to implement the system which has multiple OS behaviors. If there is a virtualization layer which has a capability of executing GPOS and RTOS in one physical machine, development of real-time embedded systems can be simpler. In [2], Armand and Gien presented several requirements for a virtualization layer to be suitable for embedded systems:

1. It should execute a current operating system and its maintained applications in a virtualized environment, such that modifications required to the operating system are minimized, and performance overhead is as low as possible.
2. It should be straightforward to move from one version of an operating system to another one; this is especially important to keep up with frequent Linux evolutions.
3. It should reuse built-in device drivers from their existing execution environments with no modification.
4. It should support existing legacy often real-time operating systems and their applications while guaranteeing their deterministic real-time behavior.

There is no open source virtualization layer that has a capability to satisfy above all requirements. VirtualLogix2 VLX is a virtualization layer designed for combining RTOS and GPOS, but it is proprietary software. OKL4 microvisor is a microkernel based virtualization technology for embedded systems, but performs poorly as the nature of microkernels. In addition, we found that there is fatal performance degradation of guest OSes when RTOS and SMP GPOS share the same physical CPU. This performance problem comes from the phenomenon called Lock Holder Preemption (LHP). It is a general phenomenon of virtualization layers, hence a solution for this problem was already proposed. However these existing solutions only focus on the throughput of guest OSes, therefore the virtualization layers that execute RTOSes cannot adopt these solutions. To the best of our knowledge, there is no virtualization layer that can execute RTOS and GPOS on a multicore processor without performance degradation caused by LHP, and is distributed as open source software. Our laboratory is developing an open source virtualization layer for combining RTOS and Linux on embedded systems that adopt multicore processors, named vlk (vCPU Layer in Kernel), a forked project from our original project named SPUMONE. During the development of this virtualization layer, we faced many difficulties specific to embedded systems. They come from the limitation of hardware resources, the requirement of engineering cost, or scheduling RTOS and SMP GPOS on the same CPU. Because of these difficulties, we believe that virtualization layers for real-time embedded systems should be developed as open source software for incorporating various insights from a wide range of community.

### Basic Architecture

#### 3.1 User-Level Guest OS vs. Kernel Level Guest OS:

There are many traditional approaches to execute multiple operating systems on a single processor in order to comprise multiple functionalities. Microkernels implement guest OS kernels at the user level. When using microkernels, various remote instructions, traps and interrupts in the OS kernel need to be virtualized by transferring their code. In addition, since OS kernels are to be executed as user level tasks, The OS kernel communicated with
application tasks via inter-process communication. Therefore, many parts of the OS need to be modified. VMMs are another approach to execute multiple OSes. If a processor offers a hardware virtualization support, all instructions that need to be virtualized trigger traps to VMM. This makes it possible to use any OSes without any modification. But if the hardware virtualization support is incomplete, certain instructions still need to be complemented by replacing some code to virtualize them. Most of the processors used for the embedded systems only have two protection levels. So when kernels are situated in the privileged level, they are tough to isolate. On the other hand, if the kernels are located in the user level, the kernels need to be modified significantly. Most of embedded system industries prefer not to modify a large amount of the source code of their OSes, so it is desirable to put them in the privileged level. Also, the virtualization of MMU introduces significant overhead if the virtualization is implemented by software. Therefore, we need reorder mechanisms to reduce the engineering cost, to ensure the reliability of the kernels and to exploit some advanced characteristics of multicore processors.

**vlk: A Multicore Processor based Virtualization Layer for Embedded Systems**

vlk is a thin software layer for multiplexing a single physical CPU(pCPU) core into multiple virtual CPU(vCPU) cores. The current target processor of vlk is the SH4a architecture, which is very similar to the MIPS architecture, and is adopted in various Japanese embedded system products. Also, standard Linux and various RTOSes support this processor. The latest version of vlk runs on a single and multicore SH4a chip. Currently, SMP Linux, TOPPERS, and the L4 are running on vlk as a guest OS. The basic abstraction of vlk is vCPU as depicted in Figure 1. In the example of this figure, vlk hosts two guest OSes, Linux and RTOS. Linux has two vCPUs, vCPU0 and vCPU1. vCPU0 is executed by pCPU0 and vCPU1 is executed by pCPU1. RTOS has one vCPU, vCPU2. This is executed by pCPU1. So both vCPU1 and vCPU2 are executed on pCPU1. Unlike typical microkernels or VMMs, vlk itself and guest OS kernels are executed in the privileged level.

Since vlk provides an interface slightly different from the one of the underlying processor, we simply modify the source code of guest OS kernels, a method known as Para-virtualization. This means that some privileged instructions should be replaced to hypervisor calls, function calls to invoke vlk API, but the number of replacements is very small. Thus, it is very easy to port a new guest OS or to upgrade the version of a guest OS on vlk. vlk does not virtualize peripheral devices because traditional approaches incur significant overhead that most of embedded systems could not tolerate. In vlk, since device drivers are implemented in the kernel level, they do not need to be modified when the device is not shared by multiple OSes.

![Figure 1. An Overview of vlk](image)

**LITERATURE SURVEY**

**SPUMONE**

The method we are trying to establish is for a virtual machine monitor called SPUMONE [1]. This is a Para-virtualization technology that works as a thin abstraction layer between hardware and OSes. Virtualization technology categorized into Para-virtualization requires modification of guest OSes,
but overhead of the virtualization layer is relatively low. In SPUMONE, each OS runs on a vCPU provided and scheduled by SPUMONE. The vCPU scheduler is activated by interrupt and through the sleep instruction of guest OSes. When the guest OSes issue a sleep instruction, SPUMONE selects the next runnable vCPU assigned to its physical CPU (pCPU). If there is no runnable vCPU, a special vCPU representing an idle state is executed just like the idle task of traditional OSes. And when interrupt is raised, SPUMONE delivers it to the vCPU which the interrupt number is assigned to. SPUMONE leverages the interrupt priority mechanism of hardware. Thanks to this mechanism, it is possible to mask interrupts partially. The interrupt controller judges which interrupts should be masked based on their priority. For example, if we assume that there are two devices with different priorities, one being the timer device which rises an interrupt periodically and the other being the Ethernet controller which rises an interrupt when it receives a frame, if a high priority is assigned to the timer device and a low one to the Ethernet controller, the interrupt service routine of the OS processing the interrupt of the timer device can mask the interrupt of the Ethernet device. This feature is key to implementing SPUMONE. In the example described above, if the RTOS is assigned the timer device and GPOS the Ethernet device, SPUMONE delivers timer interrupts to the vCPU of the RTOS, triggering its execution. If the Ethernet controller receives a frame and tries to raise an interrupt during the execution of the RTOS, the pCPU will not be interrupted by the Ethernet controller because the priority of the timer device is higher than the one of the Ethernet controller. This interrupt priority mechanism is a common feature of CPU targeting embedded systems. Our test environment, SH-4A, provides it, as well as ARM-based processors. As the description above implies, SPUMONE requires modifying the source code of guest OSes. The amount of modification is however very small: only the entry of interrupt service routine and functions for issuing sleep instruction. There is several similar works focusing on combining a RTOS and a GPOS together. RTLinux [3] treats Linux as an idle task of the real-time OS. Linux is therefore allowed to run when there is no real-time task to run. Adeos [2], targeting the x86 architecture, enables running multi OSes on one system without modification of guest OSes. It only requires inserting kernel module, but highly depends on the unused privilege levels of the x86 Architecture.

III. PROBLEM STATEMENT: MULTICORE SPECIFIC

PERFORMANCE PROBLEM

SPUMONE is a successful technology on single core environment. But on multicore systems, depicted in Fig.1, a critical performance degradation of the GPOS is observed. Fig.2 is the result of running the backbench benchmark. The leftmost bar, labeled 4 cores, is the score of Linux running on 4 dedicated physical cores. The rightmost bar, labeled 3 cores, is the score of Linux running on 3 dedicated physical cores. The bars in the middle, labeled with percentages, are the scores of Linux running on top of 4 physical cores while sharing one core with the RTOS.
The percentage describes the CPU time consumed by the RTOS. As this graph describes, when the CPU time consumption of the RTOS is larger than 70%, the scores of hack bench is lower than when Linux is running on 3 cores only. This performance degradation occurs because of the Lock Holder Preemption (LHP) [4] phenomenon. In general, LHP is caused by preemption of the vCPU executing a thread holding a busy-wait mutex (e.g. spinlock). LHP causes a significant waste of time because when other vCPUs try to acquire the lock acquired by preempted vCPU, the vCPU holding the lock cannot continue to execute the critical section protected by the lock because it is preempted. Therefore, other vCPUs trying to acquire the lock will spin in vain until the blocked vCPU is scheduled again and finally releases the lock, provoking the observed performance degradation. There is also another problem related to LHP. OSes running on a multicore processor use Inter Core Interrupt (ICI) for some types of synchronization. For example, ICI is used for TLB shootdown. In a virtualized environment, this can cause significant performance degradation or deadlock if the destination vCPU is preempted.

CONCLUSION
The traditional way to solve the LHP problem is co-scheduling [6]. Co-scheduling was originally designed for multi process programs frequently interacting with each other via IPC. A scheduler implementing this method tries to execute processes communicating with each other in same time slice, so that occurrence of blocking by IPC and overhead of context switch is reduced. Today, co-scheduling is used for scheduling virtual machines to avoid LHP. For example, VMWare [7] employs a customized version of this method. However, co-scheduling still wastes a non-negligible amount of CPU resource, so some projects explored other ways to solve this problem. Uhlig, et al proposed a method to avoid LHP in both Para-virtualization and full virtualization in [4]. The method for Para-virtualization is indicating the holding of a lock by a guest OSes with flags of the VMM. If the flags indicate the thread of a guest OS is holding a lock, the VMM never preempts the guest OS but sets another flag indicating delayed preemption. When the thread of the guest OS releases the lock, it checks the delayed preemption flag, which, if turned on, yields the CPU to another VM. This method is efficient for virtualization environments containing GPOSes only, but cannot be applied to RTOSes because it causes delay in interrupt delivery. Wells et al. proposed another method to avoid LHP using extended hardware in [5]. The extended hardware component, called Spin Detection Buffer (SDB), features eight content-addressable memory entries that can hold unique stores and loads instruction. During a given period it records stores and loads. If the entries are not full, SDB indicates that a thread of a guest OS is holding a lock. All these work introduces an extra delay to the real-time responsiveness of guest OSes, so these techniques cannot be applied in a satisfactory manner to embedded systems.

References


EMBEDDEDDEVICE AS A SERVICE:
NEW PARADIGM IN CLOUD COMPUTING

ABSTRACT

Deploying an embedded system to act as a controller for electronics is not new. Now-a-days these types of systems are all around us and are used for a multiple of purposes. In distinction, cloud computing may be comparatively new approach for Computing as a whole. This thesis project discussed these two technologies so as to make a bridge between these two widely completely different platforms. Therefore a bridge should enable new ways of exposing features and doing maintenance on embedded devices. This could save companies not only time and money while dealing with maintenance tasks for embedded systems, However this cloud additionally avoid the required to host this maintenance software systems on dedicated servers – rather these tasks could use cloud resources only if required. This paper explores such type of bridge and presents techniques suitable for joining these two computing paradigms together.

Cloud computing is an Internet based computing wherever resources unit area shared and maintained at datacenters that might be geographically located across globe. One will rent a virtual server, needed memory, OS, applications or load his own software’s on that and access it from any part of the world as per his uses. Data will be stored and secured in these data-centers which may be accessed by authorized users. It’s modified the total worlds scenario from owning private computers and servers in a private network to on-demand access network of shared computing re-sources with minimum management burden to prospective users, therefore cloud is an merger of a number of most effective computing technologies and processes for reliable, resilient and secure applications. Embedded Cloud computing is the new dimension in cloud computing arising from the merging of the Embedded computing with it. Most of the tiny embedded systems will be joined (wired/wireless) which may communicate and perform the job. However those systems might have an upper hand on the cloud, then most of the processing might be shifted to the cloud server and various data centers that will be reducing the load of
devices. Embedded device as a service is the proposed model in this paper.

1 INTRODUCTION

1.1 CLOUD COMPUTING

Cloud computing has over the previous few years become a serious platform for companies due to its ability to reduce costs and because this model leads to a managed IT infrastructure that may be used to dynamically provision and dimensional services. The cloud consists of both hardware and software which is provided by a data center for which a customer pays only for the resources that they use. Cloud computing make use of virtual machines (VMs) running on clusters of computers. Computing has seen changes over decades. Cloud computing will be able to use applications through the internet, which may be reached using a Web browser, where as the business pertaining software’s and data are stored on servers which is a totally remote location. From mainframe computing to client-server model, it has cleverly picked up some of the similarities from autonomic computing, grid computing, utility computing and many more which have been the major contributors of this master mind. In fact, the cloud is a metaphor for Internet. Cloud computing is described as a “pay as you go model,” which means the system is often right-sized. You pay only for what you use.

1.2 EMBEDDED COMPUTING

Embedded systems are deployed in various situations to act as controllers. Such systems are quite accepted today. These systems are completely different in designs, capabilities, and usage. While connecting these systems to the Internet, it has been done by varying degrees, however in various cases these systems have only been connected to internal networks. Enabling these systems to secure the function which is used as Internet enabled devices that require consideration of the embedded systems. Now-a-days an increasing fraction of these embedded systems are being connected to the Internet and form an Internet of things. An embedded system is a computer system that is created for specific controlling functions which is installed in a larger system with real-time computing constraints. It is embedded as part of a device that includes hardware and mechanical parts. By contrast, a general-purpose computer, such as a personal computer (PC), is designed to be flexible. At present, embedded systems
control various number of devices in common use today. Embedded computing seeks to design architectures that can execute particular applications functions like protocols, signal processing, user interface and so on.

1. LITERATURE REVIEW

1.3 CLOUD COMPUTING ARCHITECTURES

The Architecture of cloud computing is depends on Front end and Back end. The front end is the one which is able to notice the clients and the back end is the cloud itself made up of storage devices, servers etc. The cloud-based solution which allows you to access any of the remote devices, anywhere, anytime, from any devices. Accessing your devices through desktop, someone else’s computer or a Smartphone allows for device and location independence. The cloud that offers a way for companies to pursue opportunities quickly and cost effectively. Before cloud services, software developers had to develop or buy, configure, and maintain their own servers and software applications. The cloud provides the ability to deploy a cloud based solution quickly and easily with little to no capital expenditure accelerating time to market. The important feature which we look in a cloud solution is Hardware Agnostic looks for vendors who offer a hardware agnostic platform.

Apart from these architectural layers, the cloud is also deployed in various models such as Public, Private and Hybrid Cloud. Public cloud is already out on internet and Private cloud is private to a particular organization. Public cloud is mostly managed by organizations which deal multiple users at a time with the help of virtualization. Data is secure and multiple requests are dealt at a common platform of cloud. It is much larger than Private cloud. Private cloud is mostly for single client with total control on security, data and service. Hybrid cloud is basically the combination of both public and private clouds. Private cloud is enhanced with resources of a Public cloud and helps to maintain a better reliability and broader functioning of the cloud. Though its a complex structure because it should be judged, the distribution of the application to run on which model, whether Public or Private cloud. It is really advantageous when large resources need small computing on Public cloud.
1.4 CURRENT CLOUD SERVICES

1.4.1 IaaS

Infrastructure as a service (IaaS) In IaaS, the user utilizes "fundamental computing resources" such as processing power, storage, networking components, or middleware. The consumer can control the operating system, storage, and deployed applications. IaaS customers are often companies with extensive IT expertise who desire access to computing power but don’t want to be responsible for installing or maintaining the hardware. Cloud computing derives this feature from well known Utility Computing. In utility computing, computing resources such as storage and services are charged on the amount of time you use. Like the meters in houses to measure the unit of electricity, water, cooking gas etc. This model has advantages like you need not have to own resources and maintain them, instead rent them. There would not be in any trouble for licensing of software’s, hardware’s and other network issues. IaaS requires the benefits from this existing architecture. This is the foundation of cloud services. It needs high technical competency and involves IT architects who can very well provide Infrastructure as a Service to customers. It is based on On-Demand model or pay-for-use model. It helps an enterprise to have a virtual infrastructure and services. Customers can handle their infrastructural needs sitting in any part of the world with the help of just one console. A group of IT experts is a necessity to provide infrastructure services with resources like server, storage and network. These resources are the upper layer of infrastructure managed by the user.

![Figure 2.1: An example topology of a IaaS provider.](image)

1.4.2 PaaS

Platform as a service (PaaS) PaaS is a cloud-based platform that companies can use to develop their custom applications or write software that integrates with existing applications. The user controls the applications running within the environment (and possibly has some control over the hosting environment), but does not control
the operating system, hardware or network infrastructure that they are running on. PaaS is currently the smallest segment of the cloud computing market and is often used by established companies looking to outsource a piece of their infrastructure. Platform provided to the developers is the core area to design software’s. It provides a sort of framework for applications and hence it’s not unwise to call PaaS a kind of Framework Computing. Applications designated for definite platforms cannot run on other platforms. There is no need to worry about the underlying architecture, one can create applications with necessary tools and requirements, and put to use in disposal environment. This facilitates a rapid development and disposal of applications. Development environments include IDEs which are configured or integrated to PaaS for designing, building and validating of applications. Net beans, Microsoft Visual Studio and others as well are connected to components of PaaS and helps in development of applications on the platform.

Figure 2.3: An example topology of a PaaS provider.

1.4.3 SaaS

Software as a service (SaaS) SaaS is the largest and most mature part of the delivery model within the cloud and is an application, or suite of applications, that reside in the cloud instead of on a user’s hard drive or device. Google Maps, Salesforce.Com, and Shutter fly are examples of commonly used SaaS applications. It offers specific software based solutions running in the cloud. Customers can choose from applications such as email and other collaboration tools to be used by thin clients and/or end users. A simple example is the Gmail email service offered by Google and used by users via their web browsers.
1.5 EMBEDDED SYSTEM DESIGN

Embedded System Design is unique because it is a hardware-software co-design problem. Both, software and hardware must be designed to together to make sure that the implementation functions properly and is reliable and cost effective. Wayne Wolf describes four major tasks that are:

1. Partitioning function to be implemented in interacting and smaller pieces.
2. Allocating function is implemented directly in hardware and software running on microprocessor.
3. Scheduling function is times at which functions are executed, which is important when single hardware unit is shared.

There are various issues in designing of embedded systems such as hardware software partitioning, fabrication of hardware-software development, code design and simulation etc. Hence an easy embedded prototyping board was chosen for the purpose of interfacing. Embedded prototyping board is a series of microcontroller’s development boards designed for fast, flexible and low-risk and professional rapid prototyping.

2 PROPOSED CLOUD ARCHITECTURE

IaaS has the feature of lending OS, memory, network and other physical resources. Devices can also be considered a separate physical entity. But in PaaS, you deploy...
your code and APIs associated will help to program the device. Hence, EDaS has a domain overlapping the both services. Using IaaS is deployed in the project but using PaaS is yet to be explored.

4 CONCLUSIONS AND FUTURE WORK

In this paper embedded devices interfacing with cloud computing by using hardware-software partitioning functions and embedded prototyping board, then the proposed model in this paper is Embedded Device as a Service (EDaS). This paper also presented and evaluated the deployment of a solution to bridge use of embedded systems by users via a cloud deployed service. This creates an environment in which the end users will be able to interact with embedded systems via a fault tolerant solution creating new capabilities for interaction. An embedded cloud design is presented that consists of distributable Process Description Language (PDL), Distributed Middleware (DiMiWa), and an infrastructure. As a result, PDL can execute distributed processes and share resources as services over heterogeneous IoT devices with help of DiMiWa and the infrastructure. Modern mobile phones uses cloud services to extend their resources, such as iCloud on Apple devices and Sky Drive on Microsoft devices. Embedded Devices can thus be monitored and managed from any location and collected data shared with multiple applications which also reside in the cloud—a key consideration for industrial automation projects.

3 REFERENCES


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A Security to vehicles using Smartphone Networks

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Abstract:
Modern vehicles area unit progressively being interconnected with 
that collect information from conveyance sources and net services. 
Badly, this creates a non-negligible attack surface, that extends once vehicles area 
unit partially operated via smartphones. During this letter, a hierarchically 
distributed system design that integrates a smartphone with classical embedded systems 
is bestowed, and Associate in ad-hoc, end-to-end security layer is intended to demonstrate how 
a smartphone will move firmly with a contemporary vehicle while not requiring modifications 
to the present in-vehicle network. Experimental results demonstrate the effectiveness of the 
approach.

1. Introduction
The current trend in automotive product and services is to improve the accessibility of the vehicles 
through novel services, that need an affiliation to some Internet-based source. This can be used to 
gather information on the external environment (e.g., traffic conditions, weather forecasts, vehicle 
position and orientation, usually integrated inside the on-board vehicle management systems), and to 
supply "infotainment" services. In doing thus, the new devices that act with the vehicle (e.g., modern 
motion-picture show systems, GSM, and Bluetooth connections) lead to an accumulated 
attack surface, which can alter associate degree adversary to interrupt into the vehicle itself, inflicting 
severe safety hazards. Recently, many researchers highlighted this facet and with success attacks 
against totally different vehicles every of those works showed that it absolutely was doable to take 
management of sure functionalities of the vehicle, and interfere with safety-critical or sensitive 
elements. These vulnerabilities hamper novel solutions (e.g., smartphones to unlock the vehicle door 
or to start out the engine), because of the risk of flourishing attacks. Adding security mechanisms to 
vehicles could be a difficult task, because the connected embedded architectures are ordinarily 
designed with safety needs rather than security ones in mind. Additionally, the obtainable computing 
resources area unit generally tailored to suit tightly to the control systems desires, so as to limit the 
prices. This clearly restricts the choices on the market for adding a security layer in later design phases. 
Recently, however, security requirements are becoming additional and additional priority, 
particularly in the communication between embedded computers with ad-hoc wireless networks. In this 
letter, we tend to take into account a smartphone-in-the-loop vehicle architecture within the use case of 
a simple machine vehicle. We propose a security answer that protect against attacks by addressing the 
challenges raised higher than, meeting each performance and period constraints. what is more, we tend
to express the capabilities of the target design under consideration (i.e., no input capabilities on the vehicle aspect, restricted output capabilities, and lack of a sure execution surroundings on the mobile device). Our projected answer permits a smartphone to determine a secure session layer over associate insecure radio affiliation, which provides further security guarantees notwithstanding these security mechanisms already enforced within the physical layer (if any). As a result, the complete application layer is transparently secured. The relevance and also the effectiveness of the projected solution is supported by experimental results.

2. System Architecture

The system design into account directly relates to the vehicle management logic. The management logic can be split into two main stages: the “high-level” stage take cares of the vehicle motion and energy management, whereas the “low-level” stage takes care of information acquisition and exploit. This layout is of common in complicated automotive management systems, as they’re typically characterised by cascade structures that exploit the frequency-separation paradigm so as to decouple nested management loops. Consequently, we have a tendency to translate the logical division between the two management loops into a technological separation. The high-level and therefore the low-level management routines run on completely different devices, so resulting in a hierarchically distributed control system. The border between these two levels of abstraction may be derived in step with completely different policies like computational concerns, questions of safety, technological constraints. Clearly, the two subsystems should share information. As a consequence, a channel that guarantees the study and interconnection between the two subsystems is needed. The system design comprises two main components. The primary component is the entrance electronic management unit (ECU), that is physically mounted on the vehicle, that runs the low-level management logic communicates with sensors and associate degrade actuators via an in-vehicle network (e.g., the will bus). The entrance is provided with a radio interface that enables wireless communication between the in-vehicle network and external devices. The second part is an external device that works closely with the vehicle ECUs via the radio interface. In our situation, the external device could be a mobile device that runs the high-level management routines and acts as a driver-to-vehicle interface. This paradigm is extremely appealing and is gaining increasing interest among vehicle makers, as drivers are unit probably to be already aware of mobile apps, and because this methodology facilitates each package updates and the integration with different web-based services. We with success enforcement, the same system design. Specifically, we have a tendency to enforce an intelligence vary extender for light-weight electrical vehicles, with the goal of optimizing the energy consumption by actively modifying the vehicle dynamic behavior. This task is accomplished with a two-layer structure. A high-level controller keeps track of a reference profile, for the battery state of charge (SoC). The profile is generated by taking into consideration the route length and its elevation profile. The mobile device implements the SoC controller among associate degree ad-hoc app that we have a tendency to develop, that includes navigation options that leverage on Internet-based services (e.g., Google Maps API). Furthermore, the low-level management loops enforce speed and acceleration constraints (and in, which permit to satisfy the specified energy consumption profile. The low-level controllers act on the gas handle gap to ensure that the resurgent behaviour of the vehicle (i.e., speed and acceleration) is unbroken within the prescribed limits. The entrance and executes the low-level management loops on a 16-bits PIC microcontroller with a central processing unit speed of twenty million instructions per second, and communicates with sensors and actuators via bus. The mobile device communicate via a Bluetooth layer. They exchange both format and time period management information. Format data is packed.
into a forty-eight bytes frame and therefore the communication is unidirectional—from the mobile device to the entry one. On the contrary, the time period communication is bidirectional: The entry one sends a 64-bytes payload each zero.2 s (5 Hz), whereas the mobile device communicates a 6-bytes control-data packet whenever the vehicle travels fifty m. Simulation results and experimental information collected on a image lightweight two-wheeled electric vehicle prove the effectiveness and therefore the hardness of the projected approach. The vehicle equipped with the SoC controller saves about 200th of the energy equipped by the battery, with relation to a nominal driving behaviour.

3. Issues

In the same situation, the mobile device and also the Gateway EU (Electronic Unit) exchange sensitive knowledge. If this knowledge is compromised by Associate in Nursing someone, then the practicality of the management system, and so the vehicle “driveability” could also be severely affected: Depending on the attacker’s skills, the driving force even may loose the management of the vehicle. Our focus is on the Bluetooth layer. The protocol encompasses a two-phase session setup: when the pairing method, that permits the peers urge to grasp every other and got wind of the network properties, the particular communication is enabled. Reckoning on the protocol version, different security features are out there. However, the first Bluetooth standard and its successors, with the introduction of the secure simple pairing (SSP) protocol, suffer from varied security vulnerabilities thanks to weak cryptographical primitives. The protection of most Bluetooth applications (e.g., in embedded scenarios) depends on a static PIN solely, with no thanks to modify it.

4. Secure Layer Services

Given the applying state of affairs and also the same security issues, it's necessary to plan an application-level security mechanism that mitigates the vulnerabilities that exist the wireless link. Such security layer should be free from the underlying wireless layer and should permit secure communication between the mobile device and also the vehicle. In our attack model the mortal is aware of the radio protocol in use, and is ready to transmit and receive discrete information packets on the radio interface. The objective of the wrongdoer is to get access to the information changed between
the vehicle and also the mobile device, and ultimately manipulate the EU execution flow. We concentrate on the applying layer. Therefore, attacks against the physical layer (e.g., jamming) or attacks that need physical, even temporary, access to the vehicle (e.g., forceful shutdown) fall outside the scope of our security layer.

A. Secure Analysis

We derive the necessities of our security layer through the evaluation of the appliance situation by means of that trust domains and trust relationships between human action parties (or entities). A party is taken into account a trustworthy domain if we have a tendency to trust its correct processing and execution of the package implementation, and therefore its integrity. Otherwise, we have a tendency to contemplate the party as associate untrusted domain. Betting on the characteristics and also the security properties of the communication between entities, we can define trustworthy relationships (or accepted dependence) between entities. Our answer is intended to account for security flaws (e.g., unknown knowledge leaks) or dependencies of the appliance layer on proprietary elements of an entry.

B. Secure Session Layer

Our security layer follows the two-stage protocol. The primary stage sets up associate end-to-end relationship between each application layers (i.e., on the mobile device and on the ECU). Owing to the constraints of the state of affairs (e.g., distribution of the mobile application through app stores, property capabilities of the ECU), we have a tendency to don't assume any precomputed, static credentials or scientific discipline keys on the mobile device, nor use a public-key infrastructure on the ECU: solely the vehicle’s owner is ready to initiate the primary stage by sanctioning the one-off authorization procedure on the vehicle’s facet. For example, this procedure may be enabled by pushing a button—only reachable mistreatment the vehicle key. A classic PIN-based procedure is not continuously possible, owing to the restricted input capabilities on the EU facet (e.g., absence of keypads). At intervals a brief time span the EU accepts a mobile device’s identity and therefore the user receives the identity information of the EU. The second stage ensures that the period of time communication necessities are met. To the current finish, it implements a radially symmetrical scientific discipline scheme that establishes a secure communication session. The radially symmetrical session secret is derived from the semipermanent secret changed throughout the primary stage, and some random knowledge generated on the mobile device. We enforced our two-stage approach on the entry ECU’s microcontroller. We have a tendency to use a ECDH key-establishment scheme (asymmetric cryptography) on a homogenous curve (NIST P-192). For every authentication method, the mobile device computes a replacement random key set and transmits the corresponding public key to the EU. In distinction to the key set of the mobile device, the EU possesses a static semipermanent key set for the key institution theme. For the session cryptography, we have a tendency to enforce AES during a chaining block cipher
(CBC) mode with a 128-bit key. The key-derivation function is enforced per the quality and provides a recent 128-bit radially symmetrical key for every session. For the implementation of our security layer on the mobile device, we choose the OpenSSL library. Besides these two scientific discipline schemes, we have a tendency to enforce the SHA-1 hash operate and outlined a protocol structure for the mixing during a communication protocol stack.

C. Secure evaluation

Our answer will mitigate the protection threats beneath the human model. The goal of our security layer is to forestall attacks through the radio interface. As our answer implements cryptographic session layer, that removes the dependency from proprietary implementations, dramatically reducing the risk of exploitation. Though the offender obtains access to the ECU via the radio interface, the appliance information is encrypted with the session key. The offender has less possibilities of getting the cryptanalytic, long-run secret, than in a very regular Bluetooth pairing. Specifically, a man-in-the-middle attack is troublesome to conduct: the offender would want to be among the communication range: 1) throughout the heritage Bluetooth pairing process; and 2) throughout the primary stage of our security protocol (i.e., the exchange of the general public keys). Solely the vehicle owner will alter the authorization method for a mobile device (e.g., in his own garage) and, a lot of significantly, among a predefined and short time span. Rather than compromising the ECU’s security layer, an attacker could perform an infatuated attack against the mobile device (e.g., mobile malware). Our security framework addresses this type of security threat by providing the cryptanalytic mechanisms under the developer’s authority and is versatile with respect to future updates to the mobile device or OS. In fact, we tend to square measure ready to amendment any cryptanalytic primitive or protocol so as to shield from actual or future vulnerabilities. We assume that the protection of the mobile applications—and so of our security layer—is supported the integrity of operating system and its services.

5. Results

In this section, we tend to gift the experimental results and justify our planned answer. In our experimental setting, the entry is put in on a light-weight, electric simple machine vehicle present in production and made by Piaggio. The entry ECU implements intelligent, range-extending algorithms. Our security protocol has the two main operating modes: pairing and payload exchange. Pairing is active once the mobile device is paired with the vehicle, when the standard Bluetooth pairing mechanism has taken place. In pairing mode, we tend to measure the performance of the uneven cryptography each on the mobile device and on the entry, and also the performance of the key-generation routine (on the mobile device). The payload exchange mode activates once the AES key are literally changed, and encrypted or secret writing takes place. During this mode, we analyze the performance of the secret writing (on the mobile device) and also the performance of the secret writing. The payload consists of 64 bytes of information, which has an artifact theme for supporting discretionary payload size. The pairing could be a one-shot task, whereas the system ordinarily works in payload-exchange mode. At runtime, the payload exchange must satisfy period constraints. Here, the bottleneck lies within the Bluetooth stack, as a result of the AES encryption-decryption of the 64 bytes payload is dead whenever one in every of the peers transmits or receives a message via Bluetooth (i.e., every 200 ms). To check its performance, we tend to collected runtime information each on a machine and on a true implementation on the take a look at vehicle, to ensure a correct
characterization. Each at runtime and pairing time, the execution time could be an important performance indicator. The results support the practicability of the projected approach in sensible applications. Of course, the bottleneck of the key exchange is that the entry EU attributable to its lower computer hardware speed: The execution time is just about an 130ms—20 times larger than the common time recorded on the mobile device.

6. Future Work

In this paper it's same that the present system is of going solely in the case of two wheelers and myproposed one is that for four wheelers to underneath go sure changes like vehicle detection, broadcasting, temperature identification, weather statement, trafficking, signalling, bluetooth identification in vehicles whereas in motion and jointly describes the identification of the gap between one vehicle to the opposite one. This provides U.S.A. clarity regarding what the longer term work on the vehicles by exploitation smartphone technologies and networks. By this the upgrading of phones takes place and improvement in code takes place. By this the whole networking gets improved and jointly provides clarity however managing of those sources takes place i.e via bluetooth or wi-fi.....GSM etc... vehicular resources that area unit stopped by the road facet also are determined exploitation smartphone to smartphone association i.e by end-to-end adhoc association.

7. Conclusion

Finally we tend to associate during this paper that it's an fashionable connection to smartphone bound technological version of the realm in networking section with an automotive embedded networking background. We tend to design enforce and evaluate the protection layer over the smartphone association from bluetooth to entry and thus extend it to a lot of security issues connected like whether or not prediction, approximately distance between vehicles, accidental sensations, busy roads, vehicular sources stopped by road facet etc... Hence this will be done in such simplest way.

8. References


ROBUST AND ECONOMICAL TECHNIQUE TO EXTRACT ROADS FROM SATELLITE PICTURES

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ABSTRACT: Image classification is an important research area in computer vision. Organizing images into semantic categories can be extremely useful for searching and browsing through large collections of images. Road information has a fundamental role in modern society. In today’s world of growing population, the need for urban planning is very high. Road extraction from optical satellite images is an economic and efficient way to obtain and update a transportation database is explained, its extraction can be of great help. This paper presents an integrated method to extract urban main-road from satellite optical images. The other applications of road extraction are: Identification of isolated buildings that need to be detected and updating of GIS database according to the requirements of the human expertise. In this method, roads are extracted solely based on their color. The steps in the algorithm are easy to follow and implement. It is also less time consuming and an automatic method.

Key Words: Multi spectral Image, Median Filtering, Morphological Operations, Edge Detection.

INTRODUCTION

The Road extraction from digital pictures has drawn a special attention within the previous couple of decades. Various ways has been developed which has semi automatic and automatic road extraction. Image classification is a very important analysis space within the field of image process. pictures are classified in line with the visual and discourse information gift in it. it's a difficult task in varied application domains, as well as satellite image classification, syntactic pattern recognition, diagnosis, biometry, video surveillance, vehicle navigation, industrial visual scrutiny, vehicle navigation etc. Image classification becomes terribly troublesome if pictures contains bleary and noise. Another drawback in image
classification is that several classification ways depend upon the scene complexity. i.e., if large amount of objects are in image, then it's difficult to categorize.

Road extraction plays one among the key roles in vehicle navigation system, urban coming up with, disaster management system and traffic management system relating to the betterment of human lives. Thus, the necessity for road extraction employing a sturdy and economical methodology is additionally high. Currently, there are some ways to extract roads manually and mechanically. Road extraction explained during this paper depends solely on the colour of the road. The advantage of this methodology is that road pictures from any style of satellite may be used provided it's more than 0.5m resolution. Here, the images considered are multispectral images. Multispectral images are those pictures that accommodates 3 or additional spectral bands. Any type of roads may be extracted supported their color. The algorithmic rule is implemented using MATLAB. The main disadvantage of the various higher than given ways is that the issue to supply the most effective parameters for a particular given image. The remaining part of the paper is organized as follows. The planned steps and extraction algorithms are explained.

**PROPOSED ALGORITHM**

The first step during this technique is that the creation of a database. Multi Spectral image is taken as the input database. The input image should contain multi spectral road images whose road intensity values are in a particular range. By considering totally different intensity ranges for any type of roads can be extracted.

The basic steps concerned during this technique are given. The essential steps concerned are: the conversion of a vector image to a scalar image using spectral angle, the scalar image is filtered employing a median filter to get rid of noises that affects satellite pictures, filtered image is regenerate into a binary image, the binary image still contains some noise which is removed using morphological operations. The edges of the extracted road will be determined and finally the extracted road is overlaid onto the initial image.

![Basic Steps Envolved](image)

**Road Extraction algorithm** –

The various steps within the extraction algorithm is explained below

All multispectral images are thought-about as a vector since it contains 3 or additional spectral bands. Processing of an image as a vector is kind of troublesome. so as to convert a multispectral image into a scalar there are several strategies however here we have a tendency to use spectral angle to convert the multispectral image to scalar. The spectral angle of a picture is given clearly in. The spectral angle of a picture is determined victimization the spectral band, r is that the reference component and p is that the current component of a selected spectral band. Figure
shows the spectral angle image of a picture from the info. The 2 vital benefits of victimization spectral angle for conversion are: (i) the formula rely solely on the spectral angle and not on the quantity of spectral bands gift within the image, therefore this technique is applied to multispectral pictures with any range of spectral bands (ii) supported the reference component elite, any variety of roads is extracted. The roads to be extracted are either tarred or dirt tracks. The output for the spectral angle is the image will be in darker color. On the spectral angle image median filtering is finished to get rid of the noise that affects the satellite image. Once considering differing kinds of filters, median filter is that the most apt one to cut back noise in satellite image. Figure shows the image when median filtering. The filtered image is then born-again into a binary image for simple and quick process. The edge for binary conversion is 0.07. The image when changing it into a binary image. The binary image still contains several unwanted pixels. Morphological operations are applied on the image to remove the unwanted signals. Morphological operations removes unwanted pixels supported the foreground and therefore the background of a picture. The importance of morphological operations is additional clearly understood by relating. Since the operations are done on the binary image. The MATLAB operator used for binary image is ‘bwshape’. The image obtained when applying morphological operations is given in Figure. When applying the morphological operations we get the clean roads however it's vital to get the edges of those roads for clear identification of the roads. Gradient filter is employed for the edge detection and therefore the variety of operator used for the detection is ‘Sobel’. Sobel operator is employed as a result of the perimeters is extracted with larger accuracy. The edges of the roads are shown in Figure. The ultimate step is to overlay the extracted road onto the scalar image of the first image. Overlaying of the result helps as an instance the accuracy of the road extraction. In the final image, the skinny lines indicate the ways of roads within the image. the Final image is evolved.

**EXPERIMENT AND RESULT**

The database for road extraction will be created based on the colour of the roads. the photographs will purchased from companies selling satellite pictures or the apt free pictures from net will be downloaded. MATLAB 7.10 software package platform is employed to perform the road extraction. The scale pictures used is 512* 512. From the Figure below it's clear that some of the objects apart from roads are detected. This is often as a result of those objects are having the colour among the particular range of roads. These objects might be little components of barren land and parking tons.
CONCLUSION

The roads play an important role in urban designing. The formula introduced is automatic one. It needs solely little interaction from the users. The formula was enforced to notice roadways from satellite pictures with resolution greater than 0.5m. The vital and key parameter of this formula is that the color of the roads within the data base. Different types of roads will be extracted supported this formula. Since extraction is alone supported color, some of the barren lands and little areas of parking lots also are being extracted. This is often as a result of the locations even has the same constituent intensity values as that of roads. Totally different techniques like usage of Digital Elevation Models (DEM), active contours and computer science ways may be enclosed to get rid of the unwanted objects that are being extracted. The formula enforced is quick, strong and simple to know and implement.

REFERENCES

COMPRESSIVE OBJECT TRACKING – A REVIEW AND ANALYSIS BASED ON HUMAN COMPUTER INTERACTION

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Abstract: The objective of this article is to audit the tracking strategies, characterize them into distinctive classifications, further more distinguish new patterns. To give an improvement to the solution of drift problem in online tracking a separate section called compression tracking has been chosen. In this survey, we have taken various compressive tracking techniques along with their working, merits and demerits. Most of the methods include object segmentation using background subtraction. The following methods use diverse strategies like Mean-shift, Kalman filter, Particle filter etc. This paper presents a survey on compressive object tracking using the state of art models used. The designed models which are successfully applied using compressive sensing concepts reduces the number of pixels and these methods are efficient in feature extraction and dimensionality reduction with high accuracy.

Keywords: compressive tracking; background subtraction; particle filter; visual tracking

I. INTRODUCTION

An object tracking system is used generally for the observation of persons or objects on the move and supplying a timely ordered sequence of respective location data to a model. Object tracking, generally finds its use in videos. It is the process of locating a moving object (or multiple objects) over time using a camera. It has a variety of uses, some of which are: human-computer interaction, security and surveillance, video communication and compression, augmented reality, traffic control, medical imaging and video editing. It additionally estimates the movement of an object in a picture plane because it moves around a scene. There has been an incredible propagation of video surveillance camera in public locations like stores, ATMs, highways, traffic signals, schools, buses, subway stations, and airports so as to sight and track the moving objects. Detection and tracking of moving objects is extremely necessary to watch public transportation, and important assets. In the environments under surveillance monitoring, background gets changing frequently for this reason, it is necessary to update the value in the background images. First of all, in the real time video tracking the object has to get separated from the background and then the tracking has to be made. For this kind of segmentation various approaches are available and the discussions about the various approaches are explained in this paper. Tracking is an important research topic in computer vision and it has been studied for several decades. In this survey paper, the studies that are related to our work are summarized. Tracking the non-stationary appearance of objects with different pose, illumination variations and occlusions still remains a challenging task for the researchers’ community.

The general object tracking methods are classified into three categories, namely, point tracking, kernel tracking and Silhouette tracking. In point tracking, the objects detected in consecutive frames are described by points, and therefore the association of the points relies on the previous object state which might embrace object position and motion. This approach needs an external mechanism to observe the objects in each frame. In Kernel tracking, kernel refers to the object form and look, for instance, the kernel may be an oblong guide ortemplate elliptical form with an associated histogram. Objects are half-tracked by computing the motion of the kernel in consecutive frames. This motion is sometimes within the sort of a constant quantity transformation like quantity transformation like translation, rotation, and affine. In Silhouette tracking, tracking is performed by estimating the object region in every frame. Silhouette following ways use them knowledge encoded within the object region. This information is often within the kind of look density and form models that are sometimes within the kind of edge maps.

II. COMPRESSIVE OBJECT TRACKING TECHNIQUES

1. Compressive Target Tracking using Particle Filtering Method:

Tracking multiple targets in video is a classic problem in many areas. It is challenging for a variety of reasons, including camera movement, illumination variability, occlusions and not the least, the large dimensionality of the observed signal. It then becomes feasible to apply a number of estimation methods in order to find the target locations. They address sequential estimation, i.e. the filtering problem.

If the dynamics and/or the observations are nonlinear but the noise remains Gaussian, then the unscented Kalman filter (UKF) proposed by E.Wan et al [2] is used currently as one of the best solutions. But still it leads to large errors in the true posterior mean and covariance of the transformed Gaussian random variable (GRV), which may lead to sub-optimal performance and sometimes divergence of the filter.
Fig 1: General object tracking methods [1]

One for each target, still to improve the performance without undue complexity, they look at compressive sensing [3], which allows to the exact reconstruction of sparse signals from a small number of incoherent measurements, typically by solving an L1 minimization problem. It is assumed that compressive sensing is only a low-dimensional subspace of the state changes so that re-estimation is carried out whenever the prediction residual increases beyond a threshold. If they consider using a standard Kalman filter in the reduced state subspace [4], the compressive measurements are used for multi-view tracking. But still it has problem, where compressive sensing inversion needs to be performed at every time step.

Recently E.Wang et al [5] proposed a system which is made effective by applying compressive sensing ideas in a multi-particle-filter frame-work, it is possible to preserve tracking performance while achieving considerable dimensionality reduction, avoiding costly feature extraction procedures. Additionally, the target locations are estimated directly, without the need to reconstruct each image. This can be done using linear measurements which, under certain conditions, preserve crucial observability properties.

2. Compressive Sensing Used for Object Tracking in Video Sequences

Now a day’s video surveillance systems are widely used in many places like airports, banks, shops, traffic monitoring and within the premises of private houses so as to track an object or entities. However, this form of tracking is useful for the security purposes, but still it affects the privacy of an individual. Dufaux et al. [6] proposed an efficient privacy enabling technology for Motion JPEG 2000 videos which consists of scrambling the transform-domain coefficients of the regions of interest in a video sequence. Moreover, since there are some problems in recovering the full scene once the encryption key is made available at the decoder. In the same way, Chan et al. [7] observed that it is not necessary to capture individuals’ identity to perform this task. In fact, it could be sufficient to segment the crowd in order to find the average person dimension, and to track the motion of people as a whole regardless of individuals. Moreover, Rachlin and Baron [8] proposed the secrecy of compressive sensing measurements. They asserted that acquiring, transmitting and storing the video sequence in the projection domain is computationally secure, it means that the random projections enable decoding and any kind of further processing. In fact, even though CS cannot achieve a perfect security level. But Cevher et al. [9] had shown that CS can be effectively used to perform background subtraction in the projection domain, provided that the background estimator is linear.

Cossalter et al [10] proposed a new coding scheme suitable for video surveillance applications that allows tracking of video objects without the need to reconstruct the sequence, thus enabling privacy protection. At the decoder, they exploit the sparsity that characterizes background subtracted images in order to recover the location of the foreground object. In addition, by leveraging compressive sensing, they achieve compression, encoding a limited number of random projections, as well as secrecy.

3. Compressive Sensing Used for Radar Tracking

Compressive sensing and processing of radar waveforms enables high-resolution tracking while using low sampling rates and inexpensive processing. Compressive sensing enables the analog to information conversion of signals that sample them well below the Nyquist rate. The processing is performed using the compressive samples which are much less in number than the Nyquist rate samples. Compressive processing, however, results in an increase in estimation error as compared to processing the recovered signal or the signal sampled at Nyquist as per Davenport et al. [11]. In a delay-Doppler estimation problem, the estimation error is due to an increase in the sidelobes of the AF associated with the transmitted waveform. This AF structure deterioration will in turn increase tracking error. To overcome the above mentioned drawbacks, Ioannis Kyriakides [12] proposed a compressive sensing and processing is applied to single target tracking. Moreover, estimation using compressively sampled and processed Bjorck CAZAC sequences is shown to be improved over estimation using linear frequency modulated waveforms sampled at the Nyquist rate. This shows that low-rate acquisition and processing maintains reliable tracking performance at high resolution, while simplifying the receiver and reducing computational expense using adaptive scheme.

Compressive sampling is performed in a single step after having considered all available information. As per the above information it is found that Ioannis Kyriakides [13] had proposed an effective adaptive compressive sensing and processing scheme, applied to the radar tracking problem. The adaptive scheme naturally incorporates sequentially updated information on target state that is readily available from a
particle filter based tracker. The proposed method is shown to improve tracking performance as compared to a non-adaptive scheme, while maintaining a low sampling rate and a computationally inexpensive operation.

4. Improved Adaptive Compressive Sensing and Processing (ACSP) Method

Compressive sensing is able to preserve information in a waveform while sampling it at a sub-Nyquist rate. Compressive processing is then performed on the low-dimensional compressively sensed measurements, instead of using reconstruction [14] that is followed by higher dimensional processing. CSP, however, although simple to implement, increases estimation error as compared to Nyquist sensing and processing (NSP) according to Davenport et al [11] and Kyriakides [12]. Tracking performance when using CSP can be improved by utilizing available tracking information such as information coming from the target’s motion model and past measurements. The proposal of Kyriakides [12,15] an adaptive compressive acquisition method was proposed, utilizing information available from the estimated probability distribution of the target state.

This implementation of ACSP identifies a set of delay-Doppler shifts that are likely to appear in the radar return waveform with nonzero probability. Although this ACSP method was shown to reduce tracking error versus non-adaptive CSP, it roughly approximated the distribution of the target state to be uniformly distributed with fixed parameters throughout the duration of the tracking scenario. This resulted in a fixed sized dictionary of delay-Doppler shifts.

To improve estimation performance an adaptive compressive sensing and processing (ACSP) method is proposed by Kyriakides [16] that creates a dictionary containing delay-Doppler shifts likely to be found in the radar return waveform according to tracking information. This improved ACSP method improves tracking performance by adapting the size and content of the dictionary compared to non-adaptive CSP and a fixed sized dictionary ACSP method. The method demonstrates the improvement in tracking performance when adjusting the size of the delay-Doppler dictionary based on tracking information when using a fixed dictionary size.

5. Compressive Sensing Method Used For Visual Tracking

Visual tracking essentially deals with non-stationary data, both the target object and the background, that change over time. Most existing algorithms are able to track objects, either previously viewed or not, in short durations and in well controlled environments. However, these algorithms usually fail to observe the object motion or have significant drift after some period of time, due to drastic change in the object’s appearance or large lighting variation in its surroundings. Although such situations can be ameliorated with recourse to richer representations, effective prediction schemes or combination, most algorithms typically operate on the premise that the model of the target object does not change drastically over time. The main challenge of visual tracking can be attributed to the difficulty in handling the appearance variability of a target object. Intrinsic appearance variability includes pose variation and shape deformation, whereas extrinsic illumination change, camera motion, camera viewpoint, and occlusions inevitably cause large appearance variation. Due to the nature of the tracking problem, it is imperative for a robust algorithm to model such appearance variation.

To enhance the robustness of such object trackers, realizing the limitations Isard et al [17] introduced particle filters to visual tracking and presented the Condensation algorithm for contour tracking in which multiple plausible interpretations are propagated over time. This probabilistic approach has demonstrated success in tracking the outline of target objects. However, the representation scheme employed (curves or splines) ignores the internal appearance of the target, and is not updated to account for variations in its appearance, due to pose or illumination change.

Supervised discriminative methods used for classification and regression have also been exploited to solve visual tracking problems. Avidan [18] developed a tracking algorithm that employs the support vector machine (SVM) classifier within a optic flow framework. Although this algorithm has demonstrated success in tracking specific objects, e.g., cars from a mounted camera in a moving vehicle, significant effort is required in training a SVM. Later, Williams et al [19] developed a method in which an SVM-based regressor was used for tracking. As a result of training the regressor on in-plane image motion, this method is not effective in tracking objects with out-of-plane movements. A more elaborate mixture model fit via an online EM algorithm was recently proposed by Jepson et al. [20], in which three components were used to model the responses of wavelet filters, and thereby account for appearance variation during tracking. However, their appearance model treats pixels within the target region independently (ignoring their covariance) and thus does not have notion of the “thing” being tracked. This can result in modelling background rather than the foreground, thereby failing to track the target object.

Later very recently David et al [21] proposed a method that, during visual tracking, which employs two method for correctly updating the sample mean, and a forgetting factor to ensure less modeling power is expended fitting older observations. Both of these features contribute measurably to improving overall tracking performance. Recently T.Bai et al [22] proposed a structured compressive sensing based tracking algorithm for intelligent optical sensing, which exploits the random feature reduction and the structured sparse representation of the target visual appearances. The efficiency of the tracker is improved by a random feature reduction together with the Block Orthogonal Matching Pursuit (BOMP) algorithm. This method can achieve a more efficient tracking...
without losing the robustness compared to the reference trackers.

6. Visual tracking via Sparse Representation

Compressive sensing or sparse representation has played a fundamental role in many research areas. The problem is to exploit the compressibility and sparsity of the true signal and use a lower sampling frequency than the Shannon-Nyquist rate. Sparsity then leads to efficient estimation, compression, dimensionality reduction, and modelling. Roughly speaking, compressive sensing is a technique for reconstructing a signal (e.g., an image) using the prior knowledge that the reconstruction is sparse or compressible. With this technique, the signal is represented by a sparse set of basis functions. That is, all of the coefficients corresponding to the basis functions vanish except for a few. The challenges in designing a robust visual tracking algorithm are caused by the presence of noise, occlusion, varying viewpoints, background clutter, and illumination changes. Williams et al [23] extended the use of statistical learning algorithms for object localization. This approach is demonstrated in real-time tracking systems where the sparsity of the RVM means that only a fraction of CPU time is required to track at frame rate.

However, problem of automatically recognizing human faces from frontal views with varying expression and illumination, as well as occlusion and disguise. These problems are solved by Wright et al [24]. This new framework provides two crucial issues in face recognition: feature extraction and robustness to occlusion. The theory of sparse representation helps predict how much occlusion the recognition algorithm can handle and how to choose the training images to maximize robustness to occlusion. The problem is that the full potential of sparsity in robust object detection and recognition together is yet to be uncovered.

In the same way, Xue Mei et al [25] proposed a robust visual tracking method by casting tracking as a sparse approximation problem in a particle filter framework. Specifically, to find the tracking target in a new frame, each target candidate is sparsely represented in the space spanned by target templates and trivial templates. The sparsity is achieved by solving an $l_1$-regularized least-squares problem. The proposed approach demonstrates excellent performance in comparison with previously proposed trackers. Still there are some problem in simultaneous tracking and recognition.

Recently, T. Zhang et al [26] formulate object tracking in a particle filter framework as a multi-task sparse learning problem, which is denoted as Multi-Task Tracking (MTT). Since the model particles as linear combinations of dictionary templates that are updated dynamically, learning the representation of each particle is considered a single task in MTT. Compared with regular exhaustive search-based methods, the main advantage of Monte Carlo sampling methods is the reduction of sampling patches. Lan Wang et al [27] proposed an effective method for Markov Chain Monte Carlo (MCMC) sampling on compressive sensing on visual tracking discriminative Haar-like features are extracted from the high dimension feature space by using compressive sensing. The extraction of features reduces the computation complexity and guarantees the real time of tracking. These algorithms will provide the accuracy, robustness, and speed.

7. Background Subtraction In Compressive Sensing

Background subtraction is fundamental step in automatically detecting and tracking moving objects with applications in surveillance, teleconferencing and even 3D modeling. In all applications that require background subtraction, the background and the test images are fully sampled using a conventional camera. After the foreground estimation, the remaining background images are either discarded or embedded back into the background model as part of a learning scheme. A motion detection algorithm begins with the segmentation part where foreground or moving objects are segmented from the background. The simplest way to implement this is to take an image as background and take the frames obtained at the time $t$, denoted by $f(t)$ to compare with the background image $[28]$.

Lamarre et al [29] proposed background subtraction algorithm that uses multiple competing hidden-Markov models (HMMs) over small neighbourhoods to maintain a valid background model in all situations. They used the DCT coefficients of JPEG encoded images directly to minimize computation and to use local information in a principled way. Later Piccardi [30] presented a review about various background subtraction methods. Many video sources, however, are in a compressed format before processing. W.Wang et al [31] proposed an approach to construct background models directly from compressed video. The proposed approach utilizes the information from DCT coefficients at block level to construct accurate background models at pixel level. This method is accurate and has lowest computational cost.

Aggarwal et al [32] presented a fast and robust method for moving object tracking directly in the compressed domain using features available in MPEG videos. But several issues are addressed like handling of full occlusions, fast camera motion, multiple object tracking and unsupervised tracking of objects. In the same way Uttam et al [33] considered the background subtraction from adaptive compressive measurements, with the assumption that the background-subtracted images lie in a low-dimensional subspace. While this assumption is acceptable when image tiling is performed, background-subtracted images are sparse in an appropriate domain, spanning a union of low-dimensional subspaces rather than a single subspace.

Recently Garrett et al [34] proposed a method that adaptively chooses the number of compressive measurements collected based on cross validation (CV) theory in CS. Their contribution extended the use of CV techniques to the estimation of time varying signals and provided a practical algorithm for adaptively changing the data rate of the system in response to scene activity.
8. Kernel Based Tracking using Compression

One of the more general-purpose image processing operations is to convolve an image with a kernel. A kernel is essentially a template describing a local neighbourhood, where the elements of the kernel specify the local weightings given to each neighbouring pixel, and each pixel of the input image is replaced by the convolution of its neighbourhood with the kernel. A general purpose convolution allows for the application of Gaussian smoothing, local averaging, edge detection, Laplacian functions, and many other so-called kernel operations.

Comaniciu et al [35] introduced a new framework for efficient tracking of non-rigid objects. A kernel-based tracking technique introduced, uses the basin of attraction of the similarity function. They employed a metric derived from the Bhattacharyya coefficient as similarity measure, and use the mean shift procedure to perform the optimization. Generally semi-parametric kernel density estimation techniques are adopted. This technique fails under cases of occlusion. Vinay et al [36] proposed an improved kernel based object tracking by performing the localization using a generalized (bidirectional) mean shift based optimization. This makes the method resilient to occlusions. However, it is difficult to update this target model which is explained by Shen et al [37] presented the target representation’s fragility by breaking these trackers over a long image sequence.

Shen et al [38] proposed a novel approach to kernel based visual tracking, which performed better than conventional single-view kernel trackers [37]. They proposed a support vector machine (SVM) and the generalized mean shift (MS) tracker and then implemented by maximizing the classification score. Compared with the plain MS tracker, it is much easier to incorporate on-line template adaptation to cope with inherent changes during the course of tracking. Sam Hare et al [39] applied a method that used a kernelized structured output support vector machine (SVM), which was trained online to provide adaptive tracking and also introduced a budgeting mechanism which prevented the unbounded growth in the number of support vectors which would otherwise occur during tracking. To reduce visual drift problem which was encountered in object tracking, a two-stage sparse representation method was proposed by Yan et al [40] to improve the performance of the classifier and robustness of the algorithm, the kernel function was applied on the sparse representation. Moreover, the dimension of the target was reduced via compressive sensing.

In order to have more accuracy using kernel concept we can consider the concepts proposed by Dehshibi et al [41] a method for kernel-based object tracking in order to deal with partial occlusion. They used particle filter to estimate target position accurately. The incremental Bhattacharyya Dissimilarity (IBD) based stage was designed to consistently distinguish the particles located in the object region from the others placed in the background. The performance of this method was evaluated for real world scenarios.

9. Compressive Tracking in Real Time Scenario

The objective of real time tracking is to associate target objects in consecutive video frames. The complexity of the problem is when the tracked object changes orientation over time. Real time tracking is the process of locating a moving object (or multiple objects) over time using a camera. Adding further to the complexity is the possible need to use object recognition techniques for tracking. For these situations video tracking systems usually employ a motion model which describes how the image of the target might change for different possible motions of the object.

Various researches have done effective real time video compression. Dorin et al [42] proposed a new method for real-time tracking based on the mean shift iterations and found the most probable target position in the current frame. The dissimilarity between the target model and the target candidates is expressed by a metric derived from the Bhattacharyya coefficient. But still there was some drifting problem with these approaches. Later Grabner et al [43] employed ideas from semi-supervised learning and on-line boosting for feature selection. Thus so trained on-line classifier was used in a tracking framework in order to discriminate the object from the background. The knowledge from labelled data can be used to build a on-line classifier and they had demonstrated successful tracking of different objects in real-time on various challenging sequences.

Babenko et al [44] addressed the problem of tracking an object in a video given its location in the first frame and no other information. They used a “tracking by detection” technique where these methods train a discriminative classifier in an online manner to separate the object from the background. And also proposed a novel online MIL algorithm for object tracking that achieved superior results with real-time performance. However Li at el [45] addressed the problems in l1 tracker to provide the solution to those problems by proposing real-time compressive sensing tracking (RTCST) by exploiting the signal recovery power of compressive sensing (CS). Dimensionality reduction and a customized orthogonal matching pursuit (OMP) algorithm were adopted to accelerate the CS tracking. RTCST still produces competitive tracking accuracy compared to the l1 tracker.

Wu et al [46] proposed an effective and efficient tracking algorithm integrating motion estimation appearance model based tracking in the compressed domain. The idea is that the features are extracted from the multi-scale image feature space based on compressive sensing theories. The motion information has been integrated into appearance model based tracking by introducing motion estimator, i.e, particle filter. In the year 2014, Zhang et al [47] and made more effective and efficient compressive tracking. A very sparse measurement matrix is constructed to efficiently extract the features for the appearance model, where they compressed the sample images of the foreground target and the background using the same sparse measurement matrix. The tracking task is formulated as a binary classification via a Naive Bayes classifier with online update in the compressed domain. The proposed compressive
tracking algorithm runs in real-time and performed challenging sequences in terms of efficiency, accuracy and robustness.

III.DISCUSION AND CONCLUSION

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<td>-</td>
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</tr>
<tr>
<td>Yan et al [40]</td>
<td>Dimensionality reduction and kernel sparse representation</td>
<td>Effective Compression and robust object tracking and solve drift problems</td>
<td>-</td>
<td>SR is between 82% - 99%</td>
<td>ATE &lt; 12 %</td>
</tr>
<tr>
<td>Li et al [45]</td>
<td>Real-Time Compressive Sensing Tracking And Orthogonal Matching Pursuit (OMP) Algorithm</td>
<td>Consistently highest accuracy and robustness among all the compared tracking algorithms.</td>
<td>more accurate and robust results have to achieved.</td>
<td>-</td>
<td>ATE &lt; 30%</td>
</tr>
<tr>
<td>Zhang et al [47]</td>
<td>Fast Compressive Tracking</td>
<td>Track the right objects accurately</td>
<td>-</td>
<td>SR = 99%</td>
<td>Centre LER &lt; 10%</td>
</tr>
</tbody>
</table>

TABLE I: Comparison of Compressive Object Tracking Based On Accuracy And Error Rate

Specifically, in visual tracking a structured compressive sensing based tracking algorithm for intelligent optical sensing, this exploits the random feature reduction and the structured sparse representation of the target visual appearances in the real time scenarios. However, there is a need for more efficient solutions can be made by using very sparse measurement matrix that is constructed to efficiently extract the features for the appearance model used in compressive tracking applications. Overall, we believe that additional sources of information, in particular prior and contextual information, should be exploited whenever possible to attenu the tracker to the particular scenario in which it is used.

In conclusion, we show a broad overview of item following systems furthermore give a concise audit of related points. We isolate the compressive tracking method into various categories based on the use of this method in various applications like visual tracking, real time tracking, kernel based tracking. Radar tracking. We also discussed detailed about the background subtraction which is very much need in tracking scenarios for subtracting the target objects from the background. We have pointed out various Troubles in tracking objects that are emerging because of camera movement, illumination variability, occlusions non rigid object structures, pose variation and shape deformation.In this survey, we provided a detailed summary on different methods (like particle filtering, Kalman filter etc.) in various scenarios to overcome the troubles that we mentioned above.

At the end of this paper, a discussion is made to point the future work needed to improve the tracking algorithm for object detection and recognition under high occlusion. Furthermore, we will investigate proficient recognition modules for persistent tracking (where items vanish and return after a drawn out stretch of time). We expect that this survey on compressive tracking in video with rich theoretical details of the tracking methods along with bibliography contents will...
give valuable contribution to research works on object tracking and encourage new research.

IV. REFERENCES

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Design of an Autonomous Vehicle for Precision Agriculture using Sensor Technology

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ABSTRACT: To avoid the various problems which affects the crop production, an autonomous vehicle is to be designed and used for crop transplanting and yielding, weed detection, crop protection, soil moisture properties, water status, temperature monitoring, fertilization and pesticides with their resource usage and also special focus on control and data monitoring with the embedded system. Some of the challenges and considerations on the use of these sensors and its technologies for crop production are also discussed in this paper. Fiber optic gyroscopes and multiple resolvers are employed to acquire the data for enhancing the accuracy of target positioning and in order to evaluate there is a method which describes the behavior of agricultural automation vehicle traveling along paths of any curvature.

Keywords- Precision Agriculture, Autonomous Vehicle, Fiber Optic Gyroscope, Sensors, Service Unit, SLAM Algorithm.

I. INTRODUCTION

Precision agriculture (PA) is an innovative; the fundamental requirement of the agricultural modernization is to improve the efficiency of agriculture production without affecting these various factors. In the agriculture automation technology is to correct identification and positioning for the agriculture objects with trajectory of tracking problems. The data which is monitored recorded automatically, accumulated easily and effectively is the basis to implement in precision agriculture. But the technology is playing an important and increasing role from past several years. Recently, the advent of different autonomous vehicles ranging from different fields of operations was developed in the industry, but all these products available are commercial and impressive having a substantial cost (depending upon their accuracy and functionality) to farmer.

The fully autonomous of all vehicle operations carried out by all control routines and this control relies on a central processing unit for coordination which was developed by many systems. But these systems have high unit cost due to high demands on the processing unit of this design place. A number of electronic components on agriculture equipment increases during the situations in the normal field and the spray rate controllers, variable rate planter controllers, and implement system controllers as well as controls are interact with a normal vehicle operation. This results a creation of standard communication link within all agricultural equipment. Therefore, a new methodology was needed in the agriculture autonomous vehicle which quantifies any auto-steering system level performance and different solutions are classified according to their accuracy and reliability [1, 13].

II. EXISTING METHODOLOGY

In the existing methodology of an autonomous robot was developed by the API platform, which is able to survey an agricultural field autonomously and the robot is four-wheel drive and four-wheel steered as shown in Figure 1. The autonomous navigation of the vehicle is obtained by the crop and weed density measurements. For further processing of this information is done by combining the data into a digital map of the field.

The GPS, gyros, magnetometer and odometers was used in the equipment of the robot, in order to determine the exact location for image taking, as well as to estimate of the robot’s position and orientation for a tracking algorithm was facilitated with providing these measurements [12]. Actuation is obtained only by drive on four wheel assemblies but not with steering. The platform is connected to a base station for enabling farmer supervision and on-line data transmission.

![Fig 1: The API Platform](image-url)
The API platform is equipped with a high resolution camera in order to map the growth and density of crops and weeds and also analyzing single plants at different growth stages implying that the position of the inspection camera must be accurate within few centimeters. This platform must move between the rows to avoid the damage on crops. So, the vehicle precision must be high, to operate in the field and its mapping can be done in a fixed spatial grid or by use of adaptive route planning. For further treatment, all pictures have to be transferred to the base station within a time.

Some of the platform requirements based on these functionalities are considered in which robustness, reliability, safety and accuracy are major requirements in the field because this will not provide a satisfactory solution from the normal laboratory prototype equipment [2].

The Control, Reliability and Safety Issues are considered in an open environment; the platform has to move autonomous where unknown obstacles potentially can be in the vehicle moving direction, so there is necessity to require a high and reliable platform-self-control solution.

III. PROPOSED METHODOLOGY

In our proposed work, there is a need to add the additional hardware components and also consider some important aspects of software while designing an autonomous vehicle.

3.1 Software

In the system design, there are three kinds of operating models including regular collection model, threshold alarm and real time inquiry model [3].

3.1.1 Structure of Software System

The µC/OS-II is a portable, scalable and preemptive operating system kernel that can be embedded into ROM and can carry out multi-tasks. It is widely used in microprocessors, microcontroller and digital signal processor. The structure of software system is shown as Figure 2.

3.1.2 Optimization of µC/OS-II

According to the application difference of system, the operating system needs to be clipped and optimized, and this optimized system can not only save expenditure of system resource but also create better overall performance. µC/OS-II is an embedded RTOS (real-time operating system) that can be clipped and configured depending on different needs of application, and the functions that are not used temporarily can be closed, thus not only saving memory space but also improving the overall efficiency of the system [3].

3.1.3 Flow Chart of Node Software

In this system there are two kinds of nodes. One is sensor node for collecting information of sensors; another is data central node for receiving data sent from sensor nodes and completing communication with computer.

3.1.3.1 Design of data central node software

If the system gets off the ground to initialize then hardware protocol begins to establish network after initialization. Firstly set up network in accordance with the sensor node list and modify lists through communication among sensor nodes. Then check whether there are new sensor nodes that are waiting for accession to network and complete the upgrade of network. Finally, operate the protocol tasks after successful accession to network, receive node data and sent them to PC. If the number of times it is a failure exceeds regulate done in the process of establishment, and the next one should continue. The flow chart is shown as in Figure 3.

Fig 2: System Information.
3.1.3.2 Design of sensor node software

Sensor nodes are mainly used for collecting sensors’ data, receiving control data from data center and uploading collected data to data central node. If there is no transceiving of data, the nodes will enter into dormant state with the least power consumption.

The hardware and protocol initialization is to be done after the system initialization. Protocol tasks are carried out after successful loading. After judgment of tasks, the sensor’s data is to be measured and are sent to data center node. Then the next task is undertaken after the node enters into dormant state [3]. The establishment of network fails if the number of times exceeds the regulated one. The flow chart is shown as Figure 4.

After completion of connection to the network, the data from each node is received and this data is sent to the embedded module via serial port [4]. And then sends processed data to a remote control center through a network in Figure 5.
An additional hardware component required in autonomous vehicles is discussed below:

3.2.1 Multimodal Sensor

In precision agriculture, soil characteristics play an important role for the absorption and desorption of water and nutrient ions, nutrient solution changes in surface soil area, deep soil area, and near roots area have different behavior and time delay by the hour or day [5]. Therefore, a pinpoint measurement is required in precision agriculture. So, in our proposed work rather than using a normal temperature sensor in precision agriculture, we have to replace with a miniaturized and insertion type multimodal sensor used for precise control of the plants growth conditions in medium culture measures directly.

The diffused solution in soil and the time lag between supplying solution and soil condition change were visualized by using the multimodal sensor in actual cultivation environment, for the first time [5].

The multimodal sensor chip integrated with an electrical conductivity (EC) sensor and temperature sensor for pinpoint measurement using Si large-scale integration (LSI) processes [15], and also the chip was bonded on the PCB package with the size of 8 mm and the length of 300 mm was designed to be capable of insertion, as shown in Figure 6.

3.2.2 Soil Moisture Sensor

Focusing on soil moisture monitoring, it has been shown that the mobile agents, performing data acquisition, data analysis, data aggregation and decision making directly on the nodes, are able to respond in a timely manner to changes in the soil and to precisely schedule irrigation events, which results in a reduction of freshwater consumption and lowered irrigation costs [6]. The structure of agriculture soil under irrigation is as shown in Figure 7 [7].

Fig 7: Structure of agriculture soil under irrigation

The VG400 is a low-power and robust soil moisture sensor, it senses volumetric water content based on measurements of the dielectric constant of the soil, a technique known to provide highly accurate results. The sensor is insensitive to water salinity and cannot corrode over time as, for example, traditional conductivity based sensors. And also by monitoring, crop and climate in a field and providing the useful information which can be used in making efficient use of water resources and also achieving in high yield. If an additional sensors, such as rain sensors may be integrated into the monitoring system to further reduce the freshwater consumption and the irrigation costs [6].

3.2.3 Rainfall Sensor

The rain sensor or rain switch is a switching device, which is activated by rainfall and having two main applications in rain sensors. Initially for an automatic irrigation system, a water conservation device is to be connected then causes the system to shut down in the event of rainfall and in the next section, by using a device protection of automobile interior parts from rain was done, which supports the automatic mode of windscreen wipers [8].

3.2.4 Humidity Sensor
SHT11, a digital temperature and humidity sensor chip is widely used in fields like heating and ventilation, air conditioning, automobile, consumer electronics and automatic control [3].

The chip integrates with a unique capacitive sensor element for measuring relative humidity and a band-gap sensor for temperature, additionally the signal processing on a tiny footprint provides a fully calibrated digital output, featuring in excellent reliability and long term stability [16]. The design of sensor module SHT11 is as shown in Figure 8. The ultimate choice for this design of SHT11 is tiny size and low power consumption [3, 14].

Fig 8: SHT11 Sensor

3.2.5 Spraying Operation

In agricultural areas, the application of pesticides and fertilizers is having a crucial importance for crop yields to carry out this task mainly by using this aircrafts because of their speed and effectiveness in the spraying operation but some of the factors causes to reduce the crop yield, or damage. Weather conditions, such as the direction of the wind and its intensity during the spraying process will add further complexity to the problem of maintaining control. To avoid this problem consider the architecture, which is to address the problem of self-adjustment of the UAV routes when spraying chemicals in a crop field.

In our proposed methodology, an algorithm was evaluated to adjust the UAV route in order to change the direction and wind intensity. To adapt the path runs in the UAV, the wireless sensor network (WSN) deployed in the crop field which was obtained by input feedback. This shows the sensors can use the feedback information in order to make adjustments to the routes could significantly reduce the waste of pesticides and fertilizers. Evaluation can be done in this algorithm, because there is an impact with the number of communication messages between the UAV and the WSN [9].

3.2.6 Attitude Sensor

Due to random generating and the attitude of the vehicle rapid changes, most of the agricultural fields are uneven, so that quick response is required for the measurement of the attitude of an off-road vehicle. A low-cost electrolytic fluid inclinometer method is used to sense tilt angles (roll and pitch), this is to be resolved with several issues such as poor accuracy and sensor noisy response due to lateral acceleration of the vehicle. But in real time, there is a necessity of noise correction in the sensor was required for operation [10].

Two inclinometers and three vibratory gyroscopes are used in low-cost attitude sensor with a quicker responses and higher signal to noise ratios in their development while compare with the other inclinometers which was used alone as shown in Figure 9. These developed attitude sensor evaluates an accurate results on field tests on a flat field, a sloping ground and a bumpy road. So this low-cost attitude sensor is preferable and to replace fiber optic gyroscope which is cost effective in agriculture [10].

Fig 9: An overview of an attitude sensor prototype

3.2.7 Service Unit

To improve the productivity and efficiency in precision agriculture by doing these processes such as seeding, harvesting, weed control, grove supervision, chemical applications, etc. In an autonomous vehicle require a (unmanned) service unit which is to perform the primary or secondary tasks in the agricultural environment.
The most important current abilities in the autonomous vehicles are performed by the agricultural tasks, which can be grouped into four categories: guidance, detection, action, and mapping, and the relation between its four abilities are as shown in Figure 10 [11].

But there exists a localization problem (i.e., not able to perform the action associated with the agricultural task such as path-following, path-tracking, or trajectory-tracking activities), even though these stages are intrinsically related. If the localization system fails or is inaccurate, then this inaccuracy is propagated to the four abilities of the service unit. The SLAM algorithm was considered as an inexpensive solution for the localization problem.

The simultaneous localization and mapping SLAM algorithm minimizes the estimation and positioning errors in both the localization and the mapping processes and this algorithm concurrently estimates both the pose (position and orientation) of a vehicle and the map of the environment in which the vehicle is located. The sensors mounted on the vehicle have an extract features from the surrounding environment and these are located within a map, which is maintained and updated by the SLAM algorithm.

The SLAM algorithm have an advantage is that they can optimally perform in places where other positioning systems fail and can be used to further improve GPS-based localization systems. In addition to this, a ground station allows the tele-operation of the vehicle. Thus, there are some specific strategies that are directly related to the environment disposition and the vehicle’s capabilities during navigation, positioning, orientation, and turning maneuvers. The functional structure of the autonomous vehicle is as shown in Figure 11.

3.2.7.1 Guidance:

The guidance requires information regarding the surrounding environment (mapping) and the features are currently detected (detection). In the service units, the control and motion-planning strategies are applied to drive the vehicle within the agricultural field for specific purposes which are closely related to the action stage. Thus, the way the vehicle navigates within the agricultural environment needs information regarding its location in the field (localization system) and this system uses the sensors for a correct localization of the extracted features within the map.

3.2.7.2 Mapping:

The most important stage is to plan feasible and safe paths or trajectories for the navigation process by using the mapping and the construction of a map in agricultural field will provide most relevant features. Thus in a service unit, the map of the environment is to navigate safely, and the detected features will allow appropriate planning for performing actions (e.g., terrain leveling, chemical spreading, etc.).

During mapping, a map of the surrounding environment is built and to maintain with the aid of navigation (guidance) process. The measurements acquired from the environment (detection) and the information regarding the location of the service unit within such a map (for guidance and action). The ability of detection is done by this stage and the localization system (the DK-GPS, the internal sensors, and the low-level CPU). The high-level CPU generates a map of the environment based on the exteroceptive sensors whereas the low-level CPU provides the localization information.

3.2.7.3 Detection:

In the agricultural environment, the information is directly acquired by using the
detection (i.e., the extraction of biological features from the environment). At the mapping stage only, this information is to build and maintain an updated map of the surrounding environment to guide the navigation process (guidance) or to perform a given action (e.g., weed detection, grove maturity inspection, or agrochemical disposal). In this stage, it consists of two range laser sensors, the stereo vision system and the high-level CPU processes the sensors information.

3.2.7.4 Action:

The action means interaction of the service unit with the agricultural field (e.g., radicchio harvesting in which the vehicle was designed for the execution of the task), but it can be performed on the basis of a guidance process (e.g., harvesting or seeding), detection (e.g., weed removal), or mapping (e.g., agrochemical disposal based on previously acquired tree top information). This stage was designed to monitor and supervise a grove. Therefore, a robotic arm, controlled by a high-level CPU, can be mounted on the vehicle for manipulation purposes [11].

IV. CONCLUSION

In precision agriculture the autonomous vehicle plays a most important role, to improve the efficiency of crop production without affecting the various factors in agriculture and also reducing the cost of production. In this paper, to develop the design of an autonomous vehicle by considering the current developments and future perspectives of the Precision Agriculture (PA) for crop production. It provides a better solution that optimizes product quality and quantity of crop production by the cost minimization, human intervention and the variation caused by environment due to unpredictable nature.

V. Acknowledgment

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References

SMART INNOVATION

(A Smart Eco-Friendly Car system with Traffic Conjecture using inductive loops along with Alcohol Prevention in Automobiles)

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Abstract:

The traffic jams in cities are most common and remained as a uncontrollable problem. This idea we developed is the result of our observation in one of the major traffic intersection at Vijayawada (Benz circle). In this paper we are going to present you the best solution to eradicate heavy traffic jams without using any constructions like bridges or additional lanes on the roads. We observed that the commuters are getting stuck in the traffic jams mainly due to no proper estimation on the traffic on their way. So, we thought that we can eliminate this problem by intimating or instructing the driver/commuter about the level of traffic at any junction all over the city. Such that the commuter can escape from the traffic jam and he/she can reach the destination in time. So to intimate the density of traffic at any junction, we are going to use “Induction loops” to calculate the density of traffic at the junctions and to display them to the commuter. In addition to this we are also using Google maps to forecast the traffic through GPS to the driver at any place regarding the traffic at the junctions. And also we are using these induction loops to reduce the noise pollution at the traffic intersections. We also quoted about one of the smart car experience to the commuter ie., a touch less mobile controlling system that enables the driver to operate his/her mobile with out even touching it. This touch less mobile system is more useful to eliminate accidents that occur due to usage of mobile phones while driving. When a driver or any passengers of car consumes alcohol then the car automatically stops in a safe place side of a road using traffic conjecture & the front wheels of the car will be locked out. Through GPS technology a complaint will be sent to the nearest police station. If driver talks in a mobile for more than 8 seconds then the system of the car activates the jammers to cut the call signals & It stops the car. We are also Placing a piezo-electric devices on roads & zebra crossing will generate electric energy

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through the mechanical stress applied by the pedestrians & vehicles while going on the road. We are going to use this electric energy as the power supply to the Induction Loops, Traffic Signals & Traffic Street Lightening System. We are using this technique with less amount of investment and more Accurate Output.

**Approach:**

The traffic can be controlled by using various advanced technologies such as digital signal processing and various other. But here we are using a simple and cost effective tool to estimate the density of traffic. And after getting the data on density we are going to control the traffic depending up on the density value.

Steps involved for traffic conjecture:

1. Placing the induction loops at the junctions beneath the road.
2. Setting up a detector to detect the data given by each and every loop placed on the road.
3. Setting up a control system that enables us to display the density and give the instructions to the driver.
4. Further using the data given by the detectors to indicate the Google map with traffic density.

**Flow chart:**

![Flow chart diagram]

The main element that is needed to implement this idea is the inductive loop. And also proper controlling system to attain much accuracy.

**Inductive loops:**

An induction loop is an electromagnetic communication or detection system which uses a moving magnet to induce an electrical current in a nearby wire. Induction loops are
used for transmission and reception of communication signals, or for detection of metal objects in metal detectors or vehicle presence indicators. A common modern use for induction loops is to provide hearing assistance to hearing-aid users. Vehicle detection loops, called inductive-loop traffic detectors, can detect vehicles passing or arriving at a certain point, for instance approaching a traffic light or in motorway traffic. An insulated, electrically conducting loop is installed in the pavement. The electronics unit transmits energy into the wire loops at frequencies between 10 kHz to 200 kHz, depending on the model. The inductive-loop system behaves as a tuned electrical circuit in which the loop wire and lead-in cable are the inductive elements. When a vehicle passes over the loop or is stopped within the loop, the vehicle induces eddy currents in the wire loops, which decrease their inductance. The decreased inductance actuates the electronics unit output relay or solid-state optically isolated output, which sends a pulse to the traffic signal controller signifying the passage or presence of a vehicle. Parking structures for automobiles may use inductive loops to track traffic (occupancy) in and out or may be used by access gates or ticketing systems to detect vehicles while others use Parking guidance and information systems. Railways may use an induction loop to detect the passage of trains past a given point, as an electronic treadle.

The relatively crude nature of the loop's structure means that only metal masses above a certain size are capable of triggering the relay. This is good in that the loop does not thus produce very many "false positive" triggers (say, for example, by a pedestrian crossing the loop with a pocket full of loose metal change) but it sometimes also means that bicycles, scooters, and motorcycles stopped at such intersections may never be detected by them (and therefore risk being ignored by the switch/signal). Most loops can be manually adjusted to consistently detect the presence of scooters and motorcycles at the least. A different sort of "induction loop" is applied to metal detectors, where a large coil, which forms part of a resonant circuit, is effectively "detuned" by the coil's proximity to a conductive object. The detected object may be metallic (metal and cable detection) or conductive/capacitive (stud/cavity detection). Other configurations of this equipment use two or more receiving coils, and the detected object modifies the inductive coupling or alters the phase angle of the voltage induced in the receiving coils relative to the oscillator coil.
An increasingly common application is for providing hearing aid-compatible "assistive listening" telecoil. In this application a loop or series of loops is used to provide an audio frequency oscillating magnetic field in an area where a hearing aid user may be present. Many hearing aids contain a telecoil which allows the user to receive and hear the magnetic field and remove the normal audio signal provided from the hearing aid microphone site. These loops are often referred to as a hearing loop or audio induction loop.

An anti-submarine indicator loop was a device used to detect submarines and surface vessels using specially designed submerged cables connected to a galvanometer.

**Application of this idea to control traffic:**

The above is the case study that we had conducted. The red colored lane indicates the heavy traffic area. And the green lane indicates the free path without any traffic. The vehicle and the destination are indicated above. At the first junction before the main junction, we are going to place a board that indicates the driver about the status of the traffic and also instruct him to take diversion or not. This makes the commuter to reach his destination as fast as possible. To achieve this we need to use the inductive loop detectors and to be placed beneath the road to detect the vehicle density.

**Working:**

Our Intelligent Traffic Light System is capable of changing priority level of the roads according to their traffic level. To measure the traffic level we have several mechanisms.

- Image Processing
- Pressure sensors, give reading when pressure changes by the vehicles
- Inductive Loops

From the above methods we choose inductive loop. It is build on the concept of inductance change of a coil when a metal object come closer. You know that when you send electrical current through a wire, it generates a magnetic field. For a coil this electromagnetic field is high. You can change the inductance of the coil and change the electromagnetic flux by introducing additional conductive materials into the
loop's magnetic field. This is what happens when a car pulls up to the intersection. The huge mass of metal that makes up your car alters the magnetic field around the loop, changing its inductance.

So we have made a coil develop the inductive loop. We have some kind of metering device to meter the voltage level change in the coil.

An inductive loop vehicle detector system consists of three components: a loop (preformed or saw-cut), loop extension cable and a detector. When installing or repairing an inductive loop system the smallest detail can mean the difference between reliable detection and an intermittent detection of vehicles. Therefore, attention to detail when installing or troubleshooting an inductive loop vehicle detection system is absolutely critical. The preformed or saw-cut loop is buried in the traffic lane. The loop is a continuous run of wire that enters and exits from the same point. The two ends of the loop wire are connected to the loop extension cable, which in turn connects to the vehicle detector. The detector powers the loop causing a magnetic field in the loop area. The loop resonates at a constant frequency that the detector monitors. A base frequency is established when there is no vehicle over the loop. When a large metal object, such as a vehicle, moves over the loop, the resonate frequency increases. This increase in frequency is sensed and, depending on the design of the detector, forces a normally open relay to close. The relay will remain closed until the vehicle leaves the loop and the frequency returns to the base level. The relay can trigger any number of devices such as an audio intercom system, a gate, a traffic light, etc. In general, a compact car will cause a greater increase in frequency than a full size car or truck. This occurs because the metal surfaces on the under carriage of the vehicle are closer to the loop. Figures 3 and 4 illustrate how the under carriage of a sports car is well within the magnetic field of the loop compared to the sports utility vehicle.
Notice that the frequency change is greater with the smaller vehicle.

Also, it is interesting to note that the frequency change is very consistent between two vehicles of the same make and model, so much so that a detector can almost be designed to determine the type of vehicle over the loop. There is a misconception that inductive loop vehicle detection is based on metal mass. This is simply not true. Detection is based on metal surface area, otherwise known as skin effect. The greater the surface area of metal in the same plane as the loop, the greater the increase in frequency. For example, a one square foot piece of sheet metal positioned in the same plane of the loop has the same affect as a hunk of metal one foot square and one foot thick. Another way to illustrate the point is to take the same one square foot piece of sheet metal, which is easily detected when held in the same plane as the loop, and turn it perpendicular to the loop and it becomes impossible to detect. Keep this principle in mind when dealing with inductive loop detectors.

Some detectors provide PC diagnostics via a communication port on the detector. Diagnostic software gives you a visual picture of what is happening at the loop, and will help you troubleshoot any problems you may experience during installation or in the future. Detectors with this feature are usually in the same price range as other detectors and can help you save time solving a detection problem. The PC software and cable is usually additional, however keep in mind that if you have multiple installations you need only buy the software and cable setup once. Diagnostics software can also help determine the depth and position of the loop in the pavement.
Mapping the traffic density and enabling GPS:

By using the data given by the induction loop detector we are going to enable the Google maps to give the updates of high traffic prone areas through GPS.

GPS with Traffic Conjecture

Alcohol prevention in Automobiles:

we are seeing daily in newspaper, newschannels etc., that many people are dieing in accidents due to Alcohol consumption or negligence of the driver while driving. My solution to this problem is “Alcohol Prevention in Automobiles”. In this system firstly, we will fix Alcoholic Sensors or Breath Analyzers in stearing of vehicle, near dashboard, back part of front seats (rear & back), so we can easily detect alcohol consumption of driver and passengers in the cars, trucks, lorrys, buses etc., In Bikes, we will place sensors near the speedometer, to detect the alcohol. After detection, the system will give three warnings with voice response saying “you are alcohol consumed please stop the vehicle”. If driver does not listen then car (any vehicle) stops in a safe place on other side of the road by observing Traffic conjecture Status on the screen in his/her car, or if we have Wi-Fi in our mobile, then by clicking on Traffic Conjecture App on your Mobile you can see the Traffic Ahead of you. After car has stopped, the Front Wheels of vehicle will be locked, Car Engine will be OFF and the position of the vehicle (through Google map & through GPS) will be given as a Compliant to the nearest Police Station through Wide Area Differential Global Positioning System (WADGPS). we will also place a
camera in front of driver seat, so if driver falls asleep or became less sensitive then it warns first and then stops the car automatically after warning.

**Eco-Friendly Autonomous Car:**

We are planning to make our Automobile more Eco-Friendly one. For this, we are going to place Piezo-Electric Devices on Roads, Zebra Crossing, Footpath etc., thereby we are going to generate Electric energy from the mechanical stress applied by the pedestrians, vehicles while going on the Roads. We are going this developed electric energy as a power supply to the Induction Loops, GPS system, Traffic Signalling System, Street Lightening System, Traffic Conjecture Display Screens etc., Thus we are using renewable energy.

**Conclusion:**

At last, Our Aim is to Develop an Eco-Friendly Car with Traffic Conjecture using Induction Loops and Alcoholic Prevention System in Automobiles. Being Engineers, we did Our Maximum Efforts what we can do for Automobile Field. Hence it is a “LAUNCH OF NEW ERA OF AUTOMOBILES”…..
Development of a smart city using openmtc platform

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Abstract—  
In mobile communications Machine-to-Machine (M2M) communication offers a new communication approach that enable connecting billions of sensor objects to actuators. Smart City refers to behavior of a region where some processes of activity are done automatically through communication from M2M. The openmtc platform aims to provide a standard oriented middleware platform for M2M communication. This paper proposes a new approach on “development of a smart city using openmtc platform”. For the development of smart city, we are mainly concentrate an areas like new approach on managing all vehicle data using Machine-to-Machine (M2M) communication form which Open Machine Type Communication (OpenMTC) as communication platform for aggregating and processing location data and managing communication between doctor and patient when sudden changes in heart beat like heart attacks caught by patient. These applications are run on openMTC platform and with the help of above two applications, this paper will test the scalability and adaptability of the openmtc platform and in ensuing days scalability increased as per development.

Index Terms— M TO M communication, openmtc, vehicle tracking, ECG

1. INTRODUCTION

Machine to Machine (M2M) refers to technologies that allow both wireless and wired systems to communicate with other devices of the same type. The concept can be implemented in various domains such as logistics, smart environments, energy and asset tracking. This development is cheereed by the fact of saturation and high competition in the mobile market, which raises the need to introduce new potential services to fulfil the revenue gap. Additionally the evolution in semiconductor industry shrinking lithography continues to reduce chipset cost and power consumption, and implants more sensors into devices used in different aspects. M2M is a broad term as it does not pinpoint specific wireless or wired networking, information and communications technology. M2M is considered an integral part of the Internet of Things (IoT) and brings several benefits to industry and business in general as it has a wide range of applications such as Smart Cities, industrial automation, logistics, Smart Grid, health etc. mostly for monitoring but also for control purposes.

Smart City concepts and implementations are currently widely discussed. Definition of Smart City refers to behavior of a region where some processes of activity are done automatically through communication from M2M. Here, M2M becomes enabler to develop smart city solutions. M2M itself is a standard concept that is already designed by several standard communities, one of them is ETSI. This community defines specification of M2M system as a standard reference for all developers of platform and application.

Recently, the smart city concept is becoming trend often spoken by many researchers of ICT sector, especially, sector of Next Generation Network Infrastructure (NGNI), Internet of Things (IoT) and Future Internet (FI). Recognizing the need for reliable network infrastructures and various Standards Developing Organizations (SDO) have recently promoted several standardization activities in the M2M communication domain, just to mention a few: i) the European Telecommunications Standards Institute (ETSI) TC M2M mainly focusing on the service middleware layer. ii) 3rd Generation Partnership Project (3GPP) [8] address requirements and functional architecture for Machine Type Communications (MTC). iii) Telecommunications Industry Association (TIA) [9] established the TR-50.1 Smart Device Communications. iv) oneM2M, a consortium of several standards development bodies to reduce the standardization overlap by providing ongoing standards support, and increase the capability of M2M solutions and produces to interoperate.[10]

One implementation of M2M ETSI standard is the Open Machine Type Communication (OpenMTC) platform that is developed by Fraunhofer FOKUS. This platform aims to provide a standard oriented middleware platform for M2M oriented applications and services to facilitate research and development of M2M systems. One pre-eminence of OpenMTC platform is the ability to access and process information through standardized application programming interfaces (APIs). The main advantage using openmtc is its scalability and adaptability.
Mobile tracking system is an application for monitoring position of mobile vehicle. Big companies, which have many armadas, use such systems to track and control their vehicles. Not only location information can be aggregated and managed, but also other environmental measurements (e.g. temperature, humidity) can be aggregated to help in improving shipping patterns and assets control. Vehicle position is one piece of information that is needed in monitoring. There is further information that is able to be captured once this position data is available such as vehicle temperature, opening or closing state of the door, relative movement of the vehicle, and so on. Using M2M concepts, this information can be gathered and sent to an administration division for analysis prior to taking decisions aiming to improve the monitoring and control services. Server application has to be modified regarding variation of data types.

ECG is a physiological signal that is used to measure and diagnose abnormal rhythms of the heart. ECG is captured using device that is called electrocardiograph. For some special cases, it is required that patient’s ECG should be monitored continuously. Usually in monitoring ECG, physician uses one or two electrodes attached in patient’s body using typical configuration. In previous works, we have designed wireless LAN ECG for heart’s patient tele monitoring. Single channel ECG is connected with wireless data transmission module to transmit ECG signal to physician’s computer or terminal devices. The data collected by ECG is transmitted to openmtc for communication between doctor and patient.

This paper combines these two applications to check the scalability of openmtc and by increasing the scalability of openmtc smart city was developed by number of applications development. The remaining paper describes as follows: section II openmtc platform for smart city development. Section III implementation of smart city finally Section IV gives the conclusion.

II OPENMTC PLATFORM FOR SMART CITY DEVELOPMENT

The OpenMTC platform is a prototype implementation of an M2M middleware aiming to provide a standard-compliant platform for Smart City and M2M services. It has been designed to act as a horizontal convergence layer supporting multiple vertical application domains, such as transport and logistics, utilities, automotive, eHealth, etc., which may be deployed independently or as part of a common platform. Fig1 shows the concentrated areas of smart city.

The OpenMTC features are aligned with the ETSI TC M2M specifications. The platform mainly consists of two service capability layers, a gateway service capability layer (GSCL) and a network service capability layer (NSCL). Those have been defined and specified by the ETSI Technical Committee M2M. OpenMTC will also support the standards that are currently produced by oneM2M as an evolution of the ETSI work.

Fig1: concentrated areas for development of smart city.

The GSCL is a flexible M2M gateway that supports various M2M area network technologies and communication protocols such as ZigBee and Wireless M-Bus. The NSCL is a cloud-based M2M platform that aggregates and stores data from various devices and acts as a device management and abstraction layer providing intuitive Application Programming Interfaces (APIs). Via the APIs and standardized data structures, fast application development can be enabled across various M2M segments such as Smart Cities, eHealth, Logistics, and Utility Metering.

OpenMTC supports a RESTful architecture with a hierarchical resource tree defined by ETSI. This style governs how M2M applications can exchange data with the OpenMTC M2M Core (NSCL) and the OpenMTC Gateway (GSCL). Each entity in the M2M system, i.e. applications, devices, data, is represented by uniquely addressable resource in the resource tree, which can be accessed and manipulated via the CRUD operations (create, retrieve, update, delete) over different transport protocols (e.g. HTTP). Fig2 and fig3 shows the architecture of openmtc platform.

ETSI defined three interfaces as part of the TC M2M specifications: mla, dla and mld, as depicted below, which offer generic and extendable mechanisms for
interaction with the service capability layers (xSCL). The mIa interface resides between network applications (NA) and the NSCL; the dIa interface mediates the interactions between applications in the M2M network area, i.e. gateway applications (GA) or device applications (DA), and the GSCL; and the mId interface resides between the GSCL and NSCL.

The OPENMTC tool kit provides an SDK to make the core assets and service capabilities available to third party developers. The OpenMTC SDK consists of a set of high-level APIs which hide internal system details and allow the developer to concentrate on implementing functional M2M application logic. This will stimulate the community and facilitate innovation in the telecommunications and Internet arena helping to deliver a rich application landscape in Smart Cities.

This paper uses this platform for the development of both on managing all vehicle data using Machine-to-Machine (M2M) communication form which Open Machine Type Communication (OpenMTC) as communication platform for aggregating and processing location data and managing communication between doctor and patient when sudden changes in heart beat like heart attacks caught by patient. By this applications, we will increase the scalability of the openmtc middleware. Next we will see the implementation of these two applications by using openmtc.

FIG 2: A SIMPLE ARCHITECTURE OF OPENMTC PLATFORM

FIG 3: TECHNICAL ARCHITECTURE OF OPENMTC PLATFORM

III. IMPLEMENTATION & ANALYSIS

Implementation involves the operation of two applications and implementation of these applications. The strength of OpenMTC Platform is the ability to handle implementation for a variety of sensor and user's application. Flow of messages in of the mobile tracking application is showed in Fig.4. Device and sensor connected to the mobile vehicle are registered into a gateway. Then, gateway informs the OpenMTC core about registered applications and sensors. On the client side, user's application registers them to OpenMTC, in order to be able to get data and updates from sensors thorough the system. The application can search for devices connected to OpenMTC, and the core server will send information about available resources that meet the search criteria. The application sends a request to the gateway to access required information from the available resource, or subscribe to them, and get notifications when sensor data is received by gateway. If needed, the application will trigger actuator advice to do something according to position of the tracked vehicle. Since mobile tracking is a real time system, a robust platform which can support real time data transfer among sensors is needed. Real time data generated from
mobile tracking system is longitude, magnitude, and time sent from sensors to OpenMTC platform. OpenMTC will process and store input data, and enable the access to them by authorized client's devices via APIs. In the implemented mobile tracking system, the client application has a user friendly graphical interface that shows moving tracked objects on a map according to their position. The location information is received from the OpenMTC platform via notifications.

$GPGGA,092750.000,5321.6802,N,00630.3372,W,1,8,1.03,61.7,M,55.2,M,,*76
$GPGSA,A,3,10,07,05,02,29,04,08,13,,,1.72,1.03,1.38*0A
$GPGSV,3,1,11,10,63,137,17,07,61,098,15,05,59,290,20,08,5
4,157,30*70
$GPGSV,3,2,11,02,39,223,19,13,28,070,17,26,23,252,04,14,186,14*79
$GPGSV,3,3,11,29,09,301,24,16,09,020,,*66,
$GPRMC,092751.000,A,5321.6802,N,00630.3371,W,0.06,31.66,280511,,,A*45

Fig.5 NMEA format data

The data generated in NMEA format has several commands like

GGA – essential fix data which provide 3D location and accuracy data.
GSA – GPS DOP and active satellites.
GSV – satellites in view shows data about the satellites that the unit might be able to find based on its viewing mask and almanac data
RMC – NMEA has its own version of essential gps pvt (position, velocity, time) data
GLL – geographic latitude and longitude etc.

Similar message flow mechanism is also used in managing communication between doctor and patient when sudden changes in heart beat like heart attacks caught by patient is shown in fig.6

$GPRMC,092750.000,A,5321.6802,N,00630.3372,W,1,8,1.03,61.7,M,55.3,M,,*75
$GPGSA,A,3,10,07,05,02,29,04,08,13,,,1.72,1.03,1.38*0A
$GPGSV,3,1,11,10,63,137,17,07,61,098,15,05,59,290,20,08,5
4,157,30*70
$GPGSV,3,2,11,02,39,223,16,13,28,070,17,26,23,252,04,14,186,15*77

Fig.6 message flow graph ECG monitoring system

The ECG signal produced from ECG device has two signals from two leads. Example of these data is shown in figure 7 and figure 8.

The output of these two applications are developed on single middleware will the main objective
The signal outputs in two applications are shown in fig.10.

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MOBILE ROBOTS FOR SEARCH AND RESCUE

Abstract:

Mobile robots are integrated into a groundwork and rescue team as tools for looking victims in dangerous areas that is harmful for human, on offer the perception information for map building, and on follow the human entity throughout the mission. The teleoperated management and also the autonomous path following is enforced on the robots for the semiautonomous navigation within the simulated firing state of affairs. This paper focuses on the automaton entities within the PeLoTe project (Building Presence through Localization for Hybrid Telematic Teams). The design of the code integration for mobile robots into the PeLoTe system and also the experimental results are bestowed.

Introduction:

In the search and operation, mobile robots square measure presently developed so as to help humans in dangerous and risky tasks throughout the mission. As a team, the corporation of human and golem are often managed by a remote organiser, United Nations agency is found during a safe remote place outside of the country. This hybrid telematic team is presented in As a team member, the task of a mobile golem is to explore the unknown space and also the dangerous space that’s not accessible or risky for the human. By victimization the appropriate perception instrumentality, the mobile golem will localize itself and conjointly senses the encompassing within the dark area, during which the human has low visibility. Meanwhile, the human entity equips the sensors, a knowledge process unit and alittle show. He can even localize himself and sense the surrounding within the similar method because the robots. The mobile robots have 2 main functions throughout the mission: one is to supply the sensing element knowledge for the mapping module and another one is to follow the human entity.
These robots measure supported constant management construct victimization on the design of the microcontroller and also the PC104. Nevertheless, the computer code interface protocols of those robots don't seem to be identical. Thus, the mixing methodology of the golem computer code into the PeLoTe system is meant. This paper describes the tasks, features, functionalities, and the integration methodology of the mobile robots in the PeLoTe project (Building Presence through Localization for Hybrid Telematic Teams) funded by the European Community underneath the IST-program: Future and Emerging Technologies. The experiments were performed

Mobile Robots:

A mobile automaton is an automatic machine that's capable of locomotion. A spying automaton is an example of a mobile automaton capable of movement in a very given surroundings. Mobile robots have the aptitude to maneuver around in their surroundings and aren't fastened to a physical location. Mobile robots will be "autonomous" (AMR - autonomous mobile robot) which impliesthey're capable of navigating Associate in uncontrolled surroundings while not the necessity for physical or electromechanical steerable devices. or else, mobile robots will believe steerable devices that enable them to travel a pre-defined navigation route in comparatively controlled area (AGV - autonomous target-hunting vehicle). in contrast, industrial robots ar typically more-or-less stationary, consisting of a articulated arm (multi-linked manipulator) and gripper assembly (orfinish effector), connected to a hard and fast surface.

Mobile robots became a lot of commonplace in business and industrial settings. Hospitals are victimization autonomous mobile robots to maneuver materials for several years. Warehouses have put in mobile robotic systems to with efficiency move materials from STOCKING shelves to order fulfillment zones. Mobile automatons also are a significant focus of current analysis and nearly each major university has one or a lot of labs that specialize in mobile robot analysis. Mobile robots also are found in industrial, military and security settings. Domestic robots ar shopper merchandise, as well as recreation robots and people that perform bound responsibilities like vacuuming or husbandry.

Robot Tasks:

In the modern times, most of the rescue groups solely need teleoperated robots, exception ar the military that claim autonomous robots for map building or exploration of environment. hearth fighters ar in some cases cautious about the dependableness and flexibility of autonomy, for these cases teleoperated robots ar wished. In any case, the robots thought to give autonomous
low-level actions and emergency handling strategies so as to satisfy the requirement of lustiness. E.g. the mechanism finds the methodback just in case of communication interruption. These requirements are going to be addressed. Desired autonomies for robots in an exceedingly farer future are:

- give knowledge for map building
- Explore the atmosphere
- explore for wounded folks in wide areas
- Carry equipments

**Robot Description:**

There exists solely few costly rescue robots within the market and their options don’t seem to be complete consistent with the project needs. Their functionalities are restricted according to the mechanical structure and therefore the sensors on board. Thus, the exploited mobile robots within the PeLoTe project square measure designed supported the prevailing mobile automaton technologies. As shown in Figs. 1 and 2, the Mobile Experimental automaton for Locomotion and Intelligent Navigation (MERLIN) is controlled by 80C167 atomic number 24 sixteen bit processor and PC104 [2]. 2 motors square measure the servo steering motor and dc driving motor for the automaton orientation management and therefore the automaton speed management, respectively. The equipments on board square measure encoders, ultrasonic sensors, infrared sensors, 3-axis magnetic compass, gyroscope, optical maser scanner, beacon system, bumpers, web camera, WLAN, and white LED lamps. The mobile robots offer device information for the upper layer software interface. These information square measure the driven distance on the left wheel and therefore the right wheel, the driving speed, the angle of the automaton heading, absolutely the roll, pitch, yaw rotational angles, the battery level detector and therefore the obstacle detection. MERLIN is remotely controlled via the programmed client and server mistreatment java software package supported TCP/IP communication. The wireless local area network is employed for wireless data communication between user user interface and therefore the automaton. The control commands and measure information from sensors square measure transmitted between the shopper and server endlessly.
In semi-autonomous teleoperated management, the user commands the automaton by employing a joystick or arrow cursors as to steer the front wheels and to propel the rear wheels.

Software Integration:

The overall software system design of PeLoTe system is described in detail of the mechanism software system integration is represented during this section. From the developed GUI and hardware interface of the mechanism as explained in the previous section, associate interface layer is needed to mount 2 or additional robots into an equivalent knowledge and command protocols. From totally different protocols into one
common protocol that's recognizable for all robots, the Robot Entity management Module (RECoM) is outlined, designed, and developed. Victimization java RMI for the server communication. The RECoM may be a system consisting of many modules. The information flow among these

Types of robots:

![Image of a robot]

Dangerous zone (left) and dangerous exit (right)
Human following robot

Different Rescue Operations:
The Problem:

- There exists only few expensive rescue robots in the market and their features are not complete according to the project requirements.
- Complexity is more.
- Expensive.

Future Work:

By adding encryption and decryption algorithm, we can make the circuit more safe and secure.

By adding SOC (System on chip) we can reduce complexity of robot, as well as cost.

Conclusion:

This paper presents the mobile robots used in search and rescue operations to support the hybrid telemetric teams in PeLoTe project. As a member of the team, the robots have functionalities for searching victims, investigating dangerous area or low visibility area, providing sensor data for mapping and following human. Effective for the large-scale complicated search and rescue missions.
Design Of A RF Transmitter And Receiver For A Guided Vehicle
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ABSTRACT: The main motivation of this paper is to develop a robotic vehicle using RF technology for remote operation added with ultrasonic sensor for supervising purpose. The robot consisting with ultrasonic sensor can transmit without wire i.e. wireless real time supervising information. This is type of robot can be utilized for sighting purpose in battle fields. In case of ARM 7 series microcontroller is only used for the desired operation. At the transmitting side utilizing the MEMS, commands are sending to the receiver to control the running of the robot either to move forward/backward and left/ right etc. This new Combat robot is a radio controlled, it has got two barrel enclosure through LASER can be evoked, ultrasonic sensor in a synchronization with the enclosure can resolve up/down, left/right up to a secure eliciting limit enclosure and ultrasonic sensor mechanism has been added which has all the function like a tank, turning to any angle on its axis, moving towards and backward then turning left/ right, running instantly into opposite direction. The RF transmitter acts as a RF remote control for receiver and also transmitter.

Keywords- Combat Robot, MEMS, LASER, RF transmitter and Receiver.

I. INTRODUCTION

The world-wide focus on terrorism and protection may have start up following the 9/11 attacks in USA. The high risk of terrorist motivation can possibly never be reduced, but sensible steps can be taken to reduce the danger. The problem here is how critically the governments take the scourge of about terrorism. We can’t continue to trust for the better and dismiss the lessons [1]. Our Prime Minister also declared in a in his words during past year that earlier Indian soldiers will have robots serve them to counter terror attack. We are yet to hear more on that idea. It struck a thought in our mind, why we are unable to make a robot to tackle such type of position. This combat robot is an extended and effective version of former robot [2].

The Combat robot (Battle Robot) is radio controlled, the two barrel it has enclosures through bullet can be elicited, radio camera on synchrony with the gun enclosure can rotate up/down and left/right up to a safe eliciting limit. Gun enclosure and mechanism of camera has been installed on recent spots robot vehicle, which has all the functions like tank, returns to any angle on its axis, moving forward and reverse left/right, running into opposite direction[3]. The Combat robot is radio controlled, auto-powered, and has all the commands like a general car. A pair of laser gun enclosure has been installed in it, so that it is used as a fire on enemy remotely whenever required, this is not possible until a wireless camera is installed. Wireless camera can able to send real time video as well as audio signals. Which would be seen on a remote monitor and control can be taken accordingly. It can silently enter into enemy area and send us all the information through its’ tiny camera eyes. It is designed for, fighting as well as suicide attack [4]. The Main Objectives of using robot are man dares not hazard Robots have generally been forced to use in surroundings that are too dangerous for man [5].

The motivation is to implement a model which is efficiently used to reduce the terrorist actions and affects. To efficiently exhibit and achieve reliable long distance communication it is necessary for the open area of research to robotics as well as other technology domains. As the importance in case of robotics goes forward to grow, robots are progressively being united into everyone life. The responses of this integration are final users possessing less and lower in technical knowledge of the applied technologies [7].

The congregation robots are unable to waffle to tread even the dreaded terrain of battlefields. Their utilization in countries like Afghanistan and Iraq wars make us amazing if robots have become so efficient Battle robots of different shapes and sizes were developed to withdraw landmines, search for criminals obscuring in caves, look for bombs below cars and in building, for spying and what not. These robots can be controlled by users such as humans or mainly by military people [8].

II. BLOCK DIAGRAM REPRESENTATION

Fig.1 represents the block diagram of the RF transmitter and receiver in either way.
Fig-1: (a) Transmitter

Fig-1: (a) represents the transmitter block of the proposed system. This transmitter comprised of an ARM Microcontroller LPC2148 as a basic element and MEMS sensor followed by a RF transreceiver which can connect to receiver block and LCD is used for displaying purpose.

Fig-1: (b) Receiver

Fig-1: (b) represents the Receiver block of the proposed design. In this also LPC2148 place a cordial role. The all sub blocks are connected to this micro controller. Here, for sensing ultrasonic sensor is used and the remaining components are laser light, buzzer, motor driver and RF transceiver.

a. LPC2148:

Fig-1(c): Pin diagram of LPC2148.

Fig-1(d): LPC2148 Development board

LPC2148 is one of the most widely used IC of ARM-7 families which is manufactured by NXP Semi-conductors formerly known as Philips. It uses the RISC Architecture and Harvard Architecture. Harvard architecture has separate bus line for both Program Memory and Data Memory which is used for fast data Transfer. It has many features like it is having 64-pin High-Performance ARM Microcontroller. It has two Ports and each port consists of 32pins. In that 3pins are reserved for future applications and 16Pins are hidden which is used to boost up the remaining pins operation. Pins are available up to nine edge or level sensitive external interrupt.

There are only 45 GPIO Pins which can use for I/O applications. It has 512 kb of flash program memory and 32kb of Static RAM Data Memory. It has two UART’s which is used for Serial Communication Between two modules. It is and Interface width of 128bit which enables the operating frequency of 60MHZ. It is a low power Consumption with Operating voltage of 3.3v. It has four stages of Pipeline which is used make an sequence flow of execution. Crystal Operating frequency of up to 60MHz because it consists of Phased Lock Loop(PLL), Two I2C serial interfaces, SPI serial interfaces, 32-bit timers, PWM unit, Watchdog Timer, Real Time Clock with optional battery backup, Brown out detect circuit. It even has In-System Programming (ISP) and In-Application Programming (IAP).

Advantages of RF:

- Do not exhibits or need of line of sight.
- This could not block by common things: It can infiltrate more solids and pass even through on walls.
- More retentive in case of range.
- It is not sensitive to the light
- It is cannot closed to sensitive to the surrounding changes and also weather conditions.
Precautions to taken:

- **Interference:** Communication devices utilizing customized frequency scanners, wrist radios, wireless phones, and also personal boundaries can interfere with transmission.
- **Security Deficiency:** More sluttish to "eavesdrop (listen in)" on transmissions during the signals are circulate out in space rather than confined to a wire.
- More costly than infrared type.
- **Federal Communications Commission (FCC) should be given the licenses for proper utilization of some products.**

Reduction in speed: The data rate during the transmission is less than infrared and wired transmission.

### III. FIRMWARE IMPLEMENTATION

Firmware implementation deals in programming the microcontroller, for which OS(Operating System) to be used so that it can control the operation of the IC’s utilized in the implementation. In the presented work, we have taken the Orcad type design software for PCB circuit design description and Keil µVision4 software development tool is used to write and compile the source code, the code has been written in the C-programming language. Here, the Flash magic programmer has been utilized to compose this compiled code into the microcontroller. Software tools involved are Flash Magic Orcad, Orcad, Keil µVision4 is used for drafting the schematic diagram, it has been mentioned in above. Keilµv4, Flash magic are the two software tools are utilized to program microcontroller.

![Source code compilation](image)

**Fig-2:** Source code compilation

**Fig-3:** Run process of compiled code

**Fig-4:** Dump process

**Fig-5:** Transmitter implementation
Working:
The main aim of this work is to navigate the robotic vehicle and fixing the target by using RF technology. MEMS sensor is connected to the Microcontroller. The key data is transmitted through UR24A transceiver module to the receiving microcontroller. MEMS sensor is having the four ways of directing forward, reverse, left and then right. This commands data is transferred to the receiver kit with the help of RF transceiver. At the receiver kit ultrasonic sensor find out the targets and firing laser fix the target through LASER beam and then fire by alerting buzzer. The code was written in EmbeddedC language using KEIL compiler and for dumping the code into the microcontroller we use the relevant hex file using flash magic software.

IV. HARDWARE IMLENTATION AND RESULTS

In hardware implementation we assemble the circuit on the PCB as shown in above circuit diagram. After assembling the circuit on the PCB, check for the proper connections made before switching ON the power supply. With the help of this circuit diagram and the necessary precautions taken we had implemented RF based target firing Robot. We controlled the speed by using RF technology.
The communication between different modules in the design is properly done without any interference of any other modules and is done perfectly to meet the all system specifications and requirements as the need to full fill the project. Software tools like Keil µvision Simulator for writing the code in the language of C or C++ or Embedded C, Flash magic to dump Hex file into the microcontroller, Orcad Lite software for the schematic diagram are been used to develop the software implementation before realizing the hardware. Circuit is implemented in Orcad and also in the hardware i.e., on the microcontroller development board. The performance has been verified both in software simulator and hardware design. The total circuit of the project is completely verified functionally and is following all the software applications.

![Fig-10: operating with MEMS sensor](image)

The performance of the project shows the MEMS sensor and ARM7 controller which can perform the desired operation in better way.

It can be concluded that the design implemented in the present work provide portability, flexibility and the data transmission is also done with low power consumption.

V. CONCLUSION

In present days India is suffering from massive terror attacks, bomb explosions at many of the lavish resorts. So, to face terror attacks and to get more secured at the border as well as high density areas it’s wise to maintain a world class military technology in assisted with belligerent needs. In this paper the proposed combat robot can uses the technological power for the efficient facing of the terror attacks which can give more precise response than man power.

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Abstract: Wireless operations permit services, such as long-range communications, that are impossible or impractical to implement with the use of wires. Wireless Communications marks a prominent role in the era of modern technology, which facilitated the capability of data transfer between devices without any physical connections. This lifted the existing technology one step higher.

The break-ins are increasing day-by day which leads in financial deprivation. This work presents an idea to detect human intrusion based on Wireless Communication. There is a substantial need to control these intrusions. This work proposes a novel approach to detect the intrusion and inform to the corresponding authorities.

In this several sensors are used to detect the intrusion and message is sent to the predefined user using GSM and location of that intruder is found using GPS. When the intrusion is detected an alert sound will be given to make an indication to the neighbours. Images of the intruder are captured by camera and stored in Web using Raspberry Pi.

Keywords: GSM, GPS, Sensor, Raspberry Pi.

I. Introduction

Presently a-day's the same number of individuals are occupation holders nobody will arrive at home in light of that Human Intrusions are expanding and it is likewise hard to discover the interlopers. Due to these Intrusions, the burglaries are expanding where that can’t be diminished or recovered. So as to defeat these issues this paper is proposed. As now a day's most extreme houses are having Home Automation Technique, we utilize Sensors that are interfaced with a microcontroller that dependably screens the House and when interruption has been happened it makes an impression on the predefined client utilizing GSM and by utilizing Voice Recorder and Play back module and speaker lingerie to the Neighbours to alarm them about the interruption.

By utilizing GPS joining to the spot where interruption is conceivable we can likewise discover the area. We can likewise secure the Intruder in the house by utilizing engines which naturally shuts the entryway and we can open the entryway by sending message through GSM to open the entryway. Gatecrasher pictures are caught utilizing cam and pictures are put away in web utilizing a little PC Raspberry Pi.

The Technology that is used in this project is Wireless Communication. Wireless Communication transfers information or data between two or more points that are not connected by an electrical conductor. Wireless operations permit services, such as long-range communications that are impractical to implement with the use of wires. Information can be transferred in both short and long distances. Mostly wireless technologies use Radio Waves. Applications of Radio Wireless Technology are GPS units, garage door openers, radio receivers, satellite television.

II. Methodology

When supply is switched on and Ultrasonic Sensor detects the intruder the door will be automatically closed. Automatically door closing is done the DC motor which is connected to L293D.
location of the Intrusion will be found by GPS and the location is sent to the predefined user through GSM.

By using SMS Google Maps the location can be seen in Android Mobile Phone. By using Voice Record Playback Module we will record an alert tone for intimating the neighbours that intrusion is occurred. Speaker is attached to voice module and it sounds the previous recorded alert tone. Raspberry Pi a small computer is used to capture the images of the intruder using the USB Camera. The captured images can be seen in the monitor using web.

![Block Diagram](image)

**Fig 1: Block Diagram**

### III. Previous Techniques

This paper proposed a home security system using Microcontroller. In this door locking system is used which is password Protective and has LED based resistive screen input panel. For displaying 16x2 LCD is used. IR Sensors are used for detection of intruder at the windows and doors in the night time and when the people are away. Fire alarm system uses LM35 Temperature sensor for detecting changes in temperature and raises an alarm\(^1\).

This paper proposes a home surveillance system that consists of a home computer (HC) that is connected to the internet attached with a motion detector and Web camera. Motion detector is continuously monitored and when HC detects the motion it immediately starts a video call with the wireless computer the user is currently at which must be connected to the Net and user should be logged on to the IPTEL Session Initiation Protocol Registrar Server\(^{10}\).

This paper proposes a automated intrusion detection system which uses alarm technique that alerts the human security. Closed Circuit Television (CCTV) is used for video surveillance. This provides a means of identifying the culprit in case the intruder is able to escape before a response team arrives\(^1\).

### IV. Proposed Technique

This proposed strategy does not require any systems administration method to impart. By connecting GPS Module to the spot where interruption happens the area can be discovered even the interloper moves far from home.

As present days each one has web office in their mobiles the area can be seen regardless of the fact that the client is not accessible close to interruption. The area data is sent to the client through GSM and Door is additionally shut utilizing L293D driver. Pictures are caught utilizing cam alongside Raspberry Pi. The images of the intruder can be in PC using the IP address of the PC. The Web page that you want should be predefined so that it appears in the way that we had selected. We can set the date time and year for the pictures of the intruder so that the intrusion can be rectified easily as we will not be there in the Intruded area.
V. Results

![Practical Kit Image]

**Fig 2: Practical Kit**

This Kit shows how the connections are done between the modules, controller and other Components. Pictures of the intruder are taken using Camera attached to Raspberry Pi and stored in the web. The images of the intruder are seen in using web. As the connections are connected from controller to the remaining components single external power supply is enough to the Microcontroller. Supply for the camera is taken from the Raspberry Pi and the Supply to Raspberry Pi is taken from the lap or system that we are using. A cable is used to open the web page that had been used for storing the images and using HTML default web page is created.

VI. Conclusion

This paper finally concludes that there is no need of learning various algorithms and transfer data between nodes. It is enough if we are having the basic idea of what we are using and how to use them. So that it is very easy to implement. It can be applicable in places like closed homes, Banks, Industries.

VII. Future Scope

As we are not using any nodes here there will be no communication between several members to alert about the intrusion. This model is also used for closed systems only. Intrusions will be in open areas also so in order to reduce those intrusions some simple technique should be implemented.

References

A survey on elliptic curve cryptography

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ABSTRACT:

In this, a cryptographic method of hiding and securing data or images for the purpose of secure communication is discussed. Cryptography is a method of encrypting and transmitting data in a hidden and secure form, so that no other third party person can read it and process it. It analyzes protocols and provides various aspects for the sake of information security. Elliptic Curve Cryptography is the most powerful cryptographic technique being used widely. It is a public key encryption technique which is capable of creating much efficient cryptographic keys. The method is based on elliptic curve theory. The use of this technique will provide greater security using fewer bits and requires less bandwidth than other protocols.

Keywords: Elliptic Curve Cryptography (ECC), discrete logarithm Elliptic Curve (EC), public key cryptography.

1. INTRODUCTION:

The progress in wireless technologies and communication systems has provoked new security questions because the wireless data transfer is not that much secure and can be easily get exposed to the hackers or unauthorized users. To meet the increasing needs for secured wireless communication, advanced and high secure protocols are to be developed that requires low power and have less overhead. Some measures like authenticity, confidentiality and integrity are to be taken to obtain reliable and secured wireless communication[1]. The transmitter and receiver should authenticate one another using a session key, to encrypt the data that is being sent over the channel. The Elliptical Curve Cryptography is a public-key encryption method in which separate keys are used for encryption and decryption. It also provides digital signature methods for encryption. ECC can provide higher security and better performance than the well-known RSA technique at a smaller key size. In this way it can reduce processing time and computational costs. ECC makes use of elliptic curve defined over a finite field which restricts the variable and coefficients to its elements.

2. LITERATURE REVIEW:

I. Many researchers have been working on various Elliptic Curve Cryptographic methods to ensure the best and reliable protocols for wireless communication networks. Ray C.C. Cheung (2005), has proposed Customizable Elliptic Curve Cryptosystems[2]. In this, a method for producing hardware designs for elliptic curve cryptography (ECC) systems over the finite field $\mathbb{GF}(2^m)$, using the optimal normal basis for the representation of numbers is proposed. This field multiplier design is based on a parallel architecture containing multiple bit serial multipliers; by changing the number of such serial multipliers, designers can obtain implementations with different tradeoffs in speed, size and level of security. To facilitate performance characterization, they have developed a parametric model for estimating the number of cycles for the generic ECC architecture. ECC has been adopted to a wide spectrum of applications from digital certificates in webserver authentication [12] to embedded processors [13] in wearable devices.
In the above figure the key size for our ECC architecture, is a characteristic of the field. In this subsections under cover field multiplication, field inversion, field squaring, point multiplication, point addition and data embedding respectively.

II. In “Public Key Cryptosystem Technique Elliptic Curve Cryptography with Generator g for Image Encryption” (2012), an efficient technique of transmitting the image securely using ECC is proposed. It has been shown though the image encryption by ECC the image can be transmitted secretly and efficiently and can be recovered the same at the receiver end. An image encryption for secure internet in Multimedia application was proposed in [6].

**Image encryption and decryption:**

Step1. Take any RGB color image as sw.

Step2. A encodes the sw image as sw P = (x, y) = (g5, g3).

Similarly others points are calculated using equation (4) with generator g.

Step3. A choose a random number K and produce the

\[ \text{Ciphertext } C_{sw} = [k G, P_{sw} + k PB]\]

and sends this ciphertext \( C_{sw} \) to B.

Step4. To decrypt the sw image, B computes \( n_B \cdot k' G \).

Step5. B again computes

\[ P_{sw} + K' P_B - n_B K' G = P_{sw} - K (n_B G) + K PB = P_{sw} - K' n_B + K' n_B = P_{sw}. \]

In other words, we can say B picks the first coordinate KG of \( C_{sw} \) multiply that with his private key and then subtract this form the second point \( P_{sw} = K' P_B \).

To achieve higher security of digital image RSA scheme with MRF and ECC proposed for image encryption [9].

The scheme consists of the important algorithms namely encryption algorithm which is used to create every 2-D image pixels of the original image into the ECC points in a finite abelian group over \( GF(2^m) \). These ECC points convert into cipher image pixels at sender side and decryption algorithm is used to get original image within a very short time with a high level of security at the receiver side. The Mixed image element encryption using elliptic curve cryptography has been proposed in [10].

III. In “Encryption using Elliptic Curve Cryptography using Java as Implementation tool” (2014), the implementation of ECC for encryption/decryption and authentication process is discussed, using JAVA as the implementation tool[4]. It is worth noting that brute force attack on ECC is infeasible due to the discrete logarithm problem it possesses. Kristin Lauter as provided an overview of ECC for wireless security [11].

“Image encryption using elliptic curve cryptography”, (2013) deals with the encryption of an image using ECC with generator G. ECC points converts into cipher image pixels at
sender side and decryption algorithm is used to get original image within a very short time with a high level of security at the receiver side.

“Elliptic Curve Cryptography with Hill Cipher Generation for Secure Text Cryptosystem”, 2014, proposed an idea in which hill cipher is generated with Elliptic Curve Cryptography to provide better security and proper security coverage. Hill Cipher is harder to break due to its linearity and ECC is a smaller key size algorithm, which provides fast computations.

“Achieving Authentication and Integrity using Elliptic Curve Cryptography Architecture” (2013), presents the security protocol for securing data between two communicating nodes in mobile adhoc networks. The proposed scheme would solve the issues of space in terms of key management in adhoc networks as well as it will provide integrity and authentication for the communicating entities.

In “Use of elliptic curve cryptography for multimedia encryption” (2013), the ECC is used to perform encryption along with multimedia compression, and two ECC-based encryption algorithms are introduced and applied before and during compression. The first algorithm performs selective encryption on the transform coefficients during compression, whereas the second algorithm achieves perceptual encryption based on selective bit-plane encryption before compression.

“Speeding up Video Encryption using Elliptic Curve Cryptography” (2013), proposed a computationally efficient and secure video encryption algorithm. This makes secure video encryption feasible for real time applications without any extra dedicated hardware. It uses RC5 for encryption of the DCT coefficients and ECC for small key sized generation.

V. SECURITY MEASURES:

Some of the security measures that are to be taken to obtain secured communication are as follows:

Authentication:

In order to eliminate the fraudulent activities in wireless communication, mutual authentication of users and servers is a must. The user and the server should authenticate one another before the communication takes place.

Confidentiality:

With the advancement of technology there are commercially available scanners that can easily intercept radio signals traveling over the air in wireless communication systems[5]. Although digital systems are advantageous over analog systems in terms of security, they are also prone to eavesdropping. To avoid this problem, subscribers and servers must agree on a key that can be used to encrypt information. Key agreement is usually the last part of the authentication process between subscribers and servers. Session keys must differ for each transfer to enhance security. There may be situations that some users may not want to expose their identity or other information to third parties. So every user can be assigned with a temporary identity without revealing the original identity.

IV. In the literature, several authors have tried to take advantage of the options of global organization field to deploy for security applications. We have printed a number of the highlights of the relevant work in this section.Kristin Lauter has provided an outline of ECC for wireless security [3]. It focuses on the performance benefits within the wireless environment by victimisation ECC rather than the normal RSA cryptosystem. The customary standard specifications for public key cryptography is outlined in . In the paper as projected by Jaewon Lee presents three algorithms to perform scalar multiplication on European Union defined over higher characteristic finite fields like OEA (Optimal Extension Field). Liu Yongliang showed that Aydos et al.’s protocol is at risk of man-in-the-middle attack from any aggressor however not restricted on the within attacker.
Physical requirements:

Beyond security, there are also some necessary elements for any protocol. They are efficiency, power consumption, computational behavior, bandwidths used, battery power and storage. These all should be well defined in order to design an efficient protocol.

3. CONCLUSION:

In this paper text based elliptic curve cryptosystems is implemented. Transformation of the plaintext ASCII value by using an affine point is one of the contributions of this work. Cryptography is a method of encrypting and transmitting data in a hidden and secure form, so that no other third party person can read it and process. This design supports various parameters, such as the key size and the degree of parallelism, to enable tradeoff between level of security, design size and speed. It is a public key encryption technique which is capable of creating much efficient cryptographic keys.

REFERENCES


AN SHREWD APPROACH TO IMPROVE THE ACOMPLISHMENT OF LINEAR ALGEBRA CORES

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Abstract—This paper analyze the mapping of calculations experienced when illuminating thick direct frameworks and straight minimum squares issues to a custom direct variable based math processor. Particularly the emphasis is on level-3 BLAS calculation, which used to enhance the force and execution proficiency and to coordinate the heterogeneous framework on GPU and CPU. A level-3 BLAS used to accomplish the high productivity up to 64 GFLOPS, our augmentation to the MAC unit can accomplish the rate up to 30 percent for the blocked calculations using single flux quantum circuits.

Keywords-Level 3 BLAS, heterogeneous system, floating point arithmetic, single flux quantum circuits

I. INTRODUCTION

Lessening force utilization is an undeniably essential issue both in the installed areas, where frameworks need to work in exceedingly confined situations, and as a rule reason registering, where physical breaking points of innovation scaling have made force dividers the fundamental barrier to supported execution. Moreover, numerous rising frameworks, progressively request both elite and force effectiveness on non-customary platforms[2].

The factorization calculations are ordinarily the first and most figure serious steps experienced towards when fathoming thick direct frameworks and straight minimum squares issues to a custom Linear Algebra processor[1].

The objective of our task is to outline elite, low-control Linear Algebra Cores (LACs) that understands the level-3 BLAS portions straightforwardly in particular hardware[2]. In this paper, we sum up our outline to other level 3 BLAS, showing that with little small scale building alterations, the Linear Algebra Cores can be reached out to bolster the full arrangement of BLAS operations without misfortune in proficiency.

Moreover, we outline and coordinate a particular MAC unit and incorporate it and other key segments of LAC miniaturized scale structural engineering [3][4], to achieve the execution of 60 GFLOPS further expansion to the MAC unit can accomplish the pace up to 30 percent for the blocked calculations. This speaks to two requests of size change over current CPU architectures and a request of greatness change over current GPUs.

BLAS are indicated situated of low-level subroutines that perform normal direct variable based math operations, for example, vector scaling, copying, vector spot items, straight mixes, and lattice duplication's. Furthermore, were initially distributed as a Fortran library are still utilized as a building piece as a part of larger amount math programming dialects and libraries, including MATLAB, LINPACK, LAPACK[5].

Past work concentrated on upgrades for the internal parts of LU factorization, Cholesky factorization, and QR factorization to enhance the calculation/building design co-outline conveys to the low-level inward bit of QR factorization general blocked calculations of each of the three lattice factorization.

In gadgets, quick single flux quantum (RSFQ) is an advanced hardware innovation that depends on quantum impacts in superconducting gadgets, in particular Josephson intersections, to process computerized signs. Josephson intersections are the dynamic components for RSFQ gadgets, pretty much as transistors are the dynamic components for semiconductor hardware. Be that as it may, RSFQ is not a quantum registering innovation in the customary sense. Indeed, even along these lines, RSFQ is altogether different from the conventional CMOS transistor innovation utilized as a part of each day PCs:

it is taking into account superconductors, so a cryogenic situation is needed;
the computerized data is conveyed by attractive flux quanta that are created by Josephson intersections rather than transistors in semiconductor hardware;
the attractive flux quanta are conveyed by picosecond-term voltage beats that go on superconducting transmission lines, rather than static voltage levels in semiconductor gadgets.

Therefore the region of the quantized voltage beats that convey single attractive flux quanta is steady. Contingent upon the parameters of the Josephson intersections, the beats can be as thin as 1 picosecond with an adequacy of around 2 mV, or more extensive (ordinarily 5–10 picoseconds) with a lower sufficiency;

since heartbeats ordinarily engender on superconducting lines, their scattering is constrained and generally insignificant if no unearthly segment of the beat is over the recurrence of the vitality crevice of the superconductor;

in 2010, the commonplace estimations of the most extreme heartbeat abundance, generally called the IcRn item, is of the request of 0.5 to 1 mv. Rn is the typical resistance of the Josephson intersection that produces the voltage heartbeats, while IC is its basic current.

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On account of beats of 5 picoseconds, it is ordinarily conceivable to time the circuits at frequencies of the request of 100 GHz (one heartbeat each 10 picoseconds)

II. RELATED WORK

LINEAR ALGEBRA CORE WITH LEVEL 3-BLAS

Lessening force utilization and expanding effectiveness is a key sympathy toward numerous applications. It is very much acknowledged that heterogeneous and specialization are essential methods to enhance both power and performance. Yet, to outline exceedingly effective preparing components while keeping up enough adaptability inside of an area of utilization is a major inquiry. Here, we show the configuration of a specific LAC for an imperative class of computational bits, the level-3 BLAS. We show a nutty gritty calculation/structural engineering co-outline for mapping various level-3 BLAS operations onto the LAC and the outcomes demonstrate that our model LAC fulfills an execution of around 64 GFLOPS (twofold accuracy) for these operations, and while expending under 1.3 Watts in standard 45nm CMOS innovation with a full-hand craft and up to 50× and 10× better regarding force effectiveness than CPUs and GPU

B. Multiply and Accumulator

In computing, especially digital signal processing, the multiply–accumulate operation is a common step that computes the product of two numbers and adds that product to an accumulator. The hardware unit that performs the operation is known as a multiplier–accumulator (MAC, or MAC unit); the operation itself is also often called a MAC or a MAC operation. The MAC operation modifies an accumulator \( a \):

\[
a \leftarrow a + (b \times c)
\]

When done with floating-point numbers, it might be performed with two roundings (typical in many DSPs, or with a single rounding. When performed with a single rounding, it is called a fused multiply–add (FMA) or fused multiply–accumulate (FMA).

Modern computers may contain a dedicated MAC, consisting of a multiplier implemented in combinational followed by an adder and an accumulator that stores the result. The output of the register is fed back to one input of the adder, so that on each clock cycle, the output of the multiplier is added to the register. Combinational multipliers require a large amount of logic, but can compute a product much more quickly than the method of typical of earlier computers. The first processors to be equipped with MAC units were digital signal processing, but the technique is now also common in general-purpose processors.

C. Basic linear Algebra Core

BLAS (Basic Linear Algebra Subprograms) is a specification that prescribes a set of low-level routines for performing common linear algebra operations such as vector addition, scalar multiplication, dot product, linear combinations, and matrix multiplication. They are the de facto API for linear algebra libraries, with bindings for both C and FORTRAN.

It originated as a Fortran library in 1979 and its interface was standardized by the BLAS Technical (BLAST) Forum, whose latest BLAS report can be found on the Netlib site. This Fortran library is known as the reference implementation (sometimes confusingly referred to as the BLAS library) and is not optimized for speed.

Most libraries that offer linear algebra routines conform to the BLAS interface, allowing library users to develop programs that are agnostic of the BLAS library being used. Examples of such libraries include: AMD core math library (ACML), ATLAS, Intel Math Kernel Library (MKL), and Open BLAS. ACML and MKL are proprietary vendor libraries, optimized for their respective brands of CPUs. Open BLAS is an opensource library that is hand-optimized for many of the popular architectures. ATLAS is a portable library that automatically optimizes itself for an arbitrary architecture. The LINPACK
benchmarks rely heavily on the BLAS routine \texttt{gemm} for its performance measurements.

IV. CONCLUSION

In this paper, we presented the mapping of both inner kernels and blocked matrix factorization problems onto a highly efficient linear algebra accelerator. We propose two modifications to the MAC unit designs to decrease the complexity of the algorithms. We also showed how existing processing elements can be enhanced to perform special functions such as divide and square-root operations. To demonstrate the effectiveness of our proposed extensions, we applied them to the mapping of Cholesky, LU and QR factorizations on such an improved architecture. We studied both inner kernels and blocked-level algorithms and presented the resulting performance and efficiency benefits. Results show that our extensions significantly increase efficiency and performance of inner kernels and are effective for bigger problem sizes that fit on the LAC. Future work includes the integration of the LAC into a heterogeneous system architecture next to general purpose CPUs and a heterogeneous shared memory systems, which will allow com.

V. REFERENCE


IMPLEMENTATION OF HEART BEAT PER MINUTE RATE

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ABSTRACT

With the upcoming ageing society and emerging of some newly discovered chronic diseases, the demand of hospital nursing for people has significantly increased. For every disease knowing the heart beat per minute rate is mandatory. Because the heart beat rate reflects the functioning of the organisms. Knowing the heart beat without a doctor or stethoscope is a tough task for normal people. So in this paper we are implementing a wireless device to know the heart beat rate per minute and temperature. If any of these parameters are abnormal then the data will be automatically sent to the doctor’s mobile through GSM. So we can know the details whenever we want.

Keywords –Microcontroller, Optical sensor, Bluetooth, Temperature Sensor, GSM MODEM.

INTRODUCTION

Heartbeat is an exceptionally indispensable wellbeing parameter that is specifically identified with soundness of human cardio-vascular system. The heartbeat of a person can be measured through a fingertip. While the heart is pulsating it is really pumping the blood all through the body, and that makes the blood volume inside the finger supply route to change time to time. This fluctuation is detected by an optical sensing mechanism. This design is accurate and low cost implementation. The body temperature of the patient can be noticed by the general purpose temperature sensor. When the heartbeat and body temperature of a person reaches to abnormal levels it sends an indication to the doctor (or any other concerned person) through SMS or call. The normal body temperature is 37°C and normal heart Beats per Minute (BPM) is 72.

SYSTEM HARDWARE BLOCKS

Optical Sensor

It consists of IR LED (Infrared ray emitting LED) and photo diode placed side by side. The fingertip is place over this assembly.

ARM7-based embedded system

The ARM7-based embedded system is heart of entire System. It is designed based on low power 32-bit ARM7 (LPC2148). It is RISC architecture and can use oscillators, thus it is ideal to be used as an embedded system. The LPC2148 is an32k instructions program buffers, 512kb of RAM, three timers and 32 bit A/D converter microcontroller. It is highly performance and low cost solution for embedded applications.

GSM MODEM

A modem is a GSM remote modem that works with a remote GSM framework. A remote modem proceeds as a dial-up modem. The central difference between them is that a dial-up modem sends and gets data through a phone line modified while a remote modem sends and gets data through radio waves.

BLOCK DIAGRAM SHOWN BELOW WITH HARDWARE BLOCKS

Fig.1. Block diagram of implementation of bpm rate with GSM Module

HARDWARE DESIGN

The hardware implementation shown below and the following components are used each of them explained below.
Optical Sensor Unit

The IR LED emits the IR rays and when there is no obstacle or less volume of blood the photo diode receives less IR rays and the current through the reverse biased p-n junction of photo diode decreases. When the volume of blood is more due to pumping of blood by heart the IR rays are reflected back to the photo diode and the current through it increases. Thus there are continuous fluctuations in photo diode current.

Signal Conditioning Circuit

The reflected IR signal detected by the photo diode is fed to a signal conditioning circuit that filters the unwanted signals and boosts the desired signals. For this purpose a general purpose Op-Amp is maintained high for necessary amplifications. At the output a LED is connected that will blink with heartbeat. Here a transistor is used at the cathode of LED which is turned on for every 6 seconds. Through this the actual heartbeat can be obtained by multiplying the obtained value with 10.

Temperature Sensor

Body temperature sensor LM 35 is accomplished. This is an assembled exactness temperature sensor circuit is little and can be set anyplace in the body. LM execution is the voltage 35 is on body temperature. The external LM35 obliges no slicing or arrangement to normal correct nesses of ± 1/4 ° C to room temperature and ± 4.3 ° spread a wide temperature scope of -55 C to + 150 °. This straightforward sign is given to ADC, which changes with the basic sign and holds progressed microcontroller.

ARM Microcontroller Unit

As said earlier the output of the signal conditioning circuit changes from Vcc to 0V continuously due to heart beat. A timer is made on and after 6 seconds of time is made off. In this time span the number of fluctuations in conditioning circuit is counted and this is multiplied by 10 to get the beats per second value. The ADC is used to get the temperature value from the temperature sensor. These values are displayed on the LCD display. When these values exceed the particular range data is sent to GSM module through serial port.

Transceiver and Serial Port Interface

The output of the TTL logic is always 5V and 0V. So these values are needed to be amplified before being transmitted to the GSM Module for this purpose MAX232 is used. It has incorporated switched capacitor charge pump circuits to generate required voltage levels. It has in-built voltage doublers and inverter circuits. MAX 232 has two pairs of such transceivers.

GSM MODEM Module

An external GSM module is connected through serial port. Through this the extended AT commands for writing the SMS message can be controlled. Whenever the sensed values exceed the predefined values a signal is sent to GSM Module through transceiver and a serial port.

SOFTWARE DESIGN

Keil c

Keil programming is the main merchant for 8/16-bit advancement devices. Keil programming speaks to everyone in more than 40 nations, from the presentation of business in 1988; the keil C51 compiler is the accepted business standard and backings more than 500 present gadget variations. Presently, keil programming offers improvement devices for ARM. Keil programming makes C compilers, full scale constructing agents, constant bits, debuggers, test systems, coordinated situations, and assessment sheets for 8051, 251, ARM and XC16x/C16x/ST10 microcontroller families.

FLASH MAGIC

Flash magic can control the territory in the ISP procedure for some microcontrollers gadgets.
utilizing handshaking signs COM port to control the gadget. Normally, signs handshake sticks are utilized to control and reset, PSEN and VCC. The careful pin utilized relies upon the particular gadget. Generally as this highlight, Flash Magic remains consequently put the gadget into ISP mode to the begin of an ISP operation. Enchantment Streak then subsequently makes the gadget run code toward the end of ISP operation.

RESULTS

Fig.3.Hardware

The above Figure 3 Shown is an Hardware Kit Module of this Project. GSM Module, Bluetooth Module, and optical Sensor is interfaced with LPC2148.

Fig.4.Initialization of hardware

After initializing of hardware, at first it displays the room temperature. Whenever we put the finger into the optical sensor it displays the heart beat per minute rate along with the temperature as shown below.

Fig.5. Displaying temperature

For continuous monitoring of heart rate we used Bluetooth, and it shown below.

Fig.6.Displaying heartbeat along with temperature
Fig.7. Displaying heart rate on hardware and mobile through Bluetooth

This feature is available for all android mobiles through a Bluetooth controller app. This will show continuous monitoring of heart rate and temperature till we disconnect the Bluetooth or optical sensor. And Gsm is used for abnormal conditions, i.e., if the heart rate is not in between given range then only the message will send to the doctors mobile through gsm modem, and it shown below.

Above figure shows the heart rate exceeds the given range then the gsm is activate and sends a message whatever we given in the program. Example shown in below figure, i.e., patient condition is abnormal, then the corresponding doctor or person will respond.

Fig.8. Message sent through gsm to mobile

CONCLUSION

In this paper mechanism to continuously monitor the heart BPM and body temperature of a person is illustrated using a microcontroller interfaced with an optical sensor unit. This design is interfaced with a GSM module so that when the heartbeat and body temperature reaches to abnormal level a message is sent to the doctor. It is an intrusive process and the patient can be monitored 24x7 without much medical assistance from outsiders.

FUTURE SCOPE

The implementation will not be accurate when the blood levels of the person to be monitored are low. So in place of normal optical sensor powerful IR sensors can be replaced so that the heartbeat of those persons can also be monitored easily. Even continuous monitoring of blood pressure can also implemented as it is also important parameter while diagnosing the diseases.

REFERENCES


FEATURES

This system consumes low cost to develop and having good sensitivity of measuring pulse more over it is simple to construct and set up. Finally it gives more accurate results.
Collision Avoidance of Trains by Using ARM7

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ABSTRACT: Railways are the popular mode of Transport in almost all major cities of the World. Railways are the most widely used and comfortable modes of transportation system. The major cause for railway accidents is collision of trains on the same track. The main aim of this anti collision system is to identify collision points and to report these error cases to main control room nearer to the station as well as grid control station. Majority of accidents occurred due to improper communication among the network between drivers and control room, due to wrong signaling, worst atmospheric condition, immediate change of route. The train driver doesn’t get proper information in time leading to hazardous situations. So this system by using zigbee protocol provides communication in between trains, which provide information or track id of one train to another train to avoid collision.

Keywords – ARM7LPC2148, sensor, track switches, fire alert, zigbee technology.

I.INTRODUCTION
Today Railways is one of the efficient and largest transports in world. But railway system is also facing some problems. In this paper we are providing some electronic element to provide some safety measure for collision of trains by using zigbee protocol. It may helps to save the human life from accidents by implement this paper in railway transport. By implementing this automatic system one could avoid human error. In this implementation, every train sends its track id to nearby trains, if the one train goes in a first track, the signal is given to the other train, if any another train comes in same track and it also sends first track to other, then two trains receives same track id alerting two train drivers so that they can stop train at a distance to avoid train collisions. This system uses buzzers, switches, ARM7LPC2148, LCD display, MAX232, DC motor, Zigbee receiver and transmitter.

Collisions
Collisions are most dreaded accidents. In case of fault signaling it is very difficult to stop both the trains on the same track because generally there would be travelling very fast. Collisions are made by human errors or by equipment fault but by the collision there would be a lot of loss to property and the death toll in such accidents would be very high.

II. EXISTING METHODS AT PRESENT SYSTEM
Detection of Train Paths
This system continuously tracks the path of train. The proposed Solution is based on IR Rays & Sensors.

Anti-collision Device (ACD)
The Anti-Collision Device (ACD) is an automatic train invented by RAJARAM BOJJI director of Konkan railways. The system consists of Loco ACD (locomotive of train) with a console (message display) for the driver (in each Loco Engine), Guard ACD with remote (fitted in Guard Van), Station ACD with console (fitted in Station Masters’ Cabin), Manned(manually operated level crossing gate) and Unmanned Gates ACD with hooters and flashers (in each location) and Repeater ACDs (ensuring communication in the defined zone of 3km) which work in concert to prevent the following kinds of collisions and accidents like

a. Head on collisions.
b. Rear end collisions.
c. Collisions due to derailment.
d. Accidents at the level crossing gates.

Head on collision occurs when front end of the train/vehicle hits the another front end of train or any vehicle. Rear end collision occurs when the front of train or any vehicle hits the back end of train or any vehicle.

ACDs have knowledge embedded intelligence. Receive inputs from GPS satellite system for position updates and network among themselves and communication can be done through radio modems to take decisions for timely auto-application of brakes to prevent dangerous collisions. But drawback of ACD is as it is made from IR system (works only on LOS) fails on curved tracks and here we are using radio modem for communication which may get obstacles in places like hill stations

Related Methods
Railway Collision Avoidance System (RCAS) is the another system which identifies the train position and also the movement of direction, but they are not trust worthy. Train Collision Avoidance System (TCAS) which has signal aspect in cab and also display prevention of SPAD(signal passing at danger)with emergency break application

III.PROPOSED EMBEDDED SYSTEM DESIGN VIEW
The proposed system is used to protect the accidents between the trains automatically which helps for safety purpose by using buzzers, switches, ARM7LPCs2148, LCD, MAX 232 serial
communication, Temperature Sensor, DC Motor, Motor drive, Zigbee transmitter and receiver.

ARM7-BASED EMBEDDED SYSTEM

The ARM7-based embedded system is heart of entire System. It is designed based on low power 32-bit ARM7 (LPC2148). It is RISC architecture and can use oscillators, thus it is ideal to be used as an embedded system. The LPC2148 is an 32k instructions program buffers, 512kb of RAM, three timers and 32 bit A/D converter microcontroller. It is highly performance and low cost solution for embedded applications.

ZIGBEE TECHNOLOGY

Zigbee is the latest technology and also provides an efficient way to convey the information to the authorized official at low cost as compare to that of the GSM Modem and also utilizes a cell-phone to send the message to the officials having a long battery life. The other wireless techniques such as Bluetooth, infrared etc are having the limitations of range and also of the efficiency. The wireless system based on GSM/GPRS is well known. But the fee is needed of using GSM/GPRS network, and also the cost of hardware system is very high. The following are the some of the features of the zigbee technology.

Features:
1. Good sensitivity
2. Excellent stability
3. Good pinpointing ability
4. Loudspeaker output
5. Low cost.

TEMPERATURE SENSOR

As there are many types of temperature sensors but we are using LM35 temperature sensor. LM35 is an IC which measures temperature with an electrical output proportional to Celsius. Compared to the thermistor LM35 measures temperature more accurately. It has three pins which are positive power supply, analog output, ground or negative power supply. This LM35 is less cost effective and it is suitable for remote applications such as power supplies, battery management. It is a Waterproof temperature sensor.

MAX232 SERIAL COMMUNICATION

The output of the TTL logic is always 5V and 0V. So these values are needed to be amplified before being transmitted to the GSM Module for this purpose MAX232 is used. It has incorporated switched capacitor charge pump circuits to generate required voltage levels. It has in-built voltage doubler and inverter circuits. MAX 232 has two pairs of such transceivers.

RESULTS

FIG-4: HARDWARE OF TRAIN COLLISION AVOIDANCE SYSTEM
FIG-5: INDICATION OF TRACKS OF THE TWO TRAINS

FIG-6: DISPLAY OF ALERT MESSAGE WHEN TWO TRAINS ARE IN SAME TRACK

FIG-7: DISPLAY OF LONGITUDE AND LATITUDE WHEN TWO TRAINS COME IN TO THE SAME TRACK

FIG-8: DISPLAY OF MESSAGE ALERT WHEN TWO TRAINS COME TO SAME TRACK TO STATION MASTER.

FIG-9: DISPLAY OF LONGITUDE AND LATITUDE WHEN FIRE ACCIDENT IS OCCURED
FIG-10: DISPLAY OF MESSAGE ALERT FIRE ACIDENT IS OCCURED.

CONCLUSION
In this paper, an anti collision device has been designed ,in this system if two trains are travelling g in same track with the speed of 120kmph then immediately the information signal is sent to the train driver and the train can stop at the minimum safe distance of 920m also have safety valves at each window. So that when fire accident is occurred every one can escape from the train without any rush. By implementing this system in railways we can save many human lives

FUTURE SCOPE
Zigbee covers up to a distance of 1km whereas by using Wi-Fi we can cover over long distances so that we can easily avoid the accidents and can have the safest mode of transportation.

REFERENCES