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An All-Terrain Intelligent Autonomous Vehicle with Sensor Fusion Based Navigation Capabilities

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Abstract: *An automated defense robot building is planned, that has a laser gun attached, which is utilized for pointing laser rays to destroy the target object. One of the most important things about these robots is that they have the capability to perform missions remotely in the field, without any actual danger to human lives. In the proposed system, a robot is developed that is controlled through Microcontroller. For the aiming purpose and to view the road and the surroundings in which the robot is travelling, wireless cameras are installed. Radio frequency can be used to control the robot.*
These defense robots used in military are usually employed with the integrated system including gripper, cameras and sensors. This is specially designed for defense robotic system to save human life and protect the country from enemies. In the existing systems, personal computer using ZigBee protocol is used to monitor the robot.

Keywords: automated defense robot

I. INTRODUCTION

Spy robots are not good for spying on rough terrains due to their wheeled mechanisms. Robots and drones get stuck due to their inability to work on rough terrains. Here we propose a rough terrain beetle robot that can navigate with easy through jungles, hilly and rocky areas with ease. Its small size allows it to get go through rough terrains like a small animal crawling through the jungle with very little noise. The robot uses a crawling mechanism to achieve this task. The robot uses a microcontroller based circuit to control the motors and achieve desired movement. The robotic vehicle uses specialized climbers to climb and descend on hilly terrains. The climbers also allow it to crawl easily through bushes and grass. Also it allows the robot to cross rocky paths and obstacles. The robot is remotely controlled by a joystick remote. This allows the user to remotely control the directional movement as well as speed and power of the robot. The joystick uses RF to transmit the commands to the robot remotely. The robot circuit consists of microcontroller based circuit that receives commands from the user and then instructs the motors through driver IC to achieve desired movement. Thus we here put forward a rough terrain small size beetle robot.

1.1 Problem Definition

Dangerous fields, such as postwar areas, roads, agricultural terrains, and accident sites with fatal casualties, are seen to be the beneficiaries of remotely controlled robotic applications. If combat-mines or sharp or cutting metals exist in the surface soil, then that field has a high degree of risk potential in other civil applications (injury may occur and fatalities and bodily integrity threats are possible). Analyzing applied data from cross-sectional testing of operational parameters is a request in the fields of vehicle use, terrain exploration, and other utility equipment.
Normally some of the risky and various tasks cannot be done by human. Thus there is need for change in present era. So, robot can be a good and effective option for risky purposes.

1.2 Objectives

- The main objective of this project is to design and develop a rough terrain beetle robot that can navigate with easy through jungles, hilly and rocky areas with ease.
- Hazardous environments involve the usage of robotic applications for the detection of combat-mines, explosives, and dangerous materials to save lives and to protect the health of civilians and police.

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- The robot uses a microcontroller based circuit to control the motors and achieve desired movement.
- To design small size robot allows it to get go through rough terrains like a small animal crawling through the jungle with very little noise
- The robotic vehicle uses specialized climbers to climb and descend on hilly terrains.
- The climbers also allow it to crawl easily through bushes and grass.
- The robot can allow crossing rocky paths and obstacles.
- This robot used to detect human, bombs, harmful gases and fire at remote and war field areas.
- For visual monitoring Camera will interface with robot.

II. LITERATURE SURVEY

[1] M. Prem Kumar Er Prem Kumar had gave the paper on unmanned multi- functional robot using Zigbee adopter network for defense application. In proposed system, the communication can be done with the help of the Zigbee wireless communication network. In this system, the robot is monitored using the CMOS camera.

[2] Ramesh Nayak, Mithuna Shetty, Rakesh Ganapthi, Sushwitha Naik, Varsha Aithal. In this paper robot can be used in real war field. This paper is quite different from other because instead of using remote control it is using touch screen to control robot. The robot is fully controlled by the touch screen and the commands from the touch screen via ZigBee transmitter were received by the microcontroller. So this defense robot can be used in military applications.

An automated defense robot building is planned, that has a laser gun attached, which is utilized for pointing laser rays to destroy the target object. One of the most important things about these robots is that they have the capability to perform missions remotely in the field, without any actual danger to human lives. In the proposed system, a robot is developed that is controlled through Microcontroller. For the aiming purpose and to view the road and the surroundings in which the robot is travelling, wireless cameras are installed. Radio frequency can be used to control the robot. These defense robots used in military are usually employed with the integrated system including gripper, cameras and sensors. This is specially designed for defense robotic system to save human life and protect the country from enemies. In the existing systems, personal computer using ZigBee protocol is used to monitor the robot.[2]

[3] Pooventhan K, Achuthaperumal R, Kowshik S, Manoj Balajee C R In this paper Surveillance is taken into account. Surveillance is the monitoring of the behavior, activities, or other changing information, usually of people for the purpose of influencing, managing, directing, or protecting them. Hence Robot which continuously Monitor the place and provides security is developed. In this project a robot is designed in such way that it provides high level surveillance as required using automation. The main objective of the project is to provide an efficient surveillance wherever high level security is needed. The proposed system is an embedded based robotic module. With the proposed system, humans can feel extreme comfort and can experience automation to the maximum.

[4] Kunal Borker, Rohan Gaikwad, Ajaysingh Rajput, In this paper instead of using RF module for wireless communication they are using different modified techniques for wireless communication such as GSM. The new age of technology such as Android, GSM has redefined communication. Most people nowadays have access to mobile phones and thus the world indeed has become a global village. At any given moment, any particular individual can be contacted with the mobile phone. New innovations and ideas can be generated from it that can further enhance its capabilities. Technologies such as Infra-red, Bluetooth, WiFi which has developed in recent years goes to show the very fact that improvements are in fact possible and these improvements have eased our life and the way we live. Remote management of several home and office appliances is a subject of growing interest and in recent years we have seen many systems providing such controls. Mobile robots are robots which have the ability to move around and interact with their environment and not just hinged to a particular place. There are many labs and research groups from various universities and industries which are completely dedicated on researching mobile robots, because of their immense potential and varied application in industry, military, security, and entertainment. The robot is specially designed for surveillance purpose. The control mechanism is provided along with video transmission facility. The video transmission is practically achieved through high speed image transmission. Initially, the robot will be equipped with an Android smart phone which will capture the scenario in front of it & will transfer the images to the server on which the user will be controlling and watching the live feed.

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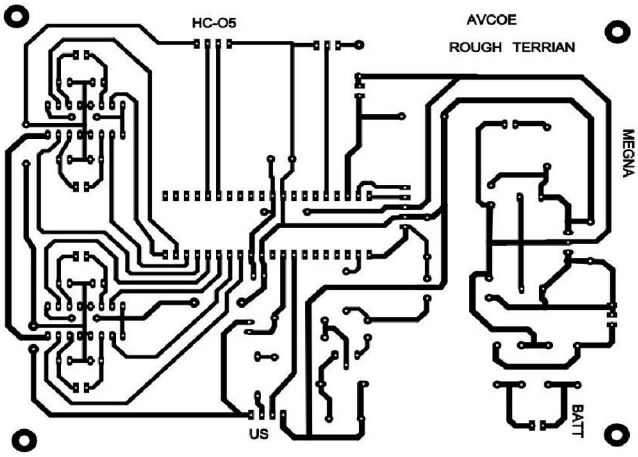
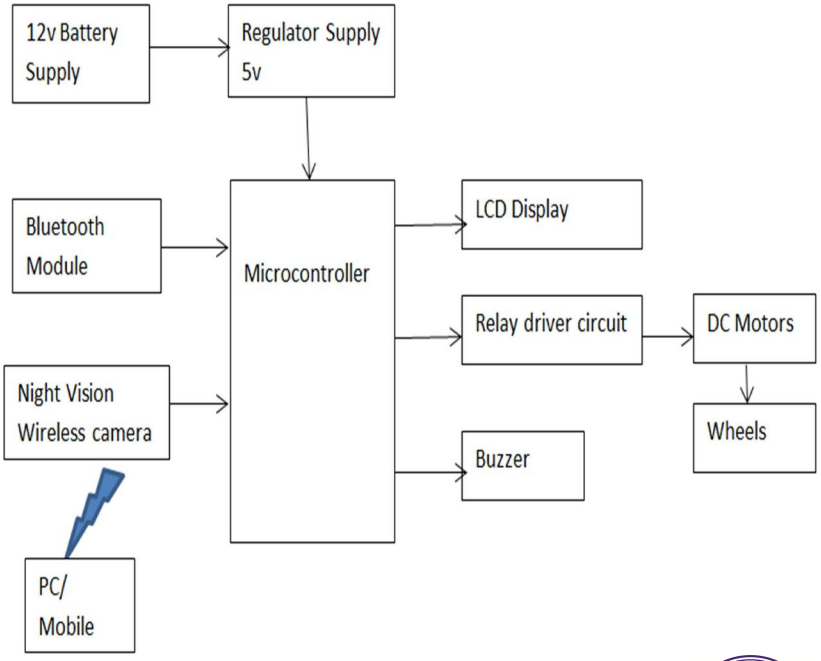
[5] Tarek Mohammad, In this paper they used IR sensor for measuring distance to an obstacle. They had divided IR sensors into three steps. First, the properties of the surface of the obstacle are determined. Secondly, the angle or orientation of the surface relative to the sensor is determined. Finally, the distance is calculated by using the information obtained in first two steps IR sensors are extensively used for measuring distances. Therefore, they can be used in robotics for obstacle avoidance. They are cheaper in cost and faster in response time than ultrasonic (US) sensors. However, they have nonlinear characteristics and they depend on the reflectance properties of the object surfaces. So knowledge of the surface properties must be known prior. In other words, the nature in which a surface scatters, reflects, and absorbs infrared energy is needed to interpret the sensor output as distance measure.

PCB LAYOUT



III. SYSTEM DESIGN

Block Diagram:



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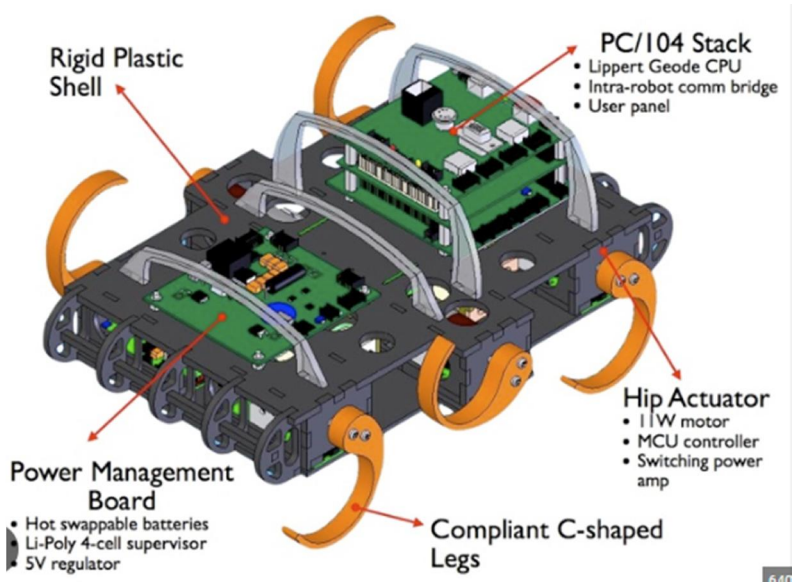
Block Diagram Description:



The block diagram of the hardware implementation of the entire system is as shown in the Figure 1. This robot is control by wirelessly from user smartphone via Bluetooth technology.

Robot receives command about movement from Bluetooth module (hc05). 12v battery requires providing supply to entire system.

Wireless camera will send real time video and audio signals, which could be seen on a remote monitor, and action can be taken accordingly. Microcontroller acts as master controller decodesall the commands received from the Bluetooth module and give commands to DC motor

Specification of components

Microcontroller (PIC18F4520)

PIC18F4520 is a low-cost, low-power, high-speed 8-bit, fully-static Microcontroller unit that has 40 pins out of which 36 pins can be used as I/O pins. It has Power-on-Reset (POR) as well as the Extended Watchdog Timer (WDT) circuitry, which can be programmed for 4ms to 131s.

It is an 8-bit enhanced flash PIC microcontroller that comes with nano Watt technology and is based on RISC architecture. Many electronic applications house this controller and cover wide areas ranging from home appliances, industrial automation, security system and end-user products. This microcontroller has made a renowned place in the market and becomes a major concern for university students for designing their projects, setting them free from the use of a plethora of components for a specific purpose, as this controller comes with inbuilt peripheral with the ability to perform multiple functions on a single chip.

PIC18F4520 is a PIC microcontroller, introduced Microchip, and mainly used in automation and embedded systems. It comes in three packages known as PDIP, QFN, and TQFP where the first one is 40-pin (mostly used) while other two come with a 44-pin interfacePIC18F4520 also comes with 3 programmable external interrupts & 4 Interrupts-On-Change (IOC) pins, which are reliable features for interrupts related applications. Also, the system has a 13-channel 10-bit ADC convertermodule.

It has a wide operating voltage range, from 2V to 5.5V., Thus it can be used in 3.3V or 5.0V logic level operations. The below image is showing the detailed pin diagram of the PIC18F4520.

Features:

- CPU Speed: 40MHz
- Program Memory Size: 32KB

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- RAM Memory Size: 1.5KB
- No. of Pins: 40Pins
- MCU Case Style: DIP
- No. of I/O's: 36I/O's
- Embedded Interface Type: EUSART, I2C, PSP, SPI
- Supply Voltage Min: 4.2V
- Supply Voltage Max: 5.5V
- MCU Family: PIC18
- MCU Series: PIC18F45xx

Fig 3.3.1(a): pic18f4520 microcontroller

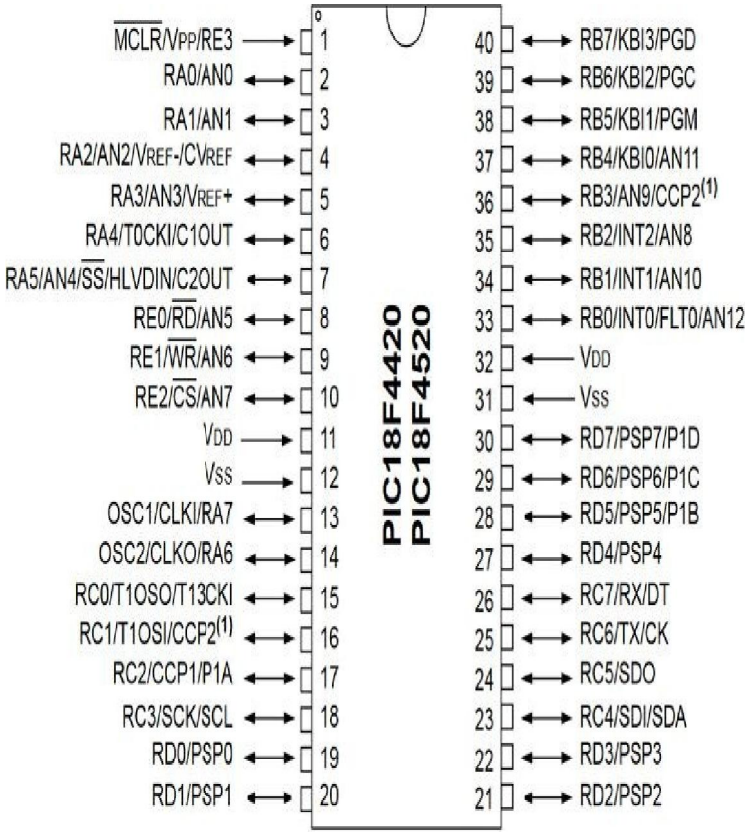

Fig 3.3.1(b): pin diagram of PIC18f4520

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GPS Module

The SKG13BL is a complete GPS engine module that features super sensitivity,ultra low power and small form factor. The GPS signal is applied to the
antenna input of module, and a complete serial data message with position, velocity and time information is presented at the serial interface with NMEAprotocol or custom protocol.

It is based on the high performance features of the MediaTek MT3337 single- chip architecture, Its –165dBm tracking sensitivity extends positioning coverage into place like urban canyons and dense foliage environment where the GPS was not possible before. The small form factor and low power consumption make the module easy to integrate into portable device like PNDs,mobile phones, cameras and vehicle navigation systems.

Figure3.4.3.1SKG13BL Top View

Features

- Ultra high sensitivity: -165dBm Extremely fast TTFF at low signal level
- Built-in 12 multi-tone active interference cancellerLow power consumption: Typical 22mA@3.3V
- ±11ns high accuracy time pulse (1PPS) NMEA Output：GGA,GSA,GSV,RMC
- Advanced Features: AlwaysLocate; AIC
- QZSS,SBAS(WAAS,EGNOS,MSAS,GAGAN)
- UART interface: 4800/9600/38400/115200 bps
- Small form factor: 15x13x2.2mm
- RoHS compliant (Lead-free)

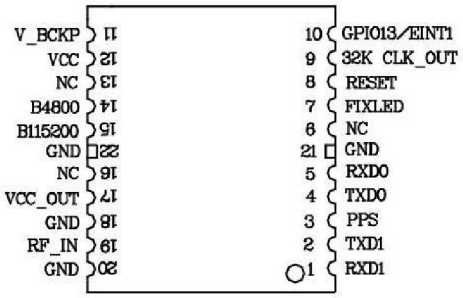

Figure 3.4.3.2 SKG13BL Pin Package

The Global Positioning System(GPS) is a satellite based navigation system thatsends and receives radio signals. A GPS receiver acquires these signals and provides the user with information. Using GPS technology one can determine location, velocity and time, 24 hours a day, in any weather conditions anywhere in the world for free. GPS was formally known as the NAVSTAR (Navigation Satellite Timing and Ranging). The basis of the GPS technology is a set of 24 satellites that are continuously orbiting the earth. These satellites are equipped with atomic clocks and sent out radio signals as to the exact time and location. These radio signals from the satellites are picked up by the GPS receiver. Once the GPS receiver locks on to four or more of these satellites, it can triangulate its location from the known positions of the satellites. It is a higher performance, low power satellite based model. It is a cost effective and portable system which accurately detects the location. The GPS receiver used here is Sky Traq Venus 6 GPS module ST22 which is having TTL logics and also RS232 as option. The GPS receiver is shown in Fig.3. This GPS is used totrack the

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position of the train after the emergency brake is applied in order to avoid the accidents,Global Positioning System tracking is a method of workingout exactly where something is. A GPS tracking system, for example, may be placed in a vehicle, on a cell phone, or on special GPS devices, which can either be a fixed or portable unit. GPS works by providing information on exact location. It can also track the movement of a vehicle or person. So, for example, a GPS tracking system can be used by a company to monitor the route and progress of a delivery truck, and by parents to check on the location of their child, or even to monitor high-valued assets in transit. A GPS trackingsystem can work in various ways. From a commercial perspective, GPS devices are generally used to record the position of vehicles as they make theirjourneys. Some systems will store the data within the GPS tracking system itself (known as passive tracking) and some send the information to a centralized database or system via a modem within the GPS system unit on a regular basis (known as active tracking) or 2-Way GPS.

Interfaces Configuration

Power Supply

Regulated power for the SKG13BL is required. The input voltage Vcc shouldbe 3.0V to 4.2V range, current is no less than 100mA. Suitable decoupling must be provided by external decoupling circuitry (10uF and 1uF). It can reduce the Noise from power supply and increase power stability.

Main power supply Vcc current varies according to the processor load and satellite acquisition. Maximum Vcc peak current is about 30 mA during acquisition.

RESET

The SKG13BL modules include a RESET pin. Driving RESET low activates a hardware reset of the system. RESET is only an input and will not reset external circuitry. At power down the reset is forced when the Vcc drops below2.7V.

Antenna

The SKG13BL GPS receiver is designed for supporting the active antenna or passive antenna connected with pin RF_IN. The gain of active antenna shouldbe no more than 25dB (18~20dB Typical). The maximum noise figure should be no more than 1.5dB and output impedance is at 50 Ohm.

Vcc_out

Antenna power output pin. When user wants to use external active antenna.The pin supply power for active antenna.

UART Ports

There are several function in SKG13BL related to UATR communication, suchas UART data transmission/receive and NMEA sentences input/output. In general, UART0 is as NMEA output and PMTK command input, UAR1 as RTCM input. The bit rates are selectable from 4800,9600,38400,115200 bps.

EINT1

The default EINT1 function is Standby mode control but the function is not supported; leave signal floating (not connected).

RF_IN

The transmission line must to be control impedance from RF_IN pin to theantenna or antenna connector of your choice. (Impedance 50Ω)

32K CLK_OUT

The 32K Out can output 32.768KHz clock which can be used to support someperipherals that need an real time clock source, don't need an external crystal and cost saving. The pin also could be programmed to be input pin which can receive the signal from an external accelerator sensor or vibration sensor to bethe wake -up signal of SKG13BL when the module is in low power mode

PPS

A pulse per second (1 PPS) is an electrical signal that very precisely indicatesthe start of second.

Dependingon the source, properly operating PPS signals have an accuracyranging 10ns. The PPS signals are used for precise timekeeping and time measurement.

RELAY

A relay is an electrically operated switch. Many relays use an electromagnet to operate a switching mechanism mechanically, but other operating principles are also used. Relays are used where it is necessary tocontrol a circuit by a

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low-power signal (with complete electrical isolation between control and controlled circuits), or where several circuits must becontrolled by one signal.

A relay is an electrically operated switch. Current flowing through the coilof 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 positions and most have double throw (changeover) switchcontacts as shown in the diagram

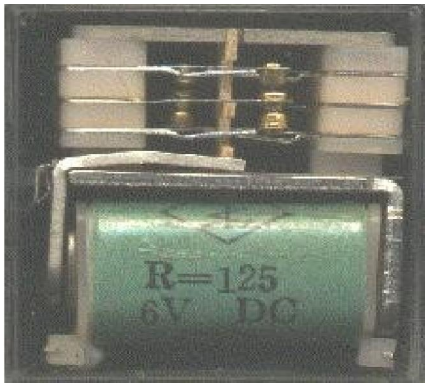

Fig 4.8 Relay showing coil and switch contacts

Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage batterycircuit 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 coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs (chips) cannot provide this current and a transistor is usually used to amplify the small IC current to the larger value required for the relay coil. The maximum output current for the popular555 timer IC is 200mA so these devices can supply relay coils directly without amplification.

Relays are usually SPDT or DPDT but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts are readily available. For further information about switch contacts and the terms used to describe them please see the page on switches.

Most relays are designed for PCB mounting but you can solder wires directly to the pins providing you take care to avoid melting the plasticcase of the relay.

The supplier's catalogue should show you the relay's connections. The coil will be obvious and it may be connected either way round. Relay coils produce brief high voltage 'spikes' when they are switched off and this can destroy transistors and ICs in the circuit. To prevent damage you must connect a protection diode across the relay coil

The figure shows a relay with its coil and switch contacts. You can see a lever on the left being attracted by magnetism when the coil is switched on.This lever moves the switch contacts.

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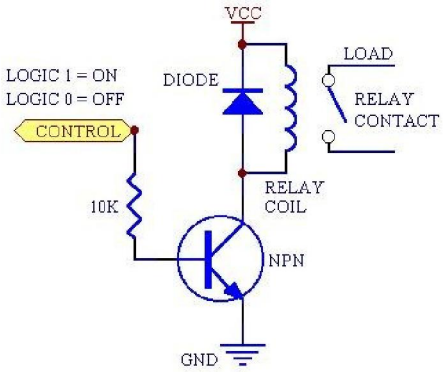


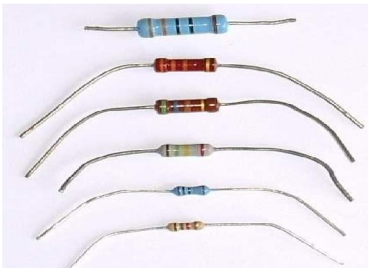
There is one set of contacts (SPDT) in the foreground and another behindthem, making the relay DPDT.
The relay's switch connections are usually labelled COM, NC and NO:
COM = Common, always connect to this; it is the moving part of theswitch.
NC = Normally Closed, COM is connected to this when the relay coilis off.
NO = Normally Open, COM is connected to this when the relay coil ison.

Applications of relays

Relays are used to and for:
Control a high-voltage circuit with a low-voltage signal, as in some types of modems or audio amplifiers.
Control a high-current circuit with a low-current signal, as in the startersolenoid of an automobile.
Detect and isolate faults on transmission and distribution lines by opening and closing circuit breakers.
Time delay functions. Relays can be modified to delay opening ordelay closing a set of contacts. A very short (a fraction of a second) delay would use a copper disk between the armature and moving blade assembly. Current flowing in the disk maintains magnetic field for a short time, lengthening release time. For a slightly longer (up to a minute) delay, a dashpot is used. A dashpot is a piston filled with fluid that is allowed to escape slowly. The time period can be varied by increasing or decreasing the flow rate. For longer time periods, a mechanical clockwork timer is installed.

RESISTORS

A resistor is a two-terminal electronic component designed to oppose an electric current by producing a voltage drop between its terminals in proportionto the current, that is, in accordance with Ohm's law:
V = IR
Resistors are used as part of electrical networks and electronic circuits. They are extremely commonplace in most electronic equipment. Practical resistors can be made of various compounds and films, as well as resistance wire (wire made of a high-resistivity alloy, such as nickel/chrome).
The primary characteristics of resistors are their resistance and the power they can dissipate. Other characteristics include temperature coefficient, noise, and inductance. Less well-known is critical resistance, the value below which power dissipation limits the maximum permitted current flow, and above which the limit is applied voltage. Critical resistance depends upon the materials constituting the resistor as well as its physical dimensions; it's determined by design.



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Resistors can be integrated into hybrid and printed circuits, as well as integrated circuits. Size, and position of leads (or terminals) are relevant to equipment designers; resistors must be physically large enough not to overheat when dissipating their power.

A resistor is a two-terminal passive electronic component which implements electrical resistance as a circuit element. When a voltage V is applied across the terminals of a resistor, a current I will flow through the resistor in direct proportion to that voltage. The reciprocal of the constant of proportionality isknown as the resistance R, since, with a given voltage V, a larger value of R further "resists" the flow of current I as given by Ohm's law:

$$I = \frac{V}{R}$$

Resistors are common elements of electrical networks and electronic circuits and are ubiquitous in most electronic equipment. Practical resistors can be made of various compounds and films, as well as resistance wire (wire made ofa high-resistivity alloy, such as nickel-chrome). Resistors are also implemented within integrated circuits, particularly analog devices, and can also be integrated into hybrid and printed circuits.

The electrical functionality of a resistor is specified by its resistance: commoncommercial resistors are manufactured over a range of more than 9 orders of magnitude. When specifying that resistance in an electronic design, the required precision of the resistance may require attention to the manufacturingtolerance of the chosen resistor, according to its specific application. The temperature coefficient of the resistance may also be of concern in some precision applications. Practical resistors are also specified as having a maximum power rating which must exceed the anticipated power dissipation of that resistor in a particular circuit: this is mainly of concern in power electronics applications. Resistors with higher power ratings are physically larger and may require heat sinking. In a high voltage circuit, attention must sometimes be paid to the rated maximum working voltage of the resistor.

The series inductance of a practical resistor causes its behavior to depart from ohms law; this specification can be important in some high-frequency applications for smaller values of resistance. In a low-noise amplifier or pre- amp the noise characteristics of a resistor may be an issue. The unwanted inductance, excess noise, and temperature coefficient are mainly dependent on the technology used in manufacturing the resistor. They are not normally specified individually for a particular family of resistors manufactured using a particular technology. A family of discrete resistors is also characterized according to its form factor, that is, the size of the device and position of its leads (or terminals) which is relevant in the practical manufacturing of circuits using them.

Units

The ohm (symbol: Ω) is the SI unit of electrical resistance, named after Georg Simon Ohm. An ohm is equivalent to a volt per ampere. Since resistors are specified and manufactured over a very large range of values, the derived units of milliohm (1 mΩ = 10−3 Ω), kilohm (1 kΩ = 103 Ω), and megohm (1 MΩ = 106 Ω) are also in common usage.

The reciprocal of resistance R is called conductance G = 1/R and is measured in Siemens (SI unit), sometimes referred to as a mho. Thus a Siemens is the reciprocal of an ohm: S = Ω − 1. Although the concept of conductance is often used in circuit analysis, practical resistors are always specified in terms of their resistance (ohms) rather than conductance.

Variable resistors Adjustable resistors

A resistor may have one or more fixed tapping points so that the resistance can be changed by moving the connecting wires to different terminals. Some wirewound power resistors have a tapping point that can slide along the resistance element, allowing a larger or smaller part of the resistance to be used.

Where continuous adjustment of the resistance value during operation of equipment is required, the sliding resistance tap can be connected to a knob accessible to an operator. Such a device is called a rheostat and has two terminals.

Potentiometers

A common element in electronic devices is a three-terminal resistor with a continuously adjustable tapping point controlled by rotation of a shaft or knob. These variable resistors are known as potentiometers when all three terminals

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are present, since they act as a continuously adjustable voltage divider. A common example is a volume control for a radio receiver.

Accurate, high-resolution panel-mounted potentiometers (or "pots") have resistance elements typically wire wound on a helical mandrel, although some include a conductive-plastic resistance coating over the wire to improve resolution. These typically offer ten turns of their shafts to cover their full range. They are usually set with dials that include a simple turns counter and a graduated dial. Electronic analog computers used them in quantity for setting coefficients, and delayed-sweep oscilloscopes of recent decades included one on their panels.

Battery -

12V 2Ah Rechargeable Lead Acid Battery is normally use for robots in competition. Wired or Wireless Robots runs for a long time with high speedwith this type of battery. Seal Lead Acid (SLA) Rechargeable battery is the most common general purpose battery.

Low cost, robust and less maintenance required are the advantages of SLA. Butit is considered heavy weight for certain robotic application. To charge SLA batteries, you can use any general DC power supply as long as it provides the correct voltage to your battery.

Features:

RechargeableRecyclable

No Memory Effect

Able to use for most of the 12V controllers, motors or any other appliancesSpecification:

Voltage: 12V Capacity: 2Ah

Size: 98mm x 43mm x 52 mmWeight: 0.450kg

Package Includes:

1 x 12V 1.2Ah Rechargeable Lead Acid Battery

16*2 LCD Display:

LCD (Liquid Crystal Display) screen is an electronic display module and find awiderange of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on.

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

GPS Module:

This is New Version (V2) of our famous GPS Receiver with Antenna (5VTTL Serial) , with 4pin 2.54mm pitch Berg strip connector option. It is made with third generation POT (Patch Antenna On Top) GPS module. The on board 3V3 to 5V level convertor enables us to directly interface with normal 5V Microcontrollers. Its low pin count (4Pin) will make it easy to interface and it is bread board friendly with 2.54 mm(0.1″) Pitch connector pads. The 4 Pins are 5V, TXD, RXD and GND. Yes, there is no setting required, just plug in to the power (5v), your raw data (NMEA0183) is ready at TX pin!. This is a standalone 5V GPS Moduleand requires no external components .It is built with internal RTC Back up battery. It can be directly connected to Microcontroller's USART.

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With the use high gain GPS engine providing a solution that high position and speed accuracy performances as well as high sensitivity and tracking capabilities in urban conditions & provides standard NMEA0183 strings in"raw" mode for any microcontroller. The module provides current time, date, latitude, longitude, speed, altitude and travel direction / heading among other data, and can be used in a host of applications, including navigation, tracking systems, fleet management, mapping and robotics.

The GPS chipsets inside the module are designed by MediaTek Inc.,which is the world's leading digital media solution provider and largest fab-less IC company in Taiwan. The module can support up to 51 channels. The GPS solution enables small form factor devices. They deliver major advancements in GPS performances, accuracy, integration, computing power and flexibility. They are designed to simplify the embedded system integration process.

Fig -3.3.7**: GPS Module**

PIEZOELECTRIC BUZZER

MICRO BUZZER 5V DC / 20mA PCB TYPE

Features

sealed: yes

operating power: 3-6V DC / 25mA extremely compact, ultrathin constructionno electrical noise

low current consumption yet high sound pressure level

Specifications

tone type: single

operating voltage: 3-6V DC rated voltage: 5V DC current consumption: 25mA osc. frequency: 3.2kHz sound level: 87dB connector type: pcb

body color: grayweight: 0.056oz

IV. PROJECT PLAN

Week No.	Action plan
1	Searching of Project information
2	Collection of components requiredfor project
3	Designing of PCB , printing ofcopper for interior layer
4	Etching, drilling, layer alignment of PCB

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5	Mounting components on PCB asper circuit diagram
6	Soldering components on PCB
7	Software Development for the project
8	Testing circuit is proper or not
9	Troubleshooting for any problems
10	Checking project is properly working or not if not then correct
11	Presentation of report
12	Presentation of PPT
13	Checking project from project guide
14	Checking report & PPT fromproject guide
15	Confirmation from project guide, co-ordinator , HOD
16	Submission of Project model,Project report, PPT

V. ADVANTAGES & APPLICATION

Advantages:

- To design small size robot allows it to get go through rough terrains like a small
- animal crawling through the jungle with very little noise
- The robotic vehicle uses specialized climbers to climb and descend on hilly terrains.
- The climbers also allow it to crawl easily through bushes and grass.
- The robot can allow crossing rocky paths and obstacles.
- This robot used to detect human, bombs, harmful gases and fire at remote and warfield areas.

Disadvantages

- Costlier.
- Sending data not secure.
- This system is not applicable for poor network connection places.

Application:

- Typical applications of robots are: Industrial – the main use of robots for manyyears.
- Military – such as UAV's (Unmanned Aerial Vehicle), UGV's (Unmanned Ground Vehicle), triage and surveillance.
- Entertainment – increasingly more and more toys

VI. CONCLUSION & FUTURE SCOPE

The proposed robot has scope of widespread industrial, defense and home applications. It can be used to analyze the environment of a coal mine without any human intervention. It can also be employed in a hostage situation to pin point the exact location of terrorists with the help of ultrasonic and PIR sensor, saving many lives during rescue mission.
Another application is home security system to sense movement of intruder through PIR sensor. Various advantages of this system are its range of operation up to100m, secure data transfer can be done with the help of Bluetooth Module and Android Application. Entire project will help in Military and Defense operations such as human detection, distance measurement, obstacle detection and also due to their bug like wheels it can travel in all terrains.

Future Scope

We have concluded from these existing and above discussed technology we can use a bug leg shaped wheels for running on a rough terrain. We can also use different sensor like PIR sensor, IR sensor and Ultrasonic sensor
for purposes like for distance measurement, obstacle detection, for depth sensing and for distance measurement respectively. Instead of using wireless camera we are using smart phone for live streaming of surroundings for spying this can be done with help of IMO application which is installed in mobile phone and due to internet services we can

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easily spy at any time. For wireless communication with Robot unit we are using Bluetooth module and easily control our robot with the help of android Application using USART Technology. Hence Android application is used as a remote control for robot which control movements of motors due to which wheel and is controlled laser shooter.

In this proposed model we want to achieve five aspects:

1. To design radar concept: In this mode we use the ultra sonic sensor that sense the obstacle and measure the distance and display in LCD.
2. Accident avoiding feature: In this mode we use the infrared sensor that sense automatically and check the problem and automatically stop and weep the buzzer.
3. Depth detection: In case of depth the robot sense the depth automatically stop and weep the buzzer.
4. Wireless robot: In this mode we operate the robot wireless technology through Bluetooth technology
5. Human Checker: In this mode we use the PIR active module for human detection.

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