An Automatic Irrigation Control Based on GSM Technologies

S.Divya, J.Subhashini ,N.Thalai Malar ,Mr.P.Balaganesh
Srividya College Of Engineering And Technology

Abstract: *Irrigation is a source livelihood of majority Indians and has great impact on the economy of the country.The green house based modern agriculture industries are the recent requirement in every part of agriculturein India. In this technology, the humidity and temperature of plants are precisely controlled. Due to the variableatmospheric conditions sometimes may vary from place to place in large farmhouse, which makes very difficult to maintain the uniformity at all the places in the farmhouse manually.Appropriate environmental conditions are necessary for optimum plant growth, improved crop, and efficient use of water and other resources. Automating the data acquisition processes of the soil moisture allows plant growth with less labor requirement. The proposed system implemented GSM is used to report the detailed about irrigation. The report from the GSM is send through the android mobile. The Arduino software is used for simulation result and embedded hardware kit will be fabricated.*

I INTRODUCTION

Agriculture uses 85% of available freshwater resources worldwide.To create strategies based on science and technology for sustainable use of water, including technical, agronomic, managerial, and communication improvements.Drip irrigation is artificial method of supplying water to the roots of the plant. It is also called microirrigation. In past few years there is a rapid growth in this system. The user communicates with the centralizedunit through SMS. The centralized unit communicates with the system through SMS which will be received by the GSM with the help of the SIM card. The GSM sends this data to ARM7which is also continuously receivesthe data from sensors in some form of codes. After processing, this data is displayed on the LCD. Thus in shortwhenever the system receives the activation command from the subscriber it checks all the field conditions andgives a detailed feedback to the user and waits for another activation command to start the motor. The motor iscontrolled by a simple manipulation in the internal structure of the starter. The starter coil is indirectly activatedby means of a transistorized relay circuit. When the motor is started, a constant monitoring on soil moisture andwater level is done & once the soil moisture is reached to sufficient level the motor is automatically turned off &a massage is send to subscriber that the motor is turned off. The water level indicator indicates three levels low, medium, high and also empty tank.

A GSM-SMS remote measurement and control system for greenhousebased on PC-based database system connected with base station. Base station is developed by using amicrocontroller, GSM module, sensors and actuators. In practical operation, the central station receives andsends messages through GSM module. Criterion value of parameters to be measured in every base station is setby central station, and then in base stations parameters including the air temperature, the air humidity.

Indu etc. al (2013) mainly focuses on reviews in the field of remote monitoring and control, thetechnology used and their potential advantages. The paper proposes an innovative GSM/Bluetooth based remotecontrolled embedded system for irrigation. The system sets the irrigation timedepending on the temperature and humidity reading from sensors and type of crop and can automatically irrigate the field when unattended.

Information is exchanged between far end and designed system via SMS on GSM network. A Bluetooth moduleis also interfaced with the main microcontroller chip which eliminates the SMS charges when the user is within the limited range of few meters to the designated system. The system

informs users about many conditions like status of electricity, dry running motor, increased temperature, water content in soil and smoke via SMS onGSM network or by Bluetooth.

In this paper, our main objective is

- Irrigation is a source livelihood of majority Indians and has great impact on the economy of the country.
- Appropriate environmental conditions are necessary for optimum plant growth, improved crop, and efficient use of water and other resources.
- Automating the data acquisition processes of the soil moisture allows plant growth with less labor requirement.

II LITERATURE SURVEY

In VeenaDivya,k, AyushAkhouri "A Real timeimplementation of a GSM based Automated IrrigationControl System using drip Irrigation Methology"dealGSM based Irrigation Control System, which could givethe facilities of maintaining uniform environmentalconditions. For this, a software stack called Android isused for mobile devices that include an operating system,middleware and key applications. The Android SDKprovides the tools and APIs necessary to begin developingapplications on the Android platform using the Javaprogramming language. Mobile phones have almostbecome an integral part of us serving multiple needs ofhumans. This application makes use of the GPRS featureof mobile phone as a solution for irrigation control system. This system covered lower range of agriculture land andnot economically.

In Mansour "Impact The Automatic Control Of ClosedCircuits Raingun Irrigation System On Yellow CornGrowth And Yield" this research paper deals of automaticcontrol of closed circuits drip irrigation system as amodified irrigation system on yellow corn crop vegetativeand yield parameters under (KSA) Saudi Arabiaconditions at Al-Hasa region. The field experiment carriedout under automatic irrigation system for three irrigationlateral lines 40, 60, 80 m under the following threedripirrigation circuits (DIC) of: a) one manifold for laterallines or closed circuits with one manifold of drip irrigationsystem (CM1DIS); b) closed circuits with two manifoldsfor lateral lines (CM2DIS), order to compensate for Etcand salt leaching requirement. and take more power.

In M. Guerbaoui ,elafou,a.ed-dahhak " GSM basedautomated drip irrigation system " we proposed a systemcontribution to the development of greenhouse productionin Morocco. The proposed solution involvesthedevelopment of an integrated system for automate the dripfertilizing irrigation in green house. The solution adoptedinvolves a data acquisition card PCL-812PGcontrolled byPC. The irrigation is provided by a hydraulic circuit basedon an electric pump. Water needs are evaluated bymeasuring soil water status by soil humidity sensor.

In Purnima, S.R.N Reddy, "Design of Remote Monitoringand Control System with Automatic Irrigation Systemusing GSM-Bluetooth",proposed artificiallysupplyingwater to land where crops are cultivated. Traditionallyhand pumps, canal water and rainfall were a major sourceof water supply for irrigation. This method hasled tosevere drawbacks like under irrigation, over-irrigationwhich in turn causes leaching and loss of nutrient contentof soil. Changing environmental conditions and shortageof water have led to the need for a system whichefficiently manages irrigation of fields. Automatedirrigation system is a machine based system, whichautomates the irrigation of land by combining varioussoftware and hardware approaches together for fieldirrigation.

III PROPOSED SYSTEM

The connections between the two mobiles are done using GSM. The GSM module and microcontroller are connected using UART (universal asynchronous receiver / transmitter). When the moisture sensor senses the low moisture content

of the soil, it gives a signal to the microcontroller.

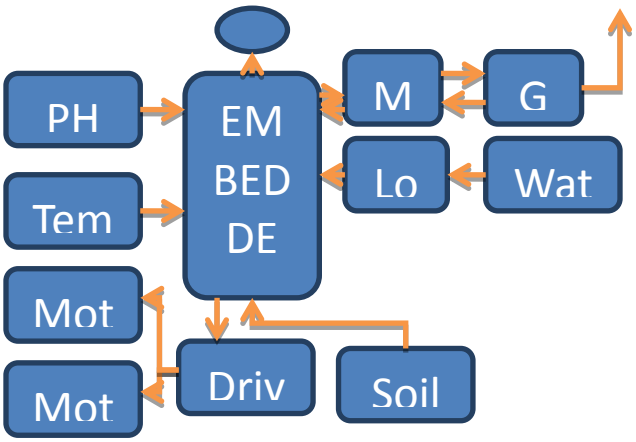

Fig. proposed block diagram

A pipe is connected from water pump and the otheropening is kept near the root of the plant, with agriculture irrigation mechanism attached to it. The flow of the waterfrom the pipe is controlled by a solenoid valve. Theopening and closing of solenoid valve is done bymicrocontroller The microcontroller gives signal to thevalves which causes it to get open. The water is given tothe root of the plant drop by drop, and when the moisturecontent becomes sufficient, the sensor senses thisandgives back the signal to the microcontroller and displays to the LCD. Then by pressing the button in the callingfunction again, the valve is made of f . The power supplyneeded by the controlling system is +5V.

The connections between the two mobiles are done usingGSM. The GSM module and microcontroller areconnected using MAX232. When the moisture sensorsenses that the moisture content of the soil has becomelow, it gives a signal to the microcontroller. Themicrocontroller then gives a signal to the called mobile(which is kept in the auto answering mode). Thecalledmobile activates the buzzer. Therefore when callingmobile calls, that buzzer is heard indicating the valveneeds to be open. By pressing the button in the calledfunction the signal is given back to the microcontroller.

Irrigation is popular because it can increase yieldsand decrease both water requirements and labors. Whencompared with drip systems, Land irrigation leads toless soil and wind erosion. Land irrigation can beapplied under a wide range of field conditions. These are applications written in Java. Some of basicapplications include an calendar, email client, SMSprogram, maps , making phone calls, accessing the Webbrowser, accessing your contacts list and others. This layerconsists of Android libraries written in C, C++,and usedby various systems. These libraries tell the device how tohandle different kinds of data and are exposed to Androiddevelopers via Android Application framework. Some ofthese libraries includes media, graphics, 3d, SQLite, webbrowser library etc. The Android runtime layer whichincludes set of core java libraries and DVM (DalvikVirtual Machine) is also located in same layer.

RuntimeAndroid: This layer includes set of base libraries that arerequired for java libraries. Every Android application gets its own instance of Dalvik virtual machine Linux-Kernel:This layer includes Android's memory management programs ,security settings, power management softwareand several drivers for hardware, file system access,networking and inter-process communication. The kernelalso acts as an abstraction layer between hardware and the rest of the software stack.

The Global System for Mobile Communications is a standard set developed by the European Telecommunications Standards Institute (ETSI) to describe technologies (2G and 3G).General packetradio service (GPRS) is a packet orientedmobile data service on the 2Gand 3Gcellularcommunication system's global system for mobilecommunications (GSM). GPRS wasoriginally standardized by European telecommunications Standards Institute (ETSI) in response to the earlier CDPD and imodepacket-switched cellular technologies.It is nowmaintained by the 3rd Generation PartnershipProject(3GPP).

The GSM (Global System for mobile communication) module (mobile)is used for Remote Control (for exampleGate Control, Temperature Control etc.). GSM/GPRSmodule consists of a GSM/GPRS modem assembled together with power supply circuit and communicationinterfaces(like RS-232, USB, etc.) for computer.fig.GSMmodule structure The MODEM is the soul of suchmodules. They generate, transmit or decode data from acellular network, for establishing communication betweenthe cellular network and the computer.

Thesearemanufactured for specific cellular network(GSM/UMTS/CDMA) or specificcellular data standard(GSM/UMTS/GPRS/EDGE/HSDPA) ortechnology(GPS/SIM). They use serial communication to interface with the user and need Hayes compatible AT commands for communication with the computer (anymicroprocessor or microcontroller system).

IV EXPERIMENTAL RESULTS

The GSM based irrigation system may offer users the flexibility to regulate and control the operations of their irrigation systems with little intervention to reduce runoff from over watering for improvement in crop yield. This enables users to take advantage of the globally deployed GSM networks with its low alerting service cost to use mobile phones and buffer to manage their irrigation system. It will be possible for users to monitor directly the conditions of their farmland, schedule the water. needs of crops, automatically control watering, and set control operational conditions in accordance with the water needs of crops. This will help minimize overwatering and crop production cost.

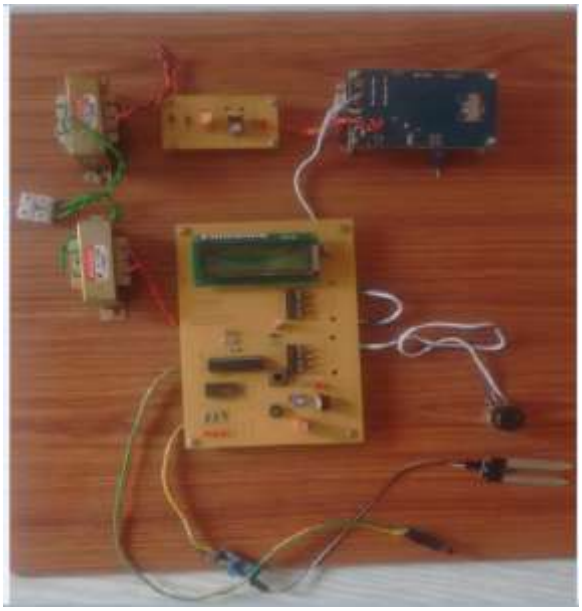

Fig. Hardware implementation

The functionality of the GSM was tested by connecting it to the microcontroller board which was programmed to turn on-and-off an LED using buffer. The major objectives of the present work are,

- The system supports water management decision, which determines the controlling time for the process and monitoring the whole system through GSM module
- The system continuously monitors the water level in the tank and provide accurate amount of water required to the plant or tree (crop).
- The system checks the temperature, humidity and dew point so as to forecast the weather condition.
- Low cost and effective with less power consumption using sensors for remote monitoring and controlling devices which are controlled via buffer using a GSM using android mobile.

V CONCLUSION

This system supports aggressive water management for theagricultural land. This architecture is based on thecapabilities of current and next-generationmicrocontrollers and their application requirements.Microcontroller used for the system is promising that itcan increase system life by reducing the powerconsumption resulting from lower power consumption.

In the present scenario on conservation of water is of high importance. Present work is attempts to save the natural resources available for human kind. By continuously monitoring the status of the soil, we can control the flow of water and thereby reduce the wastage. By knowing the status of moisture and temperature through GSM with the use of moisture and temperature sensors, water flow can be controlled by just sending a message from our mobile. Conservation of water and labor: Since the systems are automatic, they do not require continuous monitoring by labor.

System and operational flexibility: As desired, any valve can be controlled along with the pump and increases the efficiency of water use. If water is stored in tanks at irrigation lands, one can get the status of the status of the water level, temperature sensor and moisture content in soil through SMS generator by microcontroller present at the irrigation land.

The system has an incorporated wireless for remote monitoring which reduces the problem of range with GSM network and saves SMS cost for the farmer. The smoke sensors used to send emergency information to user incase of fire in field or burning

of motor. The design is low power, low cost, small size, robust and highly versatile.

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