Fire Extinguisher Using Raspberry Pi

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Abstract- *The main aim of this project is to extinguish a fire without getting fire fighter at risk for the applications like tunnel fire, industrial fire, domestic fire etc. A fire fighter robot is one that has small water cannon mounted on it. By attaching a small water cannon to the robot, the automation puts out the fire by human controlling. This is a design and construction of a robot that is able to sense and extinguish fire. This robot implements following concepts, environmental surveillance, locomotion control and process control. This robot provides surveillance by means of a digital camera with key hardware element as Raspberry Pi. Here for monitoring purpose camera is used for initial detection of fire. When the fire is viewed by means of the camera stream the water cannon can be actuated by the operator to extinguish the flame. The mobile robot can be controlled by web portal designed in javascript and html. Necessary programs are installed to run server and camera correctly, then the system is connected wirelessly via WiFi. These robots can work in a human-centred space and cooperate with men by sharing a workspace together.*

Keywords- Raspberry Pi Robot, Fire Extinguisher Robot, Wireless Robot, Surveillance Robot.

I. INTRODUCTION

The entire system is based around Raspberry-Pi which is a on board computer.

Figure 1. Raspberry Pi Module.

We have used it at the heart of our robot. Basically it consists of two units one is the on-field robot and secondly the device which can be the computer or a mobile handset or a tablet which can be used to access it.

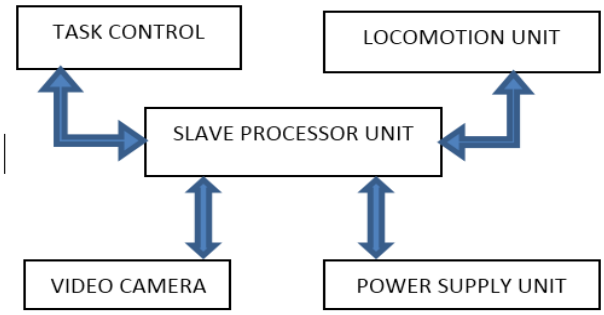

Figure 2. Robot block diagram.

First let us discuss about the on- field robot. It consists of a Raspberry-Pi which is a central processing unit. It is powered by a 12 v-2.1 amp power supply via. a micro USB pin. Then we have a locomotion unit, it consists of four 12 v-1 amp DC motors which are used to move our robot in all directions. IC L293D is used to drive the motors by using the GPIO signals.

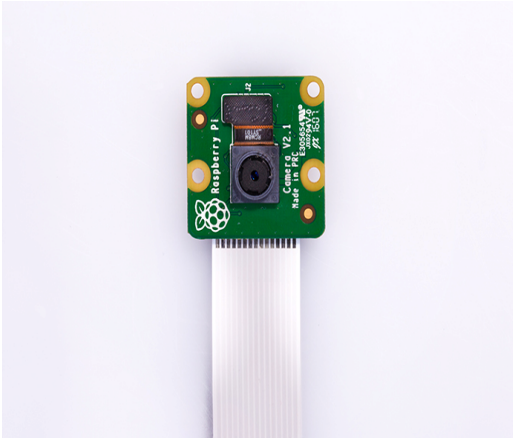

Figure 3. Camera module.

Then comes the Camera unit it consists of a Raspberry-Pi camera which is a 5 mp CSI camera which is directly connected on board the Raspberry-Pi. To change this camera angle in the vertical plane we have used one DC motor of the same specification as in the locomotion unit through a pot and a L293D motor driver.

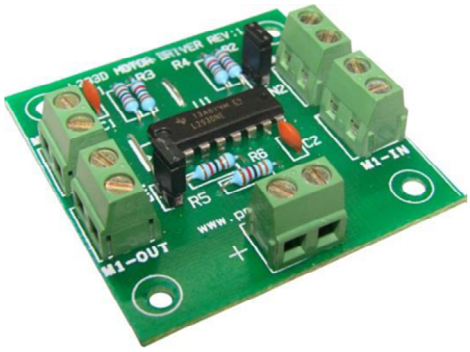

Figure 4. Motor Driver Module.

The process control block is made up of the fire extinguishing mechanism. We have used a water pump that is used as a canon to extinguish the fire.

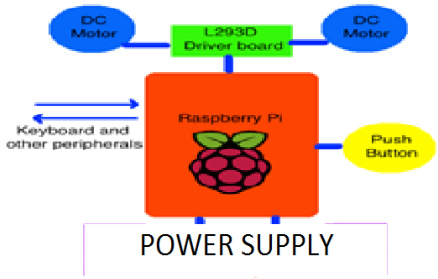

Figure 5. Basic Architecture.

Then comes the description in term of the operation. Here we have used a portal to engage the robot. The portal consists of the iframe where the camera stream can be viewed. This stream will be taken through the streamer port which is discussed later. It also consists of the control buttons which are used to navigation of the robot also the camera alignment as well as the fire extinguishing mechanism.

Figure 6. Remote part.

This portal resides in the root folder of the lightTPD server which we have used to host the portal. The server also holds the CGI scripts that are used to configure the GPIO and give signals via. the control buttons on the portal. The buttons call a function in the header which in term runs the CGI scripts. The video is streamed to port 9000 as set by us in the configuration file. We have also set the resolution and alignment of the camera stream. This stream is used as the source of the iframe that is used in the portal. Hence all-in-all we can see the camera stream on the portal and also give the necessary control signals to locomote and control the robot for process control.

II. LITERATURE REVIEW

The authors make use of SMCL microcontroller and a combination of flame detectors. The microcontroller used is a SMCL type or Motorola 6808/8051. The micro controller is Atmel or SMCL flash type's reprogrammable controller. The robot makes use of a Hamamatsu UV(flame sensor) sensor that is mounted onto the Trekker sweeping sensor brackets. Lightweight ,Low current consumption, Operates as high sensitivity UV Sensor ,Narrow spectral sensitivity of 185 to 260 nm makes it solar blind, being completely insensitive to visible light.

The Robot developed for the competition makes use of PLC[1]. The fire fighting robot is constructed using aluminum frame. The contour of the fire fighting robot is cylinder. The diameter is 50 cm, and height is about 130 cm .The fire fighting robot having a weight around 25 kg as it made use of a pneumatic system that is heavy and required a strong body framework that would provide the robot with the required stability. Fire extinguisher system will use a nominal voltage of 12.0V at most. The battery provides maximum power of 65 W and an average power of 7.8 Watts. It makes use of an auto charging system. The Robot makes use Two sets of batteries (24V = 12V + 12V) are used to power the robot. One is connected to drives and motors, while the other one provides PLC power, thus avoiding noise problem due to current peak while starting the motors[1]. The Robotic System makes use of 2 DC Servo motors, the command over which is possible by means of motion control card and driver devices[1].

There goal is to develop an intelligent multi sensor based fire fighting robot in our daily life. We design the fire detection system using four flame sensors in the fire fighting robot, and program the fire detection and fighting procedure using sensor based method. The fire fighting robot is equipped with four thermistors/flame sensors that continuously monitor the temperature. If the temperature increases beyond the predetermined threshold value, buzzer sounds to intimate the occurrence of fire accident and a warning message will be sent to the respective personnel in the industry and to nearby fire station with the GSM module provided to it[2]. This paper presents the Build and interface of a real time wheeled mobile

robot installed above it an arm and a camera. This paper gives a detailed mechanism about the robot that continuously monitors, intimates the respective personnel and extinguishes the fire. In the industry if any fire accident occurs, there is a need of person to monitor continuously and rectify it[2].

The development of this robot is based on Arduino Mega platform which will be interfaced with the microcomputer that is placed on the robot running as a server. After completing the design and testing the robot, time delay is calculated in different cases (LAN and WAN) network. Finally, this prototype of the robot is expected to solve many problems such as placing or picking objects that are far away from the user, picking and placing hazardous objects in the fastest and easiest way[3].

V. CONCLUSION

In this project we have presented a Fire Extinguisher using Raspberry-Pi. It is a wireless controlled robot which is capable of surveillance as well as performing a fire extinguishing operation using a water pump. The idea can be implemented in order to reduce human involvement in situations where there can be threat to human life. Using this system fire extinguishing can be achieved using robot without involvement of human beings on actual sight, but by controlling it through a remote sight.

This project has presented a unique vision of the concepts which are used in this particular field. It aims to promote technology innovations to achieve a reliable an efficient outcome in this field. The mechatronics application ensures a convenient way of simplifying the life by providing more dedicated and user friendly facilities in computing device.

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