Fire Fighting Robot

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Abstract:- It's necessary and very dangerous work to fight against flames. The implementation of this project is automatized as well as manualized. This project uses ARM7. In sectors such as nuclear power plants, petroleum refineries, gas tanks, chemical plants and other large-scale industries, the majority of fire incidents occurs, which results to complex situations. More number of people have lost their lives because of such incidents. We are mounting a Wi-fi module (Node MCU) for mobile communication and many other sensors to detect the fire and smoke. We use the BLYNK/TCP terminal program for mobile control of the robot. The size of the robot is around 20 cm long and 10 cm tall, capable of carrying an extinguisher (gas). 12V 1.3Ampere hours of battery power. Keil M Vision 4, Flash Magic and Embedded C are the applications used for this project.

Keywords:- Fire Fighter Robot, Extinguisher, Control, Sensors , Alert , Communication.

I. INTRODUCTION

The Fire Fighting Robots are most popularly searched to prevent the fire injuries and to improve the effectiveness of the robot. In order to determine the lead of the fire to the robot , smoke and fire (thermal) reflections can be clued. The project aims to design a robotic fire extinguishing vehicle that can be operated both wirelessly and manually. The main objective of the project is to automatically or manually design and implement a fire fighter robot to extinguish fire. The robot is equipped with sensors that help us detect fire, smoke or any obstacles in its path. The proposed vehicle has a gas spray which, compared to water, is able to extinguish fire at a faster rate. The robot control system presented here can be used for various robotic applications.

II. LITERATURE SURVEY

A. Paper [1] - "Implementation methods of fire fighting robot"

Author - Mrs. Bhavna K. Pancholi, Miss. Kena Patel

The robot presented here is an embedded device in real time. C language is the software used to implement this type of robots. During automatic mode the robot tracks the environment to detect fire accidents. This robot uses IR sensors and output of this electrical sensors is fed to amplifier transistor. This signal is later fed into the micrcontroller's IN-pin. When a fire is observed, the microcontroller drives the motors and triggers the actuators. A water reservoir is mounted on the frame which has 10rpm DC pump motor. The water reservoir is attached to the hose and the end of which is placed on the robot's head .

The water is sprayed to the flames in order to eliminate the fire. This paper also shows us how a robot is voice controlled. The robot is operated through the speech system. The commands are given to the robot in order to make them operated. The advantage of this type of robot is , hand free operation and fast data input. Disadvantage is the robot is affected by the environmental or external noise.

B. Paper [2] – "Intelligent fire fighting tank robot."

Author - E. Merry Sartika , Kristi Kosasih, Dan Muliady, M. Jimmy Hasugian.

The tank robot is made of a mixture of acrylic, plastic, aluminum and iron. There are two servo motors for each wheel, two DC motors for two flame extinguishing fans, there are many other sensors like ultrasonic, compass, flame thermal array and many other. The robot is switched on by the sound and a sound activator circuit is mounted on it. The audio activation circuit consists of a Dual Tone Multi Frequency receiver and transmitter. Microcontroller AVR ATMega16 receives data from a sound activation circuit, an infrared and photodiode circuit as a white detector, a micro switch sensor as a furniture detector, UVTRON and TPA81 as flame detectors and thermal detectors, CMPS03 as navigation detectors, SRF04 as ultrasonic sensors. Microcontroller processes signal inputs and delivers signal outputs to the servo motor (GWS S03 4.8V) on the front-left wheel and the front-right wheel, and the DC motor to spin the fan to extinguish the flame.

C. Paper [3] – "Design and Implementation of Remote Controllers for Rescue Robots Used at Fire Sites."

Author - Ho Kang, Young-Duk Kim, Duk-Han Sun, Young-Sun Ryuh , Jeon-Il , Jinung An .

There are 2 types of remote controllers in this project namely ultramobile personal computer and the other is Joystick personal platform. Though these are 2 different platforms their architectures are identical. The entire remote control system and the rescue robot is installed at the fire station. The communication between the controller and the robot starts with the use of fire station. Since fast data transmission is required , separate wireless channels are used. These separate wireless channels also offers low signal interference. This robot is mainly mounted with a camera for visual display , a LED to guide the evacuation path and different other sensors to measure the intensity of gases which are poisonous in the atmosphere. The informations are gathered and will be sent to the user using channels which are wireless. This robot plays a very important role in performing

rescue operations. For easy transportation and portable size UMPC type is used and joystick type is used for stable manipulations.

D. Paper [4] –" Advance Virtual RISC based Fire Fighting Robot"

Author - Miss. Shraddha K. Dubal, Miss. Supriya S. Kadam, Miss Pratima S. Mane, Miss. Dipali A. Mali.

This paper deals with the AVR-based firefighting robot. Infrared waves are not apparent to human eyes. So an infrared sensor is used. This is a tiny circuit which is used to send or receive the radio signals on range of the carrier frequencies. GSM is a data communication device for sending and receiving Radio Frequency signals wirelessly, which requires a wireless carrier sim card for its operation. The GSM requires a supply of DC voltage which is of 5V. The radio frequency transmitter takes the help of antennae and transforms electrical signal to electromagnetic signal. The antenna which are used here are wired loop antenna. A decoder is used to separate the address and also to convert it serial to parallel. The main of this project is ,it will detect the location's address where the incident got occurred. Since a buzzer is mounted on it , it alerts the people who are surrounded in that particular place. The robot basically displays the location and it sends the message to the fire brigade.

E. Paper [5]- "Fire Locator, Detector and Extinguisher Robot with SMS Capability"

Author - Arabiran, M.P., J.R. Mazo, J Frades, Undug, J.

In this prototype we are used here is fire alarm system and smoke detector with sms capability. When we get an trigger from the smoke detector the robot will activate and it will undergo to the find mode. In the central unit is also embedded with an GSM module, so when it detect any thing it automatically contact to the owner and fire station about the incident. when the robot is activated the infrared proximity sensor used to maintain the distance between the wall and robot and also used as navigator which robot itself guide and moves parallel to the walls. The photo elective sensor is used to move the robot forward direction, when the robot finds the wall it turns left automatically and robot finds the fire it rotates 360 degree clockwise and anticlock wise depending upon the room to move towards the fire.

F. Paper [6] –"Fire fighting robot"

Author - Mr. Adhav Gitanjali Subhash , Mr. Borse Karan Dipak, Miss. Shelke Amruta Ashok, Mr.Bansode Vishal Laxman, Mr. Gadekar Atish Mahadeo.

In this project we are using vedio streaming robot, which will continuously capture the images with the help of camera of an android phone and sent to the web server. This robot will monitor the temperature where that will present with the help of temperature sensor, where these will be sent through android phone via Bluetooth module. The fire detection will be done with the help of smoke sensor also

present in the system, after detecting the fire, the robot will automatically turn on the pump to extinguish the fire. For the obstracle detection IR sensor is used in the path of the robot, hence data from the robot is sent to the android phone through bluetooth module to the controller and sent to the web server.

G. Paper [7]:" CeaseFire: The Fire Fighting Robot"

Author - Shiva Mittal, Meenakshi Mataray , Mayank Bhardwaj Manish Kumar Rana.

The robot is extinguishing the fire using water and carbon dioxide(CO_2) sprays, where water tank is filled with a high pressure pump, the direction of the water pipes were controlled via the metal geared servos. It is switchable using solenoid valves. The CO_2 emission from the cylinder that can be controlled through another gas valve i.e. switchable wirelessly. In this camera is used over the top of the survey real fire situation, it also contain night vision camera to serve in dark to the hazard sight. It also contain a motors which is capable of providing much torque to carry the weight of the robot and also extinguish the fire equipment while moving its maximum speed.

H. Paper [8]–"Development and Implementation of Arduino Microcontroller Based Dual Mode Fire Extinguishing Robot"

Author - Dinanath S. Nair, Sheik Mohammed S, Joyal Raju, Johaan Varkey Paul , Georgy Abel John .

In fire fighting mode has both automated and manual mode. In automated mode, the robot is completely automated to search for the presence of possible flames and obstacle's. This robot moves around and search for the signs of flames. In case the presence of an obstracle is in the path of robot, it will deviate until it clear the obstracle. When the fire is detected in the long range the flame sensor which is placed either side of the robot, it will detected and move forward until the short range flame sensor is lower than the cut off value. In manual mode, a Bluetooth module is used. The system is connected to smart phone by using a Bluetooth mode. The device can be configured to receive corresponding serial data controlling the robot which is transmitted from the smart phone.

I. Paper [9] –"Automatic fire extinguisher robot"

Author - B.Swetha Sampath

The robot has been designed to shift in the direction with regard to the intensity of the fire. It uses ATmega microcontroller. To withstand high temperatures, robots are protected with calcium silicate sheets. Using a DC to AC converter, the amplified DC voltage is converted into AC. The AC voltage thus created runs the fire extinguisher's water pump. With a high dynamic range camera, the Obstacle Avoider and Motion Sensor were used for human identification and to travel in the direction of the intensity of the fire. When it detects a human signal, the robot alarms the rescuer by ringing the alarm.

J. Paper[10]–"Multiple Sensors Based Fire Extinguisher Robot Based on DTMF, Bluetooth and GSM Technology with Multiple Mode of Operation"

Author - MD. Fahim Newaz , Iftekhar Uddin Ahmed, Aasim Ullah , Humayun Rashid.

Using DTMF and Bluetooth remote control, as well as GSM and GPS technology, the built fire extinguisher robot can be controlled in multiple modes. Both the DTMF remote control and the Android smartphone can be used to control the robot and can be controlled in three different modes. The first mode allows the robot to function fully autonomously, which, depending on the situation, can be triggered by the user or the robot itself. The second mode is a line following mode in which the robot follows a black line drawn to detect fire, and the third mode uses remote control to complete manual operation. For proper output, a small fire extinguisher device along with different sensors is connected to a fire extinguisher robot. The project is being implemented using the Arduino Mega microcontroller platform from Atmega. Due to its compatibility with most sensors and modules, the Mega 2560 board has been specially selected. The MT8870 is the best option for DTMF remote control development.

With the device for data reception and transmission, the Bluetooth module HC05 was used. Bluetooth technology makes use of radio waves to interconnect with other peripheral data sharing devices. The attached 808 GSM GPS module provides GPS-based location coordinates.

K. Paper[11] – "Fire Extinguishing Robot using Arduino"

Author - Abdülkadir ÇAKIR , Nyan Farooq Ezzulddın EZZULDDIN.

In this analysis, the aim of the mobile firefighting robot application is to search for a fire created in some way with a flow chart in the labyrinth, and to extinguish the fire when a fire is found with the help of a fan. A number of mechanical and electronic components were provided for this purpose, and a mobile robot was assembled. In order to perform the intended functions, the constructed robot was eventually programmed. Touch video is being used (such as a camera, etc.).

L. Paper[12] – "Fire Extinguishing Robot using IoT"

Author - Prof. Sankalp Mehta , Sujata Tupale , Shilpa Kappalguddi, Sangharsha Madvanna , Rakshanda Patil .

The fire extinguishing robot that detects fire based on IoT. The purpose of the system proposed is to control the robot through an android application. The robot will patrol the prescribed area. The firefighting robot is wirelessly connected with the Node MCU. If a node senses fire, it will alert the Central Node MCU which will give information to fire safety officers and activate robots to perform firefighting actions and start the pump to extinguish the fire.

M. Paper [13] – "Fire Fighting Robot"

Author - Sapkal Saraswati, Mane Bharat, Prof.V.U.Bansude, Makhare Sonal.

This robot mainly deals with the capturing images, videos, keeping systematic review of temperature, notifying fire, identification of the things that block the way and maintain internet server from android based mobile which has been connected wirelesly to this robot. Some of the major devices used here are sensor-IR, temparature, smoke, micro controller chip, motors, display screen, signalling buzzer, phone etc...The passive IR based sensor it as an ability to observe the presence of human being or else any animals within its range and signals the controller. Another sensor used is centigrade detecting sensor, by using this it will get to know the hotness of the surroung area. components used hereare cost effective, consumption of low power, no noise ofelectrical parts, light weight, highly sensitive to observationand reduction of space consumption. the important advatage of this robot can controlled automatic or manual mode.

N. Paper [14] – "Development of Fire Fighting Robot"

Author - Nor Samsiah Sani, MI Yusof, Mohd Aliff, Azavitra Zaina.

The front and back portion of moving object is covered by couple of wheels and it support the robot to balance. The body part can make turn of anti clock and clock wiseabout (0-360)degree rotation. The outer body is covered with the protecting shield or plate manufactered from (acrylic)metal. It can with stand up to an some extent of 200 kelvins. Major sensors were placed in front portion of the device, depending up on there supremancy in the area of work, allocation of the parts are placed. As per this project the important piece of this robot is water-pump .The mixture of saop (foam) or water are used to suppers the fire. when a fire has detected by flame sensor the motor automatically stops at some parrallel distance and sprinkles the water. the camera which has been mounted can also notice the fire ,intern video can be seen in smart phone.

O. Paper [15] – "FIRE FIGHTING ROBOT"

Author - Sahil S.Shah, Vaibhav K.Shah, Prithvish Mamtora and Mohit Hapani.

The objective of this device is to decerease the cause of air pollution and also subconsciously notice and supress fire. Basically this robot follows the strip line and moves. when a disturbance is set up a way it can cross the path way and moves forward. Secondly it as lidar and reciever ,depending upon the identification fire these things helps to move the motor towards fire. After the wipe out of fire the robot will comeback to his native place. We can also make use of CO2 in place of fire suppressing agents like water and detergents. The reduction in consumption of fluent use of power in battery is the boan to this project. The tenacity of this project

are small rooms, appartments, recording area, factories, supercomputer rooms, space and military sector where the chance of ignition of fire will be high.

III. CONCLUSION

As per the sketch of design and enforcement of a firefighting device that moves towards the fire and pumps out gas to extinguish the fire is presented in this project. The project explained how to interface ARM7 with different components. The system may be useful for accompaning fire fighters and preventing an outbreak. This is an one of the ample opportunity to automation. It will be used in the location or sites where it is impossible to reach or dangerous for humans.

IV. FUTURE SCOPE

As part of the future scope, it is possible to use the Raspberry pi combination with a camera mounted on it for survillance and to know the path of motion as well.

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