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Landmine Detection HC-05 Bluetooth controlled Robot (LDBR) using GPS and GSM Technology

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***Abstract*—**This paper outlines state-of-the-art solution for landmine detection that facilitates the detection of mine or possible explosives that are hidden. The latitude and longitude positions are then sent to the controller via SMS making it easier to locate and further to diffuse it as well. The major components used are Arduino Uno Board, HC-05 Bluetooth module, GSM SIM900A and copper coil. The result shown from this state-of-the-art proposed system provides better security and safety mechanism for the soldiers of our country.

***Keywords*—**Arduino Uno, HC-05 Bluetooth, GPS, GSM, L29N Motor Driver, Metal Detector

I. INTRODUCTION

A. Background Study

Landmines are weapons or explosives that are buried under the soil that are activated by pressure and may kill or cause harm when steeped upon it and makes agricultural land unusable with the restriction of access to water. Landmines pose a serious threat to soldiers and civilians worldwide and also provide major problems to agricultural lands, water reservoirs and road development in border regions. [1]

B. Existing System

The existing system, the most common method is electromagnetic induction-based sensors can detect metal mines at a low cost; this method has been explored and uses the electromagnetic characteristics of the mines r the mine casing. landmine detection method requires human intervention. Every time it is required that a soldier carries a metal detector to find the mine. The use of electromagnetic sensor in the existing systems are limited in terms of restricted frequency. [2] [3]

II. LITERATURE SURVEY

S. Sasikumar, et.al [1] the paper titled as "Multi Utility Landmine Detecting Robotic Vehicle" is a prototype provides less complex structure and reduces the cost to build a landmine detection robot. Accurately it measures the latitude and longitude positioning using the GPS module.

Rajesh Kannan Megalingam, et.al [2] the paper titled as "Landmine Detection and Reporting using Light Weight Zumo Bot", addresses the humanitarian concern and has camp up with simple, light weight, autonomous wireless controlled robot which can detect the landmine.

V. Abilash, et.al [3] the paper titled as "Arduino Controlled Landmine Detection Robot", has describe overall design for wheeled robot for landmine detection purpose and implementation. The wheeled robot is less expensive, robust.

III. STATE-OF-THE-ART PROPOSED SYSTEM

This paper outlines state-of-the-art solution for landmine detection that facilitate the detection of mine or possible explosives that are hidden. The latitude and longitude positions are then sent to the controller via SMS making it easier to locate and further to diffuse it as well.

1. The Robotic vehicle is steered using a Bluetooth enabled smartphone. The robot uses HC-05 module and L293D motor driver to follow the commands being given by the smartphone.

2. The metal detector responds to any change in the inductance of the coil caused by detection of metal by triggering the GPS and GSM module.

3. The GPS module generates the latitude and longitude information of its current position.

4. GSM module sends the latitude and longitude positions to the control room in the form of text message/SMS.

IV. System Design

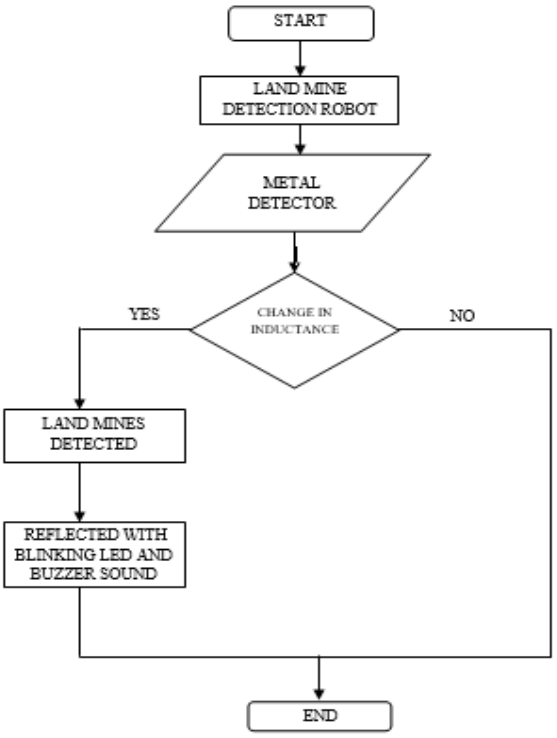

Figure 1. Data Flow Diagram

V. Methodology

This state-of-the-art work is mainly developed in two phases.

First Phase: Building a Bluetooth controlled Robot which is supposed to carry the mine detector.

Second Phase: Mine detection module which is mounted on the Bluetooth controlled robot.

Description: Bluetooth controlled robot is developed using Arduino Uno as the basic platform. The HC-05 Bluetooth module and L29N motor driver helps the robot to be steered and directed using smartphone with Bluetooth capabilities.

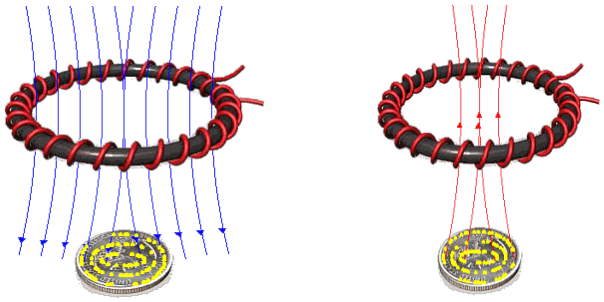

Figure 2. Principle of Metal Detector

VI. System Requirements

A. *Arduino Uno*

Figure 3. Arduino Uno Board

B. *HC-05 Bluetooth Module*

Figure 4. HC-05 Bluetooth module

C. *L298 Bridge Module Motor Driver*

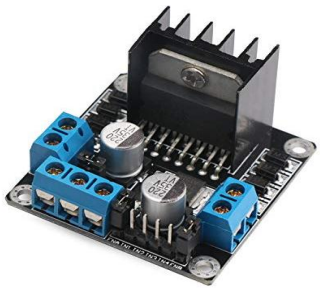

Figure 5. L298 Bridge Module Motor Driver

D. *GPS Module*

Figure 6. GPS Module

E. GSM Module

Figure 7. GSM Module SIM900A

F. Arduino IDE

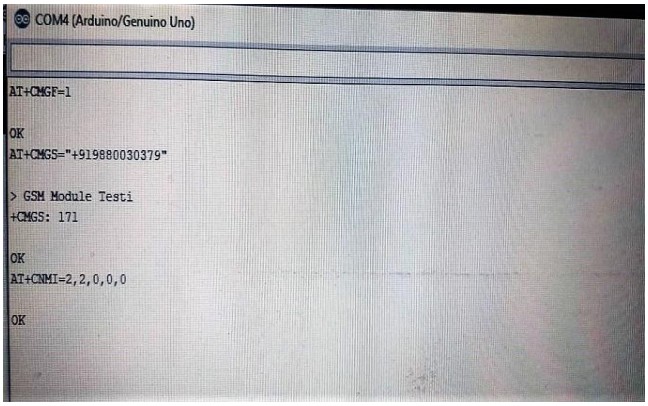

Figure 8. Arduino IDE

VII. Experimental Results

A. GSM Testing

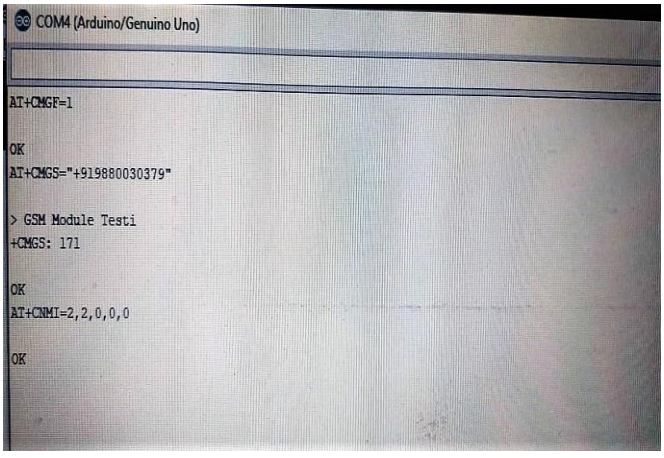

Figure 9. Successful GSM Test

Here, GSM module is being tested independently. The results are displayed om the serial monitor indicating that GSM module is working as desired.

B. GPS Testing

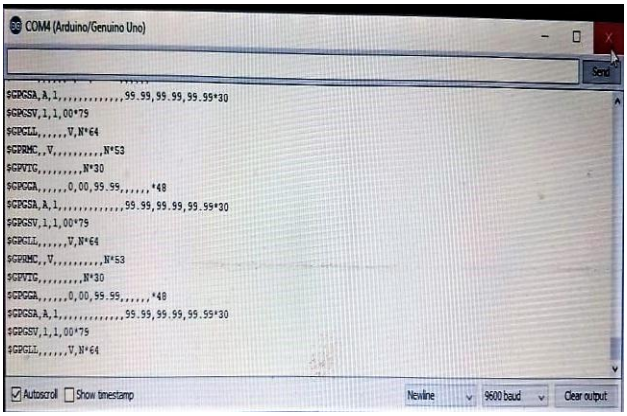

Figure 10. GPS Module searching for satellites

Here, it is shown that once the GPS is powered ON, it searches for satellites and prints the result on the serial monitor.

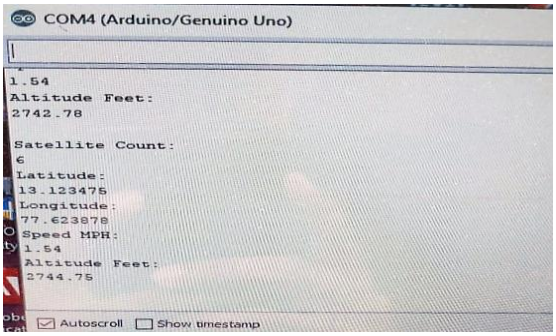

Figure 11. Latitude and Longitude values

Here, once the GPS has established connection with the satellite, it displays the Latitude, Longitude, Speed (MPH), Altitude etc. on the serial monitor. Thus, the GPS module is tested independently to be working successfully as per the requirement.

C. Integration of GPS and GSM Module

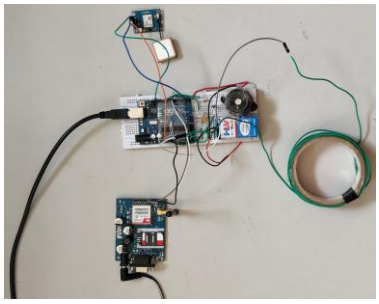

Figure 12. GPS and GSM Modules interconnected together

Here it shows how the GPS and GSM modules are intergrated together to receive the Geo coordinates and send them via SMS to the receiver

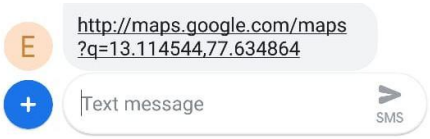

Figure 13. GSM Module sending GPS co-ordinates via SMS to Smartphone / Control Room

Here, the SMS from the GSM module is received which is a Google Maps link of the coordinates sent by the GPS.

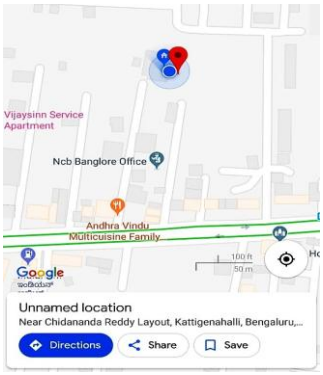

Figure 14. Output of GPS Module

Here, on clicking of the link that was received from the GSM module, it open up Google Maps application and pin point the location where the mine was detected.

D. Metal Detector

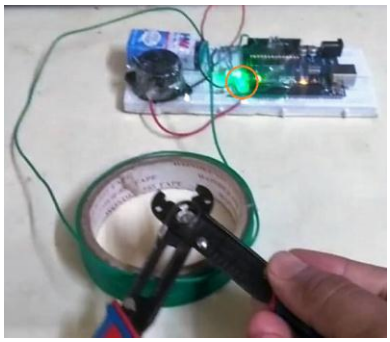

Figure 15. Successful detection of metal using metal detector (marked in RED colored circle)

Figure 15 shows the metal detector which is being used to deted the mines. The wire-cutter (metal) is brought near the detector which triggers the buzzer and the LED.

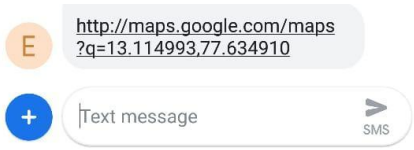

Figure 16. When metal gets detected GPS co-ordinates are sent to Smartphone / Control Room

Here, on detecting the metal, GSM module promptly send the current GPS location through SMS to Smartphone / Control Room.

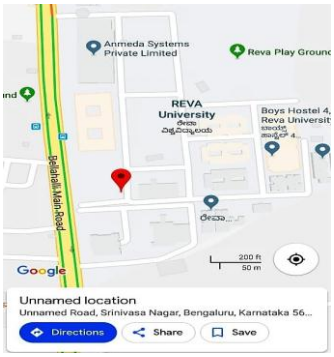

Figure 17. This is the exact location where metal got detected

Here, on clicking the link received in the SMS, Google Map application opens up and the location of mine is displayed on the map making it easier for the concerned authority to defuse the mine.

E. HC-05 Bluetooth controlled Robot integrated with Metal Detector, GPS and GSM Modules

(a)

(b)

Figure 18. (a), (b) Landmine Detection HC-05 Bluetooth controlled Robot (LDBR)

Figure 18 (a) and (b) represents Landmine Detection HC-05 Bluetooth controlled Robot (LDBR). Here all the modules are integrated together and it is covered with a digital camouflage cloth to hide it from the enemies or make it not clearly visible to the enemies.

VIII. CONCLUSION AND FUTURE ENHANCEMENT

The aim of this state-of-the-art paper work is to provide a HC-05 Bluetooth controlled Robot for landmine Detection using GPS and GSM technology. This robot is light-weight, less expensive, portable, robust and it is a useful machine in military for surveying and monitoring purpose. The main aim is to provide better security and safety mechanism for the soldiers of our country by avoiding loss of life during battle-field.

The future implementation and extension of this state-of-the-art model can go a step further by automatically diffusing the landmine to avoid any damage to the soldiers.

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