EMERGING METHODS FOR EARLYDETECTION OF FOREST FIRES

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ABSTRACT :

Forest fires are a major environmental issue, creating economic and ecological damage while endangering human lives. It is difficult to predict and detect Forest Fire in a sparsely populated forest area and it is more difficult if the prediction is done using ground-based methods. As part of the early warning system, forest fire detection has a critical role in detecting fire in a forest area to prevent damage to forest ecosystems. In this case, the speed of the detection process is the most critical factor to support a fast response by the authorities .Thus, this article proposes a new frame work for fire detection based on combining colour-motion-shape features with machine learning technology. The characteristics of the fire are not only red but also from their irregular shape and movement that tends to be constant at specific locations. These characteristics are represented by color probabilities in the segmentations stage, color histograms in the classification stage, and image moments in the verification stage. A frame-based evaluation and an intersection over union (IoU) ratio was applied to evaluate the proposed framework. Frame-based evaluation measures the performance in detecting fires. In contrast, the IoU ratio measures the performance in localizing the fires. Thus, the proposed method is suitable and reliable for integrating into the early warning system.

INTRODUCTION:

The main objective of a project is to detect the fires occurring in the forest. For this we have created a convolution neural network that predicts the fire .This is an attempt to use convolutional neural networks (CNN) to detect the presence or the start of a forest fire in an image. The model could be process in open cv and applied in real- time to low-framerate surveillance video (with fires not moving that much fast, this assumption is somewhat sound) and give alert in case of fire.

EXISTING SOLUTIONS:

Aerial monitoring of forest fire using dron

Cameras operated in remote locations

- Use of various sensors such as smoke, flame, gas etc…to sense and detect fire
- Human surveillance for forest
- Thermal imaging of forest
- Use of satellite images to detect fire

PROPOSED SOLUTION:

Using deep learning(Convolutional neural network) to predict the forest fires. The process is briefly described below.

COLLECTION OF DATABASE:

The model is trained on a provided dataset which contains images of : 'fire' and 'no fire', totally around 1900 images. These images are mostly of forest or forest-like environments like sea shore, river banks, ponds, beach, etc….

DATA PROCESSING:

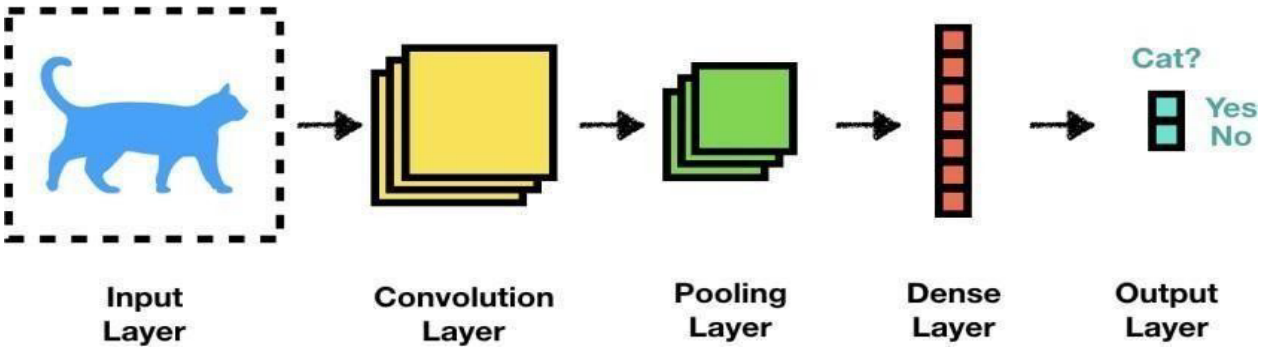
First importing the required libraries and then splitting the collected data into training as well as testing.1520 images are used for training and 380 images are used for testing. Then we perform data augmentation where we increase our available datasets by rotating, flipping, shearing, scaling, cropping, etc..This helps in reducing the chances of overfitting when training our model. Now we have more data to perform better.

BUILDING THE MODEL:

Importing the required libraries and since we are building our model to get 1 input and give back 1 output we are initiating the model as sequential. Adding the convolution layer, max pooling layer as well as flatten layer. Then passing it to a fully connected layer which is nothing but a Artificial neural network layers(i.e. the input layer, hidden layer, output layer). The activation function for hidden layer is specified as RLAF(rectified linear activation function) and the activation function for output layer is given as sigmoid. Then the model is compiled with optimizer as Adam, loss function as binary-cross-entropy.

Classification model and setting the metrics to accuracy.

training the model, setting epoch value as 10.



Accuracy VS Loss(during training):

Epoch	Accuracy	Loss	Val-loss	Valaccuracy
1	0.8612	0.5750	0.9289	0.2057
2	0.9151	0.2386	0.9151	0.1584
3	0.9461	0.1595	0.9316	0.1794
4	0.9526	0.1530	0.9026	0.2408
5	0.9480	0.1525	0.9237	0.1976
6	0.9342	0.1873	0.9289	0.1569
7	0.9507	0.1657	0.9421	0.1541
8	0.9533	0.1549	0.9316	0.1917
9	0.9513	0.1451	0.9368	0.1848
10	0.9520	0.1589	0.1496	0.9447

After this saving our model in .H5 format.

TESTING THE MODE:

Then testing our model by providing the data that is allocated for testing. We can use our saved model file for video analysis of forest fire and use it in real time surveillance camera for real time prediction.

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[10]A. Koubaa and B. Qureshi, “Dronetrack: Cloud-based real-time object then testing our model by providing the data that is allocated for testing. We can use our saved model file for video analysis of forest fire and use it in real time surveillance camera for real time prediction.