Using Content and Trace Feature Extractors for Exposing Fake Faces through Deep Learning

ADITYA AGNIHOTRI , Department of Comp. Sc. & Info. Tech., Graphic Era Hill University, Dehradun, Uttarakhand, India 248002,

Abstract

In this procedure, we make an effort to address the effect of these variables on the identification of a photo from a face sketch using a cascaded static and dynamic local feature extraction approach. to ensure that the feature vectors created are based on the appropriate patches. Along with that approach, we include the closest neighbour technique for matching sketches and photos, which concatenates the feature vectors obtained from local static extraction. Following the extraction of the image's characteristics, the most comparable images are narrowed down based on their closes neighbours. Eventually, feature vectors from the local dynamic extraction approach are used to rematch these images. The closest neighbour technique is used to match the feature vectors.The primary goals of this method are to increase the detection system's precision as well as identification rates and feature stability.

DOI Number: 10.48047/nq.2019.17.03.2020 **NeuroQuantology 2019; 17(03):194-199**

1. INTRODUCTION

Less sleep, lengthy periods of nonstop driving, or any other physical problem, such as brain abnormalities, can all affect a driver's ability to pay attention. According to several studies on traffic accidents, driver weariness is a factor in about 30% of collisions. When a driver drives for a longer amount of time than is typical for a person, this causes excessive exhaustion and also leads in tiredness, which causes the driver to get sleepy or lose consciousness. Drowsiness is a complicated phenomenon that indicates a drop in the driver's alertness and consciousness levels.There are a few indirect approaches that may be utilised to detect tiredness even if there is no direct way to do so. A variety of techniques for gauging a driver's sleepiness are described, including vehicle-based assessments, physiological measures, and behavioural measures. These techniques can be used to create an intelligence system that warns the driver when they are sleepy and helps to avoid accidents. A description of the benefits and drawbacks of each system is provided. The best approach is selected and suggested in accordance with benefits and drawbacks. The method for developing the full system is then described using a flow chart, which involves continually recording the image in real-time before framing it.

The next step is to evaluate each frame to determine face first. The next step is to find the eyes if a face is found. Following a positive eye detection result, the degree of eye closure is assessed and compared to the standards for eyes in a sleepy condition. If drowsiness is discovered, the driver is alerted; otherwise, the cycle of looking for faces and recognising drowsiness is repeated. Later parts provide a full explanation of object detection, face detection, eye detection, and eye detection. A few experiments on object detection are conducted since faces are a sort of object.

Different methods are suggested and discussed for both face detection and eye detection. The theoretical foundation for building the complete system, including Principal Component Analysis (PCA) and the Eigen face technique, is discussed. We are aware that the face has a complex, multifaceted structure. To recognise a face, one requires excellent calculation methods and methodologies. A face will be treated as a two-dimensional structure in this technique, and as such, it should be identified. Face recognition in this instance uses Principal Component Analysis (PCA).The projection of facial pictures into that specific face area is the aim here. The variation or disparity between the required known faces is then encoded. The face space is decided and defined by the Eigen face. These faces are represented by eigen vectors. Each set of faces is included in these vectors. There are instances where the nose, eyes, lips, and other facial characteristics resemble one another. The Raspberry Pi serves as the system's primary piece of hardware. In order to better understand the theoretical method, which covers the Haar Cascade, Forming Integral Image, Adaboost, and Cascading, a quick introduction to the Raspberry Pi is provided.

The algorithm for determining the condition of the eyes was created using all four of the aforementioned approaches. The recommended approach was then implemented using the correct code. the appropriate preparation for implementation In order to document how the system responded and operated, many individuals were taken. The form of a circle denoted the opening of the eyes. If a motorist is found to be sleepy, the circle that would normally indicate an eye closure will not display. Results were displayed using a number of images that showed both closed and opened eyes. Next, flaws in the system were described, and it was underlined that more work would need to be done in the future to fix them and create a reliable intelligent driver aid system.The system functionality as a whole that has been planned and executed is included in the concluding section. Drowsiness is described as a lower degree of consciousness It shows up as fatigue and difficulties staying awake but that is quickly roused by uncomplicated stimuli. Lack of sleep, medicine, drug usage, or a mental illness might be the cause. Fatigue, which can be both mental and physical, is the main cause. Muscular tired, another term for physical weariness, is the temporary collapse of a muscle's capacity to perform at its optimum. Mental fatigue is the temporary incapacity to maintain peak psychological functioning.

The slow onset of mental fatigue can result from any intellectual effort and can vary depending on an individual's psychological capacity as well as other elements like lack of sleep and general health. Mental fatigue has been linked to decreased physical performance. It may show itself as sluggishness, lethargy, or a lack of mental coherence. In accordance with the statistics currently available, driver drowsiness has progressively risen to the top of the list of factors contributing to traffic accidents that lead in fatalities, serious physical injuries, and monetary losses. Drivers who fall asleep behind the wheel face the danger of losing control and hitting another car or immovable objects.

Driving when drowsy refers to a scenario in which the motorist experiences fatigue and a decline in mental attentiveness. An extremely sleepy driver will demonstrate persistent incapacity to execute a driving manoeuvre safely. The fact that the drivers might not be aware of how alert they are is a significant irony. Driving when fatigued not only has an impact on the driver but also puts all other road users in danger. Fortunately, signs of exhaustion may be seen on a person's face, such as yawning and times of intense eye contact. This study introduces a technique for detecting driver weariness by assessing the condition of the eyes and yawning.

2. LITERATURE SURVEY

The use of smartphone-based fatigue monitoring technologies might significantly reduce crashes caused by drowsy drivers and increase driving security. Technology takes pictures of drivers with a smartphone's front-facing camera, and then utilises sophisticated computer vision algorithms to find and follow the drivers' faces and eyes in the photos. Then, signs of driver weariness are identified, including head nods, head rotations, and eye blinks. According to the National Sleep Foundation, 17% of adult drivers and 51% of sleepy drivers have both passed out at the wheel. A driver's face movement, eye blink rate, head nod, and mouth yawn are all signs of weariness.To identify driver drowsiness, one method is to use electrophysiological signals, such as EEG signals. Up to 45% of American adults in 2012 possessed a smartphone. Compared to many other tiredness detection systems, a smartphone-based fatigue detection device would be more portable and more accessible. The feature stability was improved as a result of the extraction of features from the various phases. However, because of the categorization, the process's accuracy is poor [1].

According to "EEG PCA," alcohol consumption induces theta activity to rise and alpha activity to fall. The smart cap has five integrated electrodes that are shaped like a forehead band and are used to collect the EEG signal. Preprocessing is done on the obtained EEG signal before it is sent over Bluetooth to the intelligence unit, which is a microprocessor. The EEG is broken down into alpha, beta, gamma, and delta waves using this algorithm-loaded processor. The presence of alcohol is examined in the decomposed EEG signal.The process of electroencephalography involves capturing electrical brain impulses. The brain's neurons (nerve cells) each generate a very little electrical charge. This electrical activity is detected by tiny electrodes implanted on the scalp, amplified, and recorded as brain waves (neural oscillations). The condition of the driver is a clear sign of driving weariness. On the other hand, a vehicle's installed sensors, which are difficult to tamper with, may be used to evaluate driving behaviour. The advantages of driver's state and driving behaviour detection are combined in this article. The condition of the driver is a clear sign of driving weariness [2].

One of the most frequent effects of fatal traffic accidents worldwide is driver fatigue. Road accidents are caused by distracted driving, which increases the probability of collision by 4 to 6 times compared to vigilant driving. This study offers a technique for detecting driver sleepiness that employs both mouth and eye and eye and mouth and eye detection to be effective. One of the main reasons of the rise in accidents is driver weariness and sleepiness. According to the World Health Organization (WHO), India has the world's worst road conditions, which led to almost 2.5 lakh fatalities in 2010 and 2011.Daydreaming while driving, crossing the centre line, yawning, feeling irritated, stiff, heavy eyes, and delayed reaction times are some warning signals that can be quantified as indicators of driver tiredness [3].

Driver drowsiness is a factor in over 60% of car accidents in India. Driver weariness impacts driving abilities in three ways: (1) coordination is compromised, (2) response times are slowed down, and (3) judgement is compromised. According to a poll, more than 50% of annual traffic accidents are the consequence of driver weariness. The identification of drowsy driving has been the focus of research utilising a range of techniques, including physiological detection and road monitoring approaches. Adopting a range of techniques, such as physiological detection and road monitoring approaches, researchers have been attempting to identify driver sleepiness in cars.The literature has previously discussed a number of ways for the detection of driver sleepiness. Attention assist, the Volkswagen Fatigue Detection System, Ford Driver Alert, and Volvo Driver Alert Control are examples of car driver monitoring technologies. This strategy is intrinsically problematic because it relies too heavily on indirect and inaccurate road surveillance. The frame grabber's delivered frames are taken one at a time by the face detection programme. The eyes detection feature looks for the driver's eyes in the car. The sleepiness detection feature measures how quickly the eyes blink and whether they are open or closed to determine whether the driver is sleepy [4].

By taking video sequences of the driver, the system can identify indicators of exhaustion and drowsiness on their face while they are driving. It is one of the less intrusive and costly methods that uses MATML to conduct histogram normalisation, edge detection, and face and eye identification on the collected frames. 17.9% of traffic deaths and 26.4% of traffic injuries are mostly attributable to driver weariness or alertness impairment. The goal of this research is to develop a computer vision system that can accurately detecting and tracking a driver's face as well as determining the condition of their eyes [6].

3. PROPOSED SYSTEM

The Ada-Boost algorithm was used to create a powerful classifier for detecting faces and eyes. Eyelid movement, gaze movement, head movement, and facial expression are all identified by the visual clues used. To simulate human exhaustion and anticipate fatigue based on gathered visual clues, a probabilistic model is created. This approach was tested on people of various ages, genders, and cultural origins who were experiencing actual exhaustion. Nevertheless, there were several drawbacks to employing this approach. For instance, this method is unsuitable for detecting sleepiness in a matter of seconds, its reliability is limited, and the classification system needs more time to identify an activity.

In order to extract facial characteristics from the sketch picture, this approach for face recognition system combines two layers of features, such as Static Local Feature Extraction and Dynamic Local Feature Extraction. The test features are then created by concatenating those characteristics. The photo images that match test characteristics are matched using the features. We don't use low pass filtering, as is done in the Gaussian pyramid, to blur the pictures in order to shorten the calculation time. Simply decimating every second sample lowers image resolution to simplify computation. The segmentation process thus begins from the top layer of the pyramid rather than analysing each individual pixel in an input picture.

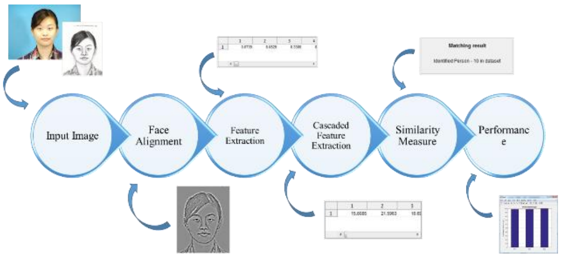

Fig 1: System Architecture

The top layer of a four-layer pyramid has a side that is eight times smaller than the input image's side. As a result, the computation time is decreased by a factor of 64 on average along with the amount of pixels. A binary map is made for each tier of the pyramid. The binary map is first made up entirely of zeros. The values associated with the coordinates of pixels that are designated as skin tones are all one. The resultant binary map is double-sided interpolated to the lower layer below. Following is a list of the several benefits of the suggested approach:

- Cascade feature extraction increases the feature's stability.
- The use of an efficient classification approach increases the recognition rate.
- This method works well for drawing faces.

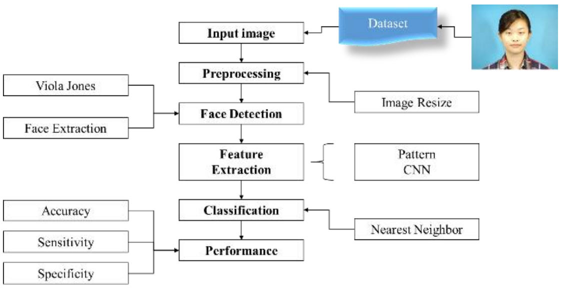

Fig 2: System Flow Diagram

The next part provides an explanation of the different stages that are implemented throughout the development of the proposed system:

1. Input image

The imread command can be used to read an image into the workspace. By reading and saving an image from one of the sample photographs included with the toolbox in an array named I, Imread determines via the file that the graphics file format is Tagged Image File Format. (TIFF). Use the imshow function to display the picture. The Image Viewer software also lets you see images. The imtool function launches the Image Viewer application, which offers a unified setting for viewing pictures and carrying out certain standard image-processing operations.

2. Face Alignment

Difference of Gaussians (DoG) is an approach for enhancing features in imaging science that includes subtracting one blurry version of an original picture from another, less blurry version of the original. To create blurred pictures in the straightforward instance of grayscale photos, the original grayscale images are convolved using Gaussian kernels having various standard deviations. When a Gaussian kernel is used to blur a picture, only high-frequency spatial information is suppressed. The spatial data that is in the range of frequencies preserved in the two blurred pictures is preserved when one image is subtracted from the other. Since only a small number of the spatial frequencies included in the original grayscale image remain after applying a band-pass filter, the difference of Gaussians is a few.

3. Feature Extraction

Deep neural networks of the type known as convolutional neural networks (CNN, or ConvNet) are often employed in deep learning to analyse visual perception. Multilayer perceptrons are modified into CNNs. Typically, when we talk about multilayer perceptrons, we're talking about fully linked networks, where each neuron in the layer below it is coupled to the neuron in the layer above it. These networks' "fully-connectedness" makes them susceptible to overfitting data. A common technique for regularisation involves adding some sort of weight magnitude measurement to the loss function. CNNs, on the other hand, use a different approach to regularisation; they employ the hierarchical structure of the data to piece together more complex patterns from smaller, simpler ones. Thus, on a scale of connectedness and complexity, CNNs are at the bottom end.

4. Cascaded Feature Extraction

Because cascaded functions similarly to concatenate functions, two feature values are concatenated to produce a single, bigger test feature. Vertical concatenation and Horizontal concatenation are both permitted in MATLAB. When two matrices are concatenated by using commas to separate them, they are simply added horizontally. Horizontal concatenation is the term for it. As an alternative, two matrices are added vertically if you concatenate them by separating them with semicolons. Concatenation vertical is the term for it.

5. Similarity Measure

A non-parametric method for pattern recognition's classification and regression is known as the k-nearest neighbours algorithm (k-NN). In both cases, the input consists of the k nearest training examples in the feature space. The outcomes depend on whether k-NN is used for classification or regression: A class membership is the outcome of the k-NN classification process. The neighbours of an item choose the class to which it is assigned based on the majority vote of its k closest neighbours (k is a positive integer, typically small). If $k = 1$, the object is simply classified as belonging to its one nearest neighbour.

6. Performance

Statistical measurements of the effectiveness of a binary classification test, commonly named as a classification function in statistics, include sensitivity and specificity: Sensitivity is the percentage of positives that are accurately classified as such (often referred to as the recall, the possibility of discovery, or the true positive rate in some sectors) (i.e. the proportion of unwell patients who are diagnosed with their ailment appropriately). Specificity measures the percentage of negatives that are accurately classified as such (sometimes referred to as the real negative rate) (i.e., the proportion of healthy individuals who are appropriately classified as not having the condition)

4. RESULTS

In this procedure, we make an effort to address the effect of these variables on the identification of a photo from a face sketch using a cascaded static and dynamic local feature extraction approach.The accompanying pictures show the findings, which show that the suggested cascaded static and dynamic local feature extraction displays superior accuracy in relation to matching face drawings with form exaggeration to photos. This is due to the fact that the form exaggeration effect is managed by employing dynamic local feature extraction for the n number of chosen candidates via static local feature extraction matching.

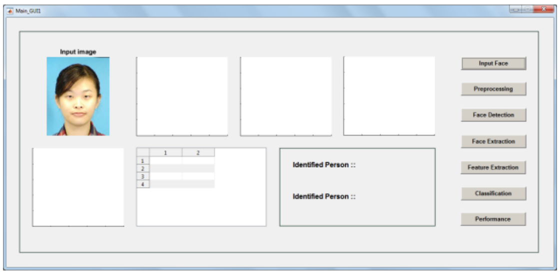

Fig 3: Input Image

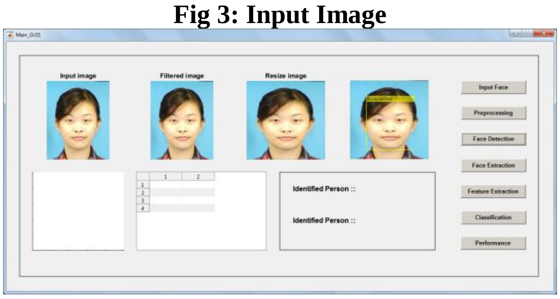

Fig 4: Face Detection

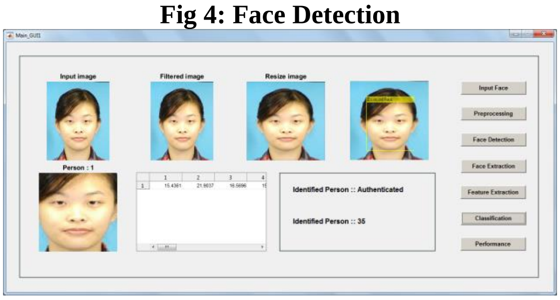

Fig 5: Classification

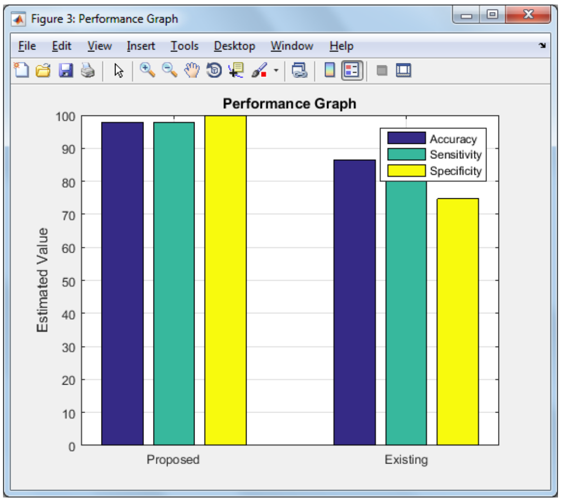

Fig 6: Performance Graph

5. CONCLUSION

In this procedure, we introduced a brand-new technique for extracting local features that combines cascading static and dynamic local feature extraction. The findings show that the suggested cascaded static and dynamic local feature extraction demonstrates superior accuracy when matching face drawings with exaggerated form to photographs. This is so that the form exaggeration effect may be addressed for the n number of candidates chosen through static local feature extraction matching.

6. FUTURE SCOPE

To locate regions of fast change (edges) in pictures, Laplacian filters are derivative filters. The picture is typically smoothed (for example, using a Gaussian filter) before the Laplacian is applied since derivative filters are particularly sensitive to noise. Laplacian of Gaussian (LoG) operation is the name of this two-step method.

REFERENCE

[1] Q. Han, L. Zeng, L. Yang, and Y. Liu, "Experimental analysis of CCA threshold adjusting for vehicle EWM transmission in V-CPS," International Journal of Ad Hoc & Ubiquitous Computing, vol. 21, p. 1-6, 2016.

[2] T. Louw, R. Madigan, O. Carsten, and N. Merat, "Were they in the loop during automated driving? Links between visual attention and crash potential," Injury Prevention Journal of the International Society for Child & Adolescent Injury Prevention, 2016.

[3] F. S. C. Clement, A. Vashistha, and M. E. Rane, "Driver fatigue detection system," in International Conference on Information Processing, 2015, pp. 229-234.

[4] S. Z. Li, R. Chu, S. Liao, and L. Zhang, "Illumination invariant face recognition using near-infrared images," IEEE Transactions on Pattern

Analysis & Machine Intelligence, vol. 29, pp. 627-39, 2007.
[5] A. Ross and A. Jain, "Information fusion in biometrics," Pattern Recognition Letters, vol. 24, pp. 2115-2125, 2003.
[6] Vinit Khetani, Jennifer Nicholas, Anuja Bongirwar , Abhay Yeole."Securing Web Accounts Using Graphical Password Authentication through Watermarking". International Journal of Computer Trends and Technology (IJCTT) V9(6):269-274, March 2014.
[7] K. Mikolajczyk and C. Schmid, "A performance evaluation of local descriptors," IEEE Transactions on Pattern Analysis & Machine Intelligence, vol. 27, pp. 1615-30, 2005.
[8] M. Chipman and Y. L. Jin, “Drowsy drivers: The effect of light and circadian rhythm on crash occurrence,” Safety Sci., vol. 47, no. 10, pp. 1364–1370, Dec. 2009.
[9] A. Williamson, D. A. Lombardi, S. Folkard, J. Stutts, T. K. Courtney, and J. L. Connor, “The link between fatigue and safety,” Accid. Anal. Prev., vol. 432, pp. 498–515, Mar. 2011.
[10] Sayed, A., Sardeshmukh, M., & Limkar, S. (2014). Improved Iris Recognition Using Eigen Values for Feature Extraction for Off Gaze Images. In ICT and Critical Infrastructure: Proceedings of the 48th Annual Convention of Computer Society of India-Vol II: Hosted by CSI Vishakapatnam Chapter (pp. 181-189). Springer International Publishing.
[11] S. Kar, M. Bhagat, and A. Routray, “EEG signal analysis for the assessment and quantification of driver’s fatigue,” Transp. Res. F, vol. 13, no. 5, pp. 297–306, Sep. 2010.
[12] K. Hyoki, M. Shigeta, N. Tsuno, Y. Kawamuro, and T. Kinoshita, “Improving the saccade peak velocity easurement for detecting fatigue,” J. Neuro sci . Methods, vol. 187, no. 2, pp. 199–206, Mar. 2010.
[13] Jeysudha, A., Muthukutty, L., Krishnan, A., & Shivadekar, S. (2017). Real Time Video Copy Detection using Hadoop. International Journal of Computer Applications, 162(9), 42-45.
[14] M. Molnar, R. Boha, et al., “The Acute Effect of Low Dose Alcohol on Working Memory During Mental Arithmetic II. Changes of Non Linear and Linear EEG Complexity in the Theta Band, Heart Rate and Electrodermal Activity”, International Journal of Psychopysiology, vol. 27, pp. 138-142, 2009.
[15] C. Zhihua, F. Ruifang, L. Guangyu and L. Tian, “Study on human brain after consuming alcohol based on eeg signal”, Proceedings of IEEE ICCSIT-2010, vol. 5, pp. 406-409, 2010.
[16] Shivadekar, Samit, S. R. Abraham, and S. Khalid. "Document validation and verification system." Int. J. Adv. Res. Comput. Eng. Technol.(IJARCET) 5.3 (2016).