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Low Frequency Based Mobile Robot

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Abstract: The main idea is to implement microcontroller based application which can provide security like video monitoring, fire safety, bomb detection using metal detector and identifying nearby obstacles using ultrasonic sensor. For this we are using DTMF [Dual Tone Multi Frequency] technique which is as in build feature in some mobiles and GSM technology. An embedded system is a computer system with a dedicated function within a larger mechanical or electrical system, often with real-time computing constraints. Embedded systems control many devices in common use today. Mobile robot is such a device which works through embedded systems which works with the help of DTMF module. Earlier, these systems are based on wired hardware with the advent of advance modules like DTMF (dual tone multi frequency) and sensors, it became easy to create wireless working robots. Earlier robots have limited working range but in this project a person can activate a robot sitting anywhere in the city. This mobile robot can be operated through any cell phone which has a headset jack to be connected. In this project, different embedded components like arduino, programmer are used. Arduino language is used as programming.

Keywords: Embedded, DTMF decoder, GSM.

I. INTRODUCTION

Today Robotics plays a fundamental role in fields of medicine, industries, home automated systems and many others. The methodology of DTMF (Dual Tone Multi-Frequency) with GSM module is used for designing our robot. Robot is controlled by a mobile, through this we can make our robot communicate on a large scale over a large distance even from different cities or place. This robot has a number of merits as well as important features. Robot is a machine which is a combination of hardware made for different applications. Robotics is a science which uses the continuing advancements of mechanical engineering, material science, sensor fabrication, manufacturing techniques, and advanced algorithms. The study and practice of robotics will expose a dabbler or professional to hundreds of different avenues of study. One of the main objectives of robotics is to reduce the manual labor with skilled labor. This is a small prototype or model of mobile based robot which serves as a basic for heavy robots used in automobile, military and automation industry. Security measures can be developed from this robot in car, handling of big machines is possible through this technology. For instance, look into the application of low cost drones. Drones are being used for videography in marriage and public functions. We can use robots for inspecting bridges or high rise buildings. Govt. and security agencies are increasingly using robots in form of drones for surveillance and rescue operations. A number of startup companies now make drones. Many of them are pretty high end as well, look for AUS start up from IIT Kanpur that is making very high end drones for research applications.

II. PROPOSED METHOD

The main application of the project is video monitoring and controlling, spying, security using mobile phone. In this project we are using Arduino which is interfaced with a DTMF decoder and GSM modem. The technology is DTMF (dual tone multi frequency) in this we require a mobile phone that is mounted on a robot. After lifting the call we need to give commands opening dial pad in the phone that is present in our hand. For every key in the dial pad there is a specific tone of two different frequencies i.e. lower frequency and higher frequency. The robotic system was purely based on electronic and electrical systems system. Android phones have been used to increase the application field of embedded systems. In 1970's and 1980's, Embedded systems had been used for manufacturing and production purposes but with the advent of embedded systems in robotics in early 90's, the scenario began to change

A. The Different Frequencies of Each Key in Dial Pad are as Follows

	column 1 1209 Hz	column 2 1336 Hz	column 3 1477 Hz	column 4 1633 Hz
row 1 697 Hz	1	2	3	A
row 2 770 Hz	4	5	6	B
row 3 852 Hz	7	8	9	C
row 4 941 Hz	*	0	#	D

DTMF digits

Figure1: DTMF keys with frequencies.

When we press a specific key in phone that is in our hand a tone is generated and it is received at the phone on robot. At the DTMF decoder we obtain the tone which consists of both higher and lower frequencies. that will be decoded by the decoder and the obtained output will be in the form of 4-bit binary data and it will be sent to the arm processor and identifies the command given at transmitter side by the processor and makes the movement of the robot.

B. The Following are the Binary Codes that are used here

Command	Address	DTMF module output
Forward	04	0010
Backward	05	1000
Left	07	0100
Right	06	0110
Stop	00	0101

Here the key '4' indicates the front move '5' indicates the back move '6' indicates the right move '7' indicates the left move '0' indicates stop

These four bit data is given as input to the motor driver circuit based upon the input provided the motor circuit enables the motors. Each motor circuit is capable to drive two motors. So there are two enable pins present on circuit when the four bit data is 0010 – forward the two motors gets enabled and robot moves in forward direction. When the motor gets enabled the indication is '10' i.e. one terminal is given with supply Vcc and another with ground. So when the two motors is on the output is '1010'.

The four bit data input to the processor is '1000' then the processor understand the code i.e. backward direction and moves the robot in backward movement by giving the supply '0101' to the motor enable pins.

If the data is '0110' then the movement of the robot is towards right side and the motor output is '0110'. Similarly if the data is '0100' then the movement of the robot is towards left side and the motor output is '1001'. Finally if the data bits are '0101' the robot is going to stop and all the enable pins are grounded i.e. no power supply is given to pins and the motor output is '0000'.

C. The Detailed Information is Tabulated as Follows

DTMF module inputs	Motor Outputs
Forward - 04- 0010	1010
Backward -05- 1000	0101
Left -07- 0100	1001
Right -06- 0110	0110
Stop -00- 0101	0000

III. RESULTS AND DISCUSSION

The result of this paper is mainly focused on the data from controlling the robot through mobile phone. The DTMF tones generated at transmitted mobile phone are received by the receiver mobile phone using GSM technology and reach the decoder and then the decoder is responsible to generate the data to control the motor driver to change the direction and movement of the robot.



1a) Left Move

1b)Right Move

IV. CONCLUSION

This report presents a useful way to control a robot, which is performed using the DTMF tones generated by the phone. It presents several advantages like the large range of working distance and the robustness of control with respect to the communication interference. However, it is not flexible with all cell phones, and mobile batteries drain out early so charging problem

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