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Wireless Detection of Landmines using GPS & GSM

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Abstract: This system uses the Global Positioning System (GPS) tracking technology in combination with Global System for Mobile (GSM) technology. An integrated system employing latest tracking techniques using satellite receiver in the form of GPS Modem, integrated with a robotic vehicle can be used to detect the exact location of metal in the field. Then the GSM module transmits the received data to the authorized Mobile user. Main purpose of this project is to detect landmines by using a GPS enabled remotely controlled robot.

Keyword: Microcontroller, GSM Module, GPS module, Sensors.

I. INTRODUCTION

Conventionally, Wireless-controlled robots use RF circuits, which have the drawbacks of limited working range, limited frequency range and the limited control. Use of a mobile phone for robotic control can overcome these limitations. It provides the advantage of robust control, working range as large as the coverage area of the service provider, no interference with other controllers and up to twelve controls.

Although the appearance and the capabilities of robots vary vastly, all robots share the features of a mechanical, movable structure under some form of control. The Control of robot involves three distinct phases as follows:
1. Perception 2. Processing 3.Action. Generally, the preceptors are sensors mounted on the robot, processing is done by the on-board microcontroller or processor, and the task is performed using motors or with some other actuators. Robot is designed to detect landmines in a remotely controlled way. User can navigate the robot and locate the landmines. Locations of detected landmines can also be accessed by mobile phones via SMS. The robot can be controlled by the developed software, which will program the parallel port and communicate with the robot via radio signals. Developed software program uses button and mouse control to navigate the robot. The developed software will indicate the real-time location of the robot and the location is transmitted. When the robot detects a landmine it sends the signal to the GSM system in the form of the type of metal detected and their location in such as Latitude, Longitude, the robotic model.

II. LITERATURE SURVEY

There were some literatures which referred before starting the work to take a good idea and to check the possibilities of getting the needed results. Jadhav. 2013) have shown in his study about the automotive localization system using GPS and GSM services. The system permits localization of the automobile and transmitting the position to the landmine at the receiving station. This system is also provided with GSM to get a text message about the where about of the mine.

This literature has some weakness as researcher in some places where there is no provision of GSM networks it is difficult for communication also did not mention more needed information of the different type of metals used for the mine. This is received by a GSM modem in the device and processed by the Spartan processor and the processor sends command to a GPS module in the device. The GPS module responds with coordinate's position of the mine. This position is sent to the station as a SMS to the user with date, time, latitude and longitude positions.

This literature has some weakness when consist air masses in the sky GPS will stop the work and do not send message and determine the location. Also some strength, using an FPGA controlled system we can easily track the mine which ensures safety for the troops in the army vehicles and also lots of uses for public transport system.
This literature has some weakness as the delayed communication networks to send message recorded when the accident and has some strength can capture the streams of data provided by their accelerometers, compasses, and GPS sensors to provide a portable black box that detects blast accidents.
The first literature study has done about the accident detection and send message using GPS and GSM modems. The second study is designing the metal detection sensor, which checks if the accident has been caused due to the blast of mines. Third literature to design station alarm system in the event of blast. Fourthly, study designing mine tracking system using GPS. Finally, all the literatures found are good and gave information about the application, working principle, how to design the System and choose best program to design the circuit this gives us the ability to write the paper and also to design accident notification system.

III. DESCRIPTION

The automated control system consists of GPS module, GSM Modem, Microcontroller, Metal detector sensor, Motor Driver L298, DC Motor. The unit is expressed in Figure below:

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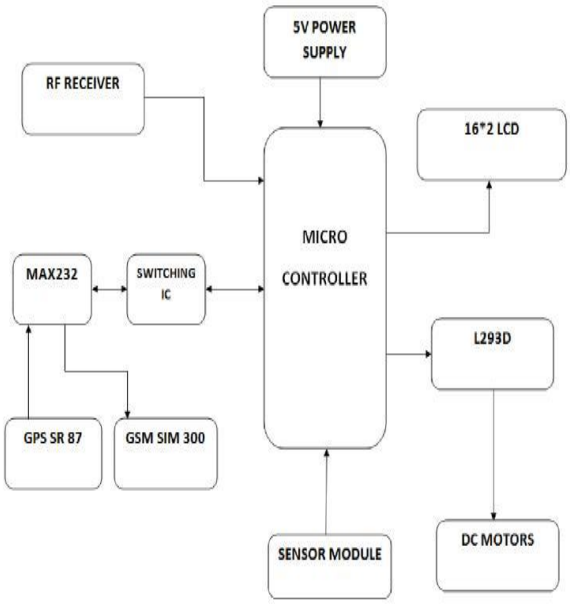

Fig 1: - block diagram of landmine detection using GSM & GPS.

We have built a prototype model which as shown in above block diagram. Following is the hardware description.

1. **PIC16F877**- This powerful (200 nanosecond instruction execution) yet easy-to-program (only 35 single word instructions) CMOS FLASH-based 8-bit microcontroller packs Microchips powerful PIC architecture into a 40 pin package and is upwards compatible with the devices. This controller features 256 bytes of EEPROM data memory, self-programming, an ICD, 2 comparators, 8 channels of 10-bit ADC, 2 capture/compare/PWM functions, the synchronous serial port can be configured as either 3/2 wire SPI or I2C respectively.

2. GPS Receiver with Active Antenna- Global Positioning System (GPS) satellites Broadcast signals from space that GPS receivers use to provide three-dimensional location (latitude, longitude, and altitude) plus precise time. GPS receivers provides reliable positioning, Navigation and timing services to worldwide users on a continuous basis in all Weather, day and night, anywhere on or near the Earth. Sunroom's ultra-sensitive GPS receiver can acquire GPS signals from 65 channels of satellites and output position data with high accuracy in extremely challenging environments and under poor signal conditions due to its active antenna and high sensitivity. The GPS receiver's 160dBm tracking sensitivity allows continuous position coverage in nearly all application environments. The output is serial data of 9600 baud rate which is standard NMEA 0183 v3.0 protocol offering Industry standard data messages and a command for easy interface to mapping software and Embedded devices.

3. Power supply unit- On-board 5V rechargeable battery is used to drive dc motors &PIC16F877 &AT89C51. We require 3.3V and for various sensors and we require 5V to drive RF module, etc. So to do this we will have to build power supply unit using voltage divider circuit and regulator ICs like LM7805.

4. GSM Module- The SIM900 is a complete Quad-Band GSM solution in a SMT module which can be embedded in the customer applications. Featuring an industry-standard interface, the SIM900 delivers GSM900 performance for voice, SMS, Data, and Fax in a small form factor and with low power consumption. With a tiny configuration of 24mm*24mm*3mm.

5. DC motor- Simple dc motors are being used as wheels of the prototype model. They are driven by 12V on board battery supply.

6. Motor Driver-It is required to drive the motor properly and it provides the required supply voltage and current to motors to drive it in either direction**.** L293D is used for this purpose; it works on H-bridge principle.

7. RF Module-In our system we are using CC2500 RF module. The RF module is use to communicate with nearby vehicles. In our system we are using 2.4 GHz radio frequency range.

Components List-
- PIC16F877.
- GPS Receiver with Antenna.
- GSM Modem.
- DC Motors.
- Motor Driver IC L293D.
- LCD.

Software's Used-
- Proteus 6.
- Keil Micro Vision 4.
- MPLAB.

IV. WORKING

Metal detector consists of copper coils. If any metal is detected, it sends the signal data to controller and with the help of GPS it indicates the latitude and longitude of the exact position. GSM through Attention Command sends the SMS.We use motor driver L298D because weprovide only +5v power supply and +12v is required to rotate the motor so only L298D has the property to rotate the motor even if the input power supply is +5v.System consists of two main modules, which are the control station, which runs on a PC or Laptop and the remotely controlled robot. The control station consists of three integrated modules consisting of Metal detecting component, GPS data collecting component and Remote control component. These three components act as one system but the underlying system components act as simultaneously working independent systems. Remote control system uses a radio frequency transmitter. Control system, which runs on a PC or a Laptop, uses the parallel port and control relays to remotely control the robot. Bluetooth GPS sends the location of the robot via Bluetooth data connection. Controlling software of the GPS acts as an intermediate layer, in the communication between the developed software and the robot. GPS component of the developed software reads NMEA data via communication port of the PC or the laptop. The software decodes NMEA data and the location of the robot is displayed on the map. UMN

map server is used as the GIS software, which serves the GIS layers to the developed software. If the robot detects a landmine by using its metal detector then it sends a radio signal by using a FM transmitter. Then the signal is captured by a FM receiver which is attached to the control system and then system recognize the position of the robot as the landmine contaminated location and adds a point feature to the landmine point layer in the GIS database.

V. ADVANTAGES

- Totally Remote Controlled.
- With the help of GPS we get the latitude and longitude of the detected position.
- Locations of detected landmines can also be accessed by mobile phones via GPRS and SMS.
- Wireless-controlled robots use RF circuits, which have the drawbacks of limited working range, limited frequency range and the limited control. Use of a mobile phone for robotic control can overcome these limitations.
- It provides the advantage of robust control, working range as large as the

Coverage area of the Service provider, no interference with other controllers and up to twelve controls.

VI. APPLICATIONS

- Anti-Car Theft.
- Alive Human Detector.
- To detect the landmine and prevent the loss of human lives.

VII. CONCLUSION

The paper presents an advanced solution and a new direct approach for remote sensing based on the concept of metal detectors to detect the metallic landmines in El Alamein region. The advanced solution solves three main problems a) The absence of maps that show landmines locations that planted in the Egyptian western desert from WWII, b) The lack of funds, c) The limited use of technology. The solution based on integrated technologies by using the wireless communications, cellular technologies and the packet oriented mobile data service to obtain a full control from a safe distance for landmine monitoring team in fenced minefields or suspicious regions. GSM sound tracker, GPS tracker, smart cellphones plus advanced applications and RC truck equipment were brought together to do three main tasks for metal landmines, a) Tracing,-b) Detecting,-c) pinpoint location coordinates.

VIII. FUTURE WORK

In future, this proposed system can be used to find the actual condition of the place where the robot is sent to detect the landmine. This can be achieved by using a CCTV (Closed Circuit Television) interfaced with the microcontroller. Thus the actual images can be accessed directly using the CCTV. Since the use of GPS, the weather conditions of the area can be accessed. Knowing the weather conditions like heavy snowfall, landslide, heavy rains, etc. can be known. Thus the army headquarters can actually decide to send more number of personnel in order to minimize the loss.

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