Mine & Smoke Detection Using Wheel Based Robot

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Abstract **- While saving human life and giving security for the same are two distinct issues, both are necessary and mandatory. This unique method is designed for activities involving a high danger of human entry, such as some criminal cases, and might be particularly useful in the military for spying purposes. The study discusses the technological design and development of a robot for surveillance, metal mine detection, and smoke detection. A wireless camera is attached to the robot, which collects and broadcasts the robot's current surroundings. Mines and smoke detection use metal and smoke detectors. The robot is controlled by a microcontroller. A hand-held RF transmitter sends commands to the RF receiver mounted on the moving robot, which controls the robot's movement. Because human life is valued, these robots are used to replace soldiers in conflict zones. This surveillance robot can be deployed in regions where intruders or terrorists may pose a threat. During a battle, it can be used to gather information from hostile terrain and watch it from a safe distance, safely devising a strategy for a counterattack, tracking the whereabouts of terrorist organisations, and planning an attack at the appropriate time. Surveillance of any affected location where humans are unable to go.**

Index Terms **- Component, formatting, style, styling, insert.**

I.INTRODUCTION

This study discusses the advantages of adopting robotic methods for surveillance, metal detection, and smoke detection. By introducing new technology, robotics is bringing revolutionary changes to the world. The primary goal of using a robotic method is to ensure human safety while reducing human labour. Surveillance is crucial when it comes to securing anything because it is a time-consuming task that leads to people being fatigued. As a result, it may be unsafe to observe all of these things, so we are going to build a robot that will continuously monitor things. This robot keeps an eye on things and sends a live stream of it to a designated person. As a result, monitoring the work will be easier and more precise thanks to technological advancements. The goal of this project is to overcome the challenge of replacing humans with surveillance robots, hence reducing human resource harm. Robots are often small in size, allowing them to access tunnels, mines, and small openings in buildings. They also have the ability to exist in severe and extreme climatic conditions for extended periods of time without harm. It is stated that wheel robots are the most commonly employed surveillance robots. Robots with wheels are more suited to flat platforms. The movies captured by the wheel robot may now be seen remotely on a PC or laptop thanks to advancements in wireless communication and the internet. The global landmine tragedy has been terrifying since there are 550 million hidden mines in more than 50 countries. Governments are taking steps to reduce the problem. One of the reason of designing this robot is to detect hidden mines, the robot has specified sensors that detect and locate the underground mines and avoid obstacles, without human contribution through wireless control. It is a reliable technology to carry out the assignment and to guarantee the safety The RF transmitter acts as a RF remote control that has the advantage of adequate range (up to 200 meters) with proper antenna, while the receiver decodes before feeding it to another microcontroller to drive DC motors via motor driver IC for necessary work Commands are delivered to the receiver from the transmitting end utilising Joysticks to direct the robot's movement forward, backward, left, or right. Four motors are connected to the microcontroller at the receiving end, where they are used to move the vehicle. The robot will come to a halt after receiving the command. Following that, the robot will continue to move in the same direction as before. We created programmes in embedded C for this purpose. There have been a few procedures taken in order to complete this application, namely: 1) Choosing a microcontroller that is appropriate for our application. 2) Robot selection. 3) DRIVER IC selection. 4) Selecting metal and smoke detection sensors.

II. LITERATURE SURVEY

1.Arduino Controlled Landmine Detection Robot

The paper describes an advanced multi-sensor demining robot. The robot transport system is based on a simple structure using pneumatic drive elements. The robot has robust design and can carry demining equipment up to 100 kg over rough terrains. Due to the adaptive possibilities of pedipulators to obstacles, the robot can adjust the working position of the demining sensors while searching for mines. The detection block consists of a metal detector, an infrared detector, and a chemical explosive sensor. The robot is controlled by means of an on-board processor and by an operator remote station in an interactive mode. Experimental results of the transport, control, and detection systems of the robot are presented. The main disadvantage of the robot is weight factor due to the overloading of sensor.

2. Low-Cost Radio Frequency Controlled Robot For Environmental Cleaning

The paper presents the technical construction of a robot which is used in cleaning. The term “cleaning” sounds simple, yet we humans face a lot of problems with the disease-ridden workplace, a few examples are factories, power plants, Bio- hazard chambers etc., where it is harmful for humans to work. RF signal is used to control this robot. It uses an Indium (micro-controller) for its operation. The mechanical part is the base (rectangular wooden piece) with servo motor and the wheels (plastic wheels) in our case. The material used in mechanical part can be changed according to our prerequisite. The electronic part consisting of the RF signal receiver, Induino and the surveillance Camera are mounted on the base of the robot. The camera acts as the “eye” of the operator transferring live video data wireless either using W-Lan or using cloud computing (in case of monitoring over large distance). The cleaning mechanism includes a normal brush (material of the brush is selected as required) with a servo motor attached to it. This robot not only helps in cleaning rather can be used to monitor things

3.Wirelessly Controlled Mines Detection Robot

This paper demonstrates the problem and effects of landmines in defense fields. We are proposing a robot that has the aptitude to detect the buried mines and lets user control it wirelessly to avoid human causalities. The robot is equipped with special wheels controlled by H-Bridge module, allowing it to move in all possible directions. In this paper, we focus on the safety of humans and the robot; the robot is equipped with special range sensors that help in avoiding the obstacles in the field by specifically detecting the position of obstacles. For the fabrication of the project, a special type of prototype made of lightweight temperature resistant metal is used to carry all objects. A wireless camera is added to the robot, which captures and broadcasts the present location of the robot. Microcontroller commands the robot. This technique has the practical benefit of reducing the number of casualties, after the implementation of the technique, the robot can be controlled efficiently and it robustly determines the position of the obstacle WIRELESS DIGITAL VIDEO CAMERA Design Document by Benjamin Tan Project Advisor: Bruce R. Land.

III. SYSTEM ARCHITECTURE

A spy robot with detection capabilities is required for use in peacekeeping missions, operations, and the cleanup of hazardous areas. The robot is controlled with the help of a controller using an RF module for the operator's safety. The robot is equipped with a metal detector and a smoke sensor in order to find mines and detect smoke. With the help of a buzzer attached on the robot, the robot produces a warning notice to nearby personnel after detecting a mine. The robot is controlled by a high-powered DC motor and a h bridge circuit, which allows the robot to travel in any direction.

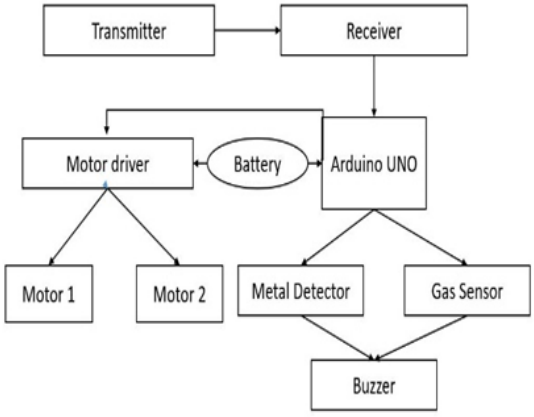

Figure 1: SYSTEM ARCHITECTURE

METAL DETECTOR

Metal detectors are used to locate metal from a certain distance. It is used to locate metal that has been hidden or buried. An oscillator generates an AC current in the metal detector we utilised. When AC current travels through a coil, it produces an alternating magnetic field that aids in metal detection. Electromagnet field lines and eddy currents are seen in the operational mechanism of a metal detector. If a piece of metal is within the coil's range, the eddy current will be induced and create its own magnetic field. Metal detection is based on the difference in magnetic field induced by metal. If there is any metal, the robot will come to a halt and inform the operator of the mine and metal presence in the field. The detection of metal is shown by the buzzer on; these message show for "Mine Detected".

SMOKE DETECTOR

A smoke detector is a device that detects smoke as a warning sign of a fire. As part of a fire alarm system, commercial security devices send a signal to a fire alarm control panel, whereas domestic smoke detectors, also known as smoke alarms, often emit a local audible or visual alarm from the detector itself. An ionisation smoke detector ionises the air with a radioisotope, usually americium-241, and detects a difference due to smoke, triggering an alarm. Optical detectors are more sensitive to fires in the early smouldering stage than ionisation detectors, which are more sensitive to fires in the blazing stage.

DIRECT CURRENT MOTOR

Any of a group of rotating electrical machines that transform direct current electrical energy into mechanical energy is known as a DC motor. The most common varieties rely on magnetic fields to produce forces. Almost all DC motors contain an internal mechanism, either electromechanical or electronic, that changes the direction of current flow in a portion of the motor on a regular basis. Because they could be supplied by existing direct-current lighting power distribution networks, DC motors were the first type of motor to become widely employed. The speed of a DC motor can be varied across a large range by varying the supply voltage or adjusting the current intensity in the field windings. Tools, toys, and appliances all employ small DC motors. The universal motor is a lightweight brushed motor that can run on direct current and is used in portable power tools and appliances. Larger DC motors are being employed in electric vehicle propulsion, elevator and hoist drives, and steel rolling mill drives. With the introduction of power electronics, it is now possible to replace DC motors with AC motors in a variety of applications.

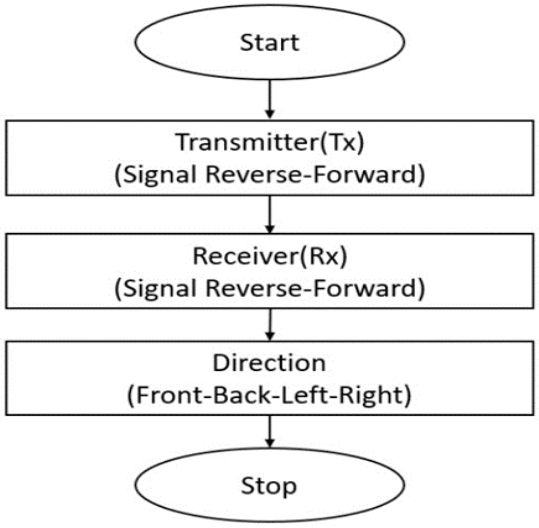

Figure 2: DFD Motor

ARDUINO UNO

The Arduino Uno is an open-source microcontroller board designed by Arduino and based on the Microchip atmega328p micro controller digital and analogue input/output (I/O) pins are available on the board. There are 14 digital I/O pins and 6 analogue I/O pins on the board. It may program through a type B USB connector using the Arduino IDE (Integrated Development Environment). It can be powered by a USB cable or an external 9-volt battery, with voltages ranging from 7 to 20 volts. Under software control (using the pin mode (), digital write (), and digital read () routines), each of the Uno's 14 digital pins and 6 analogue pins can be utilised as an input or output. They are powered by 5 volts. Each pin includes a 20-50K ohm internal pull-up resistor (disconnected by default) and can provide or receive 20 maas the recommended operating condition. To avoid irreversible damage to the microcontroller, a maximum of 40ma must not be exceeded on any I/O pin

IV.IMPLEMENTATION

1. HT12E - ENCODER

The HT12E is a remote-control encoder IC (Integrated Circuit) from the 212 series. It's frequently utilized in

RF (radio frequency) applications. We can simply transmit and receive 12 bits of parallel data serially using the coupled HT12E encoder and HT12D decoder.

Figure 3: HT12E - ENCODER

2. HT12D - DECODER

This decoder IC transforms serial to parallel input data. The VT (Legitimatem Transmission) pin on this IC is high, indicating that the transmission is valid. The HT12D can decode data in 12 bits (8 address bits and 4 data bits). Until new data is received, the output data remains unaltered. It's mostly employed in RF and infrared (IR) circuits.

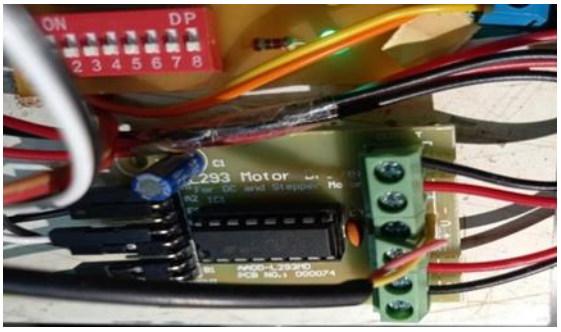

Figure 4: HT12E - ENCODER

3. DC Motor

10RPM 12V DC geared motors for robotics applications. Very easy to use and available in standard size. Nut and threads on shaft to easily connect and internal threaded shaft for easily connecting it to wheel. It will easily handle payload

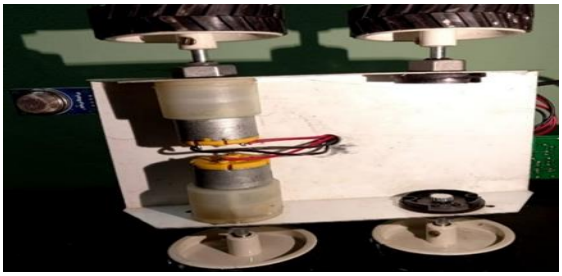

Figure 5: DC Motor

4. METAL DETECTOR

A metal detector is a device that detects the presence of metal in the immediate vicinity. Metal detectors are excellent for locating metal inclusions within things as well as buried metal objects. A handheld gadget with a sensor probe that may be swept over the ground or other objects is common A metal detector in its most basic form consists of an oscillator that generates an alternating current that travels through a coil that generates an alternating magnetic field. When the sensor comes close to a piece of metal, a buzzer sounds.

Figure 6: METAL DETECTOR

5. ARDUINO UNO

DC motor, metal detector, and smoke detector are all operated by an Arduino UNO. The Arduino Uno is an open-source microcontroller board built by Arduino and based on the Microchip atmega328p processor. The board has digital and analogue input/output (I/O). An Arduino UNO is being used to connect a smoke detector and a metal detector. The Arduino UNO can also command a DC motor and display the robot's movement direction. If any detector catches any signal, the Arduino Uno analyzes it, and also the buzzer triggers.

Figure 7: ARDUINO UNO

6. SMOKE DETECTOR

A smoke detector is a device that detects smoke as a warning sign of a fire. Commercial smoke detectors send a signal to a fire alarm control panel, whereas domestic smoke detectors, also known as smoke alarms, emit an audible or visual alarm from the detector itself or several detectors if several smoke detectors are interconnected. A smoke detector is a device that senses smoke.MQ-7 CO Carbon Monoxide Coal Gas Sensor Module detects the concentrations of CO in the air and outputs its reading as an analog voltage. The sensor can operate at temperatures from -10 to 50°C and consumes less than 150 mA at 5 V. This module provides both digital and analog outputs.

Figure 8: SMOKE DETECTOR

V. FINAL STAGE

When all of parts are attached and power is provided, the robot will run smoothly and appear to be.

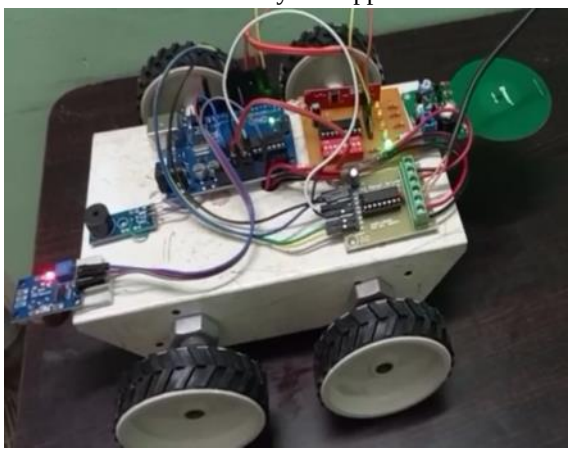

Figure 9: FINAL ROBOT

VI. CONCLUSION AND FUTURE SCOPE

This paper describes the overall design of a robot for numerous applications, such as surveillance, metal mine detection, and smoke detection, as well as its implementation. The wheeled robot is less expensive, more durable, and a valuable tool for military surveying and monitoring. The future focus will be on improving body designs by incorporating a suspension system to absorb shock from uneven surfaces. To create continuous power, the power system is built by replacing the batteries with solar panels. For the goal of bomb dispersal, the robot is fitted with a robotic arm. The retroreflective panels can be placed over the robot's whole body to make it nearly undetectable.

VII. ACKNOWLEDGMENT

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