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SPY ROBOT CONTROLLED BY DTMF ALONG WITH METAL DETECTION AND OBSTACLE DETECTION

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ABSTRACT

This project summarized a Spy robot control via DTMF technology, the robot identifies the DTMF tones with the assistance of a cellphone stacked on the robot. The received tones are processed with the help of the DTMF decoder by the microcontroller. The robot has the aptitude to detect the metal using a metal detector. The robot is armed with an ultrasonic sensors that helps to keep away from the barrier/obstacle in the field by prior detection of the obstacle and its location. The robot is attached with a wireless camera, capturing and transmitting the current location of the robot that can be viewed on the laptop. A GSM module is used to receive a confirmation message regarding the presence of the metal. This approach has a good advantage of lowering the number of casualties, on the implementation of this technique, the robot is effectively controlled and the position of the obstacle is robustly determined by the use of sensors.

KEYWORDS DTMF technology, DTMF decoder, metal detector, ultrasonic sensors, wireless camera, GSM module.

1. INTRODUCTION

Whole world started aiming on control measures for the terror attacks and ways to improve the security to a nation and avoid loss of human life. The implementation of this project helps reducing the casualties by replacing humans with a Omni directional monitoring robot accompanied by video support that is completely controlled with wireless network (DTMF technology). This project mainly focuses on a robot that can detect metal and avoid obstacles on its way. It is also configured to send the exact location to the user on presence of the metal. For the wireless network purpose, Dual Tone Multi Frequency signalling (DTMF) is used. DTMF, an in-band

telecommunication signalling system that uses voice signals between telephone equipment and other communication devices over telephone lines. DTMF uses an amalgamation of 2 sine-wave tones to signify a key known as the row frequency and column frequency. Benefit of DTMF is that it prevents misinterpretation of harmonics. A metal detector is used for metal detection. It detects nearby metal presence. These are useful for finding metal compositions hidden in underground objects or metal objects. Since Major of the bombs is composed of metal, this robot can help in detecting the bombs in the military purpose. The ultrasonic obstacle detector

(sensor) assists in detecting any obstacle that comes in the way of the robot. The robot automatically stops on detection of obstacle and so waits for the user commands. Another powerful tool is GSM/GPS module. The global system of mobile (GSM) feature is used to send and receive calls and messages between the user and robot. The global positioning satellite (GPS) is used for the tracking i.e., to receive the location of the robot on detection of the metal.

2. RELATED WORK

The main aim behind this robot is for the purpose of the military. The lives of military people are always at huge risk while entering an unknown territory. According to the report of ICBL (International Conference to Ban Landmines), 5700 casualties occurred in different countries in 2006. Therefore, they need to be reduced. The robot can act as an appropriate machine for the defense sector to reduce the loss of human life and also to prevent illegal activity. The robot has the ability to notice buried metal and observe human activity in warfare or border regions in order to reduce enemy-side infiltration. It allows the user to wirelessly control it to avoid casualties in humans. The main drawback of these wireless robots is that RF circuits are usually used. The main drawback of the RF circuit is the limited operating range and limited control [1] [4]. To overcome this, we replace RF with DTMF technology to remotely control equipment, the tones can be identified easily and know exactly the unit that we desire to control and unique predefined function we would like it to perform. Using the phone stacked on the robot, the robot detects this DTMF tone and transmits the signal to the motor driver ICs for motor operation [2] [3]. This paper summarizes the viability of Dual-Tone Multi-Frequency (DTMF) implementation as an alternative means for

Radio Frequency (RF) robotic communication [5] [6].

3. PROPOSED SYSTEM

An Atmega32-8bit AVR microcontroller is mounted to a robotic chassis. This microcontroller runs the robot. In order to operate the robot i.e., the movement, we have used DTMF technology. As mentioned earlier DTMF technology makes use of 2 phones, one is used to give the required commands and the other is used to receive them [2]. The DTMF produces a particular tone when a particular button is pressed, this tones should be determined correctly for the accurate functioning of robot. A DTMF decoder is connected to the microcontroller for this purpose, which analyzes the tones and the microcontroller instructs the DC motors on the actions to be taken.

DTMF keypad frequencies (with sound clips)

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

Fig 1: Telephone Keypad Tone Frequencies.

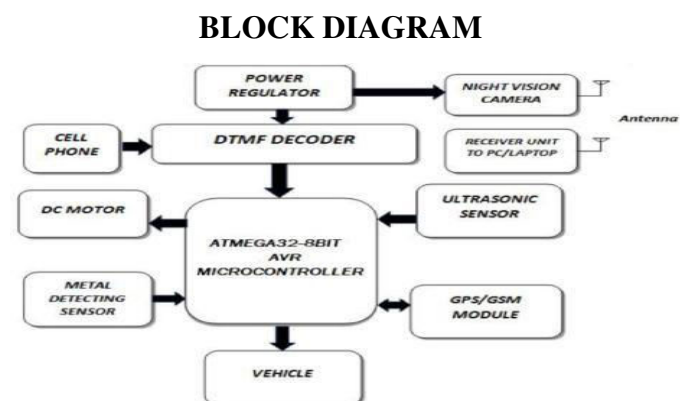


Fig 2: Working block diagram

Using Sound Waves, an ultrasonic sensor is used for measuring distance to an object / obstacle. It works by sending an sound wave at ultrasonic frequency and waits for the object to rebound back. An ultrasonic sensor is connected to the microcontroller that is programmed to detect obstacles at certain distance. A metal detector is used for the purpose of metal detection. Their operating principle is based on an oscillator and coil which creates an electromagnetic field in the sensing surface environment. The sensor's operating distance depends on the shape and size and is related purely to the material's nature. A wireless spy camera is attached to get the pictures of the ambience of the robot which is viewed on the laptop. A GSM and GPS module connected to the microcontroller has been used. The GSM module is designed to send a metal detection message. The GPS is used to know the latitude and longitude values of the current location. An H bridge, an electronic circuit switches a voltage polarity applied to the load. In robotics and many other applications, H-bridge circuits are often used to enable DC motors to run in forward, backward, right and left directions.

FLOW CHART

The program flow of the robot is as shown in the fig 3. On turning on the power supply, all the modules (ultrasonic sensors, GSM/GPRS module, motor drivers, proximity sensor, DTMF encoder and DTMF decoder) are initialized. The sender phone makes a call, with the auto-answer mode in the receiver's phone, the call is automatically answered. Simultaneously the ultrasonic sensor continuously looks out for objects. On detection of object, when the distance between the object and the sensor is less than 20cm the robot is stopped for about 30 secs allowing the user to decide their movements. Similarly the proximity sensor constantly looks for the presence of the metal and on detection of metal and the distance between them is less than 2cm the robot is instructed to stop. A message indicating the presence of the metal is sent to the pre-registered mobile numbers through GSM. The module also finds the GPS location of the place where metal's detected and sends a message with location link. On completion of this the robot continuous to follow the commands sent from the sender phone

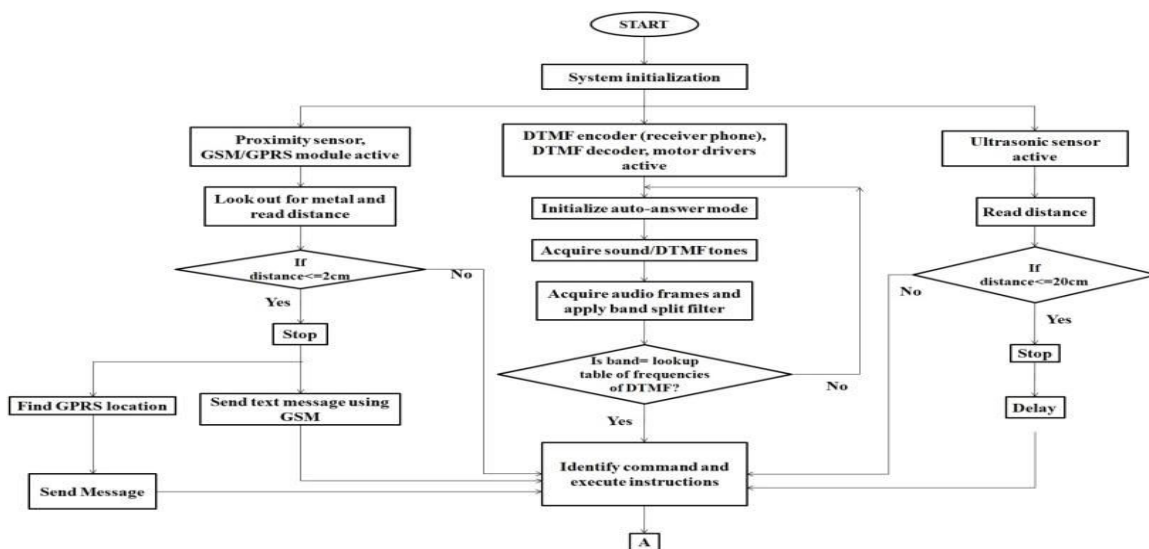


Fig 3: working flow chart

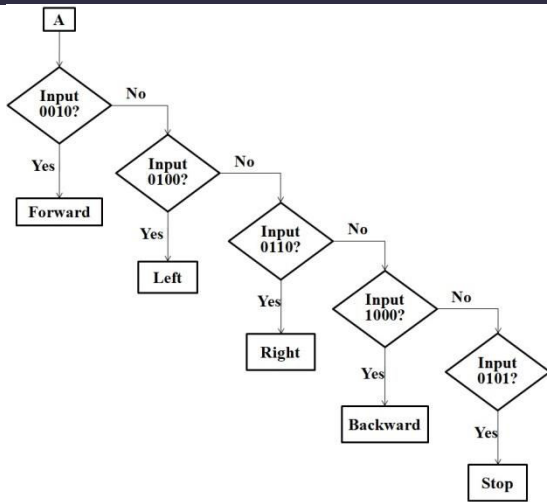


Fig 4: Motor working.

The above fig 4 explain the working of the motor. From the keys pressed on the sender phone, DTMF encoder acquires the sound/DTMF tones. DTMF decoder with band split filter identifies the band and compares it with the lookup table of frequencies of DTMF. On successful comparison, the command is identified and is executed.

4. RESULT

When the robot detects the metal with the help of metal detector the robot stops immediately, through the GSM module saying that metal detected with the location of the metal detected to the operating mobile.

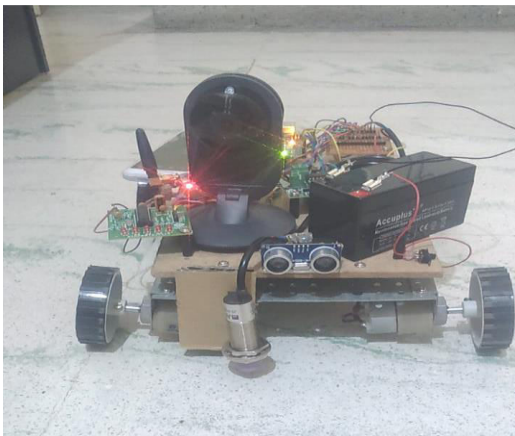


Fig 5: Robot model

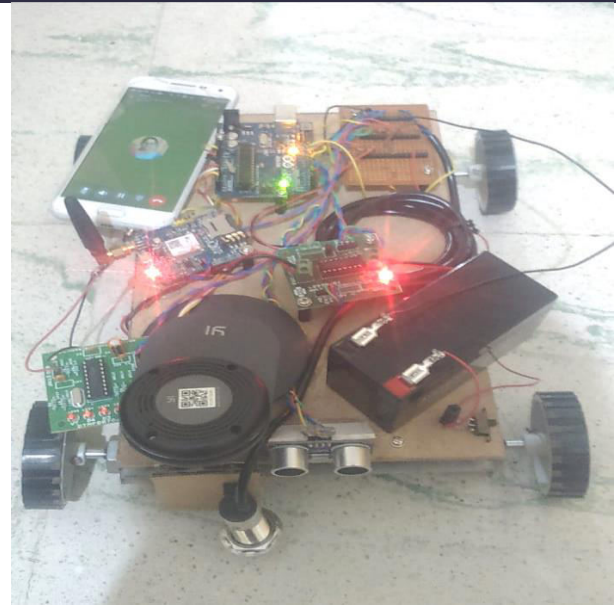


Fig 6: DTMF decoding.

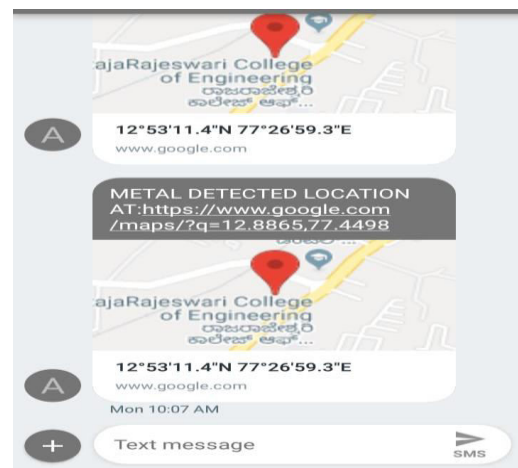


Fig 7: Metal detected location.

A wireless spy camera is attached to acquire the pictures of the surroundings of the robot which is viewed on the laptop.

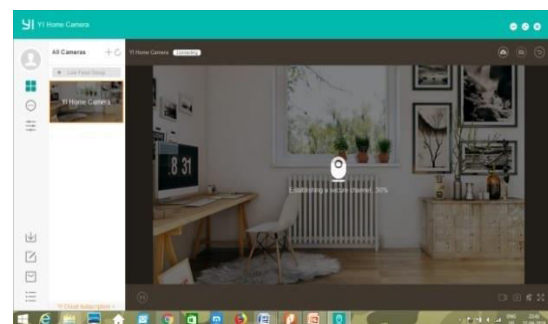


Fig 8: Live telecast through camera.

5. CONCLUSION

The robot is developed in such a manner to fulfil the requirements of detecting metal/mines, provide 360 degree picture of the surroundings and to avoid obstacles. This project has reported the implementation and design of experiment to try-out practicability of using the DTMF method as means to exchanging simple messages which is very helpful for military application as it detect the bomb. It has the advantages of solidly controlled robot with camera which can be used in surveillance purpose with larger working range and no interference with any other controllers. And this technique also has future scope, with small modifications and additions it could be used in industrial applications.

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