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Automated Fire Detection System

[1.]Jerin Jose [2.] Akhila Antony [3.] Jojo Thomas [4.] Alisha Susan Prakash [5.] Avani S
[1)] PG Student, Department of Computer Applications –Saintgits College of Engineering Pathamuttom Kottayam Kerala, India
[2)] PG Student, Department of Computer Applications –Saintgits College of Engineering Pathamuttom Kottayam Kerala, India
[3)] PG Student, Department of Computer Applications –Saintgits College of Engineering Pathamuttom Kottayam Kerala, India
[4)] PG Student, Department of Computer Applications –Saintgits College of Engineering Pathamuttom Kottayam Kerala, India
[5)] Assistant Professor, Department of Computer Applications –Saintgits College of Engineering Pathamuttom Kottayam Kerala, India

ABSTRACT
The purpose of paper entitled "AUTOMATED FIRE DETECTION SYSTEM" is to develop an ease environment to take immediate emergency action in occurrence of fire in home environment. So, there is no need to worry about massive fire occurrences in their home, The system will detect the fire in real-time which is in dangerous level and automates the emergency reporting services. The key feature of the system is the ability to remotely send alert messages to the fire department and the house owner using electronic mail in association with Google. The system is faster and error free with necessary speed in detection and action. The system is completely developed with Python and Open CV and the system also can store the email address of multiple persons residing in the same home, it uses SQLITE3 for this functionality. The system needs 24/7 Internet connectivity to ensure uninterrupted process.
Key words: *Edge Detection, Open CV, Fire Detection.*

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I. INTRODUCTION

This paper has the potential to be useful in conditions in which conventional methods cannot be adopted. The fire detection algorithm uses visual characteristics of fires like brightness, colour, spectral texture, spectral flicker, and edge trembling to discriminate them from other visible stimuli. There are various fire detection techniques such as infrared sensor, a thermal detector, smoke detector, flame detector, and optical smoke detector. These methods are not always reliable as they do not always detect the fire itself but detect one or more phenomena resulting from fire, such as smoke, heat, infrared, ultraviolet light radiation, or gas, which could be produced in other ways and hence, produces many false alarms. By the help of deep learning mechanisms and image processing techniques, it is possible to get better results than conventional systems because images can provide more reliable information. The main objective of the proposed system is to eliminate the limitations of existing fire detection systems such as accuracy and action taken after immediate detection and overall efficiency. The system can eliminate manual labour after an over limit fire The system provides easiness to users and have wide area of future enhancement. The focus in this paper is detection using a low-cost camera. This would mean that the program does not only work with expensive technology such as infrared cameras or other such cameras.

II. LITERATURE SURVEY

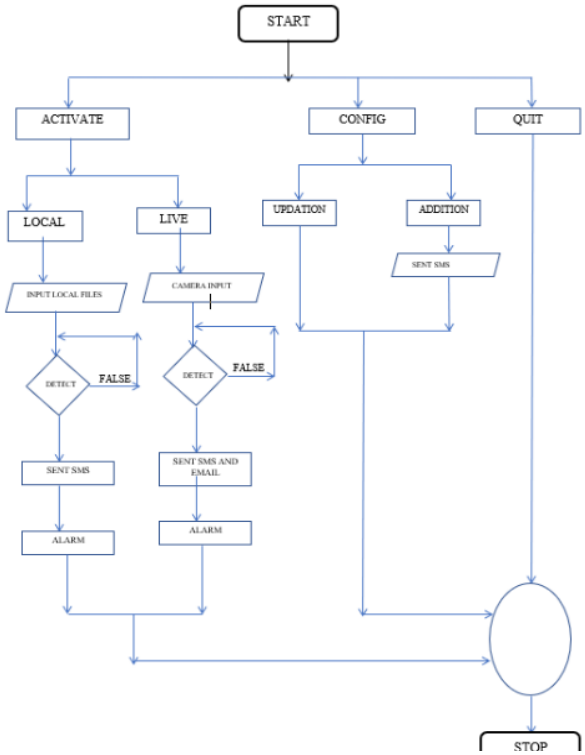
Automatic fire detection and alarm systems are a recent addition to the range of equipment available to combat the threat of fire in buildings, creating an effective and reliable means of detecting fires and signalling an alarm to the occupants. By providing an early warning to the building management team, action can be taken to deal with the fire before it takes hold. Automatic fire detection and alarm systems have a good record of performance and have demonstrated they can be effective in reducing the risk to life and property damage from fire. The guide discusses how to manage them in use. and ensure that regulatory requirements are met. It introduces the components that are used and the types of system that are available to designers. In[1], discusses the automatic fire alarm system, the composition and working principle. The system will be collected through the fire alarm detector to the fire, fault and other signals sent to the sub-machine, Submachine re-transmission of such information will be sent to the fire alarm control, and then start from the controller, sound and light alarm

display, alarm, and other devices, and automatically print a fire information. In [2], describes the overall structure of the fire alarm system, fire alarm control software in the design. Fire detectors using two-wire method to reduce the wall alignment, improve reliability, ease of construction and installation. In [4], it describes about a system which is capable of a smart fire detection system that uses wireless sensor network. It uses smoke and temperature sensors for fire and smoke detection.

III. METHODOLOGY

The implementation is one phase of software development. Implementation is that stage in the paper where theoretical design is turned into working system. Implementation involves placing the complete and tested software system into actual work environment. Implementation is concerned with translating design specification with source code. The primary goal of implementation is to write the source code to its specification that can be achieved by making the source code clear and straight forward as possible.This paper user various technologies to detect fire like OpenCV, Edge Detection Algorithm. **OpenCV** is the huge open-source library for the computer vision, machine learning, and image processing and now it plays a major role in real-time operation which is very important in today's systems. By using it, one can process images and videos to identify objects, faces, or even handwriting of a human.**Edge detection** techniques have been developed for extracting edges from digital images. Gradient based classical operators like Robert, Prewitt, Sobel were initially used for edge detection, but they did not give sharp edges and were highly sensitive to noise image. Laplacian based Marr Hildrith operators also suffers from two limitations: high probability of detecting false edges and the localization error may be severe at curved edges.Edge detection is a basic tool used in image processing, basically for feature detection and extraction, which aim to identify points in a digital image where brightness of image changes sharply and find discontinuities.

The purpose of edge detection is significantly reducing the amount of data in an image and preserves the structural properties for further image processing Implementation means the process of changing a brand new or revised system style into operational one. The implementation is the final stage and it's an important phase. It involves the individual programming, system testing, user training and the operational running of developed proposed system that constitute the application subsystems. One major task of preparing for implementation is education of users, which should really have been taken place much earlier in the project when they were being involved in the investigation and design work. During this implementation phase system takes physical shape. Depending on the size of the organization and its requirements the implementation is divided into three parts. Edge detection is an image processing technique for finding the boundaries of objects within images. It works by detecting discontinuities in brightness. Edge detection is used for image segmentation and data extraction in areas such as image processing, computer vision, and machine vision.



IV. EXPERIMENTS AND RESULTS

Our approach filters out image blocks based on thresholds of different temporal and spatial features, starting with dividing the image into blocks and extraction of flames blocks from image foreground and background, and candidate's blocks are analysed to identify local features of colour, source immobility, and flame flickering. Each local feature filter resolves different false-positive fire cases. Filtered blocks are further analysed by global analysis to extract flame texture and flame reflection in surroundingblocks.Sequences of successful detections are buffered by a decision alarm system to reduce errors due to external camera influences. Research algorithms have low computation time.

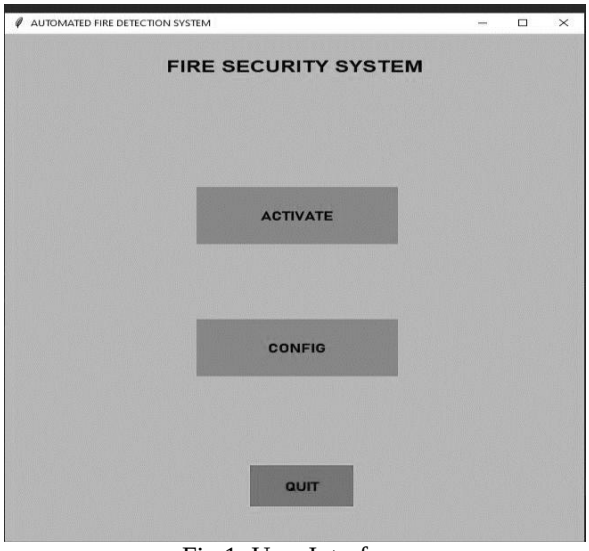


Fig 1: User Interface

Through a sequence of experiments, the result is consistent with the empirical evidence and shows that the detection rate of the proposed system exceeds previous studies and reduces false alarm rates under various environments.

V. CONCLUSIONANDFUTURESCOPE

Automated Fire Detection System for fire security has satisfied the basic requirements of homeowners. It provides easy and powerful method to detect and take security measures in absence of users. Here all the work is done by the system. Human intervention in communication with emergency fire departments have been solved. Both the owner as well as fire department will be notified in case of high intensity fire. An alert SMS as well as an email will be sent to the owner and fire department. It can be further expanded outside the home environments and implemented wherever cameras are installed.The designed fire alarm system is simple, but it has wide area of application in household and industrial safety, especially in developing countries.

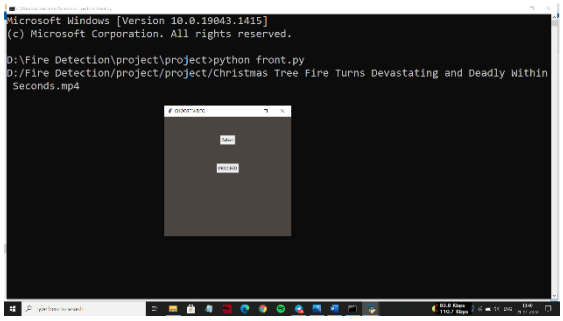


Fig 2: Selecting local file

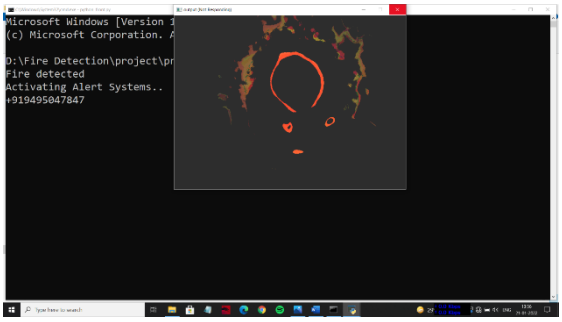


Fig 3: Detecting fire using live camera

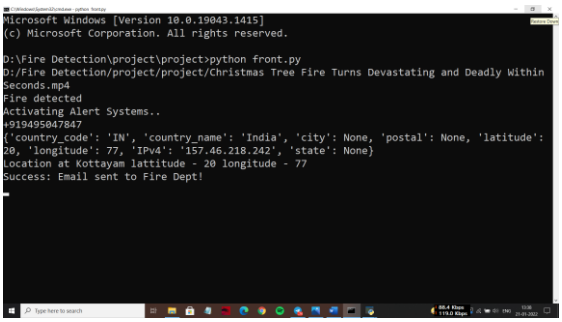


Fig 4: Sending alert.

Using this system, quick and reliable alert response is possible to initiate preventive measures to avert danger of fire hazards and minimize losses of life and property. This is a cost-effective fire alarm system which performs reliably to ensure safety from fire, and can be installed in houses, industries, offices, warehouses. etc very easily. Fig 4

depicts the processing done at the internal level for fire detection by the algorithm.Alarms should be supplemented with communications devices that allow you to provide specific information and instructions to building occupants. People tend not to always respond as they should when a fire alarm sounds. An emergency alert system can significantly improve response of your occupants. Large industrial orresidential area can be monitored through the proposed system installing multiple modules. The system can be further developed with added features like web server interconnect, fire area tracking and fire extinguisher interfacing etc.Detection and alarm systems are an important part of your overall fire protection process. Discovering fires early contributes to protecting building occupants, limiting property damage, and minimizing interruption of your operation.

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