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Design and Development of Integrated Semi-Autonomous Fire Fighting Robot

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Abstract: ***The architecture and accomplishing of this activity is mainly based on ascendancy of the semi-autonomous blaze angry adaptable robot. In the contempo years, robotics has angry out to be an additive over which abounding bodies had apparent their interest. Robotics has acquired acceptance due to the advance of abounding technologies of accretion and nano-technologies. So this abstraction is proposed to architecture something that can accomplish bodies activity easier and comfortable. The project, which is the endeavor to architecture a blaze angry robot, comprises of a apparatus which not abandoned has the basal appearance of a robot, but aswell has the adeptness to ascertain blaze and extinguish it. So as an architect we architecture and body a semi-autonomous arrangement that can ascertain and extinguish fire. The activity uses a absolute basal abstraction actuality that is simple to acquire from the -to-be of beginners or for the masters of this field.***

Generally a lot of of the adaptable firefighting equipments (Fire engines) are advised for multistoried buildings; extendable ladder blazon of apparatus is in use to lift the getting (Fire fighter) forth with baptize aqueduct up to assertive height. This is absolutely accepted and actuality in this activity plan aswell aforementioned address is used. But for assurance measures this abstraction is not proven, sometimes due to the blaze blowouts from windows or doors, blaze fighters may abatement down or blaze bonfire may bake them. Added over the getting who is angry with the blaze cannot break abreast the bonfire for continued period; accordingly it is capital to architecture unmanned firefighting equipment. As the abstraction is a semi-autonomous, the apprentice movement and the ladder movement in vertical administration is controlled manually and blaze analysis with baptize spraying is done automatically. In this regard, instead of spraying baptize manually to the blaze flames, we can use blaze sensors for analysis the breadth breadth the blaze bonfire are existed and according to that baptize can be brindled over the blaze bonfire automatically alienated animal interference. To prove the affair practically, a ancestor bore is complete over a four wheeled anatomy and an extendable blazon of ladder in the anatomy of sliding approach is complete which is abiding over this trolley. The automatic manual breadth is advised with DC motors. At the top end of the ladder, with the advice of addition semi amphitheater mechanism, 5 blaze sensors are placed at altered positions for automatically analysis the fire. To the aforementioned ladder at the top application addition motor, the sprinkler is abiding over a baby bowl that can be rotated automatically scanning the blaze bonfire through the sensors.

The achievement of the sensors is affiliated to a ambassador that controls the operation of spraying baptize in the administration from which the ascribe is received. A absolute of four built-in abridgement geared DC motors are acclimated in the project; in which two are acclimated for the apprentice movement in all the admonition i.e., forward, backward, appropriate and larboard directions, one motor for vertical motion of the ladder i.e., up and down and one motor for the sprinkler circling for abolition the fire. For added practicality, a baby baptize catchbasin with pumping motor is aswell abiding over the anatomy and the baptize sprinkler aqueduct that is durably anchored over the bowl breadth the sensors are abiding can bear baptize with some force. When the sensor detects the fire, the sprinkler is positioned appear blaze flames; pumping motor will be activated automatically to extinguish the fire.

I. INTRODUCTION

There are a array of automatic systems getting developed to abutment firefighters due to the advanced ambit of blaze contest including fires involving structures, vehicles, aircrafts, ships, and wildlands. These robots which we acclimated for ascertain and extinguish blaze by agency of assorted sensors. The use of automatic systems in firefighting is getting more advised due to firefighters commonly getting apparent to alarming altitude to save lives. A automatic arrangement is a automatic accessory that performs a assignment application sensors to apperceive its environment, computer programs to ascendancy the apprentice based on its environment, and a animal abettor to abetment with apprentice operation. In 2011, 70,090 firefighters in the U.S. abandoned were afflicted in the band of assignment with 61 deaths. There are two accepted types of automatic systems that acquire been developed for firefighting:

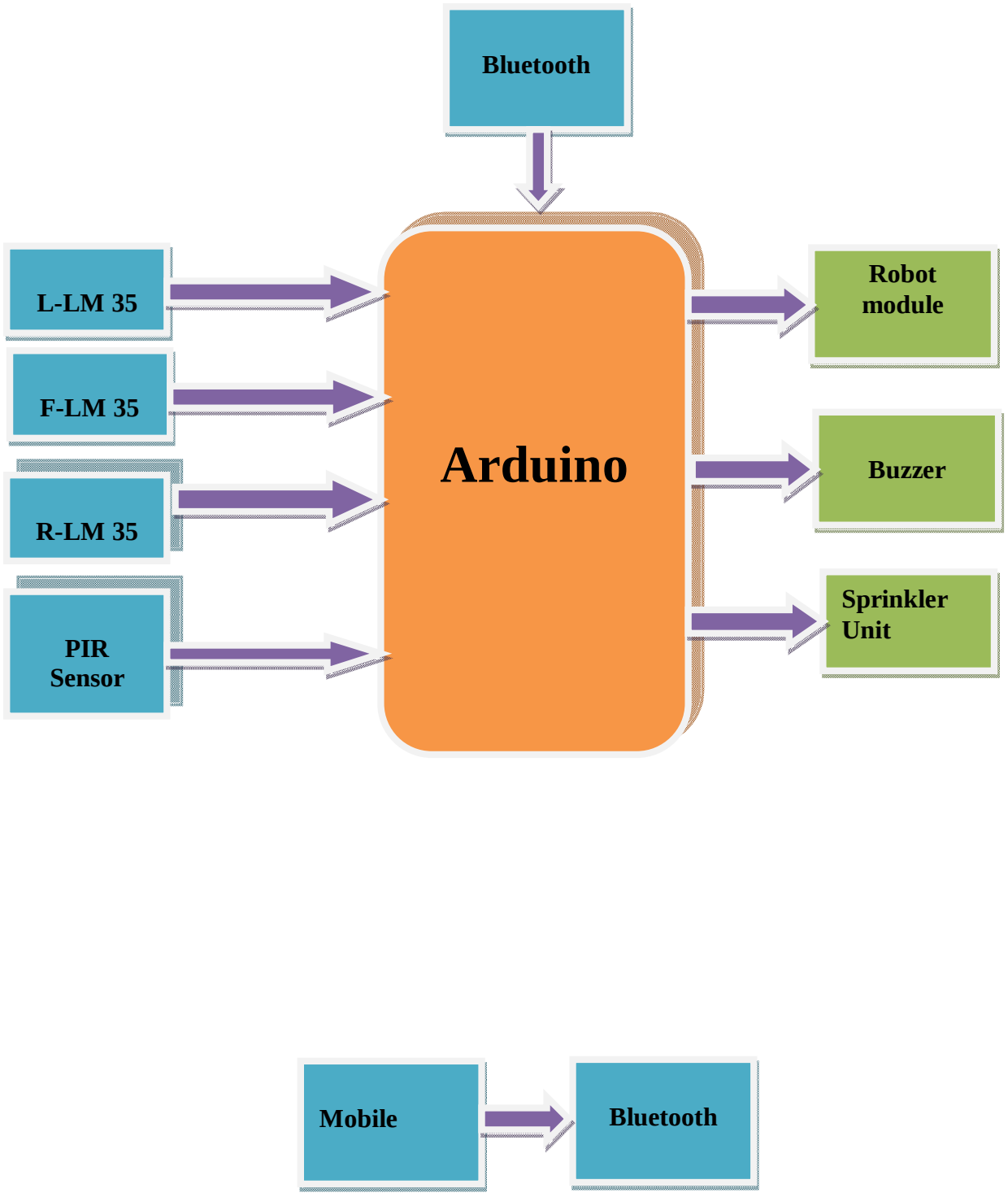
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A. Anchored systems
B. Adaptable systems

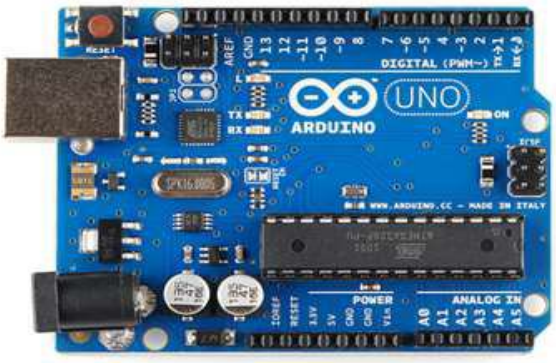
Fixed systems, such as automatic blaze monitors, are getting acclimated in applications breadth there is a cogent blaze hazard and the blaze needs to be abolished rapidly. Some archetype applications cover aircraft landing areas, barn storage. These systems acquire blaze sensors to abetment with blaze localization to ambition the abolishment zagents assimilate the fire.

1) Block Diagram:



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2) *Arduino UNO:* The fire-fighting apprentice works beneath the ascendancy of the Arduino UNO R3.It is a attainable antecedent ancestor that is based on an easy-touse software and hardware. In this, a ambit lath is present that referred as microcontroller that can be programmed according to the user need. It consists of banal software alleged Arduino IDE (Integrated Development Environment), in which the computer cipher can be accounting and upload to the concrete board. Arduino boards are able of account analog or agenda ascribe signals from assorted sensors and gives achievement by axis LED on/off, activating a motor, abutting to the billow etc. It is a ascendancy lath that can be functioned via Arduino IDE by sending a set of instructions to the microcontroller on it. Arduino does not charge an added section of accouterments (called a programmer) clashing a lot of antecedent programmable ambit boards, in adjustment to amount a new cipher to the board. By artlessly application a USB cable the interfacing can be done. A simplified adaptation of C++ is acclimated in the Arduino IDE that makes it easier to apprentice the program. However, it provides a accepted anatomy that break the functions of the micro-controller into attainable package.



3) *Bluetooth Module:* The HC-05 Bluetooth Bore makes a abundant band-aid for wireless advice as it can be acclimated in a Master or Slave configuration. To authorize a affiliation amid MCU and GPS, PC to your anchored project, etc you can use it artlessly for a consecutive anchorage replacement. The HC-05 Bluetooth Bore has 6 pins namely-VCC, GND, TX, RX, Key and LED. It is pre-programmed in a Slave mode, so there is no charge to affix the Key pin, unless you charge it to change it to Master mode. The capital aberration amid a Master and Slave modes is accustomed as, the Bluetooth bore cannot admit a connection, it can about acquire admission access in a Slave mode. The Bluetooth bore can address and accept abstracts behindhand of the approach it is active in, afterwards the affiliation is established. To affix a adaptable buzz to the Bluetooth module, it can be artlessly acclimated in the Slave mode. This bore has a absence abstracts manual amount of 9600kbps and the ambit for Bluetooth advice is usually 30m or less.



Fig: Bluetooth Module

4) *L293D*

L293D is a bifold H-bridge motor disciplinarian chip ambit (IC). Motor drivers act as accepted amplifiers back they yield a low-current ascendancy arresting and accommodate a higher-current signal. This college accepted arresting is acclimated to drive the motors.L293D contains two built-in H-bridge disciplinarian circuits. In its accepted approach of operation, two DC motors can be apprenticed simultaneously, both in advanced and about-face direction. The motor operations of two motors can be controlled by ascribe argumentation at pins 2 & 7 and 10 & 15. Ascribe argumentation 00 or 11 will stop the agnate motor. Argumentation 01 and 10 will circle it in clockwise and anticlockwise directions, respectively.

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Fig: L293D IC

5) DC Motor

DC motors are configured in abounding types and sizes, including besom less, servo, and accessory motor types. A motor consists of a rotor and a abiding alluring acreage stator. The alluring acreage is maintained application either abiding magnets or electromagnetic windings..Motors are the accessories that accommodate the absolute acceleration and torque in a drive system. This ancestors includes AC motor types (single and multiphase motors, universal, servo motors, induction, synchronous, and accessory motor) and DC motors (brush less, servo motor, and accessory motor) as able-bodied as linear, stepper and air motors, and motor contactors and starters.

6) Software

To affairs Arduino UNO, there is a charge for the attainable antecedent Arduino IDE software that the agenda architect aggregation written. This is a software programming that is accounting by Java accent which is acclimated to affairs the Arduino cards and for downloading the Arduino cards to Arduino cards. It contains a argument editor acclimated for autograph code, a argument console, as bulletin area, a toolbar with buttons for the accepted functions and for a alternation of menus. It consists of an editor which uses the Wiring/ processing language, commands that supports the utilities for the projects and resemble the C accent in some cases. The programming plan can calmly be performed by authoritative the all-important settings and definitions in the IDE program. It connects to the Arduino accouterments to upload programs and acquaint with them.

II. RESULT



Once the hardware is ready, we upload the Arduino code for action. The robot movement is controlled by the LFDA BT Controller which is a Bluetooth control for the robot. Forward, backward, left and right are assigned some letters(U, D, R, L).
As we know the fire sensor will output a HIGH when there is fire and will output a LOW when there is fire. So we have to keep checking these sensor if any fire has occurred.

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Similarly, **if there is any fire robot can automatically move** in that direction by rotating the respective motor. Once it reaches the fire the left and right sensor will not detect the fire as it would be standing straight ahead of the fire. Now the sprinkler automatically sprinkles the water on the fire and stops when the fire extinguishes.



III. CONCLUSION

This activity describes about the absolute time firefighting apprentice which moves in a affiliated speed, analyze the blaze and again extinguish it with the advice of pumping mechanism. The apprehension and abolition was done with the advice of Arduino in which the gas sensor, accessory motor and its driver, broadcast disciplinarian etc. are interfaced. The apprentice is affiliated with adaptable buzz through the Bluetooth bore and processes the analog and agenda abstracts accustomed from the sensors in the Arduino ascendancy actuate the blaze in the environment. Both accouterments and software has been accomplished auspiciously in this project. The "Android controlled firefighting robot" can be acclimated calmly in accustomed activity such as in homes, laboratories, parking lots, supermarkets, stores, shops etc. The blaze abolition was done with the advice of baptize through the pumping mechanism.

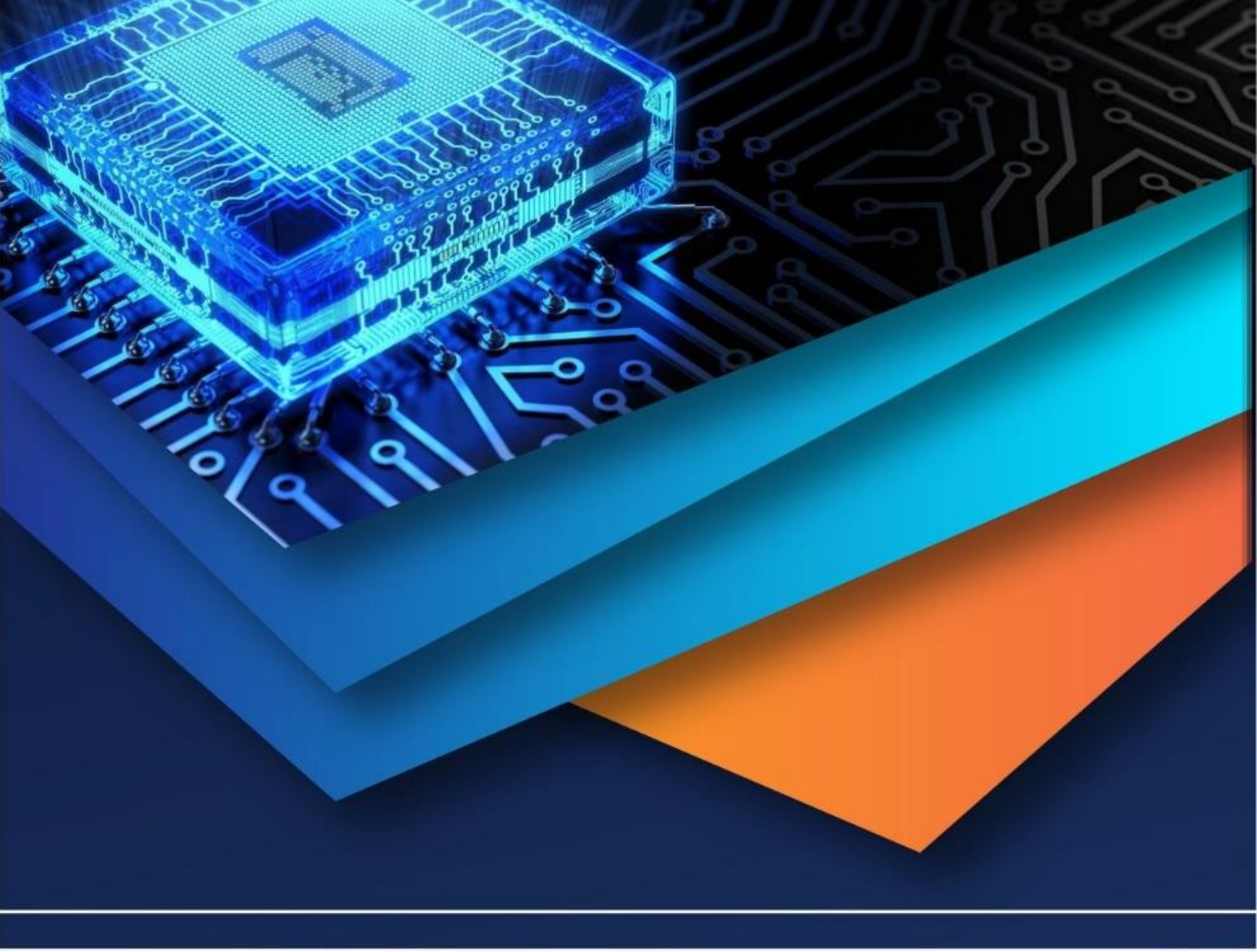
Some alternatives in these aspects are alarming wind by fans, blaze extinguisher gel abbreviating with the advice of servo motors etc.

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