

Design of Wirelessly controlled motion Robot for Disaster search and Rescue Management

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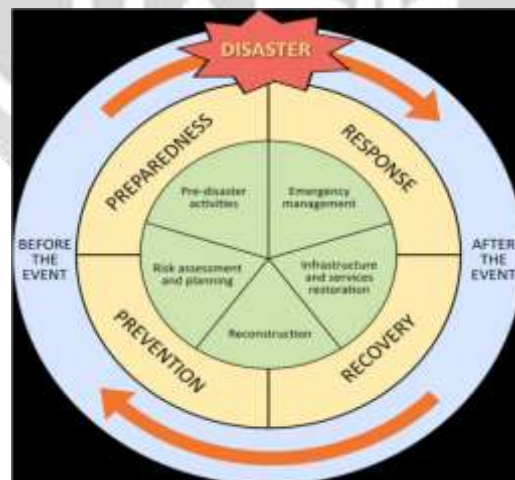
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ABSTRACT

The intention of this work is to assist reach the victims tormented by both natural and manmade disasters like land-slides, earthquakes, terrorism, fire explosion etc. So this problem can be overcome by designing the RF motion robot which involves wireless camera and sensors which can make it easy to observe the affected areas. This robot can quietly enter into enemy area and sends us the proper information gathered by the information collected by the wireless camera and sensors. The motion of this robot is wirelessly controlled by a RF transmitter device for sending commands to the RF receiver mounted on the moving bot. Since human life is often valuable, these robots are the substitution of soldiers in war areas and also the rescue team for disaster management. This robot may be stationed in hotels, shopping malls, etc, where there can be threat from intruders, terrorist or other disasters. At the time of war it can collect information from the enemy terrain and monitor that information at a far secure area, and safely devise an idea for the counter attack, tracking locations of terrorist organizations and plan attack at suitable time. Making a surveillance of any disaster affected area where personnel can't go.

1.INTRODUCTION

Developed communities have a high level of preparedness for natural or man-made disasters. But such incidents cannot be completely prevented, and when an incident such as a fire explosion, floods or an accident in a chemical or nuclear plant hits a polluted region, rescue teams have to be used. In such situations it's a necessity for rescue teams to urge a fast overview of matters so as to spot possible locations of victims that require to be rescued and dangerous locations that require to be secured. Rescue forces must operate quickly in order to save lives, and for that they often have to operate in dangerous environments.



With having a huge population of 1.7 billion people, disasters like these can cause destruction in huge amounts and affect a lot of people. Our country is frequently targeted for terrorist attacks, frequent occurrence of floods, or even pandemics such as SARS and currently hit by Corona and other such disasters, therefore a proper and efficient disaster management system is the necessity.

Robot-assisted natural disaster management has been employed to help human rescuers at disaster sites or affected regions. Because of its compactness and availability, robot has become a good tool for searching survivors from confined space like collapsed building or underground area. However, the present scope of research in this field is limited because they exchange data over bluetooth which restricts the coverage capability and it also requires physical proximity to initiate a symbol broadcast which eliminates the chance of remotely controlling. Whereas, our robot works on Wi-Fi and therefore using IOT, can be operated from anywhere around the world, which saves an enormous amount of time. Other than time, IOT technology has better speed, can transfer bigger chunks of data and is also more secured than bluetooth.

Another problem is that there are not any advanced robots that are versatile enough to be operated in both land and water, but our robot drives swiftly through both land and water and can be essentially used during floods.

This robot is small and hence portable to be operated in disaster region for locating the victims post disaster. This may help us from preventing, preparing and coping with natural and/or man made disasters that tend to increase recently. When a disaster occurs it's very likely that we cannot enter either because of physical constraint, too dangerous or inefficient. Robots don't replace humans and/or sniffer dogs, but rather act as complimentary especially to cut back life threatening risk to them.

2. SYSTEM DESIGN

2.1. ESP 32

ESP32 is an IOT platform which comes with WiFi and bluetooth combination for efficient performance. This IC is widely used for wireless devices, IOT devices such as electronic wearables or tracking devices. ESP 32 also comes with a good power consumption feature using ultra low power 40nm technology for longer working hours.



2.2. BOMB DETECTION CIRCUIT

It consists of a proximity detector IC which detects the slight change in eddy currents when it comes close to a metal, some capacitors and resistors and a NPN transistor. This circuit is connected to the ESP 32 IC, so whenever it detects a metal close by, it will send the message to it.

2.3. ULTRASONIC SENSOR

By sending UV rays in front of it, the sensor detects the presence of any obstacle in front of it and sends this message to the ESP 32 so that the user can navigate through it.

2.4. GSM & GPS

GPS Receiver is used for detection of location coordinates of the bot and the GSM module is used for sending these coordinates to the device by SMS. This information is used to detect the current location of the bot.

2.5. CMOS CAMERA

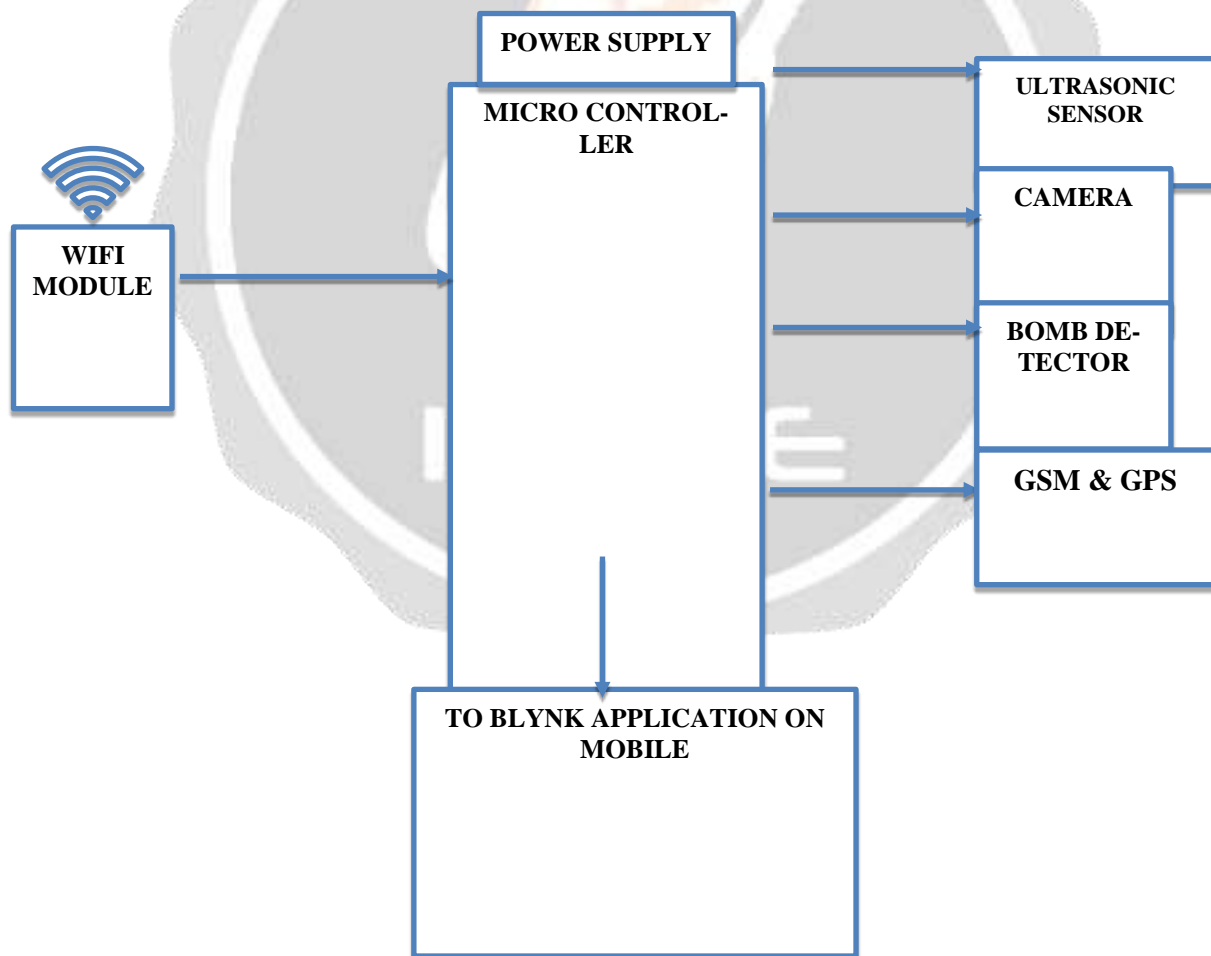
CMOS camera is used as it costs less than CCD image sensors and unlike CCD sensors that use high-voltage analog circuits, CMOS camera works on a smaller digital circuit that uses less power. It is used for sending the live footage as the robot drives through and sends it to the ESP 32 via which it is forwarded to the smartphone device.



2.6. MOTOR DRIVER IC L293D

This device is a high voltage, high current four channel driver which accepts DTL or TTL logic levels and is used for controlling the motor power and speed. This IC is further controlled by the ESP 32.

3. METHODOLOGY



The development of robotics for rescue operations rests in two areas :-

3.1 PLATFORM DEVELOPMENT.

- Our bot is a four wheeled robot with wheels suitable for difficult terrains that can't be predicted easily.
- It is equipped with an ultrasonic sensor for identification of obstacles and avoiding them.
- a bomb detector circuit connected by a detachable arm for correct monitoring of the bottom below and detection of bombs and land mines.
- We have also come up with a plan of tracking the victims as well. By using the location sent by the GPS modem, the base station can understand the position of victim.
- This bot can drive through anyplace and perform smartly with the help of internet and also within the Wi-Fi network range.



- Moreover, the bot's wheels have been designed in such a way, with triangular fins added, so that the bot will be able to drive in both land and water. The bot is supported on a polymer sheet to support it on water and all components are water proofed.
- The bot is also equipped with a CMOS camera to capture live feeds and give realtime data to the user on a mobile app over WiFi.

3.2. SOFTWARE DEVELOPMENT

All the coding of the bot required to initialise IC of ESP32 and its connections - camera, Ultraviolet sensor, bomb detection circuit is done using Arduino software(IDE). Moreover for controlling the bot, sending instructions and receiving data an application - Blynk app is used. This app needs to be installed in a smartphone and then from that data can be sent and received. As soon as the ESP 32 receives alerts either from the bomb detector or ultrasonic sensor, or the live camera footage, it will send the message to the Blynk app where the user will be notified.

Features of Blynk app are as follows:

- The app will continuously update itself from the server.
- The information at the server is sent from ESP 32.
- It will use the MQTT protocol for the communication .

With the help of app user can completely control the operation of the robot i.e navigating it to take turn or control the speed, and the app will also give a notification if the bomb detector detects and give location coordinates sent by the GPS.

We will be using a separate app for showing the live camera footage side by side V380s which is a cloud camera free application, can easily realise the remote video monitoring and management.

- By this software we can view the process of real-time video anytime and anywhere.
- Supports remote PTZ control, camera direction and rotation by touching the screen.
- Supports network video playback and image capture.

4. RESULT & CONCLUSION

We present the design of a robot which can be used as an all in one disaster search and rescue management robot. It can be used in difficult terrains with rocky paths such as in building collapse or land slides, on water bodies during floods or even during terrorist attacks. This robot is a solution to helping mankind in disasters without risking any human lives. Further more, the bot can also be used to monitor disease affected patients which can appear deadly for the humans.

Although studies have been conducted by many authors in this area, the problems were not explored sufficiently. We argue that previous literature suffers from certain weaknesses: monitoring and controlling range, speed and efficiency and versatility of system to operate in both land and water. The unexpected findings signal the need for additional studies to understand more about disasters and management techniques. We propose to design a system that can be used from anywhere around the world and easy to get to the area which requires help. Thus speeding up the rescue system.

5. REFERENCES

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