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Auto_Bot for Fire Detection and Extinguishion

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Abstract: ***In this paper, we proposed a fire detection algorithm to detect fire based on image processing techniques. This is compatible in surveillance device like CCTV, wireless camera. Video - Based Fire Detection are not mobilised and autonomous. The camera is turnedON only when the sensors reach a particular set point from temperature sensor and smoke detector. The captured video is converted to frames and image processing is done to identify the fire by means of its unique characteristics like Color, Motion and Flickering of flamesas these features are powerful discriminants. Suitable image processing techniques are applied to detect the fire.If the fire is identified, a mobile robot consists of water hoses is actuated to put off the fire.***

Keywords: Fire Detection, Image Processing, Robotic Arm

I. INTRODUCTION

Fire is the both constructive and destructive, it is according to the way it is being used. This project has developed a method to extract colour and motion from video sequences to detect fire. CCTV survillence camera is used to capture the video of the fire. The survillence camera will be turned ON when it receives the input the from temperature sensor and smoke detector. Temperature sensor used here is DHT22. Segmentation technique is used to identify the colour pixels and region of fire .The colour of the fire is identified in the YCbCr colour space followed by motion detection. Background subtraction is done by thresholding and filtering techniques. Image processing for fire detection is done in Lab VIEW software. Autobot is built on a versatile platform so that, both hardware and software can work in unison. After the detection of fire autoboot is actuated to put off the fire. The water pump drains water through hoses on the fire which is guided by autobot.

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II. HARDWARE DESCRIPTION

The project is designed with

- Arduino
- Survillence camera
- Temperature sensor(DHT22)
- SmokeDetector
- Johnson geared motors
- L298 motor controller
- Microcontroller Atmega328
- Battery

The project is designed with above mentioned components. Temperature sensor DHT22 continuously monitors the surrounding temperature. Smoke detector is used to detect the fumes of the acquired fire. When both the sensors reaches a set point it enables the CCTV surveillance camera and it is turned ON. Video is captured using surveillance camera and captured video is converted into frames. Image processing techniques is applied to the frames for the detection of fire. Image processing software used here is LabVIEW. Colour of the fire is identified by making use of YCbCr colour space modelling followed by motion detection. Colour plane extraction, thresholding and filtering techniques is used for background subtraction. After colour detection sobel edge detection technique is applied on the acquired image to detect the edge of the fire so that the growth and height of the fire can be identified. First the acquired RGB image is converted into HSI image for detecting the area under fire. After area detection colour detection is done in YCbCr colour space. Finally, fire is detected by comparing the results of the HSI image and YCbCr colour space.

After fire detection, the fire identified will be put off via auto-bot. The auto-bot is built on metal chasi and it is powered by backwheel drive which is supported with castors on the front end. Johnson geared motors with 200 RPM is used to power up the auto-bot camera. L298 motor controller is used to supply current to needed to the motor. Four ampere of continous current can be delivered by L298 motor controller. The input data to the motor controller is feed via Atmega328 micro controller. The auto-bot is powered by maintenance free lead acid battery which gives 12 volt and 4.5 ampere per hour. Servo motor holds the camera with torque which is used for video processing. The focal length of the camera should be greater than 4cm. The resolution of the camera is about 640×480. The angle of lens should be 54. The fire extinguishion auto-bot consists of 6 volt submersible water pump. The water pump is placed at the bottom of the water tank on the auto-bot chassis. Microcontroller is used to control the water pump through 5 volt relay. After the detection of fire water is drained through water hoses to put off the fire.

III. EXPERIMENTAL SETUP

The auto-bot acts as a major block of the entire project since the auto-bot is doing the extinguishion process. The temperature of the room and the smoke must be regularly monitored by the sensors used. Sensors data are fed to LabVIEW via aurdino. The camera will be actuated only if both the sensors reaches the setpoint. Auto-bot is actuated to put off the fire after detecting it. Auto-bot consists of water pump, placed at the bottom of the water tank. The water pump drains water through hoses to put off the fire acquired.

3.1 .Block Diagram

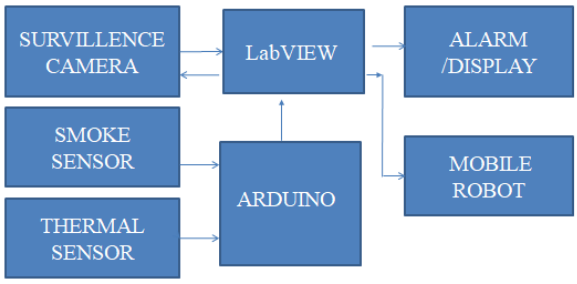

Figure.3. Block diagram of Auto-bot for Fire Detection and Extinguision

This is the block diagram representation for the proposed method of auto-bot for fire detection and extinguision.

3.2.Description of Block Diagram

Five volt power supply is given to aurdino. There are many types of aurdino among that aurdino UNO is used. Aurdino UNO reads the data from temperatue sensor DHT22 and smoke detector. If both the sensors reaches a particular set point surveillance camera is turned ON. LIFA software is used to interface aurdino with LabVIEW. Fire is detected using image processing techniques in LabVIEW. Mobile robot is used to extinguish the fire after detecting it. Fire alarm system can also be used to indicate fire.

IV. SOFTWARE DESCRIPTION

The software which we used for our project is

- Arduino
- LabVIEW

4.1. Arduino

Arduino is an open source software and it a single microcontroller board which consists of different types.The Arduino board requires five volt to power up. Aurdino reads input from both the sensor. It reads surrounding temperature from DHT22 temperature sensor and fumes of the fire from smoke detector. It gives these sensors data to LabVIEW using LIFA.

4.2.LabVIEW

Laboratory Virtual Instrument Engineering Workbench (LabVIEW) is a development environment and system-design platform for a visual programming language from National Instruments.The LabVIEW Software receives the sensors input from aurdino. Image processing is done using LabVIEW software.

V. RESULT

The fig.5.1 shows the interfacing of LabVIEW software with Arduino. It consists of front panel and block diagram. It shows the changes of sensors value. After reaching the sensors set point the camera is actuated. The camera acquires the video and from that video frames are obtained. Fire is identified using image processing techniques and extinguished using auto-bot.

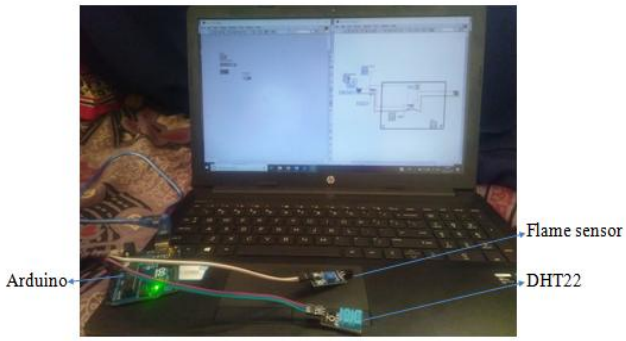

Fig.5.1Interfacing of LabVIEW with Aurdino

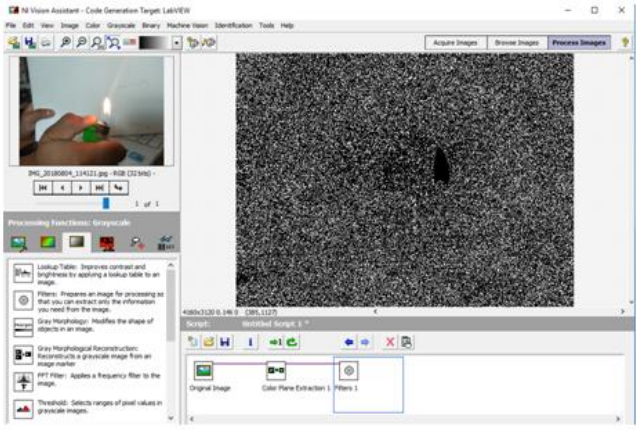

Fig.5.2Detection of fire using Canny Filter

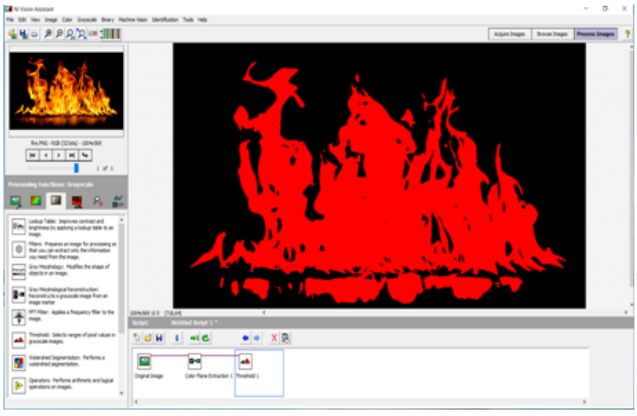

Fig.5.3 Detection of Fire After Applying Colour Plane Extraction and Thresholding Techniques

The figure 5.1 and 5.2 shows the1Interfacing of LabVIEW with aurdino and the detection of fire using canny filterrespectively.The figure 5.3 shows the detection of fire after applying colour plane extraction and thresholding techniques.

VI. CONCLUSION

This project uses a temperature sensors and smoke detector which measures the initial condition of fire. The setup identifies the initial stages of fire using sensors. After that the camera captures the video of the room to detect the fire and range of fire using image processing. Then processing of the video the coordinate of the fire is given to the mobile robot wirelessly through Bluetooth. The mobile robot puts off the fire.

FUTURE SCOPE

We may improve it further by improving the accuracy of the fire coordinates given to the mobile robot.

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