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FIRE FIGHTING BOT WITH IoT

Vanaja Shivakumar

ABSTRACT

An autonomous fire extinguisher robot is the product of this thesis's efforts to advance automation systems. With this goal in mind, we set out to create a mobile robot that could detect simulated fires (using candles) in enclosed spaces. Creating a robot that can move with the help of a rotor motor, detect fire using a flame sensor, and continue its search for a fire even after it has been discovered—all under the direction of a microcontroller—the Arduino Mega. The robot can navigate the designated path without stumbling into any barriers and can scan for fires on the go. The Blynk Robot design and application process involves designing and developing the mechanical system, the electronic system, and the software required for obstacle detection, flame detection, actuation, informing, and extinguishing. This is all accomplished through the use of the microcontroller module on the device.

Keywords : IoT, Fire, Blynk,Arduino

1. INTRODUCTION

Firefighting is a crucial yet risky profession. Firefighters need lightning-fast response times to safely put out blazes, limit casualties, and limit property damage. Now that technology has finally connected firefighters with machines, we can battle fires more efficiently and effectively. One day, firefighters may be able to collaborate with robots that can detect fires before they get out of hand, significantly lowering the likelihood of harm coming to victims. Atmospheric and oceanic average temperatures are rising at an alarming rate due to the phenomenon known as global warming. According to research, the average surface temperature of our planet has risen by about 0.8 degrees Celsius, with almost two-thirds of that rise happening since 1980. Everything becomes more combustible as a result of the high temperature of our planet's atmosphere, which means that forest fires and other fire disasters may become more common as a result of global warming. Consequently, a fire extinguishing robot is essential for minimizing the devastation caused by both natural and man-made fire disasters. The goal of this project is to create a wirelessly controlled, intelligent, live-video-feedback-voice-operated fire-extinguishing robotic vehicle. An intelligent, voice-operated, RF-controlled fire extinguisher robot is the intended outcome of this research. Voice commands may also be used to adjust the direction of the robot's attached camera.A water jet spray is integrated into the vehicle design, allowing it to sprinkle water.

Assistant professor, Department of Computer Science and engineering, Nawab Shah Alam Khan College of Engineering and Technology, Hyderabad, 500059

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You may direct the sprinkler to spray in the desired direction. New high-speed technologies have opened the door to practical possibilities for improved robot controls and the use of novel control theory approaches. The combination of technological advancements and the need for high-performance robots led to the development of new control devices, drivers, and algorithms that allowed for the creation of robots that were quicker, more accurate, and smarter overall. An innovative and cost-effective method for controlling robots is detailed in this research. A variety of complex robotic tasks are within the capabilities of the robot control system that has been shown. Research in voice recognition as a foundation for human-machine communication has been fueled by technical curiosity in creating robots that can imitate human speech or by the need to automate tasks involving machines. A microcontroller serves as the system's master controller; it is interfaced with a wireless transceiver module, a water jet spray, DC motors, and a buzzer. The speech recognition module receives voice instructions from the user, processes them using an interfaced microcontroller, and then wirelessly transmits the required data via a transceiver module. In response, the robotic vehicle's transceiver module informs the microcontroller, which in turn controls the vehicle's motors, pumps, and other systems.

2. LITERATURE SURVEY

The objective of the Fire Fighting Robot Competition is to replicate the real-life functioning of an autonomous robot by having it rescue ten victims (represented by table tennis balls) and extinguish five home fires (represented by emergency candles) in three minutes. Hardware, electronics, and programming are the three main components of a robot's development. There are a total of three DC motors on the robot: two for the drive system and one each for the ball suction and fire blowing subsystems. The robot receives input from a variety of sensors, including photoelectric, fiber optic, and RGB color sensors, all of which are interfaced with the PIC16F877A. An additional visual representation of the robot's state is provided by the LCD display.

The robot's action gain is determined from the sensors' input using the C programming language.The firefighting profession is both vital and risky. Collaborating alongside firefighters, robots that can detect fires before they spread might drastically cut down on casualties in the future. Hardware, electronics, and programming are the three main components of a robot's development.No, it is not. MAJID ABD put forth The safety of people's homes, labs, offices, factories, and other buildings is paramount. Incorporating a firefighting robot into our everyday lives, we create an intelligent security system based on several sensors. The most severe kind of burn damage is caused by electrical currents. This occurs because our security system is unable to identify and alert us to any potentially harmful or unusual situations. Beyond that, it was hard for the user to notice the little burns caused by electrical equipment. so can take the user a while to put out a fire, for example, they might have to look for a water supply before they can do so. The user is unable to easily access the little burned region due to the fire's difficulty in detecting it.

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Spaces that are difficult to perceive, for instance, might be difficult to extinguish a fire. The "Autonomous Fire Protection Robot With Notification" is a smart building's fire suppression system that uses a PIC18F4550 microcontroller, a CYTRON SK40C autonomous board, and a few more circuits. The PIC18F4550 microcontroller allows this robot to carry out a variety of tasks, and its three flame sensors are no exception. When the flame sensor senses an incoming fire, the robot will go to the scene of the blaze while simultaneously notifying any nearby GSM phone via the modem attached to the programmable device. Even before it touched the fire, this robot was designed to halt. The robot can also put out fires at 45 degrees on the top and 45 degrees on the bottom. The fire extinguisher clipper was manipulated by this robot using its finger function.

Fire fighting is an important but dangerous occupation. Robots are designed to find a fire, before it rages out of control, could one day work with fire fighters greatly reducing the risk of injury to victims.

Makhare Sonal From this project we explain the implementation and designing of fire fighting robot using web server. There are two dc motors used for motions. There are three sensors used Temperature for detecting the increase in fire, Smoke(gas) for detection of smoke and IR for detection of obstacle. Dc water pump is used to pump water for extinguishing the fire.

J Jalani In real life, fire accidents can happen anytime and anywhere that usually hardly controllable. Fire accidents can damage the buildings, kill human and may cause unpredictable losses. In addition, death not only due to the fire but also from smoke inhalation and toxic gases. Therefore the fire security is important to human life. Note that the human is difficult to detect the fire in the location that is hard to reach or see by a human. Moreover, the human also may take a lot of time to extinguish fire due to the fact that finding a water source can be troublesome. Therefore, an automatic firefighting robot has been designed and proposed in this study. This robot used 3 flame sensors to detect the fire. It also equipped with 3 ultrasonic sensors for obstacle avoiding which protecting the robot and the internal components from any obstacles. Each sensor on the robot is controlled by the Arduino. Apart from the sensors, the robot is also equipped with the water tank that provides water once the fire is detected. The robot will move randomly in the room when the power is on. When the flame sensors detected the fire, the robot will move to the fire source and send a warning message to the user. Once the robot reached the burning area, it will stop at a certain distance and extinguish the fire by using water

EXISTING SYSTEM

Fire fighting is an important but dangerous occupation. Robots are designed to find a fire, before it rages out of control, could one day work with fire fighters greatly reducing the risk of injury to victims. l Fire Fighting Robot Competition is a contest purposely to simulate the real-world operation of an autonomous robot rescuing 10 victims (table tennis balls) and stop 5 fires (emergency candles) in a house within three minutes. The robot development is consisting of three elements which is the hardware, electronic, and programming. The robot have three DC motor, two for driving system and another single DC motor for ball suction subsystem and the fire blowing subsystem. Various sensors are also interfaced with PIC16F877A as a feedback to the robot such as photoelectric sensors, fiber optic sensor and RGB color sensors. LCD display also gives the graphical information of the robot status to the user. For the programming part, C language is used to determine the robot action gainfrom the sensors input.

3.1 Disadvantages:

1. System has an issue to connect and for the motion

PROPOSED SYSTEM

The robot can move on the specified route without being caught in the obstacles, and conducts a fire scan as it moves. By using the microcontroller module on it evaluates the data in the direction of the software and performs obstacle detection, flame detection, actuation, informing and extinguishing processes. We control the water extinguish and motion using a IoT application called Blynk. The app is one of the most easiest to

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control the robot. We have used an IP camera to control theRobot design and application process; The design and development of the mechanıcal system, the design and development of the electronic system, and the preparation of the necessary software. During the design and development of the mechanical system; Draft drawings, measurements, computer aided design and solid modeling programs. The robot designed in the study was able to detect fire sources randomly placed in random obstacle areas and extinguished with determined fire extinguishing systems

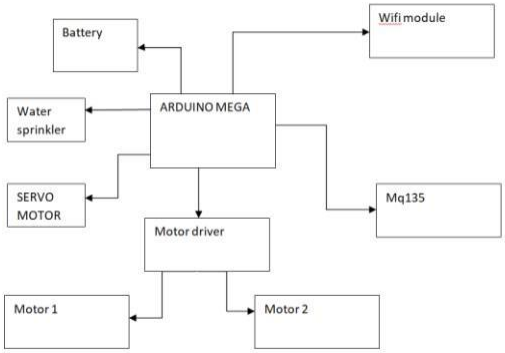

Figure 1 block diagram

Wiring diagram

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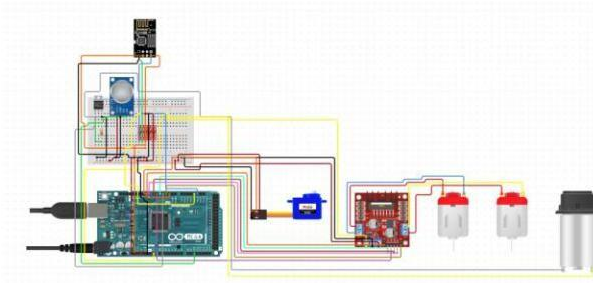

Figure 2 wiring diagram

4. HARDWARE

4.1 ARDUINO

Arduino is an open-source computer hardware and software company, project and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical and digital world. The project's products are distributed as open- source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL),permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form or as do-it-yourself (DIY) kits.

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards or breadboards (*shields*) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler toolchains, the Arduino project provides an integrated development environment (IDE) based on the Processing language project.

The Arduino project started in 2003 as a program for students at the Interaction Design Institute Ivrea in, Italy.aiming to provide a low-cost and easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats and motion detectors.

4.2 ESP8266 MODULE

ESP-01 WiFi module is developed by Ai-thinker Team. core processor ESP8266 in smaller sizes of the module encapsulates Ten-silica L106 integrates industry-leading ultra low power 32-bit MCU micro, with the 16-bit short mode, Clock speed support 80 MHz, 160 MHz, supports the RTOS, integrated Wi-Fi MAC/BB/RF/PA/LLNA, on-board antenna.The module supports standard IEEE802.11 b/g/n agreement,

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complete TCP/IP protocol **s**tack. Users can use the add modules to an existing device networking, or building a separate network controller.ESP8266 is high integration wireless SOCs, designed for space and power constrained mobile platform designers. It provides unsurpassed ability to embed Wi-Fi capabilities within other systems, or to function as a standalone application, with the lowest cost, and minimal space requirement.

ESP8266EX offers a complete and self-contained Wi-Fi networking solution; it can be used to host the application or to offload Wi-Fi networking functions from another application processor When ESP8266EX hosts the application, it boots up directly from an external flash. In has integrated cache to improve the performance of the system in such applications. Alternately, serving as a Wi-Fi adapter, wireless internet access can be added to any micro controller based design with simple connectivity (SPI/SDIO or I2C/UART interface).

4.3 MQ 135 GAS :

Figure 3 MQ135

FEATURES OF MQ135:

- Sensitive for alcohol, ethanol
- Output voltage boosts along with the concentration of the measured gases increases
- Fast response and recovery
- Adjustable sensitivity
- Signal output indicator

SPECIFICATIONS

- Power: 2.5V ~ 5.0V
- Dimension: 40.0mm * 21.0mm
- Mounting holes size: 2.0mm

APPLICATIONS

- Car alcohol alarm

BreathalyzerPUMP:

figure 4 pump

3-6V Mini Submersible Pump with DC Motor A do-it-yourself project involving a little water pump for a garden or fountain. This small-sized submersible pump motor may be operated using a power source ranging from 3 to 6V and is inexpensive. It uses just 220mA of power and can handle up to 120 liters per hour. All you have to do is plug in the engine, attach the tube to the outlet, and then immerse it in water. Always keep more water than the motor in the tank. The engine might be damaged during a dry run because of the heat, and it will also make a lot of noise.

Servo motor:

Figure 5 servo motor

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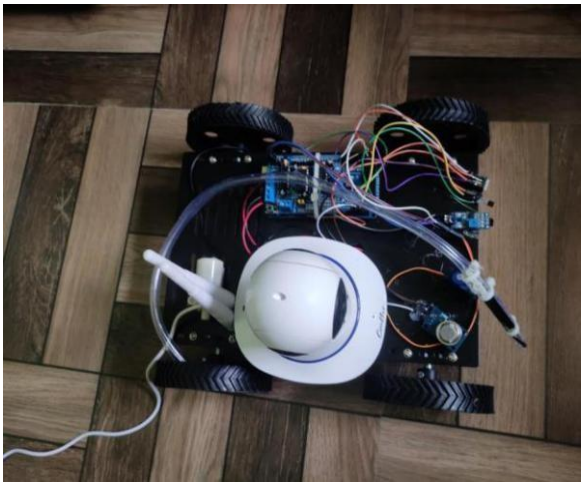
this towerpro sg90 continuous rotation 360 degree servo motor is special among all the available servo motors because its operation is very different from that of a standard servo. as instead of going to a specified angle, this servo will be static at a 1.5ms pulse, a longer pulse



gives forward rotation and a shorter pulse give backward rotation.

5. SOFTWARES

5.1 BLYNK

Blynk is the most popular Internet of Things platform for connecting any hardware to the cloud, designing apps to control them, and managing your deployed products at scale.

- □ With Blynk Library you can connect over 400 hardware models (including ESP8266, ESP32, NodeMCU, all Arduinos, Raspberry Pi, Particle, Texas Instruments, etc.)to the Blynk Cloud. Full list of supported hardware can be found here.

- With Blynk apps for iOS and Android apps you can easily drag-n-drop graphic interfaces for any DIY or commercial project. It's a pure WYSIWG experience: no coding on iOS or Android required.

- Hardware can connect to Blynk Cloud (open-source server) over the Internet using hardware connectivity available on your board (like ESP32), or with the use of various shields (Ethernet, WiFi, GSM, LTE, etc). Blynk Cloud is available for every user of Blynk for free. Direct connection over Bluetooth is also possible.

Optionally you can install Blynk Local Server and run everything locally. However, Blynk Cloud is free for anyone who is using Blynk for personal (non-commercial) use.

Arduino ide:

The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language Java. It originated from the IDE for the languages Processing and Wiring. It includes a code editor with features such as text cutting and pasting, searching and replacing text, automatic indenting, brace matching, and syntax highlighting, and provides simple one-click mechanisms to compile and upload programs to anArduino board. It also contains message area, a text console, a toolbar with buttons for common functions and a hierarchy of operation menus. The source code for the IDE is released under the GNU General PublicLicense, version 2The ArduinoIDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main() into an executable cyclic executive program with the

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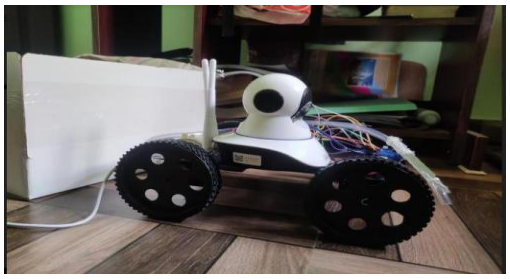
GNUtoolchain, also included with the IDE distribution. The Arduino IDE employs the program avrdude to convert the executable code into a text file in hexadecimal encoding that-is loaded into the Arduino board by a loader program in the board's firmware

6. CONCLUSION:

fire fighting robot has been successfully built. All the fundamental wall follower action such as moving forward, reverse, turn left and turn right function flawlessly. The robot has been able to pick up the table tennis ball and stop the fire. Besides that, the robot also has been able to count the maze junction and make its own decision based on the counted

junction. Other than that, the robot has been able to distinguish the game field color different either red and green or red and blue. With this ability, the robot can change the current strategy to a new strategy. Other than, the robot also capable toavoid its structure from touching the fire source that can cause point deduction. As a conclusion, the project entitled “The Fire Fighting Robot” has archived its aim and objective successfully.\



7. RESULTS

Figure 6 side view of the fire fighting robot

Figure 7 top view of the robot

Figure 8 front view of the fire fighting robot

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