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WAR FIELD SPYING ROBOT DISSERTATION

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Abstract:

With the aim of the satisfying and meeting the changing needs of human from manufacturing unit to the household unit robotics and automation has been a distinct key player throughout. This research focuses on building a RF based spying robot attached with PIR Sensor that can reduce the human victim. This robot sends the signal to the base station using PIR Sensor. One of the major applications of this research can be analyzed using android based smart phone. The robot sends the signal to the RF receiver mounted on the robot via RF transmitter at the base station. With this feature the robot can transmit real time videos with night vision capabilities and cannot be identified by the enemies in war zone. The spying robot as its name suggests in the one used for the purpose of spying on enemy territories. Its applications can be at the time of war where it can be used to collect information from the enemy terrain and monitor that information at a far secure area, and safely devise a plan for the counter attack. Tracking locations of terrorist organizations and then plan attack at suitable time. Making a surveillance of any disaster affected area where human beings can't go.

Keywords — **RF receive, RF transmitter, tracking locations, PIR Sensor.**

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I. INTRODUCTION

With the aim of developing a high-tech technology that serves high speed technology, advanced capacity to control the robots and to device new methods of control theory. The realize above standards some technical improvement along with the need of high performance robot is required to create a faster, reliable, accurate and more intelligent robot which can be devised by advanced technology, robot control devices and new drivers. Earlier the robots were controlled through wired networks but now to make robot more users friendly, they are framed to make user commanded work. Therefore to attain the requirements we can use android as a multimedia to control the user friendly robot.

The spying robot as its name suggests in the one used for the purpose of spying on enemy territories. Its applications can be:

- At the time of war where it can be used to collect information from the enemy terrain and monitor that information at a far secure area, and safely devise a plan for the counter attack.
- Tracking locations of terrorist organizations and then plan attack at suitable time.
- Making a surveillance of any disaster affected area where human beings can't go.

1. A Brief Idea about War Field Spying Robot

So let us have a brief idea about how we can use a robot in war fields for spying purpose. We can design a simple prototype of a war field spying robot which can controlled remotely and the location transmitted by the GPS can be monitored and analyzed on an Android phone.

2. Robots in Military

Now that we had a brief idea about war field robot, let us have a brief recall about practical robots in defense. One of the basic features of robots used in military operations is that they are not completely automatic. They are actually controlled remotely by human beings. The robots or unmanned machines as they are termed, can be any moving object or a flying aero plane fitted with all necessary equipment's like sensors, LIDARS (Laser based Communication RADARS), cameras etc. Their operations can be from disposing bombs, to surveying enemy territories. Global Positioning System (GPS) is a satellite-based radio-positioning and time transfer system designed, financed, deployed, and operated by the U.S. Department of Defense. GPS has also demonstrated a significant benefit to the civilian community who are applying GPS to a rapidly expanding number of applications.

There are 3 kinds of unmanned machines used in the military operations:

Unmanned Ground Vehicle (UGV): They are used for ground purposes. They can carry heavy load, move on uneven terrains and have various sensors and cameras fitted on them.

Figure 1.1 Gladiator Tactical UGV

Unmanned Aerial Vehicle (UAV): They are used to carry aerial weapons and are basically flying machines.

Figure 1.2 MQ-9 Reapers Unmanned Aerial Vehicle

Unmanned Underwater Vehicle (UUV): They are basically submarines or machines which can survey under water.

II.DESCRIPTION OF HARDWARE COMPONENTS

2.1 MEMORIES

Types of memory

The 8052 have three general types of memory. They are on-chip memory, external Code memory and external Ram. On-Chip memory refers to physically existing memory on the micro controller itself. External code memory is the code memory that resides off chip. This is often in the form of an external EPROM. External RAM is the Ram that resides off chip. This often is in the form of standard static RAM or flash RAM.

a) Code memory

Code memory is the memory that holds the actual 8052 programs that is to be run. This memory is limited to 64K. Code memory may be found on-chip or off-chip. It is possible to have 8K of code memory on-chip and 60K off chip memory simultaneously. If only off-chip memory is available then there can be 64K of off chip ROM. This is controlled by pin provided as EA

b) Internal RAM

The 8052 have a bank of 256 bytes of internal RAM. The internal RAM is found on-chip. So it is the fastest Ram available. And also it is most flexible in terms of reading and writing. Internal Ram is volatile, so when 8051 is reset, this memory is cleared. 256 bytes of internal memory are subdivided. The first 32 bytes are divided into 4 register banks. Each bank contains 8 registers. Internal RAM also contains 256 bits, which are addressed from 20h to 2Fh.

2.2 Power Supply

There are many types of power supply. Most are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronics circuits and other devices. A power supply can by broken down into a series of blocks, each of which performs a particular function. For example a 5V regulated supply can be shown as below

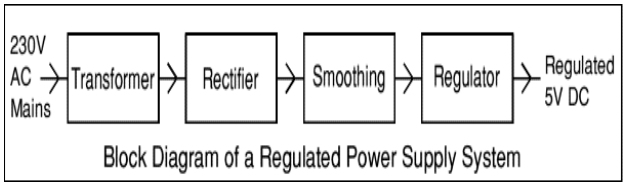


Fig 2.1: Block Diagram of a Regulated Power Supply System

Transformer

A transformer steps down high voltage AC mains to low voltage AC. Here we are using a center-tap transformer whose output will be sinusoidal with 36volts peak to peak value.

Rectifier

A rectifier converts AC to DC, but the DC output is varying. There are several types of rectifiers; here we use a bridge rectifier.

The Bridge rectifier is a circuit, which converts an ac voltage to dc voltage using both half cycles of the input ac voltage. The Bridge rectifier circuit is shown in the figure. The circuit has four diodes connected to form a bridge. The ac input voltage is applied to the diagonally opposite ends of the bridge. The load resistance is connected between the other two ends of the bridge.

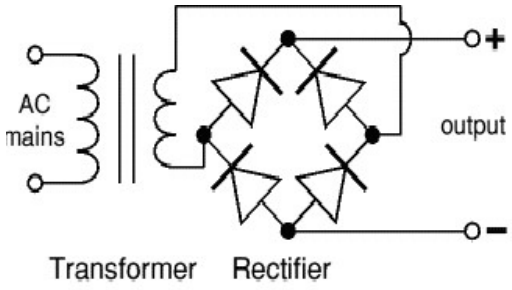


Figure 2.2 Rectifier circuit

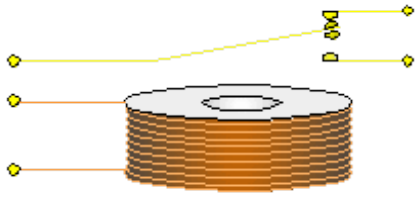
2.3 Relay

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be ON or OFF so relays have two switch position and they are double throw (changeover) switches.

Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits; the link is magnetic and mechanical.

The relay's switch connections are usually contains COM, NC and NO.

- COM = Common, always connect to this; it is the moving part of the switch.
- NC = Normally Closed, COM is connected to this when the relay coil is off.
- NO = Normally Open, COM is connected to this when the relay coil is on.
- Connect to COM and NO if you want the switched circuit to be on when the relay coil is on.
- Connect to COM and NC if you want the switched circuit to be on when the relay coil is off.
- Most relays are SPDT or DPDT which are often described as "single pole changeover" (SPCO) or "double pole changeover"(DPCO).



Advantages of Relay

- Relays can switch AC and DC, transistors can only switch DC.
- Relays can switch high voltages, transistors cannot.
- Relays are a better choice for switching large currents (> 5A).
- Relays can switch many contacts at once.

2.4 PIR Sensor

Passive Infrared sensors (PIRs)

PIR sensors are passive electronic devices which detect motion by sensing infrared fluctuations. Once a motion is detected, a high is sent to the signal pin. Because of the biological characteristic of organisms to emit heat, these sensors work well in detecting human motion and therefore are commonly implemented in security applications.

Specifications

- Single bit output
- Small size makes it easy to conceal
- Sensitivity: Presettable
- Size: Length 32mm, Width 24mm, Thickness 26mm

Figure 2.3 PIR SENSOR

III. TECHNOLOGY USED

3.1 GPS -GLOBAL POSITION SYSTEM

Global Positioning System (GPS) is a satellite-based radio-positioning and time transfer system designed, financed, deployed, and operated by the U.S. Department of Defense. GPS has also demonstrated a significant benefit to the civilian community who are applying GPS to a rapidly expanding number of applications. What attracts us to GPS is:

- The relatively high positioning accuracies, from tens of meters down to the millimeter level.
- The capability of determining velocity and time, to an accuracy commensurate with position.
- The signals are available to users anywhere on the globe: in the air, on the ground, or at sea.
- Its is a positioning system with no user charges, that simply requires the use of relatively low cost hardware.
- It is an all-weather system, available 24 hours a day.
- The position information is in three dimensions, that is, vertical as well as horizontal information is provided.

3.2 GPS is a Satellite Navigation System

GPS is funded by and controlled by the U. S. Department of Defense (DOD). While there are many thousands of civil users of GPS world-wide, the system was designed for and is operated by the U. S. military.

GPS provides specially coded satellite signals that can be processed in a GPS receiver, enabling the receiver to compute position, velocity and time.

3.3 GPS Work

A GPS receiver calculates its position by carefully timing the signals sent by the constellation of GPS satellites high above the Earth. Each satellite continually transmits messages containing the time the message was sent, a precise orbit for the satellite sending the message (the ephemeris), and the general system health and rough orbits of all GPS satellites (the almanac). These signals travel at the speed of light through outer space, and slightly slower through the atmosphere. The receiver uses the arrival time of each message to measure the distance to each satellite thereby establishing that the GPS receiver is approximately on the surfaces of spheres centered at each satellite.

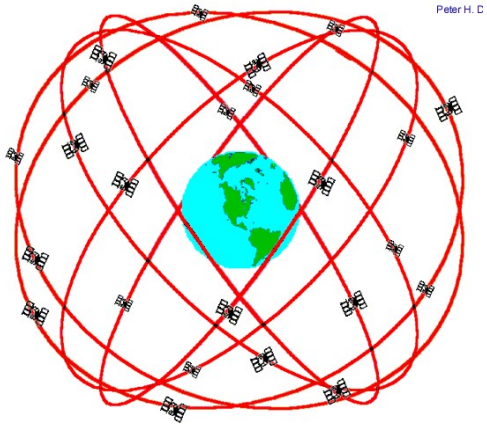


Figure 3.1 GPS Normal constellation 24 satellites in 6 orbital planes 4 satellites in each plane 20,200 km Altitudes, 55 Degree Inclination

A GPS receiver must be locked on to the signal of at least three satellites to calculate a 2D position (latitude and longitude) and track movement. With four or more satellites in view, the receiver can determine the user's 3D position (latitude, longitude and altitude). Once the user's position has been determined, the GPS unit can calculate other information, such as speed, bearing, track, trip distance, distance to destination, sunrise and sunset time and more. Although four satellites are required for normal operation, fewer apply in special cases.

3.4 Control Segment

The Control Segment consists of a system of tracking stations located around the world.

The Master Control facility is located at Schriever Air Force Base (formerly Falcon AFB) in Colorado. These monitor stations measure signals from the SVs which are incorporated into orbital models for each satellites. The models compute precise orbital data (ephemeris) and SV clock corrections for each satellite. The Master Control station uploads ephemeris and clock data to the SVs.

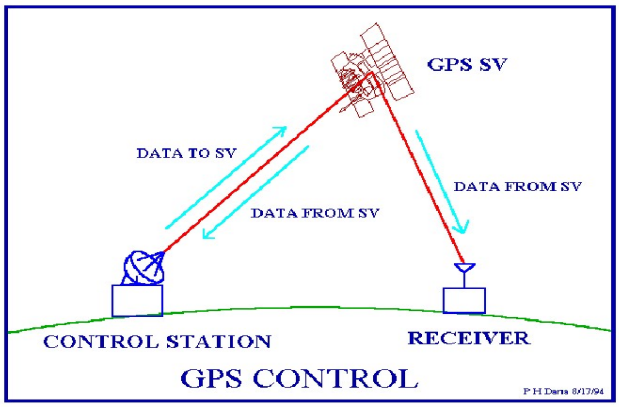


Figure 3.2 GPS Control

3.5 GSM Modem

This GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed easily. The modem can either be connected to PC serial port directly or to any microcontroller. It can be used to send and receive SMS or make/receive voice calls. It can also be used in GPRS mode to connect to internet and do many applications for data logging and control. The Space Segment of the system consists of the GPS satellites. These space vehicles (SVs) send radio signals from space.

The nominal GPS Operational Constellation consists of 24 satellites that orbit the earth in 12 hours. There are often more than 24 operational satellites as new ones are launched to replace older satellites. The satellite orbits repeat almost the same ground track (as the earth turns beneath them) once each day. The orbit altitude is such that the satellites repeat the same track and configuration over any point approximately each 24 hours (4 minutes earlier each day). There are six orbital planes (with nominally four SVs in each), equally spaced (60 degrees apart), and inclined at about fifty-five degrees with respect to the equatorial plane. This constellation provides the user with between five and eight SVs visible from any point on the earth

A Clip of New Browser

Gallery: Now the new gallery supports PTP (Picture Transfer Protocol) so that users can directly connect their cameras with Android device and transfer pictures with a single touch.

Calendar: Calendar grids are larger, for better readability and more accurate touch-targeting. Additionally, users can create a larger viewing area for grids by hiding the calendar list controls. Controls in the date picker are redesigned, making them easier to see and use.

Contacts: The Contacts app now lets you locate contacts more easily using full text search. Search returns matching results from all fields that are stored for a contact.

3.6 Android Emulator

The Android SDK includes a virtual mobile device emulator that runs on your computer. The emulator lets you prototype, develop and test Android applications without using a physical device.

The Android emulator mimics all of the hardware and software features of a typical mobile device, except that it cannot place actual phone calls. It provides a variety of navigation and control keys, which you can "press" using your mouse or keyboard to generate events for your application. It also provides a screen in which your application is displayed, together with any other active Android applications.

Figure 3.3 Android Emulator

IV. SYSTEM STUDY

4.1 Feasibility Study

The feasibility of the research is analyzed in this phase and business proposal is put forth with a very general plan for the research and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential.

Three key considerations involved in the feasibility analysis are

- ECONOMIC FEASIBILITY
- TECHNICAL FEASIBILITY
- SOCIAL FEASIBILITY

4.2 Economic Feasibility

This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus the developed system as well within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

4.3 Technical Feasibility

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands on the available technical resources. This will lead to high demands being placed on the client. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.

GSM services and features

1. Telephonic services

It includes emergency calls and fax related services.

Supplementary ISDN services

These are digital in nature and includes call diversion and call identification. It also includes SMS, which allows GSM subscribers and base station to transmit alphanumeric pages of limited length.

Subscriber Identity Module

One of the key features of GSM is the Subscriber Identity Module (SIM), commonly known as a SIM card. The SIM is a detachable smart card containing the user's subscription information and phone book. This allows the user to retain his or her information after switching handsets. Alternatively, the user can also change operators while retaining the handset simply by changing the SIM.

Some operators will block this by allowing the phone to use only a single SIM, or only a SIM issued by them; this practice is known as SIM locking, and is illegal in some countries.

GSM Security

GSM was designed with a moderate level of security. Communications between the subscriber and the base station can beencrypted.GSM uses several cryptographic algorithms for security. TheA5/1andA5/2 stream ciphers are used for ensuring over-the-air voice privacy.

Voice Codec's

GSM has used a variety of voice codec's to squeeze 3.1 kHz audio into between 5.6 and 13 Kbit/s. Originally, two codec's, named after the types of data channel they were allocated, were used, called Half Rate (5.6 Kbit/s) and Full Rate(13 Kbit/s). These used a system based upon linear predictive coding (LPC). In addition to being efficient with bitrates, these codec's also made it easier to identify more important parts of the audio, allowing the air interface layer to prioritize and better protect these parts of the signal.

a.)Most2GGSM networks operate in the 900 MHz or 1800 MHz bands.

b.)The rarer 400 and 450 MHz frequency bands are assigned.

c.)Most3GGSM networks in Europe operate in the 2100 MHz frequency band.

d.)GSM-900 uses 890–915 MHz to send information from the mobile station to the base station (uplink) and 935–960 MHz for the other direction (downlink), providing 124 RF channels (channel numbers 1 to 124) spaced at 200 kHz. Duplex spacing of 45 MHz is used.

4.4 Social Feasibility

The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity.

The level of acceptance by the users solely depends on the methods that are employed to educate the user about the system and to make him familiar with it. His level of confidence must be raised so that he is also able to make some constructive criticism, which is welcomed, as he is the final user of the system.

V. SOFTWARE DEVELOPMENT AND CODING

5.1 Introduction

In this chapter the software used and the language in which the program code is defined is mentioned and the program code dumping tools are explained. The chapter also documents the development of the program for the application. This program has been termed as "Source code". Before we look at the source code we define the two header files that we have used in the code.

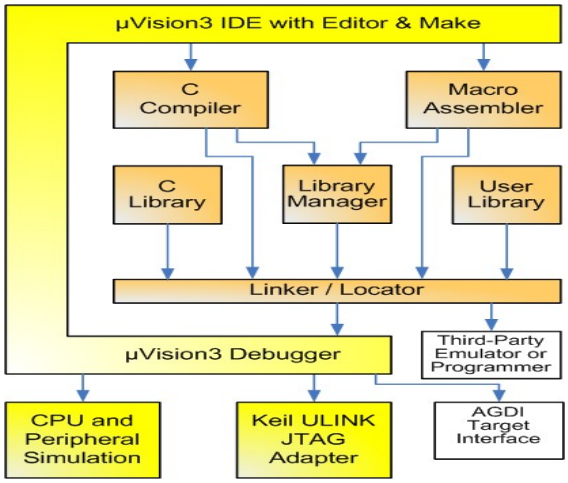


Figure 5.1 Keil Software- internal stages

Keil development tools for the 8051 Microcontroller Architecture support every level of software developer from the professional applications.

5.2 C51 Compiler & A51 Macro Assembler

Source files are created by the µVision IDE and are passed to the C51 Compiler or A51 Macro Assembler. The compiler and assembler process source files and create replaceable object files.

The Keil C51 Compiler is a full ANSI implementation of the C programming language that supports all standard features of the C language. In addition, numerous features for direct support of the 8051 architecture have been added.

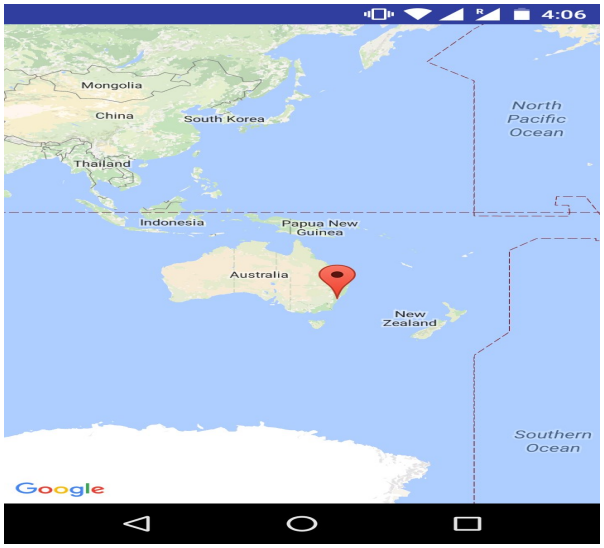
VI SIMULATION RESULT

Quick Start

- Insert SIM card: Press the yellow pin to remove the tray from the SIM cardholder. After Properly fixing the SIM card in the tray, insert the tray in the slot provided.
- Connect Antenna: Screw the RF antenna if not already connected.
- Connect RS232 Cable to PC/MCU: (Cable provided for RS232 communication)
    - Default baud rate is 115200 with 8-N-1, no hardware handshaking.
- Connect the power Supply (12V) to the power input of board. Polarity should be Center +ve and outer –ve DC jack.

- Network Led indicating various status of GSM module eg. Power on, network registration & GPRS connectivity.
- After the Modem registers the network, led will blink in step of 3 seconds. At this stage you can start using Modem for your application.

AT commands can be sent to control GSM Modem



Sending an Unicode SMS message

- Some modems also have the capability to send Unicode or UCS2 messages without encoding a PDU. You can send Unicode messages by only converting the Unicode data to a HEX string and send this string to the modem.

- To check whether your modem supports this mode, just type the following command:
  AT+CSCS=?

- This commands displays the codepages supported by the modem. The modem will respond like this:
- *+CSCS: ("GSM","PCCP437","CUSTOM","HEX")*

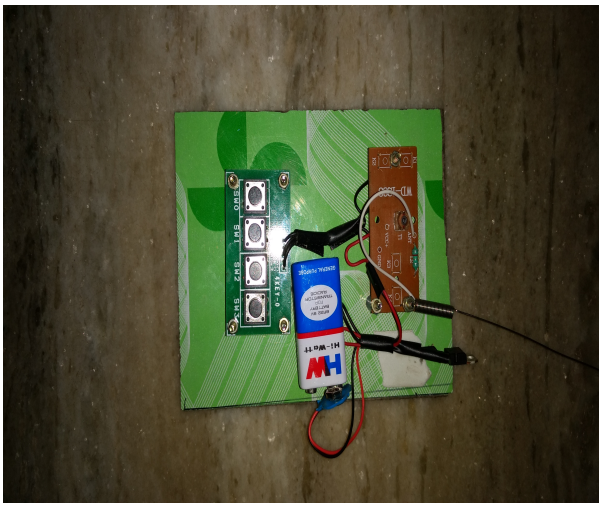
- If this string contains "HEX" or "UCS2", Unicode seems to be supported. To specify that you will use an HEX string to send the message, set the codepage to "HEX" or "UCS2" depending on the modem response. In our example we will set the modem to "HEX" :
- *AT+CSCS="HEX" <ENTER>*

- Next, we have to specify the correct DCS (Data Coding Scheme) for Unicode messages, which is 0x08. We can set this value by changing the fourth parameter of the AT+CSMP command to '8':
- *AT+CSMP=1,167,0,8 <ENTER>*

- The modem is now ready to send messages as Unicode. Now is the time to send the actual message:
- *AT+CMGS="+31638740161" <ENTER>*

Replace the above phone number with your own cell phone number. The modem will respond with:

The proposed system works with an 8051 family microcontroller and a battery for power supply. In this system,a Bluetooth is interfaced to the microcontroller for communication. Two motors are interfaced to the microcontroller through a motor driver IC, wherein they are used to change the directions of the vehicle. A group of IR LEDS connected in series with the DC supply are interfaced to the system to make the path visible during night time also by the camera. Once a user connects Android application device to this system through the Bluetooth, the user can send the control signals through the Bluetooth attached to this system. The user can enter the selected option on the Android application on the GUI to move the robot in these directions: forward, backward, lift and right, respectively. A wireless camera is mounted on the robot body for spying purpose even in complete darkness by using the mounted infrared lighting.



The transmitter unit consists of an encoder which receives parallel data input from the microcontroller through the push buttons and transmits this parallel data in serial format through the RF module. On pressing the respective push button, Microcontroller is programmed to send relevant signals to the Encoder in parallel form. The encoder converts these parallel signals to serial form to be transmitted by the RF module. This serial data is modulated with a carrier signal using a RF transmitter and is transmitter. For example if we press the left button, the microcontroller sends the command to the receiver unit through the encoder and the RF module using a wireless CCD camera, which are commonly available in the market. This camera works on 12 volts DC supply. The camera has a receiver, which is placed in the remote station. Its output are in the form of audio and video signals. These signals a re directly sent to a television or a computer through a tuner card. This CCD camera is placed on the robot. The camera captures the audio and video signals and sends those signals to the remote station and with the help of the camera receiver which is connected to the television or a computer through we will be able to see the captured signals. This is a mini wireless monitoring video camera and wireless receiver set for home and small business surveillance, security and is used by us for demonstration purpose

CONCLUSIONS

The research "WAR FIELD SPYING ROBOT" has been successfully designed and tested. Integrating features of all the hardware components used have developed it. Presence of all reasoned out and placed carefully thus contributing to the best working. The controller makes use of a PIR based input sensor to sense the human being and give us an alert indication. Also use of a remote which is used to control the robot. The primary need for our paper would be accuracy. We have been able to view the things accurately that are currently happening in the surrounding area. Our design has not caused any sort of disturbances. The robot will move depending on the motor direction based upon the input we give through command by remote section unit. It display the current operation is going on as example left robot, near to object, clear up. With the help of the camera we are able to view the things that are happening in the surrounding areawhere the robot is hidden. By keeping the circuit easy and simple, most users will be able to use it easily. Thus we should be able to manipulate its path when necessary, to create the robot safely. To all that, a control unit is needed, where control units RF signal is used. By using these signals encoding is done & signal is sent through the transmitter. At the receiver end these decoded signal are given as input to drive the motor. Not for long range applications it can be used as a spy robot within short distances.

Hence this research provides best solution for the human to detect terrorist/thief inside the border.

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