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SMART FIRE FIGHTING ROBOT

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Abstract

The outbreak of a fire is a dangerous act that has a number of consequences. Detecting fire at an early stage and extinguishing it can help in preventing various accidents. So far we rely on human resources. This often puts the person's life at risk. Therefore, fire protection becomes an important aspect for saving human lives. A firefighting robot was designed and designed to detect the fire location and extinguish the fire using sprinklers when the pump is started. This robot uses three flame sensors for accurate fire detection. This proposed model of firefighting robot using NODEMCU is used to detect the presence of fire and extinguish it automatically without any human intervention. It contains gear motors and a motor controller to control the movement of the robot when it detects any occurrence of fire and automatically starts a water pump to extinguish that fire. This robot model has a water ejector that is capable of releasing water at the scene of a fire. The water ejector tube can be moved in the desired direction using a servo motor. The entire operation is controlled by the NODEMCU microcontroller.

Keywords: Arduino UNO, Firefighting, Robot, Temperature sensors, Water Pump.

I. INTRODUCTION

According to National Crime Records Bureau (NCRB), it's miles envisioned that greater than 1.2 lakh deaths had been induced due to fire injuries in India from 2010-2014. Even although there are a lot of

precautions taken for Fire accidents, those natural/man-made failures do arise now after which. In the event of a hearth breakout, to rescue people and to place out the hearth we are pressured to use human resources which aren't secure. With the advancement of generation especially in Robotics it is very an awful lot possible to replace humans with robots for preventing the fireplace. This might improve the performance of firefighters and could also save you them from risking human lives. Today we're going to build a Fire Fighting Robot the use of Arduino, with a view to routinely feel the hearth and begin the water pump. Fires are the most essential aspects of these kind of troubles. Robot industry is available and has quite a few paintings on this region. Some of the industries are to be constant mobile robots with exceptional capabilities, structures and which are prepared with unique sensors that come across earlier than the hearth is out. These robots are used for the fireplace extinguishers by way of numerous sensors. The fire-fighting robots can grow to be alternatives to firefighters as robots are not suffering from smoke or flame and do no longer require oxygen. So, by using them, the number of fire accidents can be minimized. If IoT is incorporated with these robots, then the affected web page's environmental scenario may be effortlessly interpreted, and coordinated manage of a couple of robots can be performed. So, the rescue operation can be quicker and more secure by way of using fire-preventing robots. J. Suresh detected hearth the use of a flame sensor but has no IoT system. H. U. Zaman used manual manipulate Arduino Uno microcontroller with Bluetooth controlled feature to govern fire-preventing robot while A. R. P detected it by means of using heat, fuel presence, or a multisensory device and control manually remotely. The majority makes use of water but J.Suresh used air or a gaseous substance to extinguish the hearth. Some operate mechanically and some have provision for guide control. H. U. Zaman used IoTs to govern the robotic manually through live streaming. P. Bhosale with different researcher designed a gadget in which the sensors statistics are amassed from commercial website sensors and add the information on the net which could take the crucial selections and make alert primarily based on IoT however has no autonomous manipulate device. Another IoT based hearth alarm and monitoring gadget have designed by way of S. Tiwari this is incorporated with several sensors and send it to monitoring station the use of GSM which has no manage gadget. H.P. Singh et al evolved an Autonomous Industrial Fire Fighting Mobile Robot. The robotic performs primarily based on five infrared sensors that control the movement of the robot, and for flame detection. The microcontroller controls a D.C. Motor to hold water from field to extinguishing hearth. But, our project has incorporated connection to the wheels so that the robot can overcome any speed braking obstacles. We have also implemented camera for monitoring the fire and controlling the robot both manually and

automatically.

II. LITERATURE SURVEY

In recent paper, an IOT primarily based hearth-preventing and affected location tracking robotic is proposed. This firefighting robotic can be used as a supplementary to the firefighters in essential situations. To feature this robot, a flame sensor, a gas sensor, a PIR sensor, and a temperature humidity sensor has been used. The flame sensor is used to stumble on the hearth at the identical time as the gas sensor informs about the presence of flammable gases, the Passive Infrared Sensor confirms the presence of a human, and the temperature humidity sensor sends information about the temperature and humidity of the locality. This paper discusses the detail and top operating situation of a hearth-combating robot and recapitulates an IOT based communication device to reveal the hearth affected place the use of Wi-Fi and additionally discusses the difficult functions of every module and the implementation of the system. All the facts are sent to the cloud server for further research. The proposed firefighting robot has been used for many experiments and right assessment has been performed based on its overall performance. It has an exceptional performance to extinguish the fire in an emergency situation. Fire detection and its blow out is dangerous job. It can placed life of firefighter at hazard. In many hearth accidents firefighters are losing their lives each year throughout the sector. To keep away from this conflict studies and improvement in Artificial Intelligence offers rise to robotics. These robots are designed to use in excessive conditions wherein human interruption grow to be much less and robots are the usage of for various paintings. We are the use of this implemented robotic to help firefighters and to reduce chance of their lives. The existing system proposes a novel hose kind robotic, that may fly without delay into the fireplace supply via a water-jet. First, to govern the response force for strong flying, we evolved a nozzle module. By combining nozzles whose outlet route can be controlled, the resultant reaction pressure can be managed. Finally, we evolved a robotic with a nozzle module and conduct experiment. The experiment demonstrates that a robotic with a duration of approximately 2 m can fly stably in the air with the aid of leveraging the water jet. In addition, the pinnacle direction can a scope managed. A single longitudinal arm suspension shape for fireplace-fighting robotic is proposed, which has corrected adaptability to the ground.

III. PROPOSED WORK

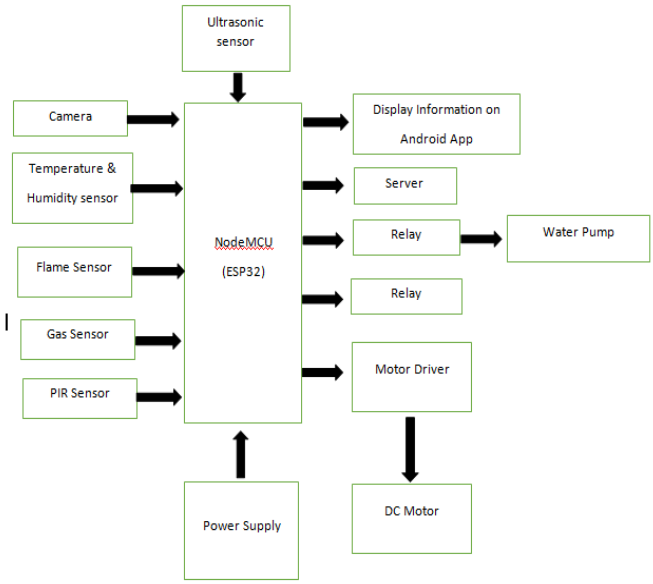
The complete system includes a sensor, a Microcontroller unit, and cars. The sensors statistics is dispatched constantly to the NodeMCU. NodeMCU Collects the records from sensors and camera after which technique the data depending upon this system. If the data are analog fee, then the information are transformed to a digital price the usage of ADC conversion and sent to the server and the android app. The PIR sensor, Gas sensor, and the humidity and temperature sensor values are immediately dispatched to the server and app through NodeMCU. Only the flame sensor price is used to decide to replace at the water cylinder robotically. Four sensors have been used to broaden this robotic. They are the PIR sensor, Flame sensor, Humidity and Temperature sensor, and Gas sensor. All the sensors are used to monitor the fireplace twist of fate area nicely. Every viable incident has been taken into consideration to avoid massive damage. All the sensors work parallelly at the same time. We have used a chain to join the two wheels of the robot so that robot speed is improved. We have inbuilt camera to monitor the fire and the operator can see lively.

IV. PROJECT DESCRIPTION

In the indoor of a business organization, the robotic is placed at the vicinity where fire accidents can appear. A microcontroller and sensors are used to perform this robotic. If there exist any fireplace signal, the sensors will ship the records to the important coordinator unit. The coordinator unit is the mind of the robotic. It makes selections primarily based upon the sensor indicators. The complete machine includes a digicam, sensors, a Microcontroller unit, and vehicles. The sensors' information is sent constantly to the NodeMCU. NodeMCU collects the statistics from sensors and camera and then manner the statistics relying upon the program. If the statistics are analog fee, then the facts are transformed to a virtual value using ADC conversion and dispatched to the server and the android app. The PIR sensor, Gas sensor, and the humidity and temperature sensor values are without delay sent to the server and app via NodeMCU. Best the flame sensor value is used to decide to interchange on the CO2 and water cylinder automatically. For guide mode, the joystick brought in the app is used to govern the robotic. Moreover, an ultrasonic sensor and flame sensors had been used to move the robot mechanically. While the robot is in independent mode, the critical processing unit collects information from the ultrasonic sensor to keep away from barriers to discover the way and the flame sensors discover the precise position of the hearth. The module has to be related with a Wi-Fi router or cellular hotspot to switch the comments records from the robotic to

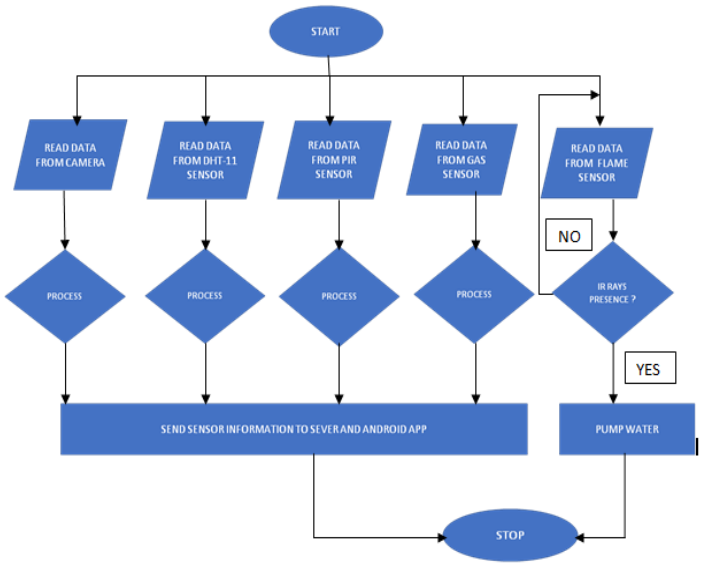
the server and Android App. We have used a series to join the 2 wheels of the robot in order that robotic speed is progressed. We have in-built digicam to monitor the fire and the operator can see active.

V. BLOCK DIAGRAM



Four sensors have been used to develop this robot. They are the PIR sensor, Flame sensor, Humidity and Temperature sensor, and Gas sensor. An IP camera has been used to stay move around the affected vicinity thru an android app. All the sensors are used to screen the fireplace accident location properly. Every possible incident has been considered to keep away from tremendous harm. All the sensors paintings parallelly at the identical time. The sensors accumulate information in keeping with their working precept. The gas sensor, PIR sensor and temperature sensor gather records, and this information are processed in micro-controller and then dispatched the choice to the android software. On the alternative side, the flame sensor constantly collects the records parallelly and ship to the micro-controller. If the

sensor unearths any flame round it, it'll prompt the motor to spray the water pump to the firing vicinity in an effort to extinguish the hearth.



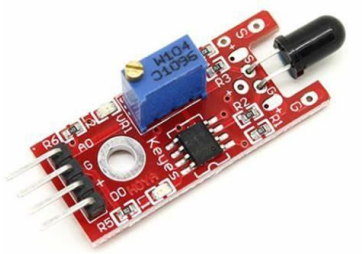
VI. HARDWARE DESCRIPTION

6.1. Node MCU:

NodeMCU is an open supply firmware for which open supply prototyping board designs are available. The call "NodeMCU" combines "node" and "MCU" (micro-controller unit). Strictly talking, the term "NodeMCU" refers to the firmware in preference to the related improvement kits. Both the firmware and prototyping board designs are open supply. The firmware uses the Lua scripting language. The firmware is based on the eLua assignment, and built at the Espressif Non-OS SDK for ESP8266. It makes use of many opensource tasks, inclusive of lua-cjson and SPIFFS. Due to aid constraints, users want to select the modules applicable for their mission and build a firmware tailor-made to their desires. Support for the 32-bit ESP32 has additionally been applied. The prototyping hardware commonly used is a circuit board functioning as a dual in-line package (DIP) which integrates a USB controller with a smaller surface-

hooked up board containing the MCU and antenna. The choice of the DIP format lets in for smooth prototyping on breadboards.

6.2. Flame sensor:



A flame detector is a sensor designed to detect and respond to the presence of a flame or hearth, permitting flame detection. Responses to a detected flame rely on the set up, but can encompass sounding an alarm, deactivating a gasoline line (consisting of a propane or a natural fuel line), and activating a fireplace suppression system. When utilized in programs consisting of industrial furnaces, their role is to offer confirmation that the furnace is running properly; it could be used to show off the ignition machine even though in lots of instances they take no direct action past notifying the operator or manipulate gadget. A flame detector can regularly respond quicker and greater as it should be than a smoke or warmth detector due to the mechanisms it uses to locate the flame.

6.3. Temperature Sensor:

Temperature sensors are a device used in our normal lives to measure the temperature of the air, a liquid, and strong count number in a wide range of industries and applications. Temperature sensors are found everywhere. If you have ever received a notification on a hot day that your smartphone has were

given too warm, that is because they comprise an embedded temperature sensor that measures the inner temperature to prevent overheating. The simplest distinction among the sensor and module is that the module will have a filtering capacitor and pull-up resistor in-built, and for the sensor, you need to use them externally if required.

6.4. Software description:

The robotic switch all of the information to the android app named Blynk App. Blynk app is the simplest way to construct a cell app that helps hardware platforms including Arduino, Raspberry Pi and a comparable micro-controller, which may be used to create required task. This app can manage the robotic thru Wi-Fi and shows the temperature and humidity value at the cell display screen. It moreover suggests the presence of humans and gasoline leakage. A switching choice has been developed among vehicle and manual mode. A Joystick has set up for the manual manage system. The digicam view also can be visible through this application. Arduino Software (IDE) - carries a textual content editor for writing code, a message area, a textual content console, a toolbar with buttons for common place functions and a collection of menus. It connects to the Arduino and Genuino hardware to upload packages and talk with them. Programs written using Arduino Software (IDE) are referred to as sketches. These sketches are written in the text editor and are stored with the record extension. The editor has functions for cutting/pasting and for searching/changing text. The message vicinity offers remarks even as saving and exporting and additionally displays errors. The console shows textual content output by using the Arduino Software (IDE), along with entire mistakes messages and different records. The backside righthand corner of the window displays the configured board and serial port.

VII. RESULT AND DISCUSSION

The challenge firefighting robot become designed in such that the robot may be operated the use of smoke detection sensor, temperature sensor detects the temperature and smoke and while the hearth burns

it emits a small amount of infrared light, this light will be obtained by using the IR receiver at the sensor module. We hit upon the route of the hearth we will use the motors to transport near the fireplace by riding our vehicles via the L293D module. When near a fire we suppress it through the usage of water. The proposed robot can circulate in ahead, backward, left, right and might stop additionally. Robot detects temperature, smoke and flame on the web page wherein the robotic exists. This robotic is help full in the one regions in which natural calamity and bomb explosions wherein took place. Robot detects fire and extinguishes the fireplace with the help of sprinkler pump. For extinguishing that hearth robotic has to reach up to there and it moves in the direction of the target with the impediment avoidance assets.

VIII. CONCLUSION

In this paper, a firefighting and affected area monitoring robot is proposed based totally at the Internet of things surroundings, that can take on the spot steps throughout fire accidents. This robot can be used to reduce the risk of human firefighters and inside the place that is out of attain for humans. The industries with a higher chance of fire accidents can use this robot to keep away from large damages. In future, Machine Learning and AI structures may be applied to enhance the performance of the robot.

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