

Multifunction Robot for Defence Application

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Abstract— In this paper, a prototype model of landmine detecting robot with wireless communication of simple and low cost is presented. The system provides video streaming through remote location using IP camera which makes the system useful for defence application. For this purpose respective sensors information sensed from the external condition and communication through Wi-Fi connectivity are used. This system is proposed with the help of Wi-Fi module where the camera mounted on robot provides live video to the user on distant location. The manually controlled robot then takes further actions on landmine and obstacle detection. Thus the proposed system, using Wi-Fi connection saves human life and reduces manual error in defence side.

Key words: IP Camera, ARM, WiFi Module

I. INTRODUCTION

The detection of landmines by manual method proposed several decades ago are practiced since then. This increases the risk and danger to the soldier's life. Robots can work in all types of polluted environments, chemical as well as nuclear. They can work in environments so hazardous that an unprotected human would die. Military robots are autonomous robots or remote controlled devices designed for military applications. Without risking human life, robots can replace humans in some hazardous duty service. The reason is that the cost per hour to operate a robot is a fraction of the cost of the human labor needed to perform the same function.

The purpose of Landmine detecting robot is to cover maximum possible area and presentation of landmines with accuracy. Similarly, this project mentions about a wirelessly controlled robot using wi-fi technology. The user interface developed for this robot is very simple, making its beginner user to control the robot easily. The aim of this project is to detect the landmines accurately so that the demining crew can easily locate and remove the landmines. The proposed system uses Wi-Fi based wireless data communication in displaying video on remote smart phone or laptop. The prime component of the system is the proximity sensor which detects the metal and indicates it with buzzer on the access system. The IP camera then captures the area for the actual confirmation of the landmine. The captured signals by the proximity and ultrasonic sensors are read by the arm microcontroller. The ARM microcontroller is capable of transmitting it to receiver with the help of a suitable transceiver device like Wi-Fi module. This is specially designed robotic system to save human life.

II. PROPOSED SOLUTION

The detection and removal of the landmines have still been in progress by manual method. Relying on only such manual work, however, it would require hundreds of years to dispose all these mines completely. Under such circumstances, the development of landmine detection and removal system in a

short period has become an urgent issue. With a view to support removal work of landmines a solution can be thought of for saving the life.

The solution to this is robot design that can detect the landmines. The system is comprised of both software and hardware. Software area includes protel designing and programming for microcontroller. The hardware area includes the development of robot mechanism with the motor drivers and its configuration with sensors and both modules.

III. SYSTEM COMPONENTS

The information and concept regarding our project was understood by reading the research papers and through internet search. The components and working of the system was studied. Designing of the overall circuit and simulation of few modules like LCD, Buzzer and DC motor interfacing was completed.

A. LPC2148

- 1) Single Flash sector or full chip erase in 16/32-bit microcontroller in a tiny LQFP64 package.
- 2) 8/16/32 kB of on-chip static RAM and 32/64/128/256/512 KB of on-chip Flash program memory.
- 3) 128 bit wide interface/accelerator enables high speed 60 MHz operation.
- 4) 400 ms and programming of 256 bytes in 1 ms.
- 5) One (LPC2131/32) or two (LPC2134/36/38) 8 channel 10-bit A/D converters provides.

B. WI-FI module

Wi-Fi Module is a complete and self-contained Wi-Fi network solution that can carry software applications or through another application processor uninstall all Wi-Fi networking capabilities.

C. IP camera

It is used for Live video streaming.

D. Ultrasonic sensor

- 1) Ultrasonic Distance Sensor provides range from very short (2 Centimeters) to long-range (5 Meters) for applications in detection and ranging.
- 2) The ultrasonic sensor can easily be interfaced to microcontrollers where the triggering and measurement can be done using two I/O pin.
- 3) The sensor transmits an ultrasonic wave and produces an output pulse that corresponds to the time required for the burst echo to return to the sensor. By measuring the echo pulse width, the distance to target can easily be calculated.

E. Proximity sensor

Proximity Sensor detects Presence objects using electromagnetic fields, light and Sound there are many types but we use inductive sensor to sense metal.

F. LCD

It is used to display whether the Landmines are detected or not. If the Landmines are present in the Particular area then a message will be displayed on the LCD “Landmines Detected”.

G. Driver IC L293D

Microcontroller works on 3.3v supply and DC motors runs on 12v supply so to interface DC motor to microcontroller we need driver IC L293D.

H. DC Motor

A machine that converts dc power into mechanical energy is known as dc motor. Its operation is based on the principle that when a current carrying conductor is placed in a magnetic field, the conductor experiences a mechanical force.

I. Buzzer

Buzzers can be found in alarm devices, computers, timers and confirmation of user input such as a mouse click or keystroke.

between Microcontroller system and Android phone through android app.

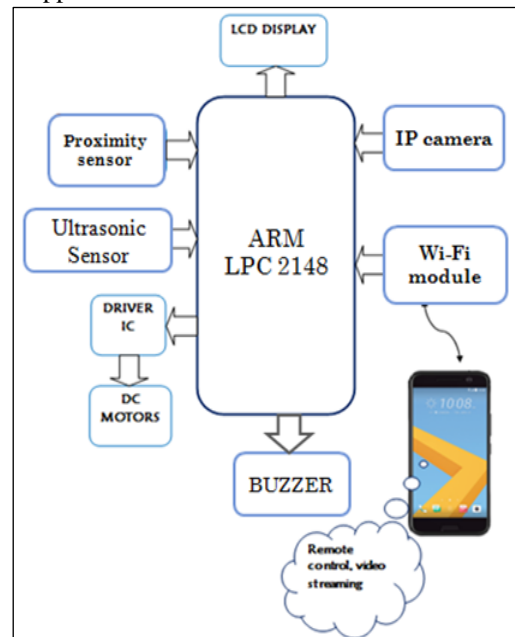


Fig. b: Block diagram of multifunction robot

The proposed robot will continuously monitor for land mine detection with the help of Metal detector. As soon as it detects the metal it will send this information to the application designed in the Android phone via Wi-Fi connectivity. The robot will run by analyzing the obstacles in the path with the help of ultrasonic sensor. As the metal or obstacle is detected, buzzer indication is given and is being also displayed on the LCD. The operator then decides the further action of the robot and as per gives the command.

Here video streaming is done with the help of Raspberry Pi Camera because of which we are able to monitor the actual field condition from remote location. With the help of camera more precise and actual view can be observed. The various parameters received from respective sensors analyzing particular conditions are sent to the android application by the microcontroller via WI-FI connectivity. Considering the received conditions from the sensors and the camera the robot is controlled through app.

IV. FLOWCHART

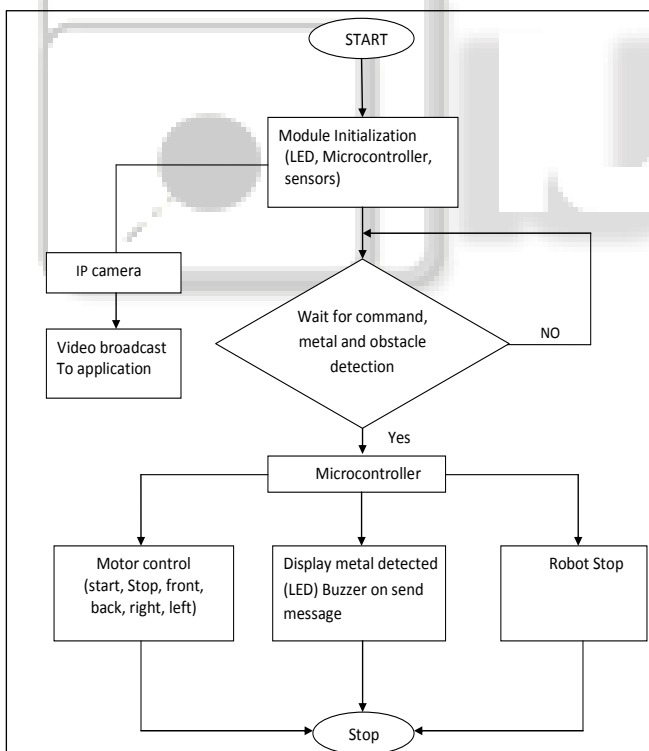


Fig. a: Flowchart of multifunction robot

V. SYSTEM DESCRIPTION

The system we are going to propose for defence application involves number of features like Land mine detection, live streaming, monitoring and controlling mechanism, etc. The system consists of ARM Micro- controller, LCD display, Ultrasonic sensor, Metal detector, DC motors for robotic assembly and Wi-Fi module for wireless communication

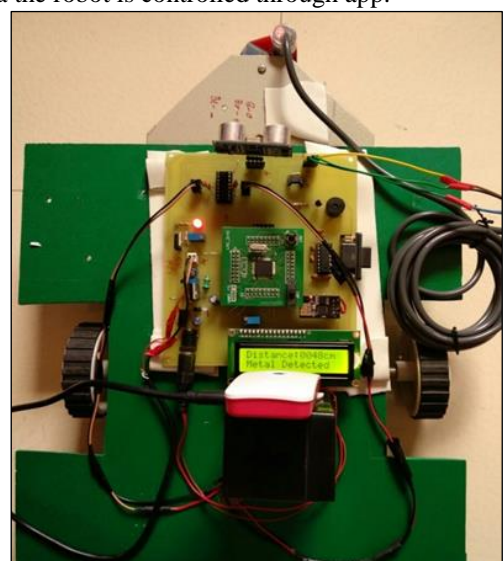


Fig. c: Hardware required

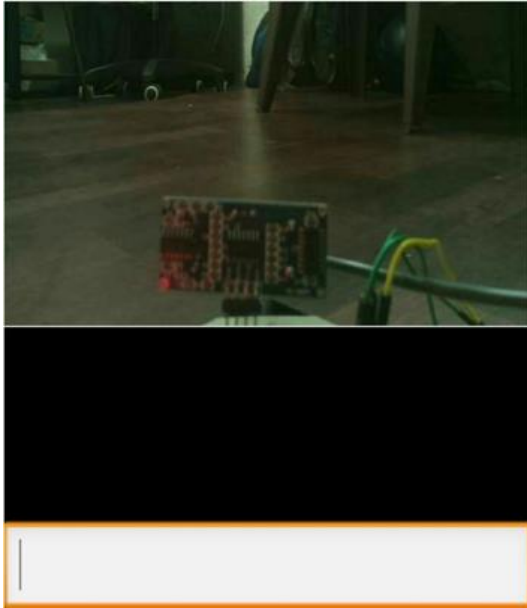


Fig. d: Video streaming

VI. FUTURE SCOPE

The Landmine Detection Robotic Vehicle is very beneficial due its more advance features. Landmine detection detects the mine and displays position of mine on land surface and alert the demining crew. So it becomes very important to detect the mine and diffuse them.

Land mines detection can be improved by using more than one sensor on robot. High resolution servos can be used to turn the cameras to track the robot. More advanced features can be added in this project like Human detection, Laser detection and gas detection. Increasing resolution and using higher quality camera can make system more efficient.

VII. CONCLUSION

This project presents a landmine detection robot controlled through an android phone via wi-fi connectivity. The proposed robot can detect the metal and obstacle present in that particular area. The result shows that the robot can be controlled by an application from distance without the operator being present at the exact location. This made the project more user-friendly and reliable.

The proposed method is beneficial for the military industry and demining crew. Once the landmine is detected it is easy to locate the mine to diffuse. This saves time and lives of the demining person. The project also provides camera facility on the robot to view the location for accurate information. Reducing the rate of death of the person while demining and observing the area is achieved by this project.

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