FACE ID RECOGNITION USING EYE RATIOS

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ABSTRACT

Importance of face recognition systems have speed up in the last few decades. A face recognition system is one of the biometric information processing. Applicability is easier and working range is larger than other biometric information processing, i.e., fingerprint, iris scanning, signature, etc. But it makes difficult or impossible to identify the face when a person is wearing a mask or a helmet. This makes face recognition a very difficult task since certain parts of the face are hidden. Hence the solution to this can be determined by using eye ratios. The first step is to discard the masked face region. Eye ratios are a method of face recognition that uses the relative size and shape of a person's eyes to identify them. Eye ratios refer to the distance between certain landmarks on the face, such as the distance between the inner corners of the eyes or the distance between the eyes and the nose, which are unique to everyone. By measuring these ratios, a computer can accurately identify a person, even if they are wearing a disguise. The eye ratios technique is based on the fact that human eyes are unique, and that the size and shape of the eyes can be used to accurately identify a person.

Keyword: *Face recognition, Masked face, live acquired image, Landmarks on face, multiple face detection and recognition.*

1. INTRODUCTION

Face recognition systems are part of facial image processing applications and their significance as a research area is increasing recently. They use biometric information of the humans and are applicable easily instead of fingerprint, iris, signature etc., because these types of biometrics are not much suitable for non-collaborative people. Face recognition systems are usually applied and preferred for people and security cameras in metropolitan life. These systems can be used for crime prevention, video surveillance, person verification, and similar security activities.

Face recognition system is a complex image-processing problem in real world applications with complex effects of illumination, occlusion, and imaging condition on the live images. It is a combination of face detection and recognition techniques in image analyses. Detection application is used to find position of the faces in each image. Recognition algorithm is used to classify given images with known structured properties, which are used commonly in most of the computer vision applications. These images have some known properties like; same resolution, including same facial feature components, and similar eye alignment. These images will be referred as “standard image” in the further sections.

Recognition applications uses standard images and detection algorithms detect the faces and extract face images which include eyes, eyebrows, nose, and mouth. That makes the algorithm more complicated than single detection or recognition algorithm. It makes difficult or impossible to identify the face when a person is wearing a mask or a helmet. This makes face recognition a very difficult task since certain parts of the face are hidden. Face identification through eye ratios can be implemented using image processing to automate the process of Identifying and determining the face of a person.

A image processing model could be trained to recognize and classify different types of eye ratio based on their appearance, size, and other characteristics. This can also be implemented as a software application that runs on a computer or mobile device. There are several different applications for eye ratios in image processing, including

facial recognition, emotion detection, and identifying individuals for security purposes. Eye ratios can also be used in medical imaging to help diagnose conditions such as Down syndrome and other genetic disorders.

1.1 BACKGROUND

The classical biometric systems based on passwords or fingerprints are also available today. Face recognition is accessible even without any need to touch any device. This provides faster authentication only when the face is clearly visible to the system. But this system is inaccessible when an individual is wearing a mask or a helmet where only the eye is visible to the system. Methods for face detection and recognition systems can be affected by pose, presence or absence of structural components, facial expression, occlusion, image orientation, imaging conditions, and time delays.

OBJECTIVES

The aim and objective of face identification through eye ratios using image processing is to accurately identify a specific individual from a group of people based on their facial features. This can be used for a variety of purposes, such as verifying a person's identity for security purposes or for automatically tagging photos with the names of the individuals depicted in them. Automatically identify individuals based on their facial features. Specifically, this system aims to identify individuals by comparing the ratios of the widths or heights of their eyes to a reference value or distribution.

2. IMPLEMENTATION PHASES

There properties that are essential considerations in system design as they help ensure that the system meets the desired requirements, performs efficiently, is maintainable, and provides a positive user experience. By prioritizing these properties during the design phase, developers can create robust, scalable, and reliable systems that meet the needs of users and stakeholders.

The equipment's needed to implement the new system is chosen. At this stage, it is kept in mind that the proposed system is aimed at removing the shortcomings of the old system. The proposed system should be designed in such a way that it overcomes the limitations in the existing system.

- Collect a large dataset of facial images with labelled eye positions
- Develop a face detection algorithm
- Identify locations of the eyes
- Compute eye ratios
- Test and evaluate the system
- Deploy the system

The implementation of face recognition through eye ratios involves the following steps:

Data collection: Collect a dataset of faces with varying poses, expressions, and lighting conditions. The dataset should also include labels for the eye positions and face orientations.

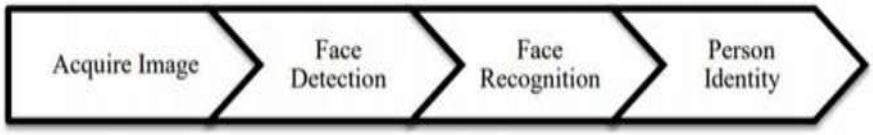

Figure 1 Steps of face recognition system Application

Pre-processing: Preprocess the images by applying image transformations such as resizing, cropping, and normalization to enhance the features of the eyes and face.

Figure 3: Landmarks on Face

Eye ratio calculation: Calculate the eye ratios by dividing the distance between the inner corners of the eyes by the distance between the outer corners of the eyes. This ratio is an indicator of the person's identity and can be used as a feature for face recognition.

Ratio = (Length A) / (Length B)

Classification: Train a classification model, such as a Support Vector Machine (SVM) or a Convolutional Neural Network (CNN) or a KNN k-nearest neighbours algorithm, using the eye ratios as features and the face labels as the target variable.

Testing: Test the model on a separate set of images to evaluate its accuracy and performance. You can use metrics such as precision, recall, and F1 score to measure the performance of the model.

2.1 COLLECTION OF DATA FOR DATABASE

The collection of datasets for the database is done manually by running a python code that prints the eye ratios of a person's face. Later this numbers can be copies into a csv file or can create another function in that code that will overwrite the data into a csv file. This database is imported in the main code.

3. WORKFLOW

- Collect a large dataset of facial images with labelled eye positions: To train a computer vision model to recognize eye ratios, you need a dataset of images with labelled eye positions. You can use publicly available datasets like the Multi-Attribute Facial Recognition (MAFR) dataset or the Labelled Faces in the Wild (LFW) dataset.
- Develop a face detection algorithm: Before you can analyse the eye ratios, you need to identify the location of the face in an image. You can use a pre-trained face detection algorithm like Haar Cascades or the Viola-Jones algorithm to detect faces in an image.
- Identify locations of the eyes: Once you have identified the location of the face, you can use computer vision techniques to locate the eyes. One approach is to use the face landmarks detector, which is a pre-trained model that can identify various facial landmarks such as the eyes, nose, mouth, and ears.
- Compute eye ratios: After locating the eyes, you can calculate various eye ratios such as the inter-eye distance, eye-to-face height ratio, eye-to-nose distance ratio, etc. These ratios can be used to identify unique features of a person's face, which can be used for recognition purposes.

- Test and evaluate the system: Once the model is trained, you can test it on a separate dataset of images to evaluate its performance. You can use various evaluation metrics such as precision, recall, and F1-score to measure the accuracy of the system.
- Deploy the system: Finally, you can deploy the system in a real-world setting, such as a security checkpoint or a surveillance system. The system can be integrated with other security systems to provide additional layers of security and to prevent unauthorized access to sensitive areas.

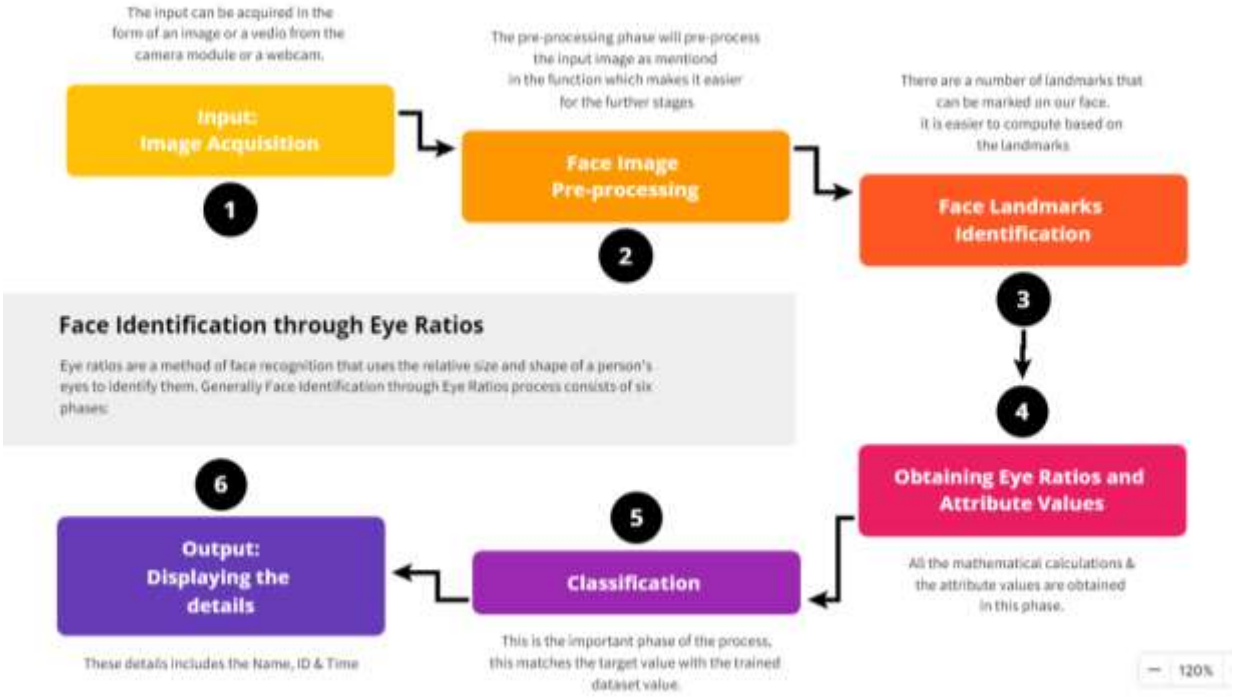

Fig-3: Sequence Diagram

3. RESULTS

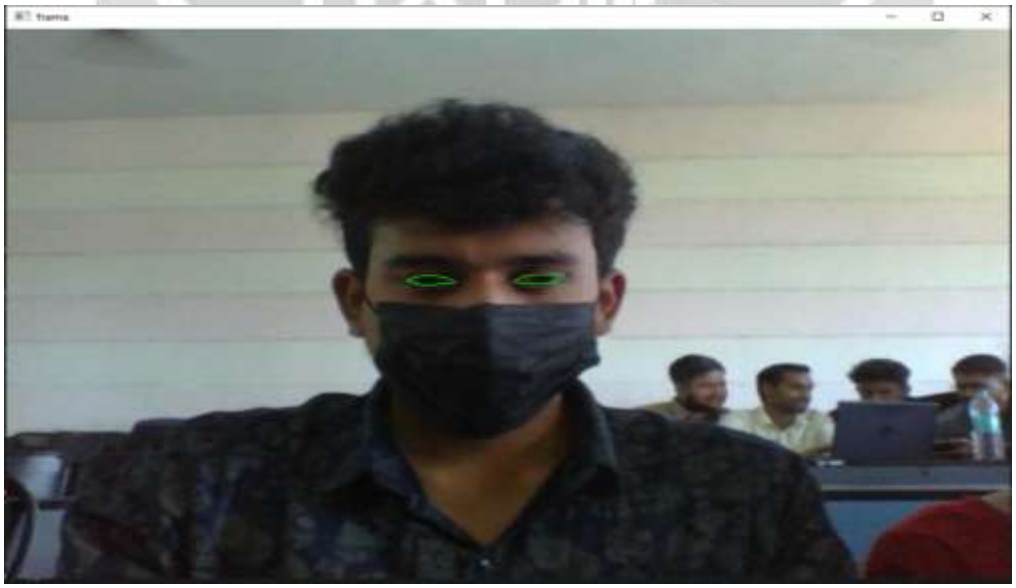

Fig-4: User Input for Face recognition

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PS D:\AMC\Eyes-Position-Estimator-Mediapipe-master> & C:/Users/user/AppData/Local/Programs/Python/Python310/python.exe
ster/Eye_Tracking_part2/Final.py
INFO: Created TensorFlow Lite XNNPACK delegate for CPU.
      ratio1    ratio2    ratio3
15  3.069493  2.548463  3.809169
19  3.019900  2.556981  3.248891
27  3.000431  2.643419  3.303461
26  2.999692  2.643905  3.305174
8   2.951889  2.629997  2.997270
24  2.981210  2.626485  3.047075
21  3.072079  2.588510  3.123031
Person predicted ['Preethi' 'Rakshith' 'Rakshith' 'Rakshith' 'RBN' 'RBN' 'Rakshith']
The maximum repeated name is: Rakshith
Were the predictions accurate? (y/n)y
PS D:\AMC\Eyes-Position-Estimator-Mediapipe-master>
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Fig-5: Output of result

4. CONCLUSION

It is important to note that the use of eye ratios for face identification using image processing is not a full proof method and can be affected by a range of challenges and limitations. While eye ratios may be useful in some cases as a secondary or supplemental biometric for face identification, they should not be relied upon as the sole method for identifying individuals. Other factors, such as the overall quality of the images used and the specific characteristics of the individuals being identified, can also have a significant impact on the accuracy of the system.

Eye ratios can be a useful feature for face identification using image processing techniques, but they are not without limitations. While eye ratios can be a useful way to distinguish between individuals, there is significant variability in eye size and shape between different people, which can make it difficult to accurately compare eye ratios. Additionally, the quality of the images used for face identification can have a significant impact on the accuracy of the system, as can facial expressions, occlusions, aging, and ethnicity.

Therefore, it is important to consider these factors when using eye ratios for face identification and to use a combination of multiple features and algorithms to improve the accuracy and reliability of the system. In conclusion, the use of eye ratios for face identification through image processing can be a useful tool in some situations, but it is important to carefully consider the limitations and challenges of this approach and to use it in combination with other biometric and identification methods to ensure the highest level of accuracy and reliability.

5. REFERENCES

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