

A Smart Fire Detection and Extinguishing System

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Abstract- The multi sensor fire-detection algorithm is one of the current important issues in the field of fire detection systems for intelligent buildings. Here an adaptive fusion algorithm for fire detection is being designed, and use flame sensors to detect fire incident. In reality, the phenomenon of the fire incident may have smoke, flame, and high temperature situations. However, these signals may happen simultaneously or sequentially. A productive system has been developed to recognize the fires and attempt to control the flames with categorical and control spray of water. An intelligent multi sensor based security system has been developed, that contains a fire fighting system in our daily life. The security system can detect abnormal and dangerous situation and notify us. Is to design the fire detection system using sensors in the fire fighting system, and program the fire detection and fighting procedure using sensor based method. Finally, the fire detection system using fire fighting system has been implemented, which involves countable components source being the lighter, RPS (Regulated Power Supply) supplying the power to all the blocks, battery used for charging and discharging, Arduino availed for controlling the signals from various sensors. To detect fire, flame sensor module has been used in this project which is an optical sensor. Relay is a electromagnetic device served for isolation between high and low voltage or current, servo motor strokes the sprayer to spray fluid at the exact position of fire affected area. Pump motor drive is a device that pumps fluid by mechanical action.

Index Terms- Safe from Fire (SFF)

I. INTRODUCTION

The most devastating outbreaks, which occurred quite recently, claimed lives and the lively hood of many hardworking citizens [1]. Due to the generally unplanned nature of the affected areas, the flames spread quickly are out of hand upon the arrival of the firemen [2]. Controlling and extinguishing these outbreaks are long and gruelling given the extreme situations. In light of this, our main aim of the project is to design and develop an effective system to detect

these fires, alert the surrounding fire stations and attempt to control the flames with a precise and controlled spray of water [3]. The extinguisher mainly consists of a high power pump, an outlet and servo or motor for control. Relying on information from the system, this feature triggers the water pump and configures the pitch [4]. With the speed of the jet of water known, the angle and a little physics the outlet directs a precise jet of water to quench the fire, because this is from a height the system may effectively control the heart of the outbreak to make fighting it more manageable and effective [5]. As mention above, the entire intelligent fire detection and extinguishing system is mounted at a height to maximize its view, give it longer range and to raise it above the heat and smoke for optimum performance [6]. The intelligent fire detection and extinguishing system (Smokey) relies mainly on three sensors, the three sensors are: Smoke detector and temperature sensor, Photo detector sensor, Photo electric smoke detector sensor. The Smoke detector and Temperature sensors work together to detect fires that are close in proximity but do not fall within the view of the camera. Upon detection, the system ceases from it & current task and attempts to control and extinguish the fires that may pose a threat to the system & integrity [7]. This is self-preservation measure to ensure functionality. The Photo detector sensor gives Smokey a sense of time as so to adjust it & protocols correctly. This allows the system to adapt to different scenarios. eg Controlled burning of waste and a fire outbreak [8]. All these sensors are mounted in a movable chassis controlled by three motors (two servos) for full 360^o view. The Photoelectric or optical smoke detectors work by generating pulses of infra red light and measuring any diffracted light. If smoke is present in the sensing chamber, the light is diffracted by the smoke particles onto a photodiode, which senses the presence of the smoke [9]. They are now largely replacing ionization detectors as a general purpose detector. Photoelectric smoke

detectors are tested across the complete range of EN54 fires; however they are most sensitive to smoke containing large particles from around 0.4 to 10 microns, such as that given off by smouldering fires [10]. A photoelectric detector would therefore be a good choice in an environment where a slow burning fire could be expected, such as a room containing modern fabrics and furnishings.

1.1 METHODOLOGY

1.1.1 BLOCK DIAGRAM

Safe From Fire (SFF) is an intelligent self controlled smart fire extinguisher system assembled with multiple sensors, actuators and operated by micro-controller unit (MCU).

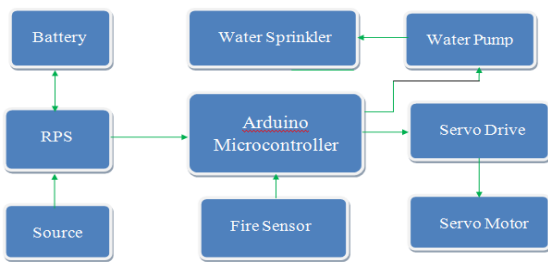


Figure 1.1: Block Diagram of “A Smart Fire Detection and Extinguishing System”

Figure 1.1 shows Block Diagram of A Smart Fire Detection and Extinguishing System. The microcontroller controls the entire project. Embedded within the microcontroller is a program that helps the microcontroller to take action based on the inputs provided by the output of the sensors. To do the experiments lighter has been used as a fire source. Whenever lighter is lighted it sends signal, and trigger fire incident. Regulated power supply regulates +5V and supplies to all the blocks. Battery is used for charging else discharging. The purpose of battery in series circuit is to give the circuit a source of energy. For controlling the signals from various sensors, and combined modules Arduino has been used in SFF. Arduino board is a physical computing platform for managing and handling electronics. It has an open source platform independent IDE, that facilitates programmer to process the electronics signal from the attached components and control them. Arduino sensor modules and components are programmed in SFF and algorithm logic is implemented.

To detect fire, fire flame sensor module has been used in this project. This module is sensitive to the fire and basically flame spectrum. It works with the

principle of light wave length between the range of 760nm-1100nm which is actually the range of typical infrared light. It is very low cost sensor, light weight only 8 gram, response time is very fast and easy to use, which makes it a right choice to work with, for prototyping and experiment.

Relay is an electromagnetic device. It is used for isolation between high and low voltage or current. Output current of the transistor is very low of order 10mA in order to drive minimum of 150mA is required, so relay driver is used and is fully isolated. Servo motor is used to move the fire extinguisher sprayer to spray fire extinguish fluid at the exact position of fire affected area. Servo motors are mainly used for armature movement. Servo motor is a kind of motor that uses gears to the control wheel accurately and it can only rotate up to 180 degree. The servo serves as a rotor in SFF of moving the Fire Extinguisher Sprayer towards precise location.

Pump motor drive is a device that moves fluids by mechanical action. Pumps operate by some mechanism (typically reciprocating or rotary) and consume energy to perform mechanical work by moving the fluid. Fire sprinkler or sprinkler head is the component of a fire sprinkler system that discharges water when the effects of a fire have been detected, such as when a predetermined temperature has been exceeded.

II RESULTS

Safe from fire takes most of the preliminary initiative to prevent fire from spreading and does all necessary activities. Hence it's a complete package of fire protection system.

The following are the result step:

In Figure 2.1 describes servo motor position without power supply.

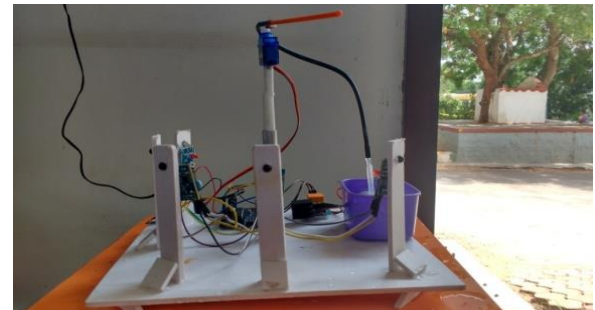


Figure 2.1: Servo motor position without power supply

In Figure 2.2, describes servo motor position when the power source is activated.

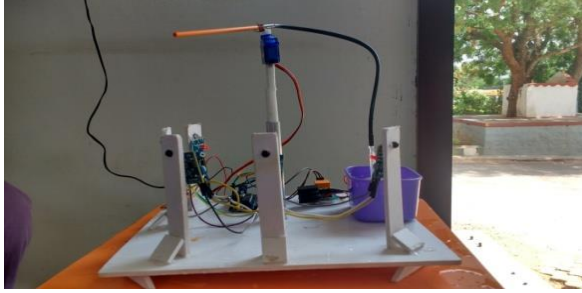


Figure 2.2: Servo motor position with power supply
In Figure 2.3, describes when the fire source (lighter/match box stick) in the opposite direction is activated; it sends the signal and triggers the fire sensor.

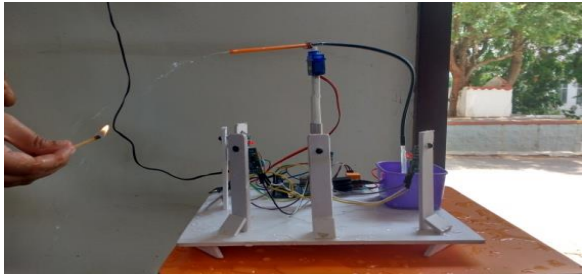


Figure 2.3: Fire detection

In Figure 2.4 it, describes that now servo motor detects the exact position (78.5degree) of the fire and rotates to the fire affected location.

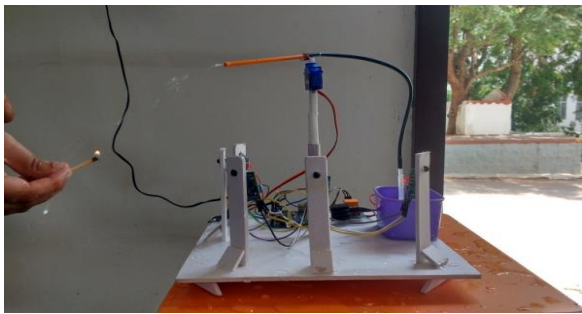


Figure 2.4: Fire extinguishing

In Figure 2.5 describes fire sprinkler discharges water when the effects of the fire have been detected and hence fire has been extinguished.

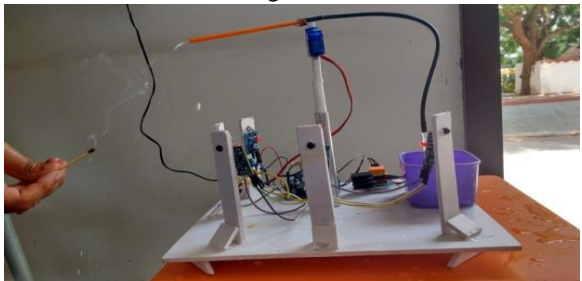


Figure 2.5: Fire has been extinguishing

III CONCLUSION

There is an immense need of implementation of an smart fire detection and extinguishing system to protect lives and assets from fire hazards. In this project, full fire protection system is explained. Safe from fire takes most of the preliminary initiative to prevent fire from spreading and does all necessary activities. Hence it's a complete package of fire protection system. The conclusion is to provide security of home, laboratory, office, factory and building is important to human life. We develop an intelligent multi sensor based security system that contains a fire fighting system in our daily life. We design the fire detection system using sensors in the system, and program the fire detection and fighting procedure using sensor based method.

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