Android Controlled Landmine and Metal Detection Robotic Vehicle

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***Abstract*—*The creation of a robotic vehicle that can detect metal and landmines while being remotely operated by an Android device is described in this synopsis. Although saving human lives and ensuring their security are two separate goals, both are crucial and even required. A land mine is an explosive device hidden beneath or on top of the ground that is intended to kill or disable an adversary. The majority of land mines are planted just below the ground's surface, and they are set off by pressure or trip wire. The majority of land mines typically have numerous metallic components that can be used in their detection. Mines that are buried during a conflict may go unnoticed. As the name implies, detection is carried out carefully and further away from the mine using a metal detector based on Colpitts oscillator. This robotic mine detection vehicle can be placed on highways in mine regions in place of personnel to find mines and protect our soldiers' lives. The use of a "Landmine detection robotic vehicle" is a secure way to find land mines. This vehicle is controlled by wireless communication, a Bluetooth module, and an 8051 microcontroller.*

Keywords*—*8051 Microcontroller, HC-05 Bluetooth Module, Metal Detector, Colpitts Oscillator, Android Device, L293 Motor Driver.

I. Introduction

When stepped upon, landmines, which are explosives or weapons placed in the soil that are detonated by pressure, may kill or cause serious injury, rendering agricultural land unusable and limiting access to water. Over the world, landmines constitute a tremendous threat to military and people. They also seriously hamper the development of roads, water reservoirs, and agricultural fields in border regions.

This project presents an approach for landmine detection that makes it easier to find mines or potentially buried explosives. The buzzer of a metal detector can warn army soldiers about landmines buried beneath the surface, helping to avoid casualties as well as damage and loss to vehicles and equipment. Mine disposal specialists and mission controllers in this system face numerous difficulties and significant risks.

The entire system is managed through an Android application. The robot will be moved by Bluetooth control using an Android smartphone. The Bluetooth module will serve as the interface between the 8051 microcontroller and the smartphone. For the system, we'll be using a Bluetooth module that can function as either a master or a slave. The controller will determine how the robot moves. In order to find mines and bombs, a metal detector is used. To control the robotic vehicle, the android application uses commands like forward, backward, right, and left direction.

II. Working Principle

A. Android Control

The user uses an Android device to give the vehicle instructions. The vehicle's 8051 microprocessor, which is its central processing unit, receives these instructions wirelessly over Bluetooth. After receiving a signal from the metal detector sensor, the 8051 microcontroller instructs the motor driver to halt the vehicle. This prevents the car from unintentionally setting off the landmine.

B. Landmine Detection

A metal detector sensor that is integrated into the vehicle will detect landmines buried in the ground. When a landmine is found, the metal detector sensor alerts the 8051 microcontroller. A metal detector in the car alerts the driver to the possibility of a landmine. A buzzer that triggers when a metal object interferes with the metal detector's coil is used as the alert mechanism in this project.

C. Bluetooth Module HC-05

The Bluetooth protocol, a wireless communication standard for close-proximity communication between electronic devices, is used by the HC-05 module. Data is transferred between electronic devices using the HC-05 module using serial connection. For flexible communication, a range of baud rates, parity, and stop bits are supported. HC-05 module configuration is possible with AT commands. For the HC-05 module to create a wireless connection, other Bluetooth devices must first be paired with it. The module can communicate with the other device through a secure wireless connection once it has been connected.

D. Metal Detector

In this project, the Colpitts oscillator circuit is used to design a metal detector. An electronic oscillator circuit that generates sinusoidal output is known as a Colpitts oscillator. It comprises of an LC circuit that establishes the oscillator's frequency and a transistor amplifier that supplies the necessary oscillation-inducing feedback. The metal detector's sensing component—an inductive coil—is connected to the Colpitts oscillator. The inductance of the inductive coil changes when a metallic object is placed next to it, which alters the oscillator's frequency. The oscillator frequency

change when metal is present close to the inductive coil. This difference in frequency is picked up by a Buzzer.

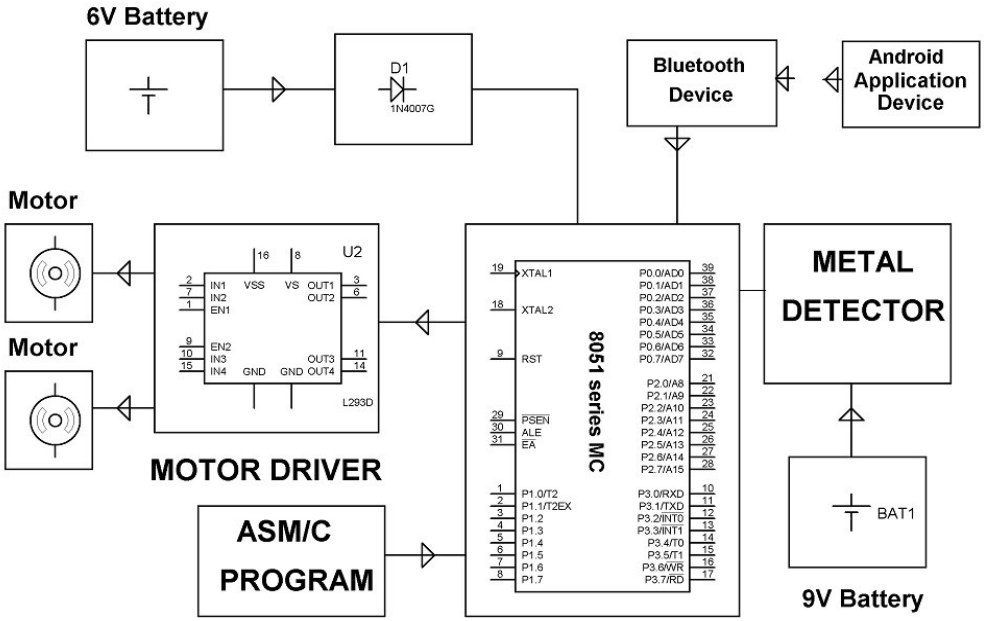

Fig 1. Block Diagram

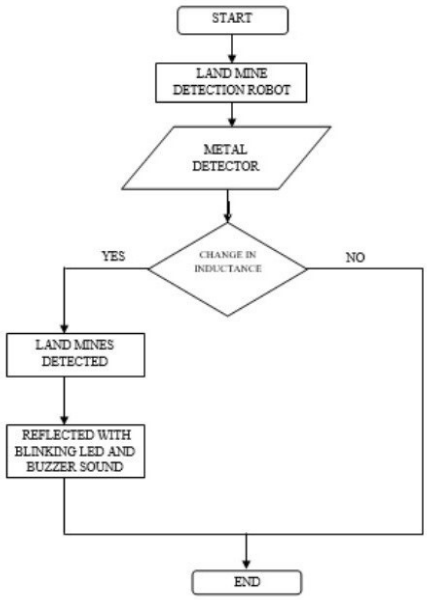

Fig 2. Flow Chart

III. COMPONENTS

A. *Softare Specifications*

- Keil uVersion IDE
- Embedded C

B. *Hardware Specifications (Robotic Vehicle)*

- Android Device
- 8051 microcontroller
- HC-05 Bluetooth Module
- L293 Motor Driver IC
- DC Motor

- 10.0592 MHz Quartz Crystal
- 22pF Ceramic Capacitor
- 10uF Electrolytic Capacitor
- 2 X 10k Resistor
- Battery

C. Hardware Specifications (Metal Detector)

- Copper Wire
- 103pF, 104pF, 22pF capacitor
- 50k Potentiometer
- 2.2k Resistor
- 2 X BC547 Transistor
- Buzzer

IV. Expected Results

The goal of this project is to create a functional prototype of a robotic vehicle operated by an android that can identify landmines buried underground using a metal detector and warn the user of their existence by sounding an alarm(Buzzer). The anticipated outcome is a robust and useful technology that can aid in reducing landmine risks, particularly in border regions.

V. Applications

1. **Landmine Detection** - This robotic vehicle can be used by the military to find landmines in border regions, saving many soldiers' lives and reducing the risk of accidents and injuries caused by landmines.

2. **Security Screening:** It can be applied to security screening tasks like finding metal or concealed weapons in public places like airports, train stations, or retail centers.

3. **Industrial Applications**: It can be used in industries to find metal items that could harm equipment or endanger safety of workers. This technology may contribute to increased workplace security.

4. **Archaeology:** This project can be modified and used in archaeology to locate artefacts and objects that have vanished over time in locations that are challenging for humans to access.

5. **Treasure Hunting:** The search for hidden treasure can be done with a robotic metal detector. It is capable of navigating over various terrains and finding hidden treasures made of gold, silver, or other priceless metals.

VI. Future Enhancements

Future modifications to this robotic vehicle could include adding a robotic arm and a wireless camera for monitoring and disarming bombs and, potentially, landmines as well. In order to relay the precise positions of the discovered landmine, we may also add a GSM and GPS to this robotic vehicle. With the addition of a wireless camera, this can be utilised for border and battlefield monitoring as well as spying.

References

[1] Selvam, M. "Smart phone based robotic control for surveillance applications". Dept. of ECE, Karpagam University, Coimbaitore, Tamil Nadu, International Journal of Research in Engineering and Technology (2014).

[2] Pahuja, Ritika, and Narender Kumar. "Android Mobile Phone Controlled Bluetooth Robot Using 8051 Microcontroller." Electronics & Communication Engineering, Department, BRCM College of Engineering & Technology, Bahal, India, International Journal of Scieintific Engineering and Research (IJSER) www. ijser. in ISSN (Online) (2014): 2347-3878.

[3] https://www.youtube.com/watch?v=lz0paXUF7lAi&list=WL&index=14