



## Design of Cell Phone Operated Multipurpose Security Robot for Military Applications using Solar Panel

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**Abstract:** This paper describes the development of a multipurpose smart robot car which is used to detect intruders, fire, various harmful gases and metals such as bombs and transmit this alert information to main location. The proposed system provides immediate response from equipped sensors by using machine intelligence. The robot system sends alert messages to the user within the specific range when any sensor becomes active even while robot is still working. The major feature that differentiates this robot from others is that it performs variety of task in rough and unplanned areas. This whole robot system operates in both automatic and manual mode. Automatic mode is default mode in which various sensors like PIR sensor for human detection, Metal detector for bombs, Temperature sensor for fire, Gas sensor for detecting harmful gases and Ultrasonic sensor to detect obstacles works automatically. In manual controllable mode, user controls this security robot from the cell phone which generates dual tone frequency which is detected by DTMF decoder and controls it manually. User will change the path of robot according to the real time visual information of surrounding provided by the camera equipped on robot. In both modes, user will be able to hear the talk of human at border areas with help of inbuilt microphone in camera.

**Keywords:** Microcontroller, Charge Controller, Gas detector, PIR sensor, Metal detector, Wireless Camera Ultrasonic sensor, DTMF decoder, GSM module, Motor Driver.

### I. INTRODUCTION

Due to gradual rise in technology, robotics also extends its applications in military field which is called as Military robots [11]. The utilization of robots in military is not latest idea. Firstly the US army had shown the utilization of robots in field of military. Later on, Nicola Tesla in 1898 extended the use of robotics in radio boats. Later on, in Second World War the use of military robot were extended when Germans used Goliath and Russians used Teletanks which had DT machine guns, to provide smokescreen there was smoke container and flamethrowers [12]. Earlier, robots were just the thoughts of scientific mind rather than reality. Later on Manmohan Singh the former Prime Minister of India confirmed that India is pledge to include robots in various areas and also extend its application in significant areas like medical, mining, industries, military and space. Then India had successfully launched Chandrayaan-1 space satellite for robotic exploration of moon which shows his commitment towards technology. Then India had shown its first robotic solider Daksh in May 2010. Daksh was developed by Defense Research and Development Organization (DRDO) which utilize by Indian army to detect and diffuse bombs.

Presently, the Indian Army has 20 Daksh robots to oppose terror attacks. As there is continuous growth in technology India has also engaged for developing an armed infantry robot which has capability to track, pursue and engage with

terrorists and militants in all over India, but mostly in Kashmir [14]. Due to continuous growth in technology, there is also gradual rise in development of military robots to reduce grievance and death of soldiers in the war fields [13]. Thus for border surveillance and to detect landmines and bombs these unmanned vehicles are used by various military forces. Robots in defense areas are miniature in size so they has capability to enter in small building and space, diffuse bombs even by climbing stairs, to detect landmines and have capability to survive in harsh and difficult climatic conditions for life long time without causing any damage.

### II. PROPOSED SYSTEM

This paper describes the security robot which is operated both in automatic and manual mode. Ultrasonic sensor is used to drive the robot automatically. The main objective of this robot is to increase the range of communication over which robot is controlled manually. In order to achieve this objective this robot should be controlled by user's cell phone. Through the cell phone robotic vehicle can be controlled any where form whole country. DTMF decoder is required to control the robot manually from user's cell phone. Every cell phone generates the dual tone frequency when any key is pressed from keypad. This dual tone frequency will be detected by DTMF decoder equipped on robotic vehicle which convert this dual tone signal into the corresponding

binary equivalent and microcontroller perform the specific operation according to this binary signal.

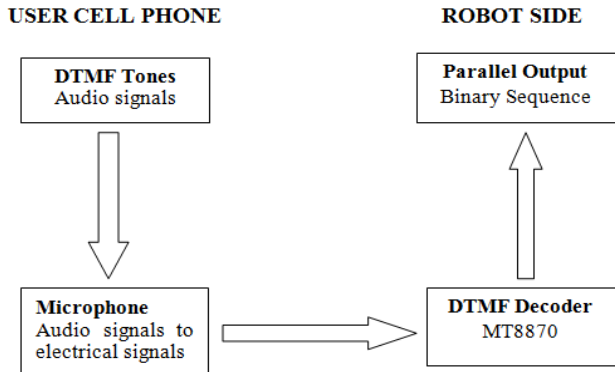


Fig.1. Working of DTMF decoder.

Fig.1 describes the functionality of DTMF decoder which converts the audio signals of keypad into corresponding binary sequence and input to microcontroller which perform Specific operation depending upon the algorithm. As this robotic system equipped with various sensors to provide surveillance at border areas, so when any of the sensor become active, this robotic vehicle alert the nearby people by sounding the buzzer. The user at remote area also gets alert by receiving text messages from robotic vehicle. These alert messages have been transmitted directly to user’s cell phone via GSM module. This module can transmit messages to multiple users simultaneously.

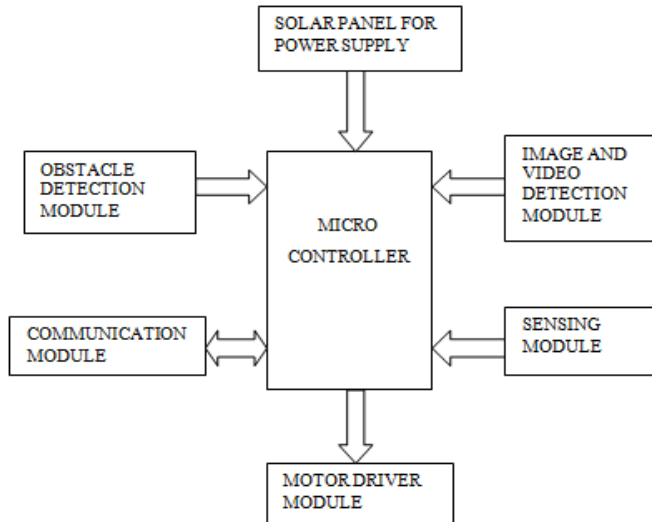


Fig.2. Block Level Representation of System.

Fig.2 shows the block level representation of security robot which includes various modules which have their own functionality.

**III. HARDWARE DESIGN OF SYSTEM**

Fig.3 shows this robotic system consist of Sensory network which is used to detect presence of human, harmful gases, pistols, bombs, mines, fire etc at remote areas. In border areas, the entry of unknown person is totally restricted. Through PIR (Pyroelectric Infrared Sensor) sensor we can

detect presence of any human being in prohibited areas. Metal detector is used for detecting metals at the border areas because mines, bombs, pistols, electronic circuits are made up of metals. Temperature sensor measures the temperature of outside environment and when temperature goes beyond the specific limits then according to feed algorithm robot send the alert messages to the user cell phone and user perform specific action to control it. Switching from automatic mode to user mode is very fast and from without any delay. It can be done by pressing the 1 key from user’s cell phone keypad. Solar Panel which provide power to robot enhance the working duration of robot without changing the battery. Solar Panel provide power to charge controller which stabilize both voltage and current. Thus charge controller provide regulated power to rechargeable battery to charge it up to certain level. Wireless camera is used to send the visual data of surrounding to the user on remote side which requires while controlling the robot manually.

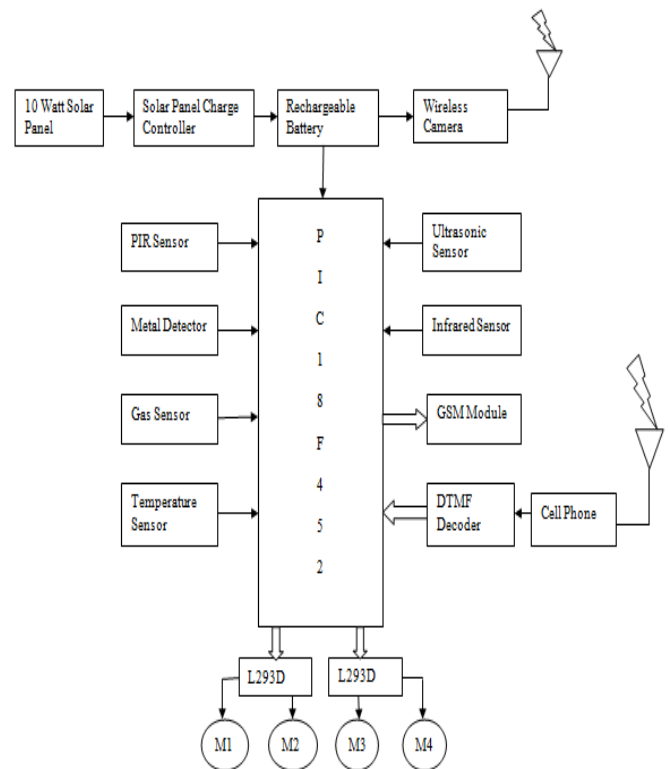


Fig.3. Block diagram of the whole system.

**IV. FLOWCHART OF ALGORITHM**

Fig.4 describes the algorithmic flow of system in which initially automatic mode is set and robot starts moving forward. If the robot detects any object and any sensor become active then it activates the wireless camera which transmits images through GSM module. During automatic mode robot continue moving forward until ultrasonic sensor detects any obstacle. If ultrasonic sensor detects object then it moves either left or right according to the algorithm and if any key is pressed from keypad then it comes in manual mode. When any key is pressed from keypad it generates some dual tone frequency which is detected by DTMF decoder on robotic side and generates binary equivalent corresponding to that dual tone frequency and controller

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perform operation according to that binary equivalent. All the sensors operate normally in both automatic and manual mode. When any of the sensors becomes active, robot sends alert messages to remote users via GSM module. This process is continuing unless or until power supply is given.

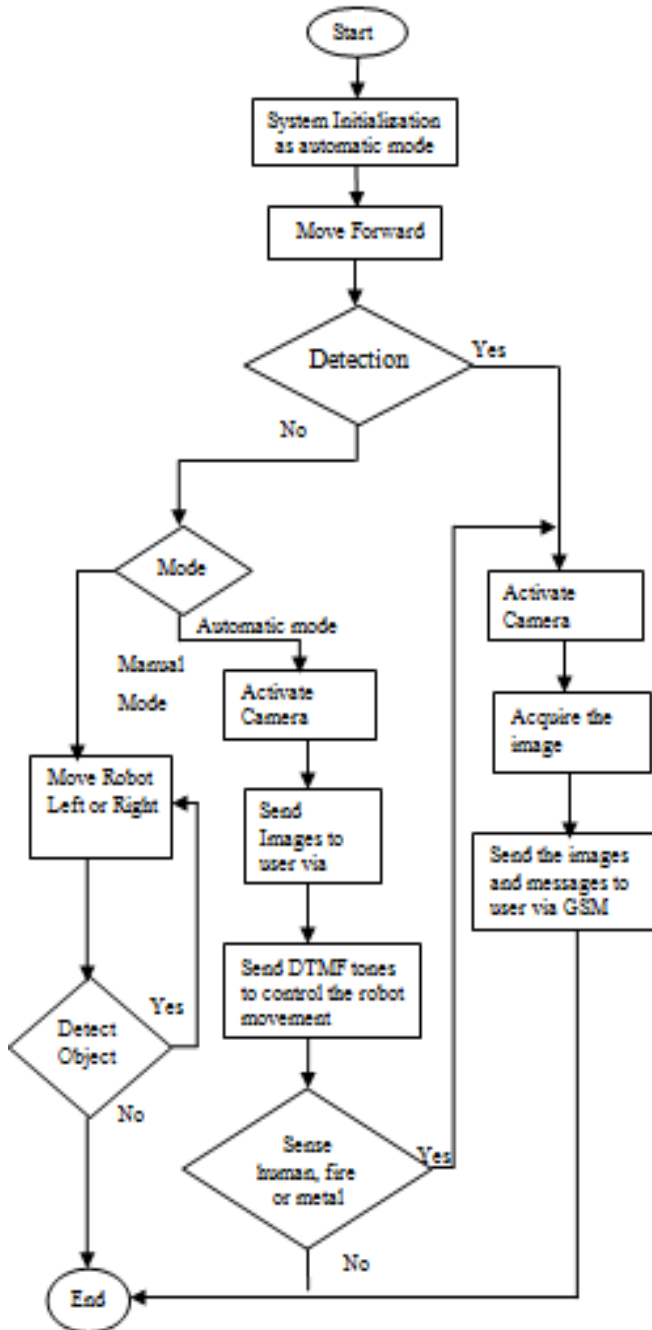


Fig. 4. Flowchart of Developed System.

### V. SOFTWARE DESIGN

We implement the security robot by programmed it in *mikroC PRO* which is a complete featured *ANSI C compiler for PIC components*. It provides various features such as instinctive IDE, prevailing compiler with *complex optimizations*, plenty of hardware and software libraries, and extra tools that provide help to the user.

TABLE I: Output file formats of mikroC PRO

Format	Description	File Type
Intel HEX	Intel style hex records. Use this file to program PIC MCU.	.hex
Binary	mikro Compiled Library. Binary distribution of application that can be included in other projects.	.mcl
List File	Overview of PIC memory allotment: instruction addresses, registers, routines and labels.	.lst
Assembler File	Human readable assembly with symbolic names, extracted from the List File.	.asm

```

#include<serial.h>
#include<gsm.h>

#define METAL PORTC.F1
#define PIR PORTC.F2
#define BUZZER PORTC.F0

volatile int temp=0,smoke=0,i=0,s22=0;
void interrupt ()
{
    if (PIR1.ADIF == 1)
    {
        PIR1.ADIF = 0; // clear AD interrupt flag
        if(i == 0)
        {
            temp = (ADRESH*256 + ADRESL)/2;
            ADCON0.CHS0 = 1;
            ADCON0.CHS1 = 0;
            ADCON0.CHS2 = 0;
            i = 1;
        }
        else if(i == 1)
        {
            smoke = (ADRESH*256 + ADRESL);
            ADCON0.CHS0 = 0;
            ADCON0.CHS1 = 0;
            ADCON0.CHS2 = 0;
        }
    }
}
  
```

### VI. RESULTS OF EXPERIMENT

The results of developed system include the snapshots of hardware which describes functionality of system. Fig.5 shows the hardware of robot equipped with various sensors, GSM module, DTMF Decoder and wireless camera.

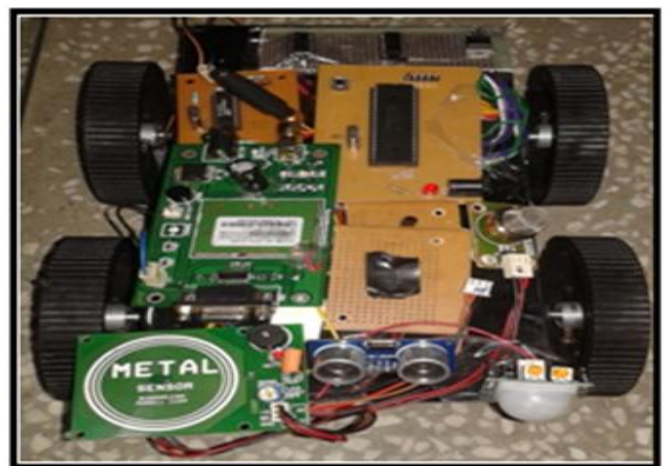


Fig.5. Robot equipped with all components.

Fig.6 shows the complete hardware of robot equipped with solar panel. Solar Panel is inclined at angle of  $30^{\circ}$  to get maximum light.



Fig.6. Complete Hardware of robot.



Fig.7 Alert messages received by user.

This security robot uses the cell phone of user as the receiver. Cell phone is used to receive alert messages during both automatic and manual mode as shown in Fig.7. It is also used to drive the robot manually and also used to watch the surrounding of robot by receiving the images send by camera.

## VII. CONCLUSION

This paper describes the development of security robot which also encourages the use of inexhaustible resources as a power source. This robot also has capability to detect fire, intruder, harmful gases and bombs at border and highly defense areas. This security also extends the communication range by using cell phone as a receiver for user.

## IX. REFERENCES

[1] Khushwant Jain, Vemu Sulochana. Design and Development of Smart Robot Car for Border Security.

International Journal of Computer Applications. Vol. 76 No.7, pp.23-29, Aug 2013.

[2] V.Prasanna Bajaj, H.Gautham. A Multipurpose Robot for Military. International Journal on Theoretical and Applied Research in Mechanical Engineering. Vol.2, Issue 3, pp.53-56, Jan 2013.

[3] Srinivasavaradhan, Chandramouli and A.G. Maniprashanna. 7TH sense. A multipurpose robot for military. MEMSTECH 5th International Conference on Perspective Technologies and Methods in MEMS Design. Vol. 2, Issue 3, pp. 2319-3182, Sep 2011.

[4] Binoy B. Nair, Abhinav Kaushik ,T. Keerthana , P. Rathnaa Barani. A GSM-based Versatile Unmanned Ground Vehicle. International Conference on Emerging trends in Robotics and Communication Technologies. pp. 356-361, Dec 2010 .

[5] Sai k.v, Riichiro Tadakuma, Jose Berengeres. Design and Fabrication of Holonomic Motion Robot using DTMF Control Tones. Spherical wheel in Proc. IEEE/RSJ International conference on intelligent Robots and systems. Vol. 18 No. 1,pp. 63-66,2010.

[6] Ren C. Luo , Tung Y. Lin, Hsin C. Chen, Kuo L. Su " Multisensor Based Security Robot System for Intelligent Building. IEEE International Conference on Multisensor Fusion and Integration for Intelligent Systems. pp. 408-413 ,Sep 2006, Heidelberg, Germany.

[7] Hou Tsan Lee, Wei Chuan Lin, Ching Hsiang Huang, Yu Jhih Huang. Wireless Indoor Surveillance Robot. SICE Annual Conference Waseda University. Tokyo,Japan, 2011.

[8] S.Naskar, S. Das, A.K Seth, A. Nath.. Application of Radio Frequency Controlled Intelligent Military Robot in Defense. International Conference on Communication Systems and Network Technologies (CSNT), 2011.

[9] <http://www.mysteryoftheiniquity.com> .

[10] <http://www.sunrom.com/>.

[11] <http://www.armyofrobots.com>.

[12] <http://www.engineersgargage.com/articles/military-robotics>.

[13]<http://www.armyofrobots.com/current-use-military.html>.

[14] [http://en.m.wikipedia.org/wiki/DRDO\\_Daksh](http://en.m.wikipedia.org/wiki/DRDO_Daksh).