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FOREST FIRE DETECTION USING MACHINE LEARNING

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ABSTRACT: Wildfires are an uncontrollable disaster which causes damages to the society as well as endangering nature. Forest Fire Analysis and Prediction System is made to detect the forest fires then performs prediction of the hearth spread. With the assistance of massive data analysis and machine learning algorithms we shall build a tool which serves an aid to the society and thus prevent the occurrences of this disaster. Detection of fireside should be fast and accurate as they'll cause damage and destruction at an outsized scale.

Keywords-

PIC Microcontroller, Speed, Distance, L293D Motor Driver, Ultrasonic sensor, LED Display, Buzzer.

I. INTRODUCTION

Wildfires are one among the most important catastrophes faced by our society today causing irrevocable damages. These forest fires are often man-made or caused by mother nature by different weather, torrential winds. These fires cause damages not only to the environment, they also destroy vast homes and property. Hence, we devised a panacea "Fire Analysis and Prediction System" to fight this disaster and help our planet. Forest fires are a matter of concern because they cause extensive damage to the environment, property and human life. Hence, it's crucial to detect the hearth at an earlier stage. This will help in saving flora and fauna of the region alongside the resources. Also, it's going to help to regulate the spread of fireside at the initial phase. The task of monitoring the forests is difficult thanks to the vast territory and dense forest.

II. EXISTING SYSTEM

In the scientific literature there are tons of methods and approaches for the hearth and/or smoke determination which are supported image segmentation procedures. We refer to some surveys on this topic, but some articles contain ideas and procedures which are close to the present investigation, are checked, where is located between 15 and 25. However, the appliance of this method in our investigation directly is impossible, when the brightness of the monitoring area is non-homogeneous.

III. PROPOSED METHOD:

Forest fires represent an unbroken threat to ecological systems, infrastructure and human lives. Past has witnessed multiple instances of forest and wild land fires. Traditional fire protection methods use mechanical devices or humans to observe the environment. the foremost frequently used fire detection techniques are usually supported particle sampling, temperature sampling, and air transparency testing. An alarm isn't raised unless the particles reach the sensors and activate them. So, we are getting to capture the pictures through satellite and can give the captured image as an input to the software, this technique will give the output as whether the hearth is present or not.

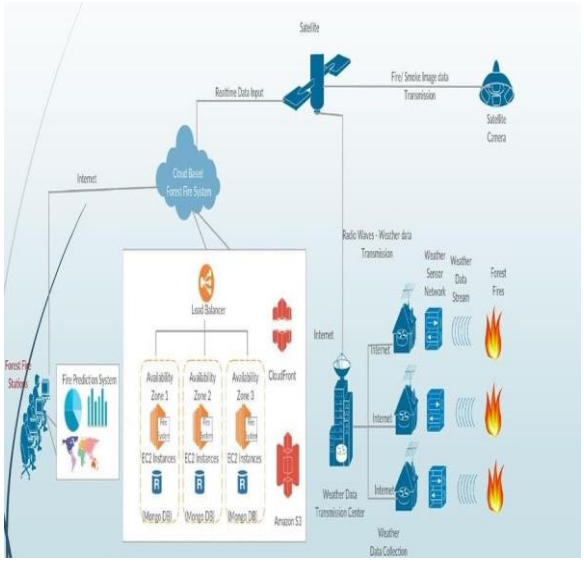


Fig.1 System Architecture

Support Vector

In the SVM algorithm, we have to maximize the margin between the data points and the hyper plane. The hinge loss helps to maximize the margin. When the actual value and predicted value are of same sign then the cost is 0. We can calculate loss function if the values are not same. A regularization parameter is added to cost function. To balance the margin maximization and loss, the regularization parameter is used. The cost function is viewed as below after adding the regularization parameter.

IV. IMPLEMENTATION

Pre-processing

To realize a supervised learning algorithm the first requirement is a dataset. Hence the first step towards implementation is data collection. An environment resembling the forest situations at the time of initiation of fire. The data of each node is recorded. After certain weeks, set of CSV file is generated. Detection of forest fire requires the features such as temperature, humidity, smoke etc. For our project, we tried two methods to collect the data. We created dummy dataset by taking some samples at room temperature then by burning the leaves and finally the samples were taken when the fire was stopped.

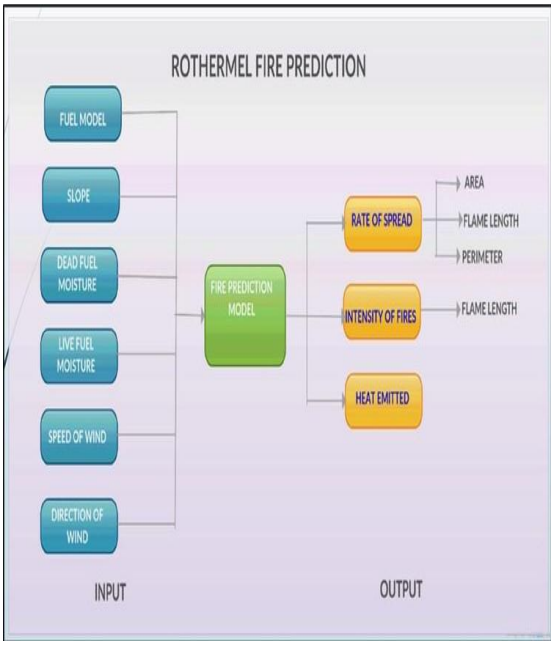


Fig.2 Forest Fires Prediction Model

Algorithm

Model Generation

This stage is dedicated to training the agent to generate an accurate and flexible model. The same dataset is divided into two parts. One is used for training purpose whereas the other is used for validation of the model. It uses a Decision tree-based approach for the classification purpose.

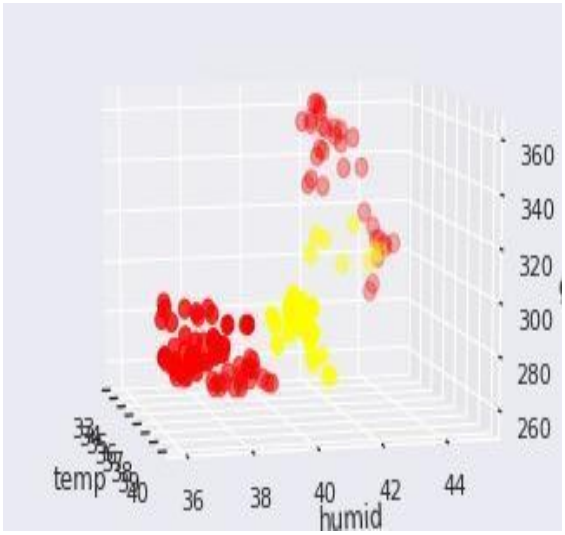
Nodes Deployment

All the sensor nodes are deployed over the entire area under surveillance and are launched. Once commenced, they periodically update the data from sensors on the cloud.

Prediction

At the base station, the updated values are used to predict whether a fire like situation is created. An alarm is generated to alert the fire fighter in case of emergency.

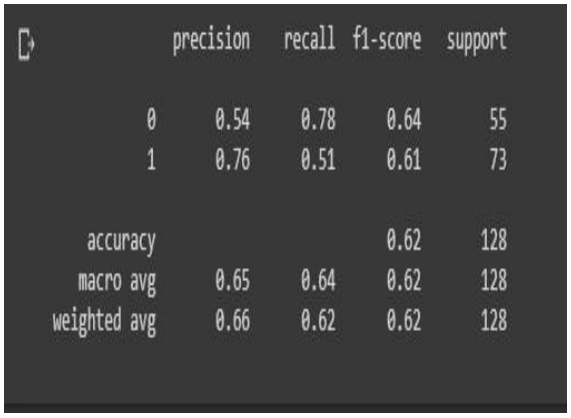
V. Results



No Fire

Fire Present

Figure 3 Visualization of Dataset



	precision	recall	f1-score	support
0	0.54	0.78	0.64	55
1	0.76	0.51	0.61	73
accuracy			0.62	128
macro avg	0.65	0.64	0.62	128
weighted avg	0.66	0.62	0.62	128

Figure 4 Classification Report for SVM

	SVM
Accuracy	0.62
Precision 0	0.54
Precision 1	0.76
Recall 0	0.78
Recall 1	0.51

Fig.5 PERFORMANCE EVALUATION

Based on these observations after our experiment and analysis we can clearly compare the performance of the models to predict the chances of fire.

VI. CONCLUSIONS

From this project we came to the conclusion that call trees feature a remarkable accuracy of 99% in predicting fires in forest areas. This reduces the chances of false alarm to a great extent.

Our system is in a position to differentiate various fire scenarios, from initial case (no fire) to detection of fireside, fairly accurately. It can accurately determine the growth of fire. This will help in early stages of fireside detection and help to confine fire to limited areas before much damage occurs. The system will be very effective in preventing occurrence of false alarms. We aim at monitoring the forests without constant human supervision.

VII. REFERENCES

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5.Detection of Forest Fires using Machine LearningTechnique: A Perspective Aditi Kansal1, Yashwant Singh2, Nagesh Kumar3, Vandana Mohindru4 Department of Computer Science & Engineering Jaypee University of Infonnation Technology Waknaghat, Solan-173234, (H.P), India 1 aditi.kansaI4@gmail.com, 2yashu _ want@yahoo.com

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