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Landmine Detection And Flagging System Using Advanced Electronics

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Abstract: Landmine identification is one of the most important aspects of combat since it allows armed vehicles to be deployed into enemy territory. These armed vehicles or main battle tanks follow the path of the pilot tank, which is manually operated to avoid battle tank damage/distraction and defensive crew casualties. Furthermore, post-war, mines buried during battle can be identified and diffused by deploying a mine detection robot, saving civilian lives and avoiding human casualties. So we're creating a prototype model of an automated guided vehicle. The safety of humans was addressed and created with a particular set of sensors used to avoid obstructions. This project prototype was fabricated utilizing a lightweight, temperature-resistant metal. A Global Positioning System (GPS) sensor determines and communicates the vehicle's current location. Path planning, obstacle recognition, and avoidance algorithms will be utilized to correctly drive the vehicle and go along the intended path while avoiding impediments. The Arduino microcontroller is used in this vehicle. The automated vehicle system incorporates a metal detector capable of detecting the landmine. Furthermore, a temperature sensor is utilized to identify landmines by measuring the temperature difference between the floor and the buried landmines. The landmine detection algorithm has been used to determine whether the acquired signal is the desired object or not.

Index Terms – Land mine detector, Robotic System, Proximity sensor

I INTRODUCTION:

Several world wars and grudges in humanity have resulted in a hidden landmine problem. The detection and removal of land mines is currently a serious economic, humanitarian, environmental, and political challenge. There is mutual importance in resolving this challenge, and a solution is being sought in a variety of engineering domains. According to the UN Mine Action Services, over 100 million mines have been distributed over the world since the 1960s, posing a hazard to more than 78 countries. During this process, millions of humans and animals are killed or maimed by landmines. Antipersonnel landmines primarily kill unarmed civilians.

There has already been a lot of research done in this area on landmine detection, extraction and demining, remote sensor technology, manual man handling detectors, devices using electromagnetic coils, nuclear quadruple resonance, metal robotic vehicles, and light-based imaging detectors. For all of these methods, detection is most likely done manually by trained persons holding a detector and scanning a specific area of land. All of these techniques are expensive, time-consuming, and dangerous to one's life.

Landmines have terrible effects in underdeveloped countries. Mines have been regarded as "weapons of social disaster," causing not just horrific injuries but also long-term social and economic ruin. They maintain

poverty for decades after battles have ended. Afghanistan, Angola, and Cambodia account for 85 percent of global landmine casualties. Iraq and Laos have also been significantly affected.

The catastrophic impacts of landmines in developing countries are generally acknowledged. The Lao government has found a strong link between the occurrence of UXO and poverty rates. Landmines impede humanitarian help, refugee repatriation, economic progress, and reconstruction. Landmines also restrict development. Mines near roads and train tracks impede refugee return and hamper relief delivery. They cut off access to markets, schools, jobs, and water.

II.LITERATURE REVIEW

Bharath J. Automatic Land Mine Detection Robot with Microcontroller. It describes the challenges associated with land mines in 70 countries. The goal of this study is to solve the problem of land mines. The goal of this study is to create a robot prototype that can identify and relocate buried land mines while also allowing the user to manage the robot wirelessly from a distance. This technology integrates the metal detector circuit in a robot to hunt for landmines.

Seong Pal Kang, Junho Choi, Seung-Beum Suh, and Sungchul Kang. Mine detection robot designed for a Korean minefield. It describes the critical design restrictions of mine detection robots for the Korean minefield. As part of a demining robot research project, the environment of a Korean minefield was investigated, and the prerequisites for appropriate robot design were established.

Waqar Farooq, Nehal Butt, Sameed Shukat, Nouman Ali Baig, and Sheikh Muhammad Ahmed highlighted the dangers and consequences of landmines in defense grounds. They propose a robot capable of detecting concealed mines and allowing users to control it wirelessly in order to prevent human casualties. The robot is fitted with special wheels controlled by the H-Bridge module, allowing it to travel in any direction. In this study, we focus on the safety of both humans and robots; the robot is equipped with particular range sensors that aid in avoiding obstacles in the field by precisely recognizing their position. A special form of prototype composed of lightweight temperature-resistant metal is utilized to transport all of the project's objects.

According to MV Ramesh, wireless sensor networks are one of the most promising developing technologies, allowing for real-time surveillance of disaster-prone geographical locations (both remote and hostile. This work, which focuses on landslide detection, underlines wireless sensor networks' ability to mitigate disasters. A complete functioning system comprising of 50 geological sensors and 20 wireless sensor nodes was deployed in Idukki, a district in Kerala State's southwestern region, India, which is prone to landslides.

For the past three years, the wireless sensor network system has collected massive amounts of data, including correlated sensor data values on rainfall, moisture, pore pressure, and movement, as well as other geological, hydrological, and soil properties, which have contributed to a better understanding of the landslide scenario. Using wireless sensor networks, a novel three-level landslide warning system (early, intermediate, and imminent) was created. This technology demonstrated its effectiveness by providing a genuine warning to the local population amid severe rains in the July 2009 monsoon season. This system's implementation makes use of unique data aggregation methods for power optimization in field deployment.

III. PROBLEM DEFINITION:

Arduino/Genuino UNO is a microcontroller board built around the ATmega328P. It contains 14 digital input/output pins, 6 of which may be configured as PWM outputs, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header, and a reset button. We're utilizing the ATmega328P microcontroller since it's more efficient, less expensive, and easier to program. Arduino Microcontroller version Ultrasonic sensors are transducers that convert ultrasonic waves to electrical impulses

Inability to detect silent heart attacks

OVERVIEW OF COMPONENTS:

Arduino UNO Pin Diagram:

The Arduino UNO board can be configured with power pins, analog pins, an ATmegs328, an ICSP header, a reset button, a power LED, digital pins, a test led 13, TX/RX pins, a USB interface, and an external power source. The Arduino UNO board's description is given below.

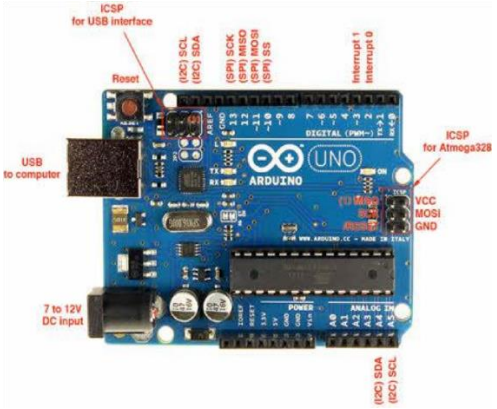

Fig 1: Arduino UNO Board Pin Diagram

Power Supply: You can power the Arduino UNO with a USB connection or an external power supply. External power supplies often comprise an AC to DC adaptor or a battery. Connect the adapter to the Arduino UNO by inserting it into the board's power port. Similarly, the battery leads can be connected to the Vin and GND pins of the POWER connection. The recommended voltage range will be 7 to 12 volts. Communication: The Arduino UNO ATmega328 supports UART TTL-serial communication, which is accessible via digital pins TX (1) and RX(0). The Arduino software includes a serial monitor, which allows for convenient data collection. There are two LEDs on the board, RX and TX, that will blink anytime data is broadcast via USB.

Ultrasonic Sensor:

Ultrasonic transducers are devices that convert ultrasonic waves into electrical impulses, or vice versa. These devices operate on a similar basis to transducers used in radar and sonar systems, which analyze target characteristics by interpreting echoes from radio or sound waves, respectively. The HC-SR04 Ultrasonic Sensor is ideal for any distance detection application in robotics.

Fig:2 Ultrasonic Sensor Module

DC Motor:

A motor driver is a device or collection of devices that controls the functioning of an electric motor in a predetermined manner. In this project, we choose a planetary geared DC motor type RMCS-2006 because it gives the requisite speed for the autonomous vehicle to travel while also providing high torque at the rated speed and current levels.

Fig: 3 RMCS-2006 DC Motor

IV. METHODOLOGY:

Arduino programs are written using the Arduino Integrated Development Environment (IDE). Arduino IDE is a piece of software that runs on your computer and allows you to build sketches (a synonym for program in Arduino language) for various Arduino boards. The Arduino programming language is built on a very basic hardware programming language called processing, which is similar to the C language. After writing the sketch in the Arduino IDE, upload it to the Arduino board for execution. Sketches are programs that are written using the Arduino Software (IDE). These sketches are created in a text editor and saved with the file extension. No. The editor includes features for cutting/pasting and searching/replacing text. The message area provides feedback during storing and exporting, as well as displaying errors. The console displays text output from the Arduino Software, which includes detailed error messages and other information. The configured board and serial port are displayed in the bottom right corner of the window. The toolbar buttons let you validate and upload programs, create, open, and save sketches, and launch the serial monitor.

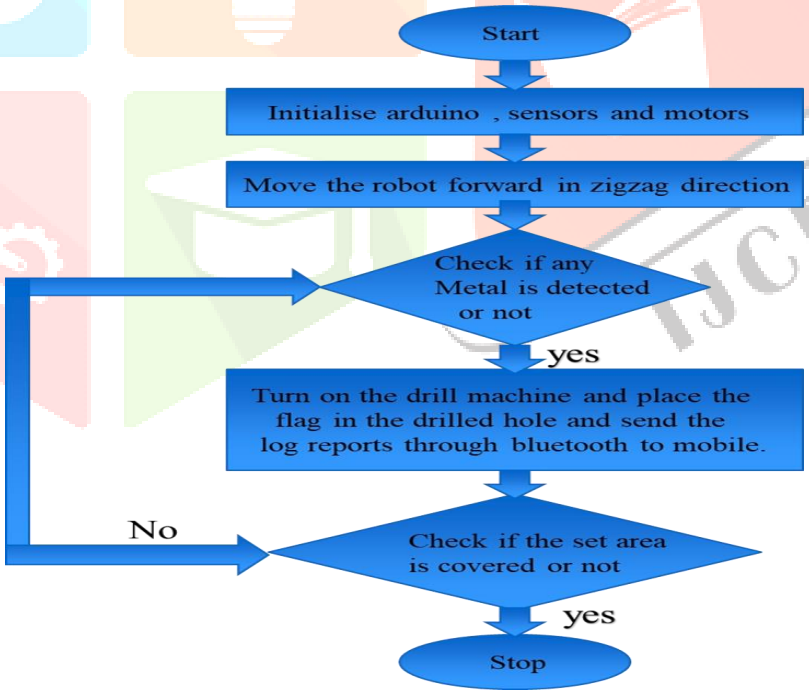

Fig: 4 Methodology block diagram

The Automated Guided Vehicle includes the following components: a proximity sensor (metal detector), a temperature sensor, a GPS module, a Bluetooth module, and a robotic arm with gripper. When the vehicle starts driving on the surface, the proximity and temperature sensors will trigger when it passes through the buried landmine.

Two gigantic wheels and two free wheels are mounted on the vehicle's rear and front sides, respectively, to allow for movement. Following the above steps, the GPS module will send the latitudinal and longitudinal data, which are the positional coordinates of the discovered landmine, to a connected mobile device via the Bluetooth module. Also, a flag will be set near the landmine by drilling a hole and then placing the flag with

the robotic arm. This step will be performed for each detected location. Finally, it will assist authorities in identifying and manually defusing landmines.

V.CONCLUSION:

In this paper, heart attack detection using ECG data obtained through the device and later processed by Landmines are explosive devices that are hidden under the ground and used to destroy targets such as cars or tanks. Landmines are a major hazard to national security. Landmines are common in border zones, posing a serious threat to soldiers. This project addresses this issue. This project focuses on detecting landmines. This is accomplished by utilizing a metal detector mounted at the front of the Automated Guided Vehicle. Each duty is processed and executed by the Arduino Board installed in the vehicle, which is pre-programmed with Arduino code. Metal detection is performed using a parallel LC circuit. The landmines are primarily constructed of metals. The metal landmines that are hidden in the earth. The project detects these concealed metal landmines in the earth, and once discovered, the drilling mechanism begins, and flags are placed at the prescribed locations. The flags serve as a warning symbol for soldiers, alerting them to the danger of landmines. This allows the military to remain away from them or safely diffuse them, thereby saving human lives.

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