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A Study on Face Mask Detection Techniques

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ABSTRACT: The rise of the coronavirus has been very problematic and painful for a large number of individuals across the world. A large number of people have suffered from this viral infection and a section of those have succumbed to their illnesses. This virus in unlike what anyone has seen before with very high infection rates and comparatively low recovery. The emergence of this pandemic has resulted in large number of material as well as emotional losses for the residents of this planet. The most effective techniques for the prevention of the spread of this virus is the use of a facial mask which is mandated by various governments across the world. With low compliance to this face mask rule there is a need for an effective system that can identify the mask on individual and alert if the mask is not found. For this purpose, a lot of related research on the topic of facial mask detection have been elaborated and our approach has been effectively realized in this survey paper through the use of Recurrent Neural Networks RNN and Decision Tree. Our approach will be elaborated further in the upcoming editions of this research.

KEYWORDS: Recurrent Neural Networks and Decision Tree.

I. INTRODUCTION

In recent years there has been increased interest towards the development and improvement of facial detection systems. These detection systems are highly useful for the purpose of surveillance and commercial applications such as psychiatric analysis of patients. They have been increasing number of smart phones and other devices that have been utilizing the facial features for the purpose of achieving effective biometric security on their personal devices. This increasing amount of research has been highly concentrated towards improving the identification and detection of a face and the facial features.

With the increasing spread of the novel coronavirus which has reached peak levels in various parts of this planet. This increase in the number of infections of the coronavirus has led to complete shutdown by various governments all across the world. This lockdown and social isolation is highly important to prevent the spread of the coronavirus which is a very deadly and has been the cause for various fatalities all across the globe. This virus spreads increasingly fast through tiny droplets called aerosols that are admitted by a person normally while speaking and breathing.

There have been multiple researches that have been performed for the purpose of analyzing the spread of the virus and the various modes and means of this airborne disease. The researchers recommend the use of fabric masks to prevent an infected person to reduce the spread of the infection. Therefore this has been mandated by the governments across the world for the compulsory use of facial mass when out in public.

The facial mask provide effective protection against for the spread that can reduce the infection rate across the world and improve the pandemic conditions significantly. As the medical services and other health sectors are highly strained to provide adequate medical attention to the large number of patients with the increasing number of infections of with the coronavirus the compliance to this mask rule is highly necessary. As the law enforcement officers and other agencies cannot monitor each and every person on the streets and in shops and malls. There is the need for an effective system that can effectively detect the facial mask on a person through the use of image processing approaches and issue a suitable alert if a mask is not formed.

For this purpose a large number of researches that have been performed for facial recognition and mask detection have been evaluated extensively in this survey paper. This image processing approaches have been significant in realizing the design of our approach that will be stipulated in much more detail in the upcoming research article on this topic.

This literature survey paper dedicates section 2 for analysis of past work as a literature survey, and finally, section 3 concludes the paper with traces of future enhancement.

II. RELATED WORKS

M. Yazdi narrates due to sleepy drivers there has been an increase in road accidents it is a major problem these days. The system predicts the driver's drowsiness and issues a warning as soon as the driver distracts his attention on the road. [1] Certain postures of the body and face are used as indications of driver's fatigue. Face postures such as yawning and nose tip are the first thing to be recognized in an image. By using depth information, the location of the minimum depth data in the face image drowsiness is detected. Drowsiness usually occurs at night under insufficient lighting conditions. Driver drowsiness can be detected with very high accuracy thus by using depth information.

C. Yu explains the latest statistical data where 1.35 million deaths and 20 to 50 million non-fatal injuries occur due to road accidents. [2] A major factor in many of the accidents is the driver's drowsiness. Most of the methods require expensive sensors but their performances are limited, Thus in the proposed paper author introduces a new method called DrowsyDet. It is a real-time mobile application to detect driver drowsiness. The facial region and landmarks are extracted with a face detection model and landmark model it is the very first step in DrowsyDet. To classify facial drowsiness state, eyes state, and mouth state respectively three CNN (Convolutional Neural Networks) models are built.

H. Xu introduces optimization problems such as Obstacle detection and polarization skylight navigation. In recent researches polarization skylight navigation has the advantages of independence and non-error accumulate with time has been revealed. [3] Cloud detection or support vector machine (SVM) classifier for obstacles detection in the existing methods of polarized navigation. In the proposed system E-vector method based on polarization, a novel angular feature is introduced which is highly sensitive to all obstacles. On this basis, a multi-obstacles detector is designed. The results show that the E-vector angular feature achieves a small rate of false detection.

Y. Zhou introduces a vision-based autonomous detection scheme to detect obstacles on the runway without the ground obstacle detection system. [4] By combining a canny operator edge detection algorithm and hough line detection algorithm to identify and segment the runway region accurately it is taken from adaptive singular value decomposition and reconstruction. Thus in the proposed paper to detect obstacles on the runway without the ground obstacle detection system is introduced. To evaluate the information of the optical flow field in the runway area mixed Gauss background model is implemented. According to an accurately scaled model, the proposed technology is feasible and accurate.

K. Dhakate states data provided by the Government of India in 2017, there were around five lakh road accident incidents in India which killed one and a half lakh people, and around five lakh people got injured these accidents were majorly occurred due to wireless devices such as mobile phones, Bluetooth devices while driving the vehicle. [5] Distracted driving can be distinguished into four type's biomechanical distraction, visual distraction, cognitive distraction, auditory distraction, and the activities such as Talking on a cellphone, eating something, talking to co-passengers, tuning the radio, or stereo system major cause of distraction is from inside of the car. The proposed system detects activities done by the driver in a real-time environment.

A. Assefa introduces a deep recognition model that handles illumination conditions and the driver's hand's skin color to make biomechanical distraction recognition. [6] The main cause of the distracted driver is mainly categorized one is visual distraction second one is Cognitive distraction and the final one is a biomechanical distraction. The proposed paper uses stacked autoencoders to hand and face localization stage and different skin color tones effects both methodologies are sequentially trained. Thus it proposed paper approaches distracted driver detection models with an accuracy of 98.68%.

C. Huang narrates in the recent research on traffic safety a large number of traffic accident fatalities. Approximately 1.35 million people worldwide have died from traffic accidents according to the report from the World Health Organization (WHO).[7] In the proposed paper they have used a hybrid CNN framework (HCF) which is used for visual analysis to detect the behaviors of distracted drivers by using deep learning. To takeout, driver behavior features are based on a transfer learning cooperative pre-trained model that combines ResNet50, Inception V3, and Xception. When detecting distracted driving behaviors HCF achieves the classification accuracy of 96.74%.

J. Mlynczak presents a framework device that would be able to detect alcohol vapors in moving cars. The detection of alcohol in the air exhausted by humans in moving cars is not easy. Resonance absorption of electromagnetic radiation is a very famous and well-known concept for stand-off detection of vapors and gases. In the proposed paper authors develop cascade lasers for stand-off detection of alcohol vapors in moving cars. [8] The device used for least indicate the car, it is very difficult to get the exact alcohol concentration.

S. Al-Youif states road safety has always been the priority. The signboards, direction arrows, and lanes have made the following rules much easier for the safety of the people from the accident. A pre-existing Alcohol sensor will be used in the proposed paper [9]. The paper is divided into three major first is the alcohol sensor second is the controlling unit it is necessary for the alcohol sensor and the last part is the motor driver shield it is used for a hypothetical scenario of motor control it is connected with the on-board chip with external power feed. The proposed framework results in the best for accident prevention system developments.

H. Wakana explains there is a lot of effort made for preventing stop drunk driving. The driver status is monitored from the remote location by the proposed framework. The proposed framework consists breath sensor unit which is divided into four parts the first is a water vapor sensor second is gas sensors to detect ethanol acetaldehyde, and hydrogen all these sensors are connected and operated by the smartphone to check alcohol [10]. The system measures the alcohol level by the detector on a smartphone and displays it this data is also sent to the cloud. Thus the proposed system is very useful in decreasing alcohol-related accidents.

X. Li narrates in signal processing removing the noises from the useful signals has been important research by Raman spectroscopy. [11] Raman spectroscopy has a specialty for detecting unknown materials in the laboratory and testing these materials in non-laboratory conditions. In the proposed system the Raman spectra of alcohol are used for the noise reduction method process and it is compared with the wavelet noise reduction method in MATLAB. Thus due to fluorescence background interference, the signal is too weak to detect.

H. Singh aims to implement a non-intrusive system that can detect fatigue of the driver. A huge number of accidents occur due to the driver's drowsiness and alcohol detection. The proposed framework will be helpful in preventing many accidents [12]. The framework will use a camera to observe the eyes of the driver and will detect the driver's fatigue early enough to avoid an accident. Firstly the image is taken via camera and image processing is done afterward the hypo-vigilance is extracted from the eyes if the blinking is normal no warning is issued if the eyes are closed for more than one-sec system issues a warning to the driver by the alarm.

III. CONCLUSION AND FUTURESCOPE

The paradigm of facial mask detection has been effectively surveyed in this literature review paper. Wearing a facial mask is mandatory by various authorities across the world to prevent the effective spread of the coronavirus. This is due to the nature of the virus that spreads through contact with aerosols that are emitted while breathing and speaking. Therefore, for effective compliance to this law and assisting the law enforcement officials and other establishment owners in the mask rule compliance, is highly necessary and can be effectively achieved through their implementation of image processing approaches along with Recurrent Neural Networks (RNN) and Decision Tree. Approach realized in this survey paper will be effectively outlined in the upcoming editions of this research.

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