

# Real Time Embedded System Based Fire Fighting Robot

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## ABSTRACT

This project works consists of multi sensor based fire-fighting robot. As robotics technologies have been advanced, humans have tried to substitute human labor with new robotics technologies. Therefore due to this, the robots are able to work on human's daily routines or hazardous tasks. However, there are still limitations on capabilities of robots because humans work better on certain tasks than robots do. Thus, collective intelligence, which allows interaction between a human and a robot, is desired to produce the most efficient output with minimum resources. Therefore there is need to think beyond that is instead of human we are using robot. It will be more beneficial as the human life is more precious and the robot will work in any environment that human can't do. But there are less chances of robot damage if it is made up of fire retardant material. If this happens with human being we cannot recover the loss. But in case of robot we can build new robot. By adopting the advanced and efficient robotics technology we can extinguish the fire. So, here we have come up with "FIRE Fighter Robot".

**Keywords:** Wireless A/V Camera, Bluetooth Module, Temperature Sensor , PIC16F877A

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## I. INTRODUCTION

Robotics technologies have been develop, purpose of human have tried to replace human task to perform with new robotics technologies. so robot are able to do the work on human's hazardous task .robot have a capabilities to do the human work better on certain tasks .This robot is design to detect for a fire in small area like ,area of house, small scale industries to detect and extinguish fire by using spreading of water on flame through user monitor to control robot. Such as this robots work of as a firemen and easier to get a effective result of security. This robot performance will be faster than that of fire fighters. In this project we used number of sensors, temperature sensor, gas sensor etc [1]. In which robot we have a placed on web camera, This wireless web camera is place to the head of the robot. This web camera provide surveillane of the situation of fire to provide user. Then user will monitor to control this situation through the robot to extinguish a fire i.e robot to perform fire fighting operation [2]. Todays need is to use a device which is capable of detecting and extinguish the fire by its own because of nowadays we have seen large number of fire

accident because of negligence therefore, It is necessary to build an autonomous machine which is capable of extinguish fire. So, we need used this machine will be controlled remotely by giving it instruction [4].

## II. SYSTM METHODOLOGY

### 1. Block Diagram:

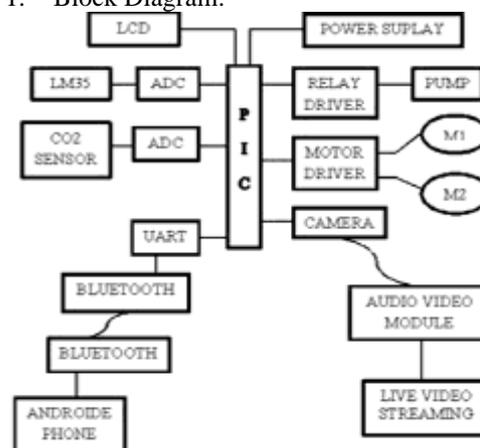


Fig.1 block diagram of fire-fighting robot

## 2. DESCRIPTION:

Fire -fighting robot which can be helping to solve many fire problem in small scale industries. This project basically based on multi sensor. the sensor are used to detect the fire even if it is a small one take necessary action to put on to in house, small scale industries, which can detect fire .sometimes some robot can control by using through remote control. So, robot built in such way that it can automatically detect and extinguish fire. In this project, in which robot is capable of performing human task and behaving like human like manner. So, building a robot require complex programming and putting together sensor, motor, web camera, water tank ,connecting wire, among mounting components. The sensor used for the purpose of detecting the fire accident such as temperature sensor, co2 sensor are used.

### A. Pic microcontroller:

PIC16F877 8-bit microcontroller based on Harvard architecture used. It has a data memory bus of 8-bit and program memory bus of 12,14,16 bit that length depending on the family of this microcontroller have a 5-port. This controller use because of low cost and free development tools.

### B. Sensors:

CO2 sensors and LM35 sensors are use for detection of fire and the fire can detect the sensor by using sensing capability of sensor to measure the distance near the fire and spreading of water on burn fire for extinguish fire through centrifugal pump. This situation monitor by web camera and control by user to robot through by remote control and target achieved by using web camera and sensor are place on front and end of the robot.

### C. UART:

UART is computer hardware device use for a communication in which the data format and transmission speeds are configurable. UART is a device use for serial communication in which the data format and transmission speeds are configurable to each other and interface computer or peripheral device. UARTs are commonly used in conjunction with communication standards such a RS232, and also supports synchronous operation.

### D. ADC: Analog-to-Digital converter

ADC analog to digital signal is a system that converts an analog signal such as a sound picked up by a microphone , into a digital signal and It is also provide an, desired and isolated measurement for an electronic device that converts an input analog voltage or current to a digital form. the conversion of analog signal result in term of 10-bit digital number there for because of it is basically need for specifically matched component.

### E. Bluetooth:

Bluetooth (HC-06) is a wireless device use for universal radio interface in the 2.4 GHz frequency band for exchanging data over short distances and communicate wirelessly via short-range (10-100 m) to other devices and It is use because of easy to set up and device compatible

and also have ability to handle both data and voice simultaneously.

### F. Audio Video Module:

Need of an audio and video interface: In this project we used A/V web camera in which consist of A/V module for interfacing with pic controller such a wireless connection and this module provide Audio Video signal. Today's digital device much more capable in accepting audio and video input and also outputting audio and video to speaker and LCD or any display device. streaming audio and video in/out of a processor is not that easy task. So main purpose of this module it helps you to designing audio/video interface to an embedded system.

### G. A/V Web camera:

Wireless Audio/Video Web camera it is use for capturing the live streaming video and it work on via over the range of 2.4 GHz as a wireless transmitter and receiver system. This Wireless A/V web camera we can place camera in any location without running a video cable from the camera to the monitor. And send the audio video signal to the monitor room. The wireless signal range is up to 700 feet.

### H. S/W Design: MPLAB

MPLAB it is a software used for development of embedded application on Microchip's pic and Pic microcontroller and it has a large set of software and hardware development tools integrated within one software package called MPLAB. MPLAB IDE (Integrated Development Environment ) it is used to provide a free, integrated toolset for the development of embedded applications . It is called an Integrated Development Environment, because it provides a single integrated environment to develop code for embedded microcontrollers and it work on 32-bitaplication on MS windows, and upgrading from the free software simulator to hardware debug and programming tools.

## III. RESULT

Below fig.2 shows actual demo of Fire-Fighting Robot indicating temperature and fire on LCD display.



Fig.2 Actual Demo Of fire-fighting robot

Below fig.3 shows the fire-fighting robot which indicates no fire is detected hence motor is off.



Fig.3 Fire-Fighting Robot which indicates no fire in room hence motor off.

In this way we have developed the fire- fighting robot which extinguishes the fire with the help of sensors, web camera, and the water tank present on the robot itself. In this project the fire is detected by sensor i.e, fire sensor and gas sensor then robot is controlled by using live streaming through web camera and we are connected with robot through bluetooth module. Then we can give the commands easily to robot from android mobile phone or computer example, forward, reverse, right, left, fire, off etc. and extinguish the fire.

#### IV. CONCLUSION

This project shows the fire fighter robot in which humans have tried to replace human work with new robotics technologies. After considering all of the hardware, software and required mechanical aspect for project we successfully implemented for "FIRE-FIGHTING ROBOT". In this project, we used temperature sensors and gas sensor in automatic mode and perform operation according to sensors detected temperature and gas and extinguishes the fire.

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