

Fire Fighting Robot

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Abstract:- The main goal of this project is to develop a robotic vehicle which is used to find and fight fire remotely through RF application in an event of any major fire hazard particularly in industries. Major fire accidents do occur in industries like nuclear power plants, petroleum refineries, gas tanks, chemical factories and other large-scale fire industries resulting in quite serious consequences. Thousands of people have lost their lives in such mishaps. Therefore, this project is enhanced to control fire through a robotic vehicle. With the advancement in the field of Robotics, human intervention is becoming less everyday and robots are used widely for purpose of safety. In our day to day life fire accidents are very common and sometime it becomes very difficult for fireman to save human life. In such case fire fighting robot comes in picture. The fire extinguishing robotic vehicle can be controlled wirelessly through RF communication. The vehicle is controlled through connected remote key input. The language input allows a user to interact with the robot which is familiar to most of the people. The medium of interaction between humans and computers is on the processing of speech. The proposed vehicle has a water jet spray which is capable of sprinkling water. The sprinkler can be moved towards the required direction. The advent of new high-speed technology provided realistic opportunity for new robot controls and realization of new methods of control theory. This technical improvement together with the need for high performance robots created faster, more accurate and more intelligent robots using new robot control devices, new drivers and advanced control algorithms. This project describes a new economical solution of robot control systems. The presented robot control system can be used for different sophisticated robotic applications.

The controlling devices of the whole system are Microcontrollers, wireless transceiver modules, water jet spray, DC motors and buzzer are interfaced to Microcontroller. When the user fed the commands through a remote controlled device, the microcontroller interfaced to it reads the command and sends relevant data of that command wirelessly using transceiver module. This data is received by the transceiver module on the robot and feeds it to microcontroller which acts accordingly on motors and pump. The complete system consists of two subsystems transmitter section and the receiver section. This project controls left, right, forward and backward movement of robot wirelessly within 500m range using 433 MHz RF frequency. At the receiver side of robot PIC microcontroller is also used. The microcontroller takes command wirelessly transmitted by a RF transmitter. The need for a device that can detect and extinguish a fire on its own is long past due. Many house fires originate when someone is either sleeping or not home. With the invention of such a device, people and property can be saved at a much higher rate with relatively minimal damage caused by the fire. Our main objective was to design and build a prototype system that could autonomously detect and extinguish fire.

INTRODUCTION:

Fire-fighting is an important but dangerous occupation. A fire-fighter must be able to get to a fire quickly and safely extinguish the fire, preventing further damage and reduce fatalities. Technology has finally bridged the gap between fire fighting and machines allowing for a more efficient and effective method of fire fighting. Robots 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. Our world is currently facing the global warming whereby the average temperature of our earth atmosphere and oceans is increasing year by year. Studies show that our earth mean surface temperature has increased about 0.8C which about two-third of increase occurring since 1980. The global warming of the earth may lead to more forest fire and fire disaster occur as everything gets more flammable due to the high temperature of our earth atmosphere. Therefore, fire extinguishing robot is needed to reduce all the damage caused by natural or human made fire disaster. The project aims at designing an intelligent live video feedback voice operated fire extinguishing robotic vehicle which can be controlled wirelessly.

The project aims at designing an intelligent voice operated fire extinguishing robot which can be controlled wirelessly through RF communication. The Robot has a

camera mounted on it whose direction can also be controlled using voice commands. The proposed vehicle has a water jet spray which is capable of sprinkling water. The sprinkler can be moved towards the required direction. The advent of new high-speed technology provided realistic opportunity for new robot controls and realization of new methods of control theory. This technical improvement together with the need for high performance robots created faster, more accurate and more intelligent robots using new robot control devices, new drivers and advanced control algorithms. This project describes a new economical solution of robot control systems. The presented robot control system can be used for different sophisticated robotic applications. Whether due to technological curiosity to build machines that mimic human's or desire to automate work with machine, research in speech recognition as a first step towards human-machine communication. The controlling devices of the whole system are Microcontrollers, wireless transceiver modules, water jet spray, DC motors and buzzer are interfaced to Microcontroller. When the user fed the voice commands to the speech recognition module, the microcontroller interfaced to it reads the command and sends relevant data of that command wirelessly using transceiver module. This data is received by the transceiver module on the robotic vehicle and feeds it to microcontroller which acts accordingly on motors, pump and lamp.

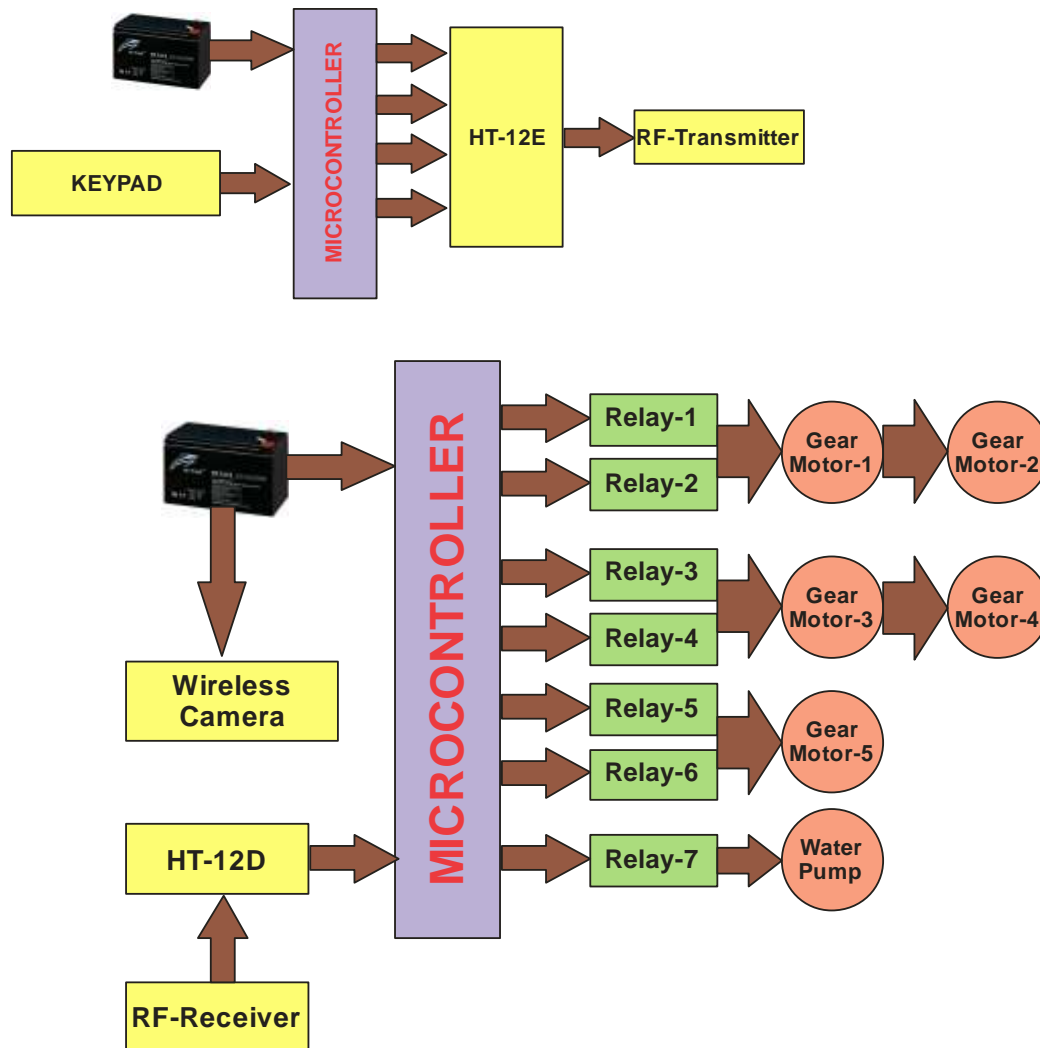
The project provides the following learning's:

1. RF transmitter and receiver module operation.
2. Interfacing of RF modules to Microcontroller.
3. DC motors working and need for motor driver.
4. Interfacing RF modules to Microcontroller.

The main building blocks of the project are:

1. Regulated Power Supply.
2. Microcontrollers.
3. RF transmitter and receiver module.
4. Wireless Transceiver modules.
5. DC motors with driver.
6. LED indicators.

BLOCK DIAGRAM:



Block Diagram Description:

Above figure shows the building blocks of the proposed work "Fire Fighting Robot" which consists of a regulated power supply unit, microcontroller, a speech recognition module, DC motors, water pumps etc. The power supply unit provides regulated supply of 5v and 12v DC. Power supply design consists of various steps like step down transformer, rectification, filtering and regulator. This power supply provides supply to all the components in the circuit as per the requirement. The microcontroller is the brain of the complete circuit. The microcontroller used in this application is a PIC microcontroller which operates on 5v DC supply. This controller is programmed to perform the desire operation of the prototype module. This

microcontroller commands the robot according to the speech recorded in the speech recognition module.

The circuit is subdivided into two parts:

1. Transmitter section.
2. Receiver section.

The transmitter section consists of a keypad for controlling the robot, a microcontroller, and a RF transmitter. The microcontroller used here is a PIC microcontroller. In this system a keypad containing various switches for the controlling of the robot is interfaced with the microcontroller. In this system six switches are connected, 4 out of which are used to move the robot in 4 directions and 2 are used for the movement of the ARM of the robot. When the user presses a switch, robot will move in particular direction as per the stored program in the

controller IC. The microcontroller interfaced to it reads the command and sends relevant data of that command wirelessly using RF transmitter. A HT-12E encoder circuit is used to encode the data to be transmitted by the RF transmitter.

The receiver section consists of a RF receiver along with a decoder, microcontroller, DC motors interfaced with microcontroller through relays, a water pump etc. The data from the transmitter is received by the RF receiver on the robot. This received data is then decoded and feeds it to microcontroller which acts accordingly on the arm and

pump. In this application the DC motors are interfaced with the microcontroller through the relay driver IC ULN2803A. The prototype consists of 4 motors for the movement of the robot and one for the ARM of the robot. 7 relays are used in this project out of which 6 are used to drive the motors and one for the action of the pump.

A wireless camera is connected to the arm of the robot. This camera is used for viewing the live images on PC.

CIRCUIT DIAGRAM:

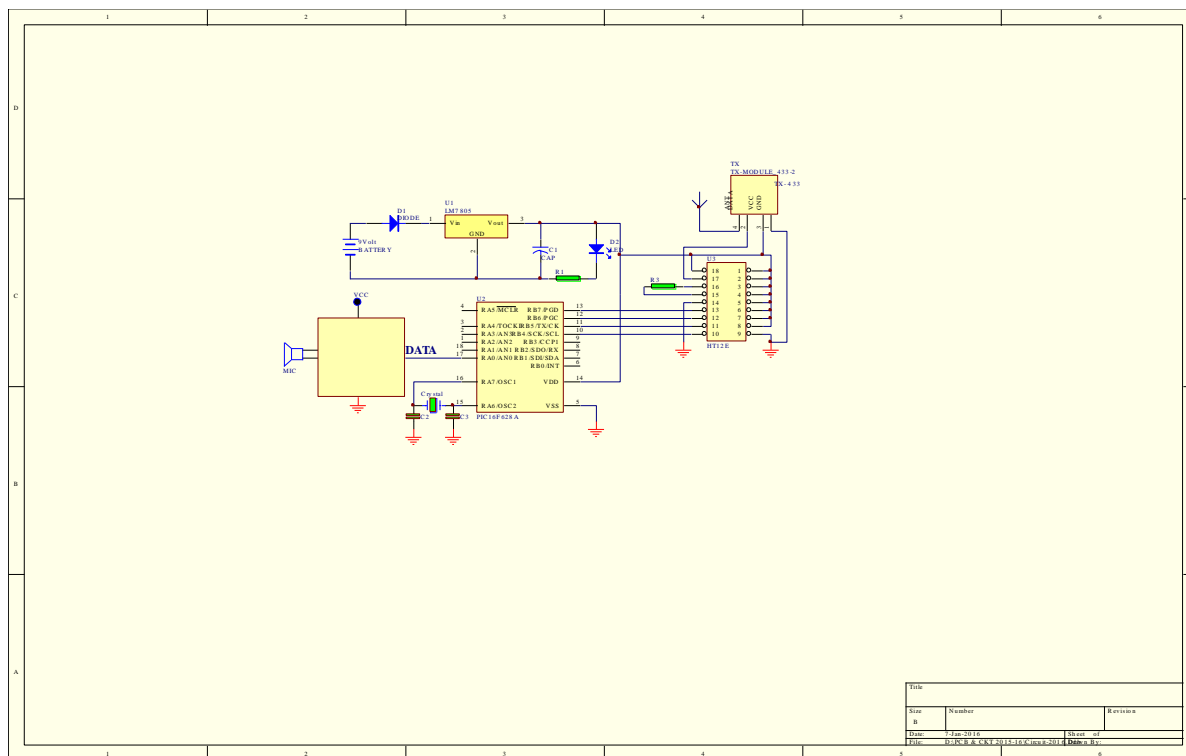


Fig: Transmitter section

WORKING:

The power supply:

To drive every one of the segments in the transmitter segment 5V dc and 12V dc are required. The mains give the 230V air conditioning. The 230V air conditioning is ventured down to 12V air conditioning by utilizing venture down transformer. At that point the yield is given to the full wave rectifier. The rectifier takes out the negative crest voltage of the info voltage .The yield of the rectifier is the throbbing dc. The blunder heartbeats are dispensing with by utilizing capacitor channel. At that point the yield at the parallel of the capacitor is the 12V dc. In any case, the Micro Controller takes a shot at 5V dc .To change over the 12V dc into 5V dc a controller is utilized. The yield of the controller is consistent regardless of the info voltage. At the transmitting end, orders are sent to the recipient to control the development of the robot either to push ahead, in reverse and left or right and so on. The changes associated with the transmitter are utilized to move the robot and arm of the robot. In the wake of squeezing specific switch the

transmitter sends the sign to the collector with the guide of the RF transmitter module. The microcontroller is customized to recognize this information i.e. to which paired code. This information is then changed over to the applicable structure by the microcontroller, and is sustained to the RF transmitter for the transmission purpose. The RF transmitter goes about as aRF remote control that has the point of preference ofadequate range (up to 500 meters) with legitimate radio wire. Before transmitting the information to the collector this information is expected to encode by HT12E encoder. The RF transmitter is interfaced with the microcontroller through this HT12E encoder. The HT 12E Encoder ICs are arrangement of CMOS LSIs for Remote Control framework applications. They are fit for Encoding 12 bit of data which comprises of N location bits and 12-N information bits. Every location/information is remotely trinary programmable if fortified out. All address pins of HT12E is grounded. In this way the information encoded by HT12E will be 0111. This encoded information is accessible at pin 17 of HT12E. The RF transmitter recurrences regulate

information flag and transmit utilizing reception apparatus. For RF transmission purposed it is expected to encode the sign produced with the help visual essential code. This

information is then transmitted by the RF transmitter. This transmitter sends the information in binary form to the receiver.

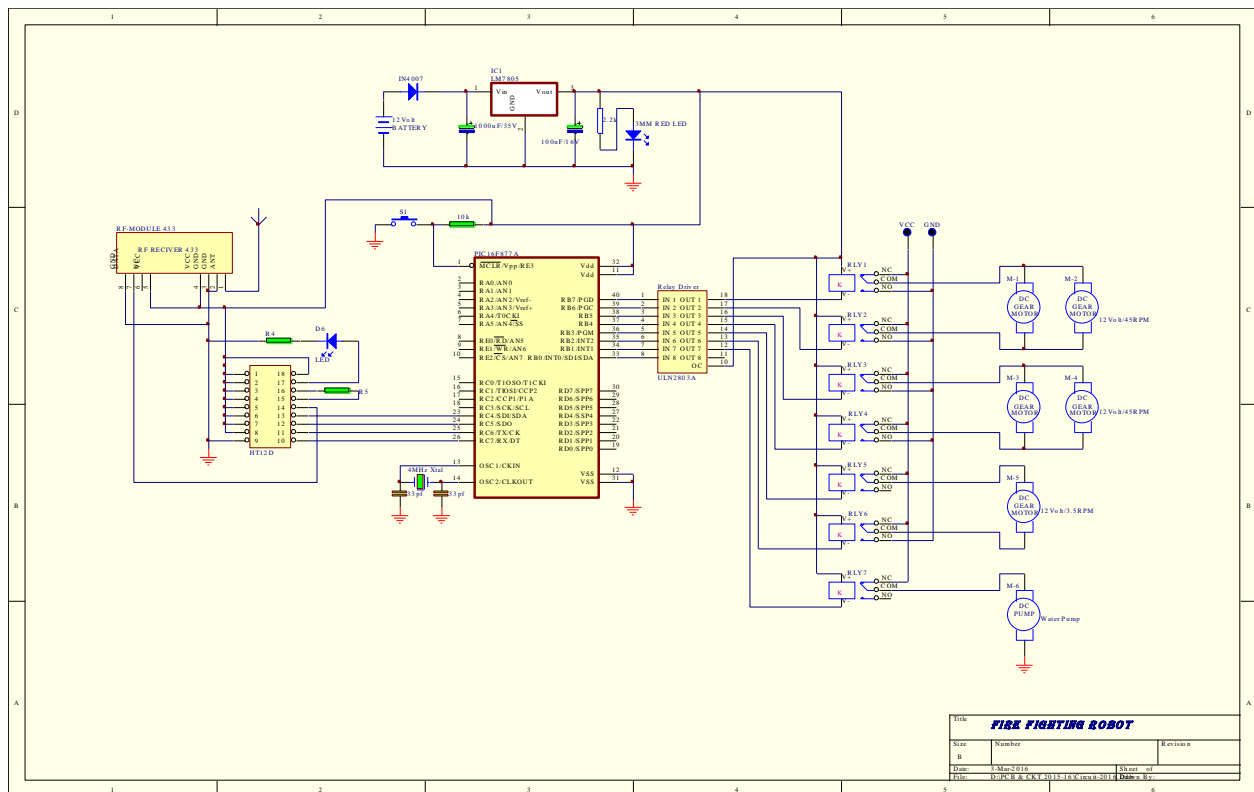


Fig: Receiver Section

WORKING:

The power supply

To drive every one of the parts in the recipient area 5V dc and 12V dc are required. Two 6v batteries associated in arrangement are utilized to give the obliged energy to the circuit. Since the microcontroller and different segments in the circuit requires directed 5v supply a voltage At the recipient area the information is gotten by the RF collector. Since the information is encoded amid the transmission it should be decoded before bolstered to the microcontroller. HT 12D Receive and disentangle 12 bit encoded information transmitted by HT12E, for further preparing. The HT12D is 12 bit decoders are a progression of CMOS LSIs for remote control framework applications. They are combined with Holtek's 2¹² arrangement of encoders. For legitimate operation, a couple of encoder/decoder with the same number of locations and information configuration ought to be picked. The decoders get serial locations and information from a customized 2¹² arrangement of encoders that are transmitted by a bearer utilizing a RF transmission medium. They look at the serial information three times constantly with their residential locations. On the off chance that no mistake or unmatched codes are found, the information codes are decoded and afterward exchanged to the yield pins. The VT stick likewise goes high to demonstrate a substantial transmission. The 2¹² arrangement of decoders are equipped for deciphering data that comprise of N bits of location and 12_N bits of information. Of this arrangement, the HT12D is organized

to give 8 address bits and 4 information bits. This information is then given to the microcontroller. The microcontroller forms this information as indicated by the information got that is which order is acquired. To give the orders to the robot switches are utilized here are four switches are associated for forward, in reverse, right and left development of the robot. The robot is stacked with water tanker and a pump which is controlled over remote correspondence to toss water. At the accepting end five engines are interfaced to the microcontroller where four of them are utilized for the movement of the vehicle and the one is to position the arm of the robot. What's more, one DC pump engine is utilized for the activity of the water pump. The receiver translates before nourishing it to another microcontroller to drive DC engines by means of engine driver IC for vital work. A water tank alongside water pumps mounted on the robot body and its operation is carried out from the microcontroller yield through appropriate signal from the transmitting end. The entire operation is controlled by PIC microcontroller. A transfer driver IC ULN2803A is interfaced to the microcontroller through which the controller drives the engines.

In this application engine 1 and engine 3 are drive to move the robot in the forward heading. The engine 2 and 4 are drive to move the robot in the regressive heading. To move the robot in the left course engine 1 and 4 ought to be empowered. What's more, for the right development of the robot engine 2 and 3 are utilized. Engine 5 will move the ARM of the robot UP and DOWN. At the point when there

is a charge "flame" is acquired then to empower water pump the engine 6 will be empowered and the water is tossed out by the water pump. The activity of the water pump is relies on the yield of the flame sensor. Here the flame sensor is a thermistor. The flame sensor is interfaced with the microcontroller and mounted on the robot body. To stop the activity of the framework the recipient ought to get the paired code of 1111. Further the undertaking can be improved by interfacing it with a remote camera so that the individual controlling it can see operation of the robot remotely on a screen. A VGA remote camera is utilized as a part of this anticipates. A VGA camera utilizes a visual illustrations cluster of 640 pixels wide and 480 pixels high, about what might as well be called a 0.3 megapixel image. Regulator IC 7805 is utilized. Some air conditioner swells can be available in the supply. These blunder heartbeats are disposing of by utilizing capacitor channel.

APPLICATIONS

1. It guides the blind persons to reach a particular destination by using the voice feature.
2. It is used in hazardous places.
3. It warns the person against the intruders.
4. Useful in controlling fire at extreme places where human being cannot reach.

RESULT AND DISCUSSION:

The robotic vehicle, i.e. transmitter section and receiver section had been designed and the programs were burned into both the PIC microcontrollers at receiver and transmitter section. The project is successfully tested for all the commands and it also detected the fire with the help of a flame sensor. Once the flame is detected, a buzzer is activated and a motor drives the water pump. The commands are provided by pressing the switches connected on the transmitter section for forward, backward, right and left movement of the robotic vehicle. A camera is provided to get the live video feedback of the room for the smooth movement of the robot.

CONCLUSION:

We have presented a live video feedback wireless controlled fire extinguisher with a speech recognition module. The security system of the home and building contains fire fighting robot security vehicle, RF module. The main controller of the fire fighting robot is a microcontroller. We programmed the microcontroller to control the robotic vehicle to acquire flame sensor data, and run the vehicle towards fire by giving directions using speech recognition module. Once the flame is detected by flame sensor, buzzer is activated. The water pump is activated in automatic mode.

FUTURE SCOPE

Some of interfacing applications which can be made are controlling home appliances, robotics movements, Speech Assisted technologies etc. By making it GPS enabled, robot can be controlled from remote station also. A CO2 booster can be attached to make it powerful extinguisher.

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