Department of Electrical and Computer Engineering
North South University

Senior Design Project 499(A)

Fire and Smoke Detection Using YoloV8

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Related Work

1.1: An Efficient Deep Learning Algorithm for Fire and Smoke Detection with Limited Data

Detecting smoke and fire from visual scenes is a demanding task, due to the high variance of the color and texture. A number of smoke and fire image classification approaches have been proposed to overcome this problem; however, most of them rely on either rule-based methods or on handcrafted features. We propose a novel deep convolutional neural network algorithm to achieve high-accuracy fire and smoke image detection. Instead of using traditional rectified linear units or tangent functions, we use adaptive piecewise linear units in the hidden layers of the network. We also have created a new small dataset of fire and smoke images to train and evaluate our model. To solve the over-fitting problem caused by training the network on a limited dataset, we improve the number of available training images using traditional data augmentation techniques and generative adversarial networks. Experimental results show that the proposed approach achieves high accuracy and a high detection rate, as well as a very low rate of false alarms.

1.2: Forest fire and smoke detection using deep learning-based learning without forgetting

In this study, we implement transfer learning on pre-trained models such as VGG16, InceptionV3, and Xception, which allow us to work with a smaller dataset and lessen the computational complexity without degrading accuracy. Of all the models, Xception excelled with 98.72% accuracy. We tested the performance of the proposed models with and without LwF. Without LwF, among all the proposed models, Xception gave an accuracy of 79.23% on a new task (BowFire dataset). While using LwF, Xception gave an accuracy of 91.41% for the BowFire dataset and 96.89% for the original dataset. We find that fine-tuning Forest fire and smoke detection using deep learning-based learning without forgetting In this study, we implement transfer learning on pre-trained models such as VGG16, InceptionV3, and Xception, which allow us to work with a smaller dataset and lessen the computational complexity without degrading accuracy. Of all the models, Xception excelled with 98.72% accuracy. We tested the performance of the proposed models with and without LwF. Without LwF, among all the proposed models, Xception gave an accuracy of 79.23% on a new task (BowFire dataset). While using LwF, Xception gave an accuracy of 91.41% for the BowFire dataset and 96.89% for the original dataset. We find that fine-tuning

1.2: A Study on a Complex Flame and Smoke Detection Method Using Computer Vision Detection and Convolutional Neural Network

Fire detection plays a crucial and significant role in saving societies and possessions. A fire detection system is able to realty reduce damages and increase the effort to control fire related incidents. A Study on a Complex Flame and Smoke Detection Method Using Computer Vision Detesction and Convolutional Neural Network. The smoke detection results were similar, and in the model presented in this study, the accuracy was 93.0%, precision was 93.9%, and detection rate and F1 score were 92.0% and 92.9%, respectively. In the case of SSD, the accuracy was 85.0% and Faster R-CNN was 89.0%.

1.3: Another Study on Early Fire Detection and Alert System using Modified Inception-v3 under Deep Learning Framework, there used many fire detection algorithms have been developed using several models such as ANN, deep learning, transfer learning etc. The accuracy of the model varied from 61% and 92%. Though this model achieved good accuracy but it was suffering in high false positive rate.

1.4: A vision-based system for early fire detection which was developed by Pedro Santana, Pedro Gomes, and Jos´e Barata. They work on video-based early fire detection system. Most importantly, background subtraction is performed in a windowed manner for improved accuracy. There used an attentive mechanism to focus a computationally expensive frequency analysis of potential fire regions, interaction with a people detection and tracking system is included to enable model-based false alarms rejection, a new color-based model of fire's appearance as well as a new Wavelet-based model of fire's frequency signature are proposed, and the camera-based model is proposed. The average success rate of 92.7% of the model to real-life applications.