

Article

IoT Grounded Fire Extinguishing Robotic Vehicle Using Android

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A B S T R A C T

In today's life, robotics has become very vital in supplementary for human beings. The use of robotics systems in fire fighting is being increasingly studied due to fire fighters routinely being exposed to dangerous conditions to save lives of victims during fire accidents. Many fire fighters lose their lives while extinguishing fire. To overcome this drawback, we can develop IoT based fire fighting robotic vehicle controlled using android application for remote operation. The sensors situated over wide area will send the fire detection status over the cloud. The administrator will receive the notification of fire detection and will send the robot to that location. The robotic vehicle is loaded with water tank to extinguishing fire.

Keywords: Fire Extinguisher, Node MCU, Sensors, Android, Bluetooth, IoT

Introduction

In today's life, robotics becomes important in assisting for human beings. The use of robotics systems in fire fighting is being progressively studied due to fire fighters routinely being exposed to dangerous conditions to save lives of victims during fire accidents. Many fire fighters lose their lives while extinguishing fire. To overcome this drawback, we can develop IoT based fire fighting robotic vehicle controlled using android application for remote operation. This project is designed to develop an IoT Based Fire Fighting Robotic Vehicle Using Android Claim. A sensor network situated on the wide area to detect flame and smoke. The collected data from sensors was continuously uploaded on cloud and then it will be transferred through the NodeMCU. If smoke level or flame level goes beyond the threshold value then fire will be sensed and notification will be send to the operator also the buzzer will give the alert. And the operator will be responsible to extinguish the fire through robotic arm and navigation of robot through android app. The robot has Arduino board, robotic arm and water tank

mounted on it. The Android application is used for the navigation of the robot.

Related work

Android Application

Android is a mobile operational scheme developed by Google, grounded on an improved version of the Linux kernel and additional open source software and considered primarily for touch screen mobile devices such as smart-phones and tablets. In addition, Google has further established Android TV for televisions, Android Auto for cars and Wear OS for wrist watches, each with a particular user interface. Variants of Android are also used on game consoles, digital cameras, PCs and other electronics.[1] Initially industrialized by Android Inc., which Google bought in 2005, Android was unveiled in 2007, with the primary marketable Android device launched in September 2008. The operating system has since away over numerous main statements, with the current version being 9.0 "Pie", unconfined in August 2018. The core Android source code

is known as Android Open Source Project (AOSP), and is primarily licensed under the Apache License. Android is also associated with a suite of proprietary software developed by Google, called Google Mobile Services [10] (GMS) that very frequently comes pre-installed in devices, which typically comprises the Google Chrome web browser and Google Search and continuously contains core apps for facilities such as Gmail, as well as the request store and digital distribution platform Google Play, and related expansion platform. These apps are licensed by builders of Android devices certified under standards compulsory by Google, but AOSP has been used as the basis of competing Android ecosystems, such as Amazon.com's Fire OS, which use their own equals to GMS.

IoT

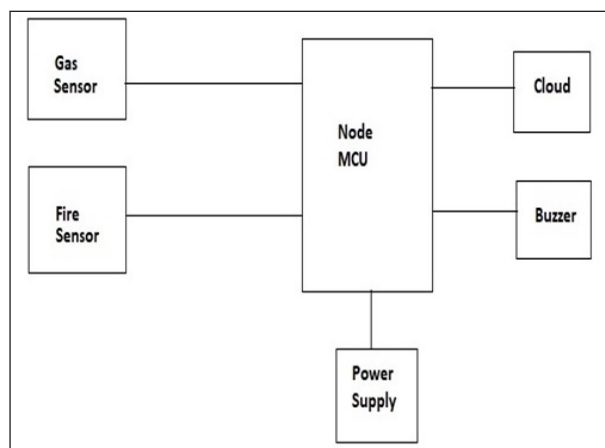
The Internet of things (IoT) is the web of bodily devices, automobiles, home appliances, and additional items engrained with electronics, software, sensors, actuators, and connectivity which allows these belongings to attach, assemble and conversation data. IoT includes encompassing Internet connectivity beyond standard devices, such as desktops, laptops, smart-phones and tablets, to any range of traditionally dumb or non-internet-enabled physical devices and ordinary objects. Embedded with technology, these devices can communicate and interact over the Internet, and they can be remotely monitored and controlled. With the arrival of driver-less vehicles, a branch of IoT, i.e. The Internet of Vehicles starts to gain more attention.

Methodology

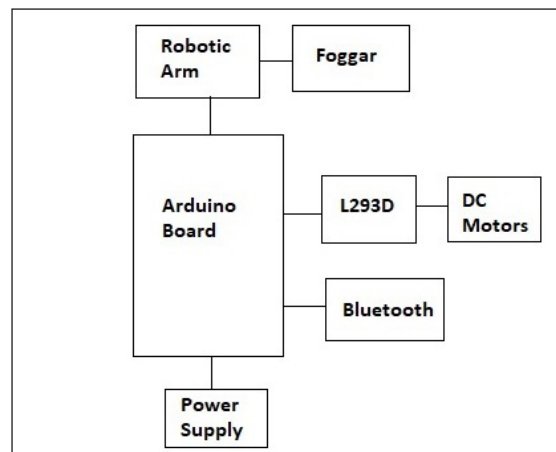
System Architecture

Fig. 1 Shows System Architecture of IoT Based Fire Fighting Robotic Vehicle Using Android Application. The system architecture consists of two parts:

Area under Observation: Area under observation is the location where sensors are situated for detecting fire as shown in Fig. 1(a).



(a) Area under Observation



(b) Area under Observation

Figure 1. System Architecture

Components of Robot: This part consist of all the components of robot like Arduino board, robotic arm, L293D driver, DC motor, Bluetooth, power supply, fogger as shown in Fig. 1(b).

The Gas and Fire sensors are situated at the location which we have taken under observation. These sensors continuously sense the fire, gas and temperature and also upload sensed data on cloud database. The sensors are connected to the NodeMCU which is 30 pin IC. ESP8266 is the IC used in NodeMCU which works on WiFi. If the sensed parameters are beyond threshold value then buzzer will give alert and notification will send to the operator. Then the operator will navigate the robot through Android application. The Arduino board is the heart of the robot. AT Mega328p Arduino board is used for functioning of the robot which has 28 pins. Four DC motors are used for the movement of the robot which are interfaced with Arduino board with the help of L293D driver. L293D is 16 pin IC. Robotic arm is also connected to the robot which is used to sprinkle water on fire with the help fogger. Bluetooth technology is used to make communication between robot and the android application. Bluetooth HC05 module is used for this purpose.

Advantages

An IoT based fire extinguishing robotic vehicle has following advantages:

- Ability of detecting precisely with the increased flexibility.
- Prevention from dangerous incidents.
- Consistent and inexpensive.
- Reduces financial loss.

Limitations

This system has following limitation:

We only use metal sheet as a material i.e. if we use plywood for outer cover then it may catch fire.

Applications

The system can be used in the given below applications:

- Fire department
- Factory
- Chemical Industries
- School and colleges

Results and Discussion

The sensors collect data continuously and upload sensed data on cloud. If sensed data crosses threshold value limit then buzzer will give alert also operator will be notified through mail. The operator should navigate the robot to the location through android application. These are the expected results of this model.

Conclusion

In an existing fire fighting system, lots of fire fighters lose their lives while extinguishing fire. Hence, an IoT Based Fire Extinguishing Robotic Vehicle Measured by Android application is future. This robot is also helpful in those small areas where human cannot enter.

Future Work

In future, this robotic vehicle can be enhanced by adding the functions like wireless camera to visualize fire or to extinguish fire using CO2 gas cylinders.

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