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Rescue Robot using ESP Microcontroller

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Abstract - *The technical advancements made in recent years create an opportunity for better communication. And in sensitive situations information is the most valuable resource. This project deals with the communication of essential information in cataclysmic situations and can be helpful in saving lives. It is equipped with a temperature sensor, humidity sensor, motion sensor, metal detector, and also an ultrasonic sensor to move through obstacles as this is also a mobile robot and its motion can be controlled by an android device.*

***Keywords*: Wireless robot, Microcontroller, IOT, Remote controlled, PIR sensor, DHT11 sensor, ultrasonic sensor, metal detector**

1. INTRODUCTION

The world is not exactly a safe place and disasters have become increasingly common these days and humans have to be aware of the methods which can be used for rescue operations. During disasters information is really valuable and transmission of this data is very important. This project enables the transmission of this essential data to the user or the concerned and since this project uses transmission via IOT the device can be sent to a much larger distance.

The device is equipped with a number of sensors which communicate with each other and transmit information such as temperature, humidity, presence of any moving objects and also a metal detector to detect the presence of any suspicious metallic objects. And all this data is detected and simultaneously transmitted as the node MCU contains an embedded wireless communication chip continuously sending the data to the user through cloud-based network. The microcontroller is run with a C language program.

2. LITERATURE

We wanted to make a robot, which would help to save lives during crisis by transmitting essential data as quickly as possible. We took our inspiration from and started with IRsensor. However, as its data would not be sufficient, we wanted to add more sensors. The robot was made wirelessly controllable as seen in and was also made to transmit data.

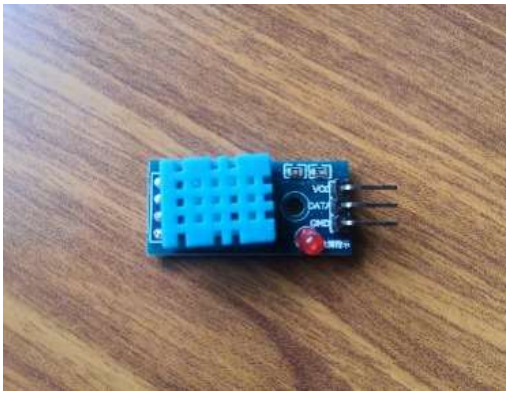
3. SYSTEM COMPONENTS

3.1 Microcontroller

The NodeMCU is an open source IoT platform which includes a program which runs on the ESP8266 module.

3.2 DHT11 sensor

It is a temperature and humidity sensor which can be interfaced with any microcontroller and it uses a capacitive humidity sensor and a thermistor to measure the surrounding environment and sends a digital signal. This sensor sends new data every 2 seconds.



3.3 HC-SR04

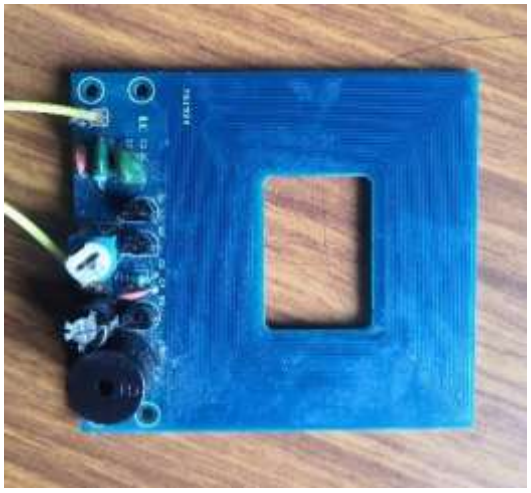
It is an ultrasonic sensor which is used to measure the distance. It sends an ultrasonic sound at 40K Hz which travels and gets reflected back to the module in case of the presence of any obstacle. The benefit of ultrasonic sensor is that it can also detect transparent objects unlike optical sensors and it is not affected by impurities like dust or dirt.

3.4 Pyroelectric ("Passive") Infrared Sensor

Passive infrared sensor or commonly known as PIR sensor are used to detect motion of a within the sensor's range. They detect the change in IR levels and send a digital output.

3.5 Metal Detector

The module operates by inducing a current in metal objects sends digital output when response is observed. It is also equipped with a buzzer which helps is the identification of metal objects.



4. COMMUNICATION NETWORK

4.1 IoT

Internet of things or IoT is a system of interconnected devices, in this case NodeMCU and system of sensors, which communicate with each other and transfer the data to the user over the network. This interface was chosen for this project because through this interface the robot can be sent to a much far distance and the data can be sent without any hassle.

4.2 Blynk Application

Blynk is a platform which works on Android devices which can be used to connect the supported hardware modules, in this case NodeMCU to the internet and relay the data over the cloud. The application even allows the controlling of the motor driver of the robot which creates an all in one interface with both visual real-time output display and also a controller to move the robot.

5. BLOCK DIAGRAM

The Figure 1 shows the block diagram of the Rescue controlled robot using NodeMCU, IOT and Android.

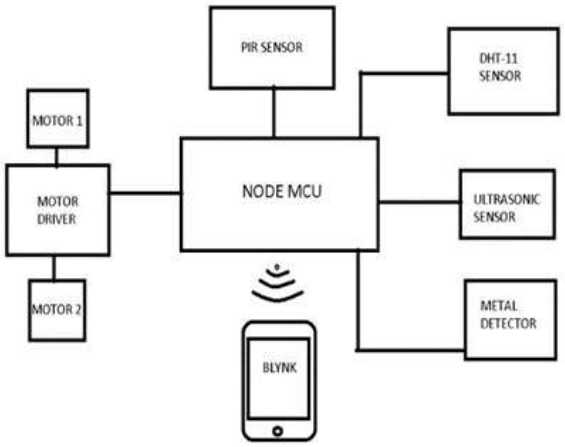
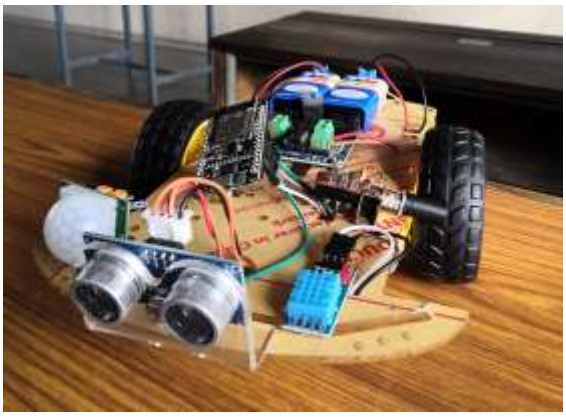


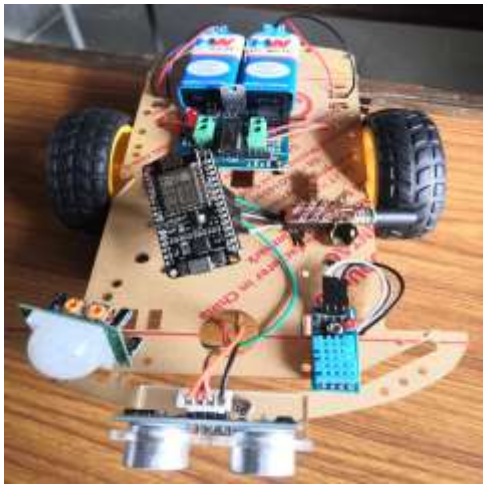
Figure 1. Block diagram

6. WORKING

Disaster never strikes with any kind of mercy. During a disaster, all kind of communication system usually go out of service and makes it difficult for any kind of rescue operation to be held. In this situation this rescue robot helps to establish a communication between the impact zone and rescue volunteers. Since the robot is equipped with sensors and a wireless transmitting device which can send the information to the volunteers through cloud enabled network, it enables the responders to identify and analyze the nature of the situation and also identify the survivors.

The robot is first sent into the impact zone remotely as it can be operated with the help of an application. The ultrasonic sensors enable the user to identify the presence of any obstacles and also the proximity to it so that one can maneuver the way through the obstacle into the impact zone. Then the sensor equipped on the robot identity their respective data parameters. This data is processed by the NodeMCU present on the robot and this helps in processing the data. This data is analyzed by the authorities. This essential information helps in proper assessment of the situation and helps in the allocation of resources of repair and rescue of the impact zone.





7. CONCLUSION

During crisis every single minute is precious and transmission of critical data is very essential for the rescue operation to be successful. The sensors equipped with the device record and transmit the data and as the MCU is connected to network wirelessly it can be sent to locations which are not in human reach. This project in an attempt which provides a solution while keeping economic and technical constraints in consideration.

8. FUTURE SCOPE

The approach towards disaster management has evolved from response centric to a holistic integrated way in the recent years. In this ever-changing world we are facing significant challenges like global climate change, population boom, resource depletion and increased risks due to various natural and man-made factors. All these challenges can be overcome with innovative solutions through collaboration by national and international agencies.

The future seems bright for continued advances in the areas of integrated detection, forecasting and warning systems through IOT based communication platform. Through an interconnected system of devices, objects and machines data can be collected, analyzed and transmitted seamlessly across the globe which proves crucial in disaster management in the future.

The IOT based app-controlled robot designed in this work has the potential to revolutionize the future of disaster management. In the future it can be made autonomous in its function and operation wherein technologies like AI, Big data analytics and real time processing are integrated to collect and analyze information from areas under risk, predict risk patterns and conduct mitigation measures through effective deployment in those areas. The bot is flexible to be equipped with mechanical arms, long range sensors and other devices which not only record and transmit data but can also conduct rescue operations to minimize impacts of disaster on life, property and environment.

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