

# Wireless Voice Driven Robot Navigation

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**ABSTRACT:** *The voice operated robot for physically disabled person is controlled with the voice command by himself or a care taker. The robot can be interfaced using battery powered system with DC motors. When the word voice control comes into the picture, the first term to be considered is Speech Recognition i.e. the system is made to understand human voice. Once the voice recognition module recognizes the voice commands, it compares to the registered voice, the respected code of digital signals would be sent to Microcontroller which then controls the Robot accordingly. The obstacle is detected by an IR sensor. The speech recognition circuit will trace the functions independently from the robot's main intelligence (CPU). It is an advantages because it doesn't take any of the robot's main CPU processing power for word recognition. Voice driven robot navigation also provides a security for the particular system by recognizing and understanding only the registered voice.*

**KEYWORDS:**Speech Recognition,IR sensor,Microcontroller

## 1. INTRODUCTION

Elderly or physically disabled people use wheelchair, who find difficult to move without external aid. The physically challenged person have special needs and often require some assistance to perform their daily routine. In this paper propose a voice driven robot which comprises of a wheelchair, voice module Infrared sensors and wireless A/V camera. Using a voice driven robot, elderly and the physically challenged can go to different rooms in a house by giving commands which are predefined for the system.

## EMBEDDED SYSTEM

Embedded system is a computer system with a dedicated function within a mechanical or electrical system with real-time computing constraints. Hardware and mechanical parts are embedded as a part of complete device. Embedded systems is control many devices.98.8% of all microprocessors are manufactured as components of embedded systems. For simplifying the system design and to provide flexibility, microprocessor are used. Embedded systems perform several things at once. Modern embedded systems are based on microcontrollers. A microcontroller is a tiny computer on a single integrated circuit. The embedded system is inexpensive

that they are used in almost every electronic product in our life.

## ROBOTICS

In engineering discipline Robotics is included. Designing, construction, operation, and usage of robots, computer systems for controlling them are included in robotics. One of the substitute for the human is robots. Robotics requires a working knowledge of electronics, mechanics and software, and is usually accompanied by a large working knowledge of many subjects. According to the International Organization for Standardization a robot is defined as “an automatically controlled, reprogrammable, multipurpose, manipulator programmable in three or more axes, which may be either fixed in place or mobile for use in industrial automation applications” [2].

## USES OF BUILDING ROBOTS

Robots bring about a drastic change in an industrialized manufacturing atmosphere. Robots are employed in medicine and medicinal institutes. Robots are in the early stage of their evolution. As robots are evolving, they have become more flexible, match the human capacity and ability to do the tasks easily. While the personal computer has made a lasting mark on society, the personal robot hasn't come into existence [1]. A number of robotic directed automobiles and lifting supporters are developed to make the work easier. Robots can work in polluted, chemical as well as nuclear environments. The developed robot cannot recognize many words but can only recognize the commands which is predefined. The five basic tasks performed by a robot are:-

1. Move forward
2. Move back
3. Turn right
4. Turn left
5. Stop

## ARM 7 MICROCONTROLLER

ARM 7 or Advanced RISC Machine, uses a 32-bit RISC (Reduced Instruction Set Computing) processor where 7 is the version of ARM. LPC 2148 (low power consumption) is used

for ARM7 MICROCONTROLLER, which takes 3.3v. The instruction set and related decode mechanism are simpler than those of CISC machine.

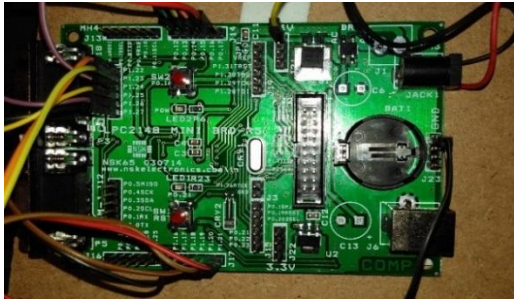


Figure 1.ARM7 LPC2148 Board

### HM2007 VOICE MODULE

HM2007 (hidden markov model) is a single chip CMOS voice recognition LSI circuit which has analog front end ON chip. It analyses the voice, performs recognition process and system control function. An external microphone, keyboard, 64K SRAM, and some other components are used to construct a voice recognition module. A smart recognition system can be built using microprocessor.



Figure 2.HM2007 Voice Module

### LCD

HD44780U dot matrix liquid crystal display controller and driver LSI displays alphanumeric, characters and symbols. A dot matrix LCD can be driven by 4/8 bit microprocessor. The components used to drive a dot matrix LCD are display, RAM, generator, and liquid crystal driver.



Figure 3. HD44780 LCD

### IR SENSORS

An infrared sensor is a sensor that reacts to infrared (IR) radiation. Infrared Sensor Module has built-in IR transmitter and IR receiver that sends out IR energy and looks for reflected IR energy to sense any obstacle in front of the sensor module. The module has on board potentiometer that lets user adjust detection range. The sensor has very good and stable response even in ambient light or in complete darkness.

### DC MOTOR LD293D

A DC Motors is rotary electrical machines. For movements of robot two DC motor's has been used, this motors speed can be controlled over a wide range, it take's 12v power supply and converts it into 2.0v to 5.5v. The DC motors are driven by DC Motor drivers (L293D).

### WIRELESS A/V CAMERA

A wireless camera is a device with delicate appearance, good performance and provides high-quality picture a sound transmitting and receiving. It supports minimum of 100m transmission distance without any obstacle. It could be used on TV, monitor, LCD, etc. including adaptive bracket and supports easy installation. Wireless video communications is shown in *figure 4*. From the camera, an audio-video signal is sent to the TV tuner which is linked to the local system through the easy USB 2.0 Grabber. The Audio-Video streaming is done at the local and also at the remote system.



Figure 4. Wireless Video Communication.

### THE EASY USB2.0 GRABBER

A high-quality audio-video files can be captured by the Easy USB 2.0. Audio-Video adapter is directed by USB2.0 interface without sound card.The installation is very simple and the external power is not required. It is the solution for laptop where the professional video or audio editing software Tin Cam is included to provide best editing function. More speed rendering and real-time performance assures less waiting time.

Key Features of USB2.0 Grabber is as follows:

- The USB2.0 grabber interfaces and do not require any other power.
- It captures audio and video signals through USB 2.0 interfaces.
- Luster, Variation, Colour, and Saturation control is supported.

- It is portable.
- Audio is captured without the sound card.
- High plug and play.



Figure 5. USB2.0 Grabber.

## 2. SYSTEM MODEL

### 2.1 EXISTING SYSTEM

A speech recognition technique has been used. Speech recognition is a process of capturing voice or a pre-recorded voice. Speech recognition technique doesn't provide security. Even an unauthorized person can access the robot which is unsecured. Arduino board is used which has less pins which is difficult for future enhancement. We are over coming from all existing system with the different module and with different controller.

### 2.2 PROPOSED SYSTEM

HM 2007 is used as voice recognition module. Voice recognition is a process of identifying the person based on real time voice. Voice recognition involve speaker verification and speaker identification. Voice recognition provides security by recognizing particular voice. A keypad is fixed on a robot. When a registered person is not able to communicate efficiently, the keypad can be used by him for movements. The commands are programmed for the buttons in order to make movements. The other case which comes into picture is when a registered person is not able to use keypad, a third person can access the robot by his mobile using wireless communication .A camera is mounted on a robot to achieve wireless communication. The signal captured by the camera is sent to the TV tuner to view the movements of robot. The third person can control the robot by viewing the movements from camera using his mobile. The DTMF technology is used to control the robot. Dual Tone Multi Frequency is a technique where a signal is sent to a phone when an ordinary telephone's touch keys are pressed. Embedded C is used for programming the commands for the movements of robot. Keil-U-Vision acts an integrated Development Environment (IDE) to write and compile the code. Philips Utility acts a dumper which is used to flash the code or convert the hexa files. DC motor driver are used to drive the DC motors. DC

motor L293D is used to make clock-wise and anti-clockwise movements.ARM7 LPC 2148 is a microcontroller which is used to build the robot. It consumes a less power of 3.3V.It has 64 pins which can be efficient for future work.



Figure 6: System Architecture

- When a command is given, the microcontroller recognizes the registered voice and the movements are made.
- A keypad is used to move the robot when the person when his voice is not efficient.
- A wireless camera is been placed on robot to monitor the movements.
- The third person can access the robot through his mobile using DTMF technique by viewing the robot using camera. Two cell phones are used one as transmitter and another is receiver.
- A LCD is used to display the commands.
- A dc motor is used to move the robot which provides clockwise and anti-clockwise movements.

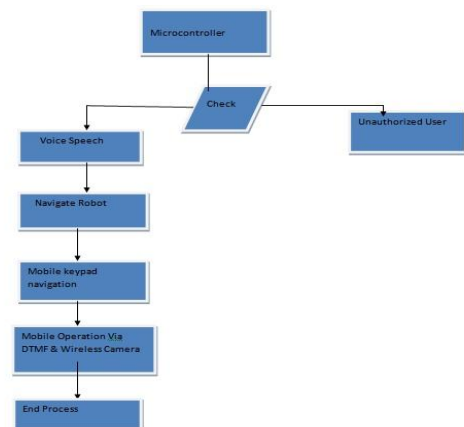


Figure 7: Data flow diagram

When a voice command is given, the microcontroller checks the given voice to ensure whether it is authorized or unauthorized user. When it is an authorized person then the robot can be navigated. If he is not able to communicate, a mobile can be used to move the robot using DTMF technique and wireless camera has been used. Two cell phones are used here one is transmitter and another is receiver. The signal from the receiver the cell phone headset is given to the IC which decodes the dual tones and gives the binary data according to the key pressed in the transmitter cell phone. The receiver cell phone is kept in the robot. When call is made from a transmitter cell phone. After the call gets activated in the receiver end, we can control the robot through the transmitter cell phone. In case unauthorized users try to access the robot, it cannot be navigated.

## ALGORITHM

Step1: Interface the LCD and the Keypad to the ARM 7 Microcontroller 2148.  
Step2: Initializing the LCD.  
Step3: Interface the sensor with controller.  
Step4: Configure the Voice Module Hm2007.  
Step5: sensors are programmed using digital.  
Step6: If the Voice are detected then send command to Controller.  
Step7: Check for the condition and then command controller to act upon it.  
Step8: When DTMF or Keypad gets initialized, then command the controller to navigate the robot.

## FUTURE WORK

Ultrasonic sensor can be used to detect obstacle. To make the system more advance, GPS (global positioning system) can be used to navigate in village or in city. By using GPS tracking wheelchair can be found out. For security purpose fingerprint can also be added.

## CONCLUSION

In this paper “**Wireless Voice Driven Robot Navigation**” a robot is developed for navigation using a particular voice which has been registered. As discussed earlier the robot can sense the obstacle by using sensors and DC motors are used to move the robot. HM 2007 is used as a voice recognition module in order to provide security. DTMF technique is used. Two cell phones are used here one as transmitter and another as a receiver. The overall model is tested completely and results found are satisfactory.

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