

# An Intelligent Environmental Novelty System Using Mobile Technology For Warfields

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## Abstract

*The robotics play a vital role in today`s scenario. They are increasingly found in the dangerous environments. On keeping this in view, the robotics is being proposed in the field of defense, where actual purpose is served. This method is proposed using mobile technology with multiple applications embedded in it. The multi-purpose manipulator is designed with various features like movement in all the directions; consisting of a vision based object recognition. Also it is fixed with a robotic arm for carrying weapons to war-site and also to provide first-aid kit, if necessary. An advantageous feature of using solar panel is being used serving to be effective.*

**Keywords---** Object recognition, Robotic arm, Solar panel, Mobile technology.

## 1. Introduction

The design and development of autonomous mobile robots are difficult to design to function well in real environment with the current technologies being used today. In the present scenario, the needs of robots are becoming mandatory in defense/military applications.

Today`s military robots don`t do a whole lot, though they are programmed with sophisticated techniques. Military operations are often executed under pressure, when speed is critical. And although communication is essential, it is difficult to establish in many cases. Lying of cables, securing the connections and deploying equipment can be time-consuming; leaving staff without the means to communication with other functional groups or deployed troops in the field for a connection can be inflexible and limit user mobility. In order to overcome these limitations faced by the technology, we prefer wireless technologies. This technology can speed network deployments and help military staff and commanders stay connected, while providing flexibility to move freely within the allotted command post.

The misconception that arises in using wireless technology for defense lies in the range of protocols being used in communication. The range of protocols being used faced is clearly mentioned. The need for secure, reliable wireless connectivity and mobile communication which supports real-time, mission-critical applications is easily access able with high through put using 802.11 and 802.16 wireless standard protocols. It is also featured with an enhanced security with a built-in intrusion prevention system (IPS) that supports network admission control (NAC) and helps in enabling the defending network. This solution combines confidential communications for variety of users and robust threat defense to protect the information and systems from wireless threats.

This paper user a multi-purpose manipulator in the field of defense for monitoring various parameters. It is added with various features and is purely based on GSM as its control.

The GSM platform is a hugely successful wireless technology which has become the fastest growing technology. We know however that shortage of non-renewable fuel in the future is an upcoming global issue; therefore renewable energy sources such as solar energy can eventually replace the non-renewable energy sources. With this notion, this paper has an added advantage of using automatic battery charging with solar energy, which uses solar panel for this purpose.

Also, some other functions like movement of robot(in all the directions); laser-gun shooting; providing first-aid kit; on-board camera consisting of visual feedback(with zooming functionalities) are included, that makes it effective to complete the required tasks with high accuracy. Apart from these functions, it is also designed with a robotic arm to carry weapons to the tanker at the defense-site. To be precise, there is no one definition of robot which satisfies everyone as people have their own perceptions.

## 2. Hardware Description

The block diagram of the proposed system is shown in the figure 2.1. The proposed method is developed using Atmel AT89S52 microcontroller.

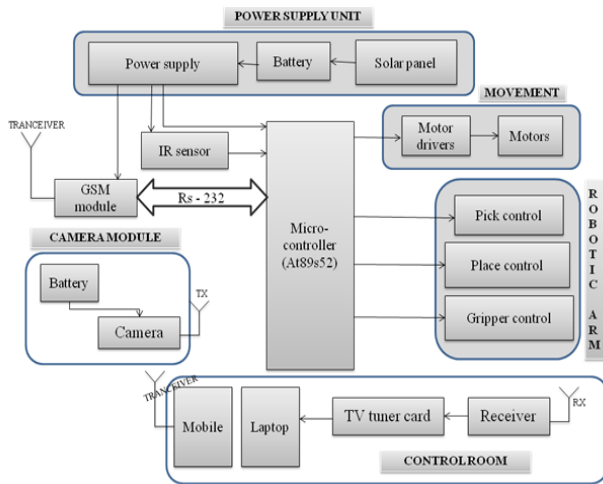


Fig.2.1. Block Diagram

The system has the following blocks:

- Micro-controller unit
- GSM module
- Object sensing module
- Wireless camera module
- Motor driver unit
- Robotic arm
- Solar panel

### 2.1. Micro-Controller Unit (AT89S52)

The microcontroller forms the heart of an embedded system. The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The AT89S52 provides the following standard features: 8K bytes of Flash, 256 bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes. The Idle Mode stops the CPU while allowing the RAM, timer/counters, serial port, and interrupt system to continue functioning.

The Power-down mode saves the RAM contents but freezes the oscillator, disabling all other chip functions until the next interrupt or hardware reset.

The microcontroller is always in the active mode, if the IR sensor senses a object the information sent to micro-controller. The micro-controller uses AT+CMGS command to send the SMS where the GSM is connected to the microcontroller through RS232 cable.

### 2.2. GSM Module

The module of GSM is as shown in fig.2.2.(b). A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. A GSM modem exposes an interface as shown in fig.2.2.(a) that allows applications such as SMS to send and receive messages over the modem interface.

The mobile operator charges for this message sending and receiving as if it was performed directly on a mobile phone. To perform these tasks, a GSM modem must support an “extended AT command set” for sending/receiving SMS messages. Due to some compatibility issues that can exist with mobile phones, using a dedicated GSM modem is usually preferable to a GSM mobile phone.

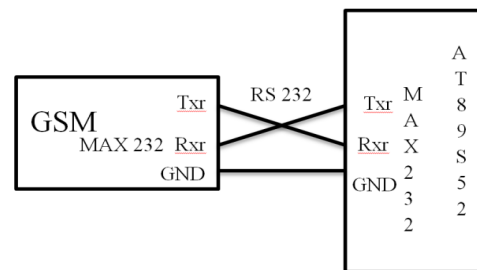


Fig.2.2 (a) Interfacing GSM with AT89S52.

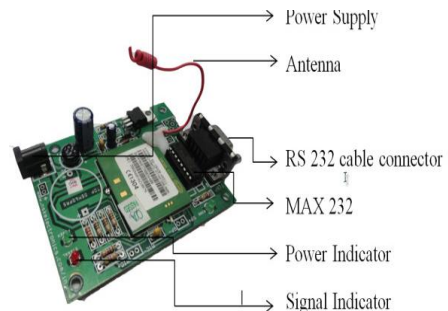


Fig.2.2 (b) The developed GSM module.

### 2.3. Obstacle Sensing Module

An IR module is used to detect the obstacles in front of the robot. It consists of transmitter and a Receiver which combines to form an obstacle sensing module as in fig.2.3.

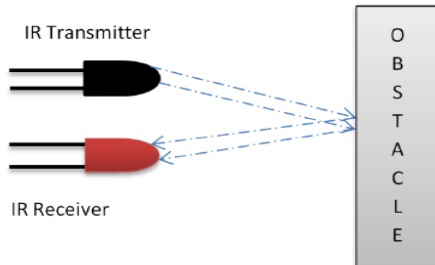


Fig.2.3. IR Sensing Module

### 2.4. Wireless Camera Module

Wireless security camera systems consist of wireless transmitter and receiver antennas to transmit a wireless signal using a 5.8 GHz signal up to 4 miles as in fig.2.4. These wireless security camera systems are new high performance digital wireless security camera transmission systems. These wireless systems offer exceptional video data transmission using 5.8GHz and 2.4 GHz frequencies. They are made for long distance outdoor use with a direct line of sight between the transmitting and receiving antennas.



Fig.2.4. Wireless camera.

### 2.5. Motor Driver Unit

OPERATION	A	B
STOP	LOW	LOW
CLOCKWISE	LOW	HIGH
ANTI-CLOCKWISE	HIGH	LOW
STOP	HIGH	HIGH

Table.2.1.Operation of motor driver.

The motor driver is an integrated high voltage, high current four channel driver designed to accept standard DTL or TTL logic levels and drive inductive loads and switching power transistors. A separate supply input is provided for the logic, allowing operation at a lower voltage and internal clamp diodes are included. This device is suitable for use in switching applications at frequencies up to 5 kHz. The behavior of motor for various input is shown in Table.2.1.

### 2.6. Robotic Arm Unit

A robotic arm is usually programmable, with similar functions as a human arm. The basic block diagram is as in fig.2.5. The links of them are connected by joints with rotational motion. They are designed to perform any desired task such as carrying weapons, first-aid kit etc., depending on the application.

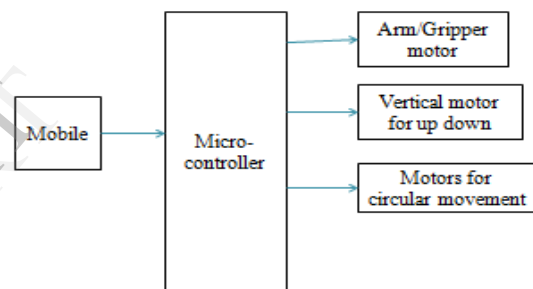


Fig.2.5. Block diagram of robotic arm

### 2.7. Solar Panel

Solar panels are made up of several special photovoltaic cells as in fig.2.6. These cells convert light energy into electrical energy, and are sometimes referred to as "solar cells." Each solar cell produces approximately 0.55 Volts of direct current electrical energy. Like any voltage source, solar cells can be wired in a series circuit to create an increased voltage differential.

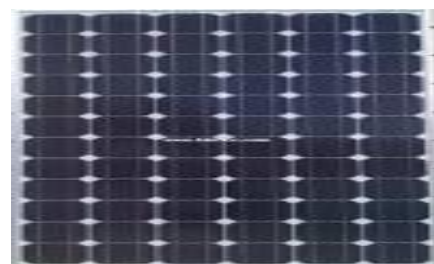


Fig.2.6. Solar panel.

### 3. Software Description

#### 3.1. Embedded C

An embedded system is the one which is designed to perform a specific task and the embedded software rules the entire system.

#### 3.2. Keil Compiler

After developing the software, it is downloaded to the microcontroller through any of the downloading tools such as universal programmer. The keil compiler comes into act at this place.

### 4. Working

The proposed robot is self-powered and controlled through the wireless technology. The signal from the mobile (GSM Module) is sent directly to the micro-controller.

- In-case of movement of robot;  
The signal received from the micro-controller is sent to the driver circuit. This is then sent to the motors for various functions like forward, reverse, left and right directions. Also it can be made to stop under suspicious movements.
- In-case of capturing images;  
The wireless camera is placed on the robot. The camera starts capturing images continuously. These images are directly sent to the personal computer (PC) placed in the control room.
- In-case of pick and place of objects;  
On receiving the signal from the micro-controller, the robotic arm does the appropriate function.

### 5. Conclusion

Robots being used today are very essential in the military purpose. The implementation of this robot is very effective to use in defense. Because this multi-purpose manipulator is designed with several functions on a single platform. On designing these functions on a single stretch, the cost is effective. Instead of designing different applications on different robots, this manipulator becomes efficient. Also our future work is to include additional features like bomb detection and gun assembly.

### 6. Results and Discussions

The results have been shown out through the snapshots given below, which includes for GSM module and Wireless camera module.

The GSM module used is SIM300 which has advance features of easy interfacing. The obstacle on detecting is given a message to the mobile.



The wireless camera covers a distance of about 50m to 100m, which has the sensitivity of 18dB. The power requirement is 9v (DC) and the transmission signal includes both picture and sound.



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