NOVATEUR PUBLICATIONS
INTERNATIONAL JOURNAL OF INNOVATIONS IN ENGINEERING RESEARCH AND TECHNOLOGY [IJIERT]
ISSN: 2394-3696
VOLUME 4, ISSUE 3, Mar.-2017

LANDMINE DETECTION ROBOT USING ARDUINO BOARD

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ABSTRACT
Detection and removal of landmines is an important worldwide concern. A huge number of landmines have been deployed over the last twenty years and demining will take several more decades, even if no more mines were deployed in future. An adequate mine-clearance rate can only be achieved by using new technologies such as improved sensors, efficient manipulators and mobile robots. The ideas and concepts from the theoretical stages are shaped into the physical hardware components by fabrication of a prototype and then software programs are integrated into the system so as to test and experiment the concepts that had been developed. The designed robot is capable of detecting a buried mine, marking the exact location of the buried mine, and controlling itself from stepping over it and detonating the mine. The detection of the buried mine is done by using metal detectors since most land mines contain metal components.
KEYWORDS: Arduino board, Metal detector Sensor, PIR Sensor, Ultrasonic Sensor, GSM GPS Modules, Servo Motors.

INTRODUCTION

The project presented here is land mine detection robot system. In a situation where there are land mines are placed like in such as boarder areas, there is need for better security system. It is much safer to have a system that monitors and communicates to the device owner without putting human life to risk. This tends to utilize the availability of GSM network, mobile phone and electronics circuit to achieve an automated system which is programmed to work as a thinking device to accomplish this purpose.

Blasting of land mines is one of the main concerns of many countries in such border area and also in public places. Many times we have heard about the blasting of the land mines and some have faced such situations. Main intention of this project is to avoid such situation.

This project is designed and developed by taking into consideration the problem mentioned above. In SMS based land mine detection robotic system, we have to use the metal detector sensor to detect the lane mine in underground. If the metal detected at certain level then this sensor gives a particular signal to the microcontroller. Also it can be detect the presence of the human beings where it will be alive by using PIR sensor. If it detected then this sensor gives a particular signal to the AT mega microcontroller. Then the AT mega microcontroller turn on the buzzer and send message to the user. The fuel detector involves hardware and software parts construction and the integration of both parts to create the system.

Landmines are weapons or explosives which are buried under the soil that are activated by pressure, and may kill or cause harm when stepped upon it, and also cause long term physiological effects. Landmines pose a serious threat to soldiers and civilians worldwide and also provide major challenges to agriculture, infrastructure and road development in post-conflict regions.

The landmines are usually buried 10mm to 40mm below the soil and requires about minimum pressure of 9Kg to detonate them. The face diameters of these AP mines ranges from 5.6 to 13.3cm.Landmines are broadly categorized into two types of landmines Anti-Personnel and Anti-Tank landmines. We have developed a robot whose movement and directions can be controlled remotely using GSM modem. A metal detector circuit with buzzer is implemented and Arduino is used to regulate the complete operation.

BLOCK DIAGRAM

The implementation of proposed system mainly involves three sensors, which are PIR sensor, Ultrasonic sensor, Metal detector sensor of Land mine detection robot using Arduino uno board. The block diagram of the system is shown in Figure.

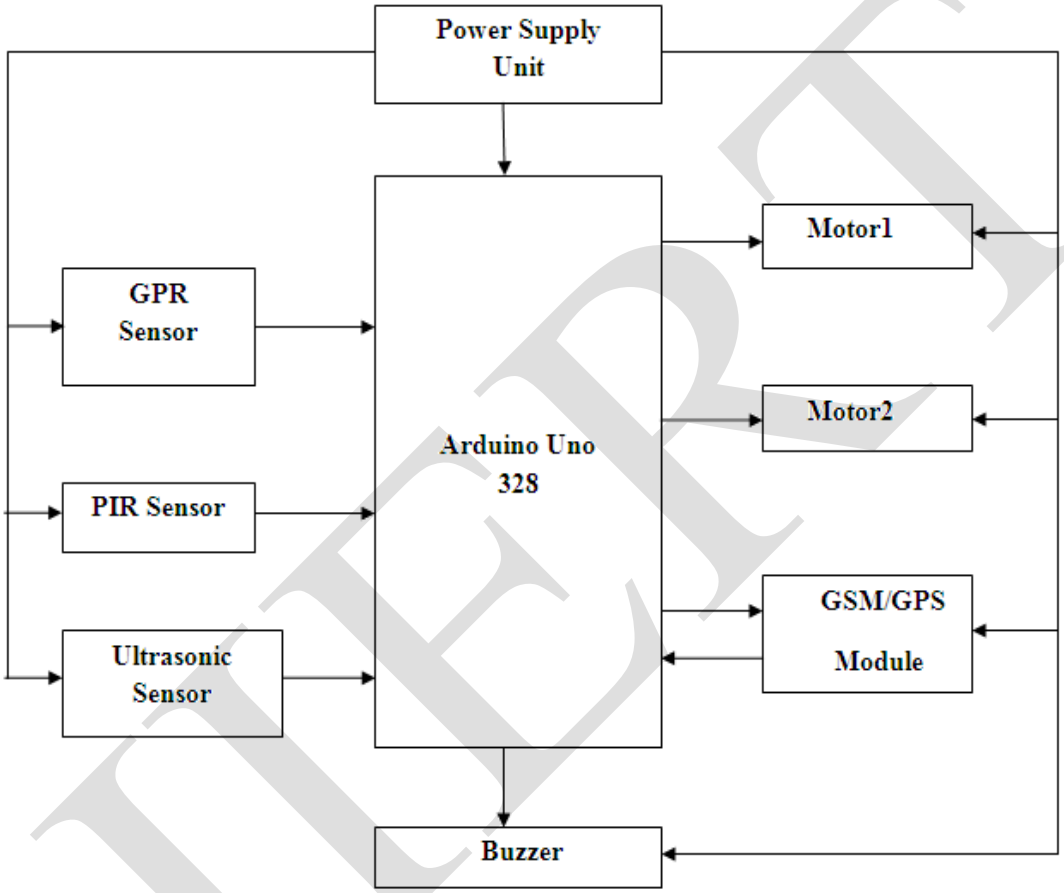

Fig.1. Block Diagram

BLOCK DIAGRAM EXPLANATION

1. POWER SUPPLY UNIT (BATTERY)

While with the electronics, you always must have one basic thing that is Power. In every electronic zone power supply is required. The proper operation of each and every component, it is important to supply the sufficient amount of voltage and current to the circuitry. If the power excelled its limit, it can be pernicious. It is possible to supply the power to complete robot with the only one 12v battery for the Arduino Uno board as well as for servo driver boards.

2. ARDUINO UNO 328

The Arduino Uno is a microcontroller board which is based on the ATmega328. It consists of 14 digital input/output pins, 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.

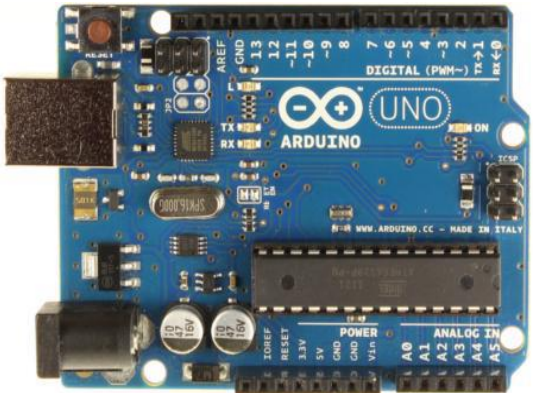

Fig.2. Arduino uno 328

3. PIR Sensor

PIR sensor stands for passive infrared sensor. It is an electronic appliance measures infrared radiation from objects in generated field by PIR detector. Sometimes it called PID – Passive Infrared detector. It detects changes in amount of IR radiation, which is depends upon the outside characteristics and temperature of the objects in front of detector. It means if human being or animal will come in range of detector it will detect the movement of body because live body eliminates warm energy in form of IR radiation. So it will give you signal by light or alarm when any live object in front of PIR.

Fig.3. PIR Sensor

4.ULTRASONIC SENSOR

Ultrasonic sensor also called transducers that convert ultrasound waves to electrical signals or vice versa. Those that both transmit and receive may also be called ultrasound transceivers; many ultrasound sensors likewise being sensors are some or the other way transceivers because they can both sense and transmit. These devices work on a principle of transducers used in radar and sonar systems, which evaluate traits of a target by deciphering the echoes from radio or sound waves, respectively. It is also used for measure the distance between obstacle and user so it also called ultrasonic range finder. Its range is minimum 2Cm and maximum range is 4m. While the distance between range [40-70] cm then alert signals very fast. when the obstacle near from the person then alert signal become very fast and give to the instruction to the user.

ELECTRIC PARAMETER:

1. Working Voltage DC 5 V
2. Working Current 16mA
3. Working Frequency 50Hz
4. Max Range 5m
5. Min Range 2cm.
6. Measuring Angle 15 degree.
7. Trigger Input Signal 10uS TTL pulse.
8. Dimension 45*20*15mm.

Fig.4. Ultrasonic Sensor

5. GPS (LS20032)

LS20030~3 series products are complete GPS smart antenna receivers, including an embedded antenna and GPS receiver circuits, designed for a broad spectrum of OEM system applications. The GPS smart antenna will acquire up to 66 satellites at a time while providing fast time-to-first-fix.It can provide you with admirable sensitivity and performance even in urban valley and dense vegetation environment. Its far-reaching capability meets the sensitivity requirements of location-based applications.

SPECIFICATION:

1) Arbitrate high sensitivity solution
2) Support 66-channel GPS
3) Support AGPS
4) Up to 10 Hz update rate
5) Capable of SBAS (WAAS, EGNOS, MSAS)
6) LED indicator for GPS fix or not fix (not in LS20033).

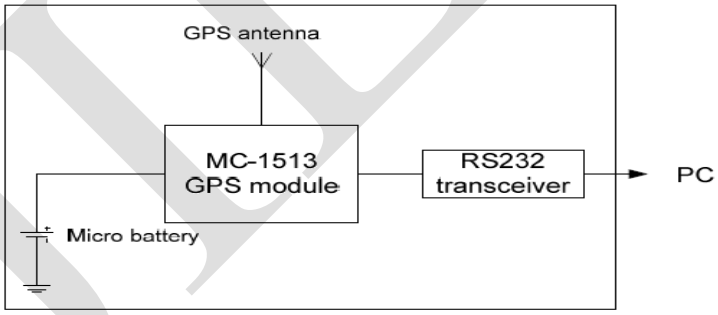

Fig.5 . Block diagram of GPS LS20032

6. UART

1) After Reset, All Registers Are Identical to the 16450 Register Set
2) Capable of Running All Existing 16450 Software
3) Used to serial communication.
4)

7. GSM

1) RTC supported with Super Cap.
2) Short message service.
3) Free serial port selection.
4) Power on/off and reset function supported by Arduino interface.

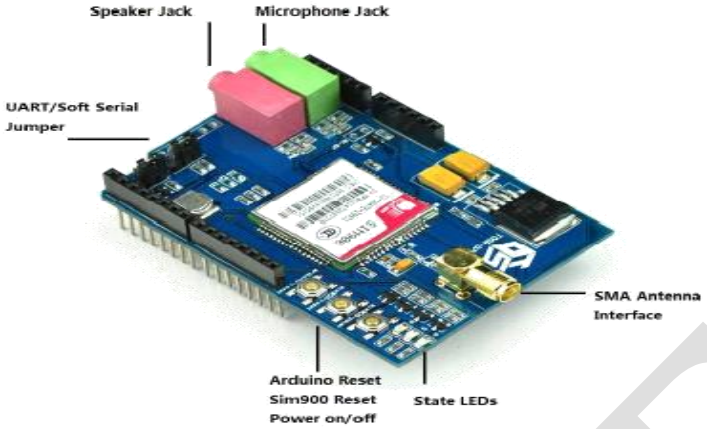

Fig .6 GSM Board

8. BUZZER

Fig 7 Buzzer

FEATURES

1) operating power: 3-6V DC / 25mA
2) extremely compact, ultrathin construction
3) no electrical noise
4) low current consumption yet high sound pressure level

SPECIFICATIONS

1) operating voltage: 3-6V DC
2) rated voltage: 5V DC
3) current consumption: 25mA
4) oscillator frequency: 3.2kHz
5) sound level: 87DB

9.GPR

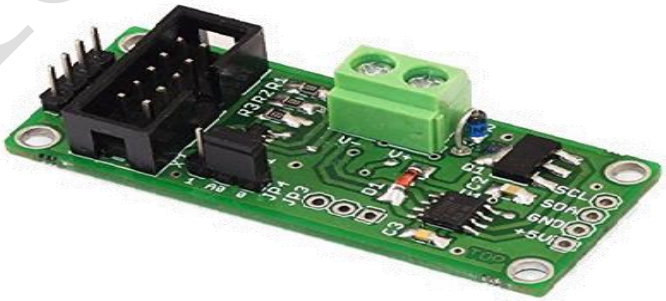

Fig. 8 Ground-penetrating radar

Ground-penetrating radar (GPR) is a geophysical method. It will uses radar pulses to image the subsurface. This nondestructive method uses electromagnetic radiation in the microwave band such as UHF/VHF

frequencies of the radio spectrum, and detects the reflected signals from subsurface structures. GPR can have applications in a diversity of medium, including rock, soil, ice, fresh water, pavements and structures. In the right conditions professionals can use GPR to detect subsurface objects, changes in material properties, and voids and cracks.

- Low quiescent current: 200µa
- 5v regulator for external circuits
- Vref for sensor excitation:xtr116: 4.096v
- low span error: 0.05%
- Low nonlinearity error: 0.003%
- Wide loop supply range: 7.5v to 36v

10. DC MOTOR

Fig4.1.9.Dc motor

DC motors are generally more powerful than servos in terms of speed and torque. Microcontroller could not accurately control DC motors without a motor controller. So, motor Controllers are must needed. An encoder is use to get feedback from the DC motor. In real life, though, DC motors will always have more than two poles (. In particular, this avoids "dead spots" in the commutate. We can imagine how with our example two pole motor, if the rotor alignment is exactly at the middle of its rotation it will get stuck there.
Specifications:

- Input Voltage:4.8/35V
- Maximum output current:15A/13.8V per channel.

WORKING

The paper consist proposal of Landmine Detection .The above proposed work is that it takes advantages of mine workers to protect from different hazardous conditions and hazardous gas present in the mine environment.
The power supply can be achieved by using rechargeable battery. The system needs 5V supply for all the sensors, controller and DC motors GPS/GSM modules.

CONCLUSION

The primarily aim is that study of various types of land mines, also study about detecting sensors. This project will demonstrate the successful implementation of promote technology innovative to achieve a reliable and efficient outcome from the various instruments. The result will show that the robot has been used for detecting the landmine and then it will send the message to the predefined number or user. With a common digitalized platform, these latest instruments will enable increased flexibility in control, operation, expansion and eventually benefit the human life with improved services, reliability and increased convenience.

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