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Automatic Fire Extinguisher Robot Using IoT

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ABSTRACT—

A fire outbreak can have serious consequences, making it crucial to detect and extinguish fires quickly. However, relying on human resources for this task can be dangerous and puts individuals' lives at risk. Therefore, fire safety measures are essential to protect lives. This article introduces a proposed solution: a fire extinguishing robot equipped with a honey detector for accurate fire detection. The robot operates using an Arduino UNO microcontroller, automatically detecting and extinguishing fires with sprinklers and a driving pump. Motors and a motor driver that are integrated into the robot's design enable the control of its movements and the activation of the water pump. The water ejector pipe can be directed towards the fire using servo motors. Overall, the fire extinguishing robot provides a safer, more reliable way to detect and extinguish fires without risking human lives.

Keywords— Arduino UNO, Flame Sensor, Motor Drive

I. Introduction

A. Problem Statement

Firemen are additional at threat of loss of life within the route of their day by day recreating of firefighting. The time element is a problem in a domicile Situation. Hearth as a result of gasoline leak and chemical oil painting can also need to cause an explosion, so unstable to mortal actuality. Using robots is Absolutely one of the occasion mediums for lowering firemen casualties and perfecting fireman chops.

B. Objectives

We purpose is to format a robot capable of detecting and suppressing fires and decreasing the efforts of human Labor and degree of Destruction. By way of designing and enforcing a self-sufficient robot capable of detecting and extinguishing flames, failures may be Averted with minimal chance to human life.

C. Scope

This venture has been brought on by the preference to layout a system which could stumble on fires and intervention. This gives us the opportunity to skip directly to robots' responsibilities that Historically human beings had to do however had been inherently existence threatening. Hearth-combating is an apparent candidate for such automation. Given the wide variety of lives Out of place regularly in firefighting, the tool we envision is crying for Adoption. Of Course, this assignment has only scratched the surface. As within the layout simplifications and the implementation constraints I endorse, our challenge is very a whole lot an evidence-of-concept. Specifically, a realistic self-sufficient hearth-preventing device should consist of a series of Robots, speaking and cooperating inside the undertaking; moreover, this kind of system Calls for centers for going via limitations within the presence of fire, and ability to get keep of instructions on-the-fly at some point of an operation. All such worries were out of doors. The Scope of this challenge but, there has been research on lots of the one's quantities in specific Contexts, e.g. coordination amongst cell entrepreneurs, strategies for detecting and fending off obstacles

II. LITERATURE REVIEW

This paper focuses on erecting a smart firefighting robot with multiple operations. In the moment's world, the hazard of fire and explosion is veritably destructive in terms of lives lost, injuries and property damage. This robot is erected in such a way to minimize the damage due to any fire accident. The SAFF robot has a binary controlling medium. It can operate both manually and autonomously. In homemade mode, the robot is manually controlled by a firefighter to extinguish fire by using water. On the other hand, in the independent mode, the robot can automatically describe the fire, walk towards the fire and extinguish it by using carbon dioxide. It's a handicapped robot which detects fire by using gas and honey detectors. It can also view what's in front of it through a camera. The entire setup consists of three Arduino boards, buck modules, detectors, a GSM module, relays, servo motors and dc gear motors which all are powered by two 12V lithium polymer batteries +[1]. This paper examines and leverages the eventuality of robotization in dangerous but important occupations such as firefighting. Robots are designed to find the position of fire, before it goes out of control. It could be used

to work with firefighters to reduce the threat of injury to victims. This paper presents the Fire Fighting Robot. The development of robots is divided into three rudiments which are tackle, electronic, and programming. A 12 Volt DC pump for suction and spraying of water. Servo Motor (SG90) for axial spraying of water.(0 degrees to 60 degrees) colorful detectors are also connected with Arduino Uno Board. For the programming part, Arduino IDE language was used to determine the robot movement from the detectors input[2]. This paper proposes a new type of timber firefighting system. When one or further suspected fire spots are set up in the timber, the firefighting Unmanned Aerial Vehicles(UAVs) can safely and snappily reach the asked position, conduct a thorough disquisition of the suspected firepots. However, it's necessary to drop firefighting accouterments to put out the fire, If a fire occurs. At the same time, considering the characteristics of limited abidance and low cargo capability have always limited the operations of UAVs, Unmanned Ground Vehicles (UGVs) are considered in this paper as an fresh and comprehensive problem result to give energy and supplement accouterments for UAVs. In order to enable firefighting UAV to plan a safe and effective path in real time in the complex timber terrain, a new bettered D * Lite algorithm is proposed for UAVs in the charge platoon. Indeed when the 3D workspace is incompletely known or fully unknown, the algorithm can plan an effective path so that the firefighting UAV can move to the fire spots and UGV in real time[3].

III. Layout OF fireplace stopping robotic

A. IR Sensing

Infrared transmitter is one sort of LED which emits infrared shafts usually referred to as IR Transmitter. Also, IR Receiver is used to admit the IR shafts transmitted through the IR transmitter. One critical point is that both IR transmitter and receiver should be positioned in a straight line to each other. The transmitted signal is given to the IR transmitter on every occasion the signal is high, the IR transmitter LED is accomplished and it passes the IR shafts to the receiver. The IR receiver is attached with a comparator. The comparator is constructed with an LM 741 useful amplifier. inside the comparator circuit the reference voltage is given to flipping input outstation. The non flipping input outstation is attached to the IR receiver. whilst intruding the IR shafts between the IR transmitter and receiver, the IR receiver is not undertaking. So the comparator non flipping input terminal voltage is superior to the flipping input. Now the comparator affair is in the variety of 12V.consequently the transistor is conducting. Then the transistor acts as a switch so the collector and emitter could be closed. The affair is taken from collector outstation. Now the affair is zero. while the IR transmitter passes the shafts to the receiver, the IR receiver is conducting due to that non flipping enter voltage is decreased than flipping enter. Now the comparator affair is-12 V so the transistor is in the arrestment region. The 5v is given to 40106 IC which is the inverter with buffer. The inverter affair is given to the microcontroller or laptop. This circuit is drastically used for counting operation, meddler sensor and many others.

B. PIR Motion Detection

Passive InfraRed detectors (PIR detectors) are electronic bias which measure infrared light radiating from objects in the field of view. PIRs are frequently used in the construction of PIR- grounded sensors, see below. Apparent stir is detected when an infrared emitting source with one temperature, similar to a mortal body, passes in front of a source with another temperature, similar as a wall.

FIG1: PIR Sensor

C. Arduino UNO

THE ARDUINO UNO IS A good sized BOARD OF ARDUINO. THEN UNO MANNERS OF' BONE ' IN ITALIAN. It's far known as UNO TO LABEL THE primary release OF THE ARDUINO software application software program. It's also the number one USB BOARD launched with the aid of manner OF AN ARDUINO. ITS prolonged HAULS ARE considered as the important BOARD hired in a single-of-a-type duties. ARDUINO. CC advanced THE ARDUINO UNO BOARD. ARDUINO UNO IS GROUNDED ON AN ATMEGA328P MICROCONTROLLER. It's clean to use in assessment to one-of-a-type boards, WHICH encompass THE ARDUINO MEGA BOARD, AND severe OTHERS. THE BOARD includes digital AND ANALOG enter/ AFFAIR LEGS (I/ O), SECURITIES, AND precise CIRCUITS THE ARDUINO UNO includes 6 ANALOG LEG INPUTS, 14 virtual LEGS, A USB CONNECTOR, A strength JACK, AND AN ICSP(IN- CIRCUIT PERIODICAL PROGRAMMING) identify. It's far PROGRAMMED GROUNDED ON IDE, WHICH STANDS FOR covered ENHANCEMENT surroundings. It could RUN ON each ON- LINE AND OFFLINE gadget.

FIG 2: Arduino UNO

D. FIR Sensor

Sensor module for deployment in honey alarm systems in Structures. A honey detector detects a honey within the Wavelength of 760nm – 1100 nm from a particular moderate pressure. At the same time as effective as a discovery outfit, it may Fluently get damages while subordinated to inordinate temperatures. Because of this, usually Function it at a selected distance from the honey strain. A honey detector's regular Honey Discovery distance is a hundred cm with a discovery station of six hundred. A honey detector will Have a digital or Analog signal. As a result paperwork is an vital 1 element in fire or Honey Preventing robots along with admonitions (honey admonitions). A honey detector comes as A unique sensor designed for seeing except responding to honey or fire Frequentness. In most instances, the invention response to the honey relies upon on its Fittings. As an instance, it could consist of a honey repression machine. Also, marketable Programs like boiler structures provide authentication of whether or not it(boiler) Works nicely or no longer. The response timeline of honey detectors proves much less speedy and correct than financial institution/ warmth Sensors because of its discovery medium. The jogging principle of a honey detector proves Sincere to all people familiar with detectors. One has to boom it with an electronic Circuit that makes use of a receiver inclusively with electromagnetic radiation. Nearly all of the Honey detectors I recognize use an infrared honey Flash style, which permits the detector to Serve without any coating of water vapor, dirt, oil portray, otherwise ice.

FIG3: Fir Sensor

E. DC MOTOR FORWARD REVERSE CONTROL

This circuit is designed to govern the motor within the forward and reverse route. It includes two relays named relay1, relay2.

• The relay ON and off is controlled through the pair of switching transistors. A Relay is nothing but an electromagnetic switching device which consists of three pins.

• They're not unusual, typically near (NC) and usually open (NO). The common pin of the relay is connected to the nice and terrible terminal of the motor via the snubber circuit respectively. The relays are linked within the collector terminal of the transistors T2 and T4.

• While excessive pulse sign is given to either base of the T1 or T3 transistors, the transistor is undertaking and shorts the collector and emitter terminal and When the pulse signal becomes 0 it will alert the base T2 or T4 transistor. So the relay became OFF country.

• Whilst relay 2 is within the ON nation and relay 1 is within the OFF state, the motor is jogging inside the reverse path.

FIG4: Dc Motor

F. OBJECT SENSING

This design is used to smell the object for different operations. The 4046 timer creator is used to induce 38 KHZ carrier signals which are transmitted through the sensor TSOP1038. The CD4046 micro power phase locked circle consists of a low power, direct, voltage controlled oscillator, a source follower, a Zener diode, and two phase comparators. The two phase comparators have a common sign enter and a common comparator enter. The signal input can be directly coupled for a large voltage signal, or capacitive coupled to the tone turning amplifier at the signal input for a small voltage signal. Phase comparator 1, an exclusive OR gate, provides a digital error signal and maintains 90 phase shifts at the VCO Center frequency between signal input and comparator input; it may lock onto the signal input frequency that are close to harmonics of the VCO Center frequency. Phase comparator 2 is a part controlled digital reminiscence. It provides a digital error signal to indicate a locked condition and maintain a 0phase shift between signal input and comparator input. The direct voltage controlled oscillator produces an affair signal whose frequency is determined by the voltage at the VCO input, and the capacitor and resistors at the VCO input and the capacitor and resistors connected to leg C1a, C1b, R1 and R2.

G. LCD DISPLAY

- Crystalloids fleck – matrix (alphanumeric) liquid demitasse displays are available in TN, STN types, with or without backlight. The use of C-MOS TV regulator and motorist ICs affect low power consumption. These modules can be conceived with a 4- bit or 8- bit microprocessor Micro regulator.
- Correspond to high speed MPU interface (2 MHz)
- 80 x 8 bit display RAM (80 Characters maximum) bit character creator ROM for a total of 240 character sources. 208-character sources (5 x 8 blotches) 32-character sources (5 x 10 blotches)
- 64 x 8 bit character creator RAM 8 character creator RAM 8 character sources (5 x 8 blotches) 4 characters sources(5 x 10 blotches) Programmable duty cycles – for one line of 5 x 8 blotches with cursor – for one line of 5 x 10 blotches with cursor – for one line of 5 x 8 blotches with cursor Wide range of instruction functions display clear, cursor home, display on/ off, cursor on/ off, display character blink, cursor shift, display shift. Automatic reset circuit, that initializes the controller/ automobile list ICs after power on.

H. Alarm

A buzzer or beeper is a signaling device, generally electronic, generally used in motorcars, ménage appliances similar to a microwave oven roaster, or game shows. It most generally consists of a number of switches or detectors connected to a control unit that determines if and which button was pushed or a present time has lapsed, and generally illuminates a light on the applicable button or control panel, and sounds a warning in the form of a nonstop or intermittent buzzing or telephoning sound. originally this device was grounded on an electromechanical system which was identical to an electric bell without the essence gong (which makes the ringing noise). frequently these units were anchored to a wall or ceiling and used the ceiling or wall as a sounding board. Another perpetration with some AC- connected bias was to apply a circuit to make the AC current into a noise loud enough to drive a loudspeaker and hook this circuit up to a cheap 8- ohm speaker. Currently, it's further popular to use a ceramic- grounded piezoelectric sounder like a Son alert which makes a high-pitched tone. Generally these were hooked up to " motorist" circuits which varied the pitch of the sound or palpated the sound on and off.

FIG5: LCD Display

BLOCK DIAGRAM

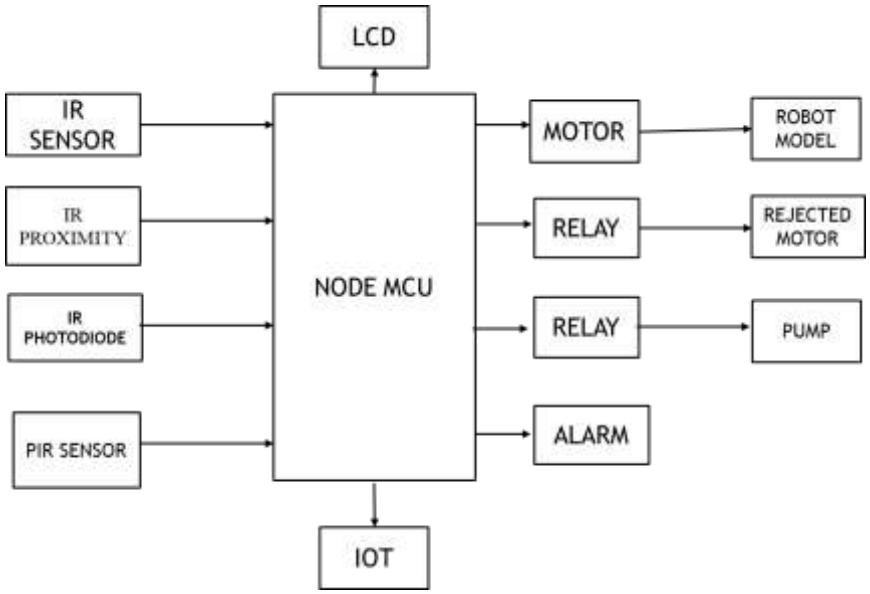

Fig 6: block diagram

The IR sensor module will be used to detect the presence of fire or heat in the environment. The IR photodiode module will be used to detect the presence of flames, while the PIR sensor module will be used to detect the movement of people or animals in the environment. The IR proximity sensor module will be used to detect obstacles and avoid collisions.

RESULT

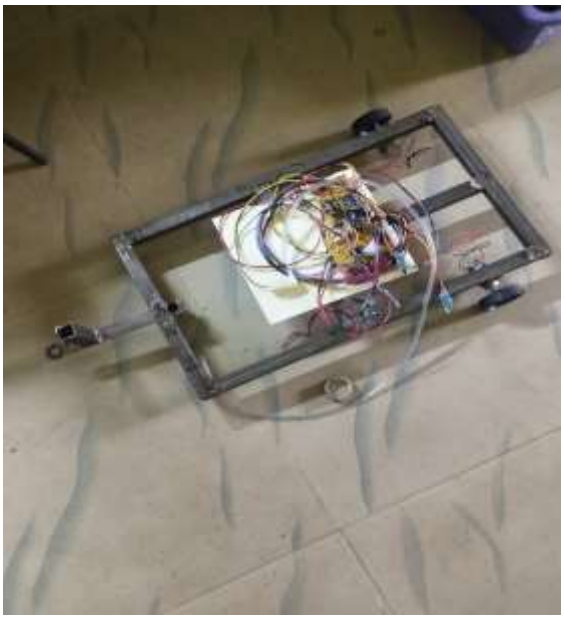

FIG 7: Model of Fire Fighting Robot

FIG 8: Side View of Model

FIG 9: Front View of Model

Conclusion

In conclusion, an automatic fire extinguisher robot using IoT is a promising technology that can help prevent fires and protect lives and property. By leveraging IoT sensors and connectivity, such a robot can detect fires early, navigate to the location of the fire, and extinguish it autonomously. Some potential benefits of this technology include faster response times, reduced damage to property, and improved safety for people in the vicinity of a fire. Additionally, IoT-enabled fire extinguisher robots could be used in a variety of settings, such as homes, offices, and factories, to prevent fires before they get out of control. However, there are also some challenges to implementing this technology, such as ensuring the robot is reliable and safe, integrating it with existing fire safety systems, and managing the data and connectivity required for IoT functionality. Overall, an automatic fire extinguisher robot using IoT has the potential to be a valuable tool in fire prevention and safety, but careful consideration and testing are needed to ensure it is effective and practical in real-world situations.

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