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AUTOMATIC FIRE DETECTION SYSTEM

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***Abstract*:** The threat because of fire has become increasingly serious to people's lives and property. To overcome the problem of traditional fire detection i.e., false alarm rate, we proposed an innovative detection method based on multi feature fusion of flame. First, it is considered as fire pre-processing stage where we combined the motion detection and colour detection of the flame. Second, flame has a certain similarity in the sequence of the image, even though it is irregular. Then, we included some features extraction to improve the accuracy of recognition. The new features are of spatial variability, shape variability, and area variability of the flame. At the end, we used a support vector machine for training and completed the analysis of candidate fire image. Thus, achieved automatic fire monitoring. The method can also be applied to real-time camera monitoring systems, like home security, forest fire alarms, and commercial monitoring.

Keywords: flame, camera, fire detection, alarm, monitor, SVM, fusion.

1. INTRODUCTION

The number of permanent residents in cities and the population density is increasing due to the rapid spread of urbanization in the world. When a fire occurs, it seriously effects people's lives and causes major economic losses. According to incomplete statistics, there were 312,000 fires in the country in 2016, with 1,582 people killed and 1,065 injured, and a direct property loss of 3.72 billion dollars. Firstly, If a fire detecting alarm is to be triggered, a certain concentration of particles in the air must reach that machine. By the time the alarm triggers, fire may already be too strong to control, defeating the purpose of early warning. Secondly, most of the alarms can only be effective in closed environment, which is not that effective at outdoors or public places. Thirdly, there may be false or damaged alarms. When the bonfire particle concentration reaches the alarm concentration, it will sound the alarm automatically. To prevent most of such cases and rapid fire growth, it is necessary to establish a monitoring system that can detect fires early. A camera-based automatic fire monitoring algorithm can achieve all the above cases. It also provides 24/7 automatic monitoring without interruption. That greatly reduces labour costs, and the rapid spread of urban monitoring systems provides the groundwork for camera-based fire detection.

2. LITERATURE SURVEY

Link: https://en.cnki.com.cn/Article_en/CJFDTotal-AQHJ201301055.htm
YUAN Jie1,2,SHEN Shi-fei2(1 Yichun Fire Department, Yichun 33600, Jiangxi,China;2 Department of Engineering Physics, Center for Public Safety Research, Tsinghua University, Beijing 100084,China).
Description: To be more accurate, the data sets of the areas of each type of public gathering place are collected, and the extractions of the areas of these places are summed up, later, the fire occurrence hazard indicator, fire loss hazard indicator, the fire casualty hazard indicator are analysed in detail.

Link: https://digital-library.theiet.org/content/journals/10.1049/iet-ipr.2014.0935
Description: In general, visible band image sequences are used to automatically detect suspicious fire events in indoor or outdoor environments. Benchmarking is performed in order to assess performances of 12 algorithms that can be used for the segmentation of wild land fire images.

Link:https://www.mdpi.com/1424-8220/18/2/553/htm
Description: Indoor fire detection using gas chemical sensing has been a subject of investigation since the early nineties. Hence, systems based on chemical sensing can provide faster fire alarm responses than conventional smoke-based fire detectors.

3. EXISTING SYSTEM

Generally, at the fire pre-processing stage we combine the motion detection and color detection of the flame. In screening the fire candidate pixels a lot of computation time can be saved using this method. Flame has a certain

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similarity in the sequence of the image, even though it is irregular. By using RGB colors in the flame they are detecting the fire accidents.

4. PROPOSED SYSTEM

In our project, we are using the Surveillance camera, flame sensor, GPS tracker, Arduino etc. It identifies the temperature at that current location while Spreading rate of fire accidents and it's very useful for the Administrators of the fire department. It navigates and sends the current location along with an image of fire accident and a message to the administrators. All these will be done with the help of surveillance cameras. In this way we are going to calculate the rate of fire and set the temperature range through which it can alert the Administrators at the time of large accidents only.

Benefits of Proposed System:

Here we don't use any sensors so we can reduce the cost of the project. We use telegram to send messages to the owner, fire station and ambulance so we can reduce the time of reaction. By using our project we can save many lives. The accuracy is also very high for our project.

5. ARCHITECTURE

In this project we have the below modules:

Frame Division: Dividing video into frames and store the frames in a folder. For these, we have to provide video as input and we got frames as output.

Detecting objects: The frames which are stored in the folder, should give as input to program to detect vehicles in each frame and get count from each frame.

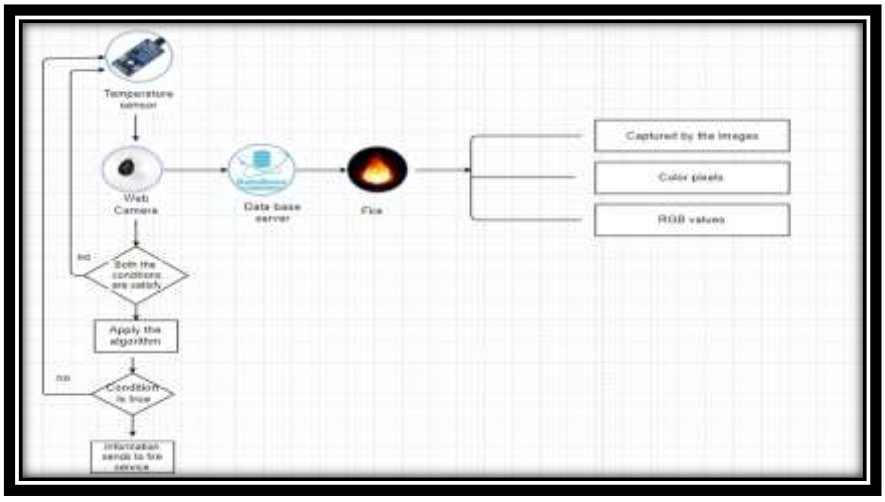

Figure 1: Architecture of the system

Algorithms:

In this work, we have used a classification algorithm called Support Vector Machine. This algorithm is the world's commonly used data mining algorithm for the purpose of classification.

i.Support Vector Machine(SVM):

Input:

Data: Dataset with P variables and binary outcome*

Output: Ranked list of variables according to their relevance

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Find the values for tuning parameters of the SVM model;

Train the SVM model;

P←p;*

While** p≥2 **do

SVMp ←SVM with optimized tuning parameters for the p variables and

observations in Data;

wp←calculate the weight vector of the SVMp(wp1,…….,wpp)

rank.criteria←(w_{p1}^2,……..,w_{pp}^2);

min.rank.criteria←variable with lowest value in rank.criteria vector;

*Remove min.rank.criteria from **Data**;*

$Rank_p$ ←min.rank.criteria;

P ←p-1;

***end**;*

*$Rank_1$ ←variable in **Data** ∉ ($Rank_2$,……,$Rank_{p*}$);*

***return** ($Rank_1$,……..,$Rank_{p*}$);*

6. RESULT

These are the output screens of our project:

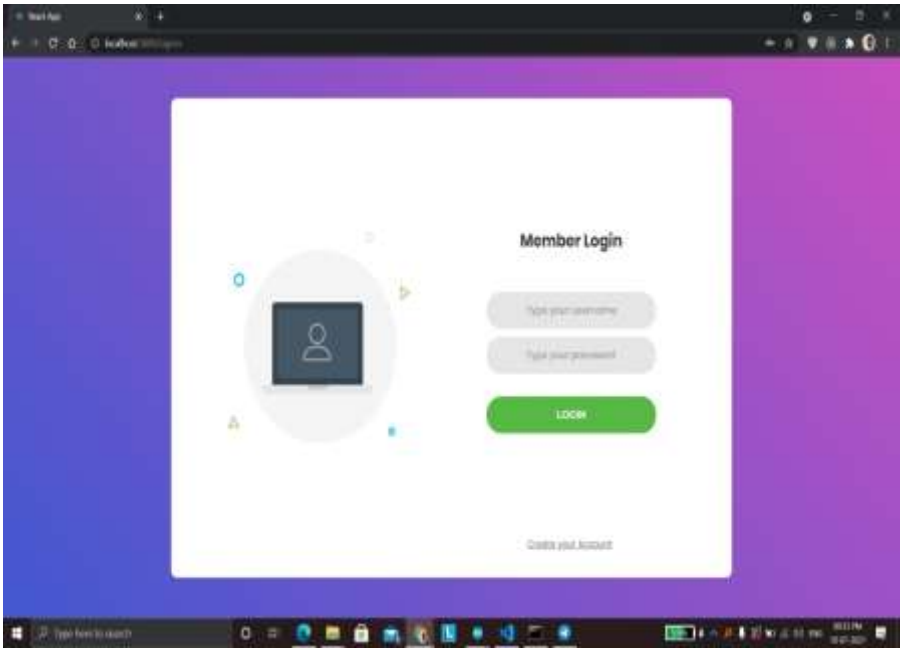

Figure 2: login screen

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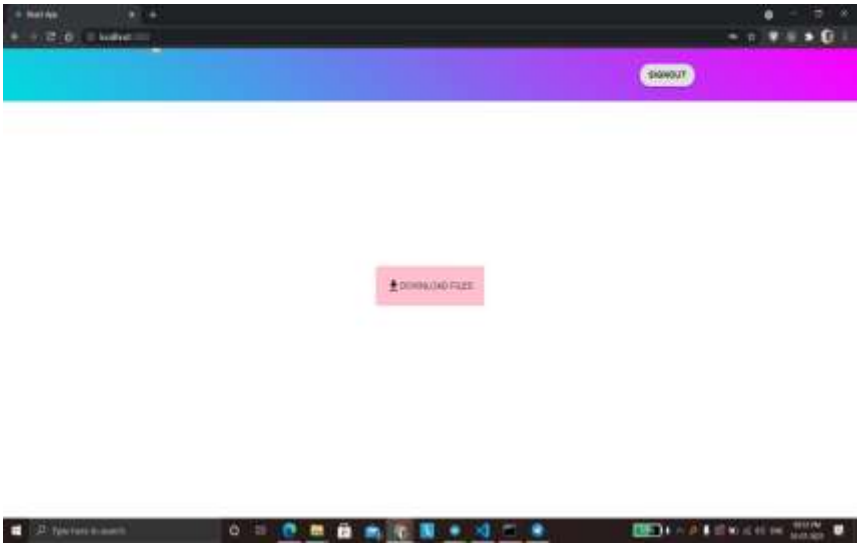

Figure 3: downloading screen

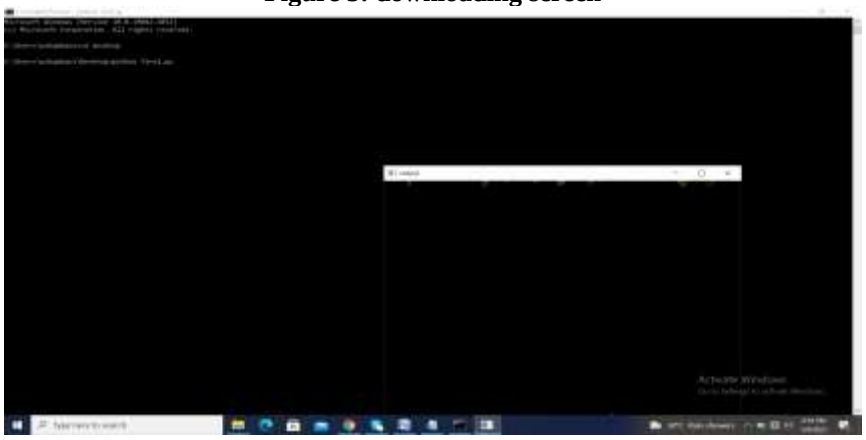

Figure 4: output screen 1

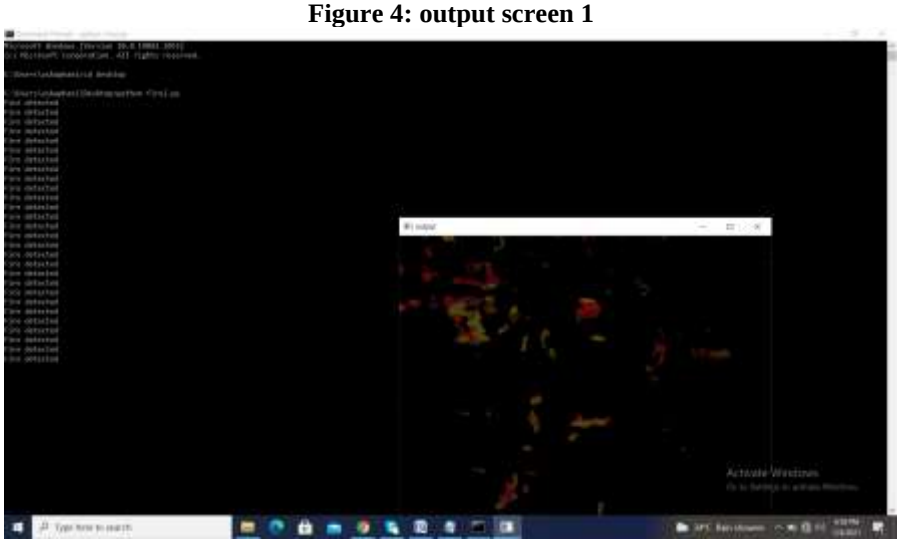

Figure 5: output screen 2

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7. CONCLUSION AND FUTURE ENHANCEMENT

A fire detection algorithm based on image processing techniques is proposed by us. Here we use RGB colour model to detect the colour of the fire. The sobel edge detection is used for detecting growth of fire. Finally based on the results from the first technique and second technique a colour based segmentation technique was applied to identify the region of interest (ROI) of the fire a colour. The algorithm works very well when there is a fire outbreak. The overall accuracy of the algorithm is greater than 90%, indicating the effectiveness and usefulness of the algorithm. Future scope of our method is as follows: The system can be made waterproof, Smoke detection along with fire detection can be added as a feature, System Optimization and Delay Reduction i.e. lesser latency may be achieved. System can be used to detect forest fires. System may be embedded on a drone for surveillance purposes of property. The system can have military applications.

8. REFERENCES

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