Improving the Accuracy of Intruder Detection from Surveillance Videos using Face Features

Submitted By

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Improving the Accuracy of Intruder Detection from Surveillance Videos using Face Features

Major Project II

Submitted in partial fulfillment of the requirements

for the degree of

Master of Technology in Computer Science and Engineering (INS)

Submitted By

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Certificate

This is to certify that the major project entitled **"Improving the Accuracy of Intruder Detection from Surveillance Videos using Face Features"** submitted by **Karan Lakhani (Roll No: 21MCEI12)**, towards the partial fulfillment of the requirements for the award of degree of Master of Technology in Computer Science and Engineering (INS) of Nirma University, Ahmedabad, is the record of work carried out by him under my supervision and guidance. In my opinion, the submitted work has reached a level required for being accepted for examination. The results embodied in this major project part-I, to the best of my knowledge, haven't been submitted to any other university or institution for award of any degree or diploma.

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Statement of Originality

I, **Karan lakhani**, . **Roll No.21MCEI12**, give undertaking that the Major Project entitled "**Improving the Accuracy of Intruder Detection from Surveillance Videos using Face Features**" submitted by me, towards the partial fulfillment of the requirements for the degree of Master of Technology in **Computer Science & Engineering (INS)** of Institute of Technology, Nirma University, Ahmedabad, contains no material that has been awarded for any degree or diploma in any university or school in any territory to the best of my knowledge. It is the original work carried out by me and I give assurance that no attempt of plagiarism has been made.It contains no material that is previously published or written, except where reference has been made. I understand that in the event of any similarity found subsequently with any published work or any dissertation work elsewhere; it will result in severe disciplinary action.

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Signature of Student
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Place:

Endorsed by
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Abstract

Computers have revolutionized many aspects of modern life and have become essential tools in a wide variety of fields. Some of the ways in which computers are important include: Communication,Information Processing, Education, Business, Science and research, Entertainment. Overall, computers are important because they have the ability to perform a wide range of tasks quickly and accurately, and they have had a significant impact on many aspects of modern life.in that we are going to discuss about two things and that are Information processing and Science and research.

- Information processing: Computers are capable of storing, organizing, and analyzing large amounts of data quickly and accurately, making them essential tools for tasks such as data analysis and decision-making.
- Science and research: Computers are used to analyze data and perform simulations in a wide range of scientific and research fields, including medicine, meteorology, and astrophysics.

Device having such advantage can be more useful to fight cybercrime. In this paper we are going to discuss about the CCTV that are present all over in the planet reordering every activity with the help of right algorithm to detect face and body movements. we can able to fight crime and make our jurisdiction and police stronger like never before.

Abbreviations

SIFT	Scale-Invariant Feature Transform.
HOG	Histogram of Oriented Gradients.
CNNs	convolutional neural networks.
SURF	Speeded-Up Robust Features .
LBA	Local Binary Patterns.

Contents

List of Figures

Chapter 1

Introduction

Computers have had a profound impact on our lives, providing numerous benefits over time. They have increased productivity by automating tasks, processing large amounts of data, and enabling efficient work processes. Through connectivity and the internet, computers have revolutionized communication, connecting people globally and facilitating collaboration and information sharing. They have made information readily accessible, empowering individuals with vast knowledge and resources. In education, computers have transformed learning, offering interactive platforms and expanding educational opportunities. Scientific advancements have been accelerated through computer simulations, data analysis, and modeling. Video footage analysis has benefited from computer vision techniques, allowing real-time person detection and tracking. This has improved security, crowd management, forensic investigations, and human-computer interaction. Overall, computers have enhanced our lives by optimizing efficiency, enabling connectivity, and advancing various fields through their processing power and capabilities.

Our focus in this paper is on OpenCV (Open Source Computer Vision), an open-source library that offers a range of functions, tools, and algorithms for computer vision tasks. OpenCV is a powerful software for video analysis and person detection, and its versatility and durability make it a top choice for many users. OpenCV offers a range of algorithms that have the capability to detect and track individuals in video footage. One such algorithm is the Haar cascade classifier, which is highly effective in detecting human faces and objects with great accuracy. OpenCV also supports deep learning models like CNNs, which can recognize complex patterns and features, thus enhancing the accuracy and reliability of person detection. Additionally, OpenCV has efficient

algorithms optimized for real-time performance, making it suitable for applications that require quick person detection in video footage. With its broad range of algorithms, extensive documentation, active community support, and compatibility with multiple programming languages, OpenCV is a valuable resource for person detection and video analysis tasks, enabling developers to create effective solutions in various domains.

The paper follows a structured format, beginning with Chapter 2, which presents a literature review of software-based commercial vendors and recent research papers. This review aims to explore existing solutions and provide a comprehensive understanding of the topic. In Chapter 2, the drawbacks and weaknesses of the current software are identified, laying the foundation for addressing the existing issues. Chapter 3 proposes an approach to overcome these identified issues, offering a potential solution. The implementation of the proposed approach is detailed in Chapter 4, followed by an evaluation of its accuracy in Chapter 5. Chapter 5 also discusses the challenges that may arise during the implementation and usage of the proposed approach. Chapter 6 concludes the paper by summarizing the findings and their implications, while Chapter 7 explores potential future directions and areas for further research.

Chapter 2

Literature Survey

Facial detection and recognition are being advanced and it is being used by everyone for their daily use like phones to unlock and the corporate office to enter via face recognition and law enforcement can identify criminal from Video footage. There are many software available and more research has been conducted on facial detection.

2.0.1 Software Based Application

Table 1 states the available software in the market, and all software technology is based on 2 technology Deep learning algorithm and 3D Face Recognition Algorithm.

Deep Learning Technology: Deep learning facial recognition is a method of identifying people based on their faces. It uses artificial intelligence to extract features from 2D images of faces, which are then used to train a model that can identify people based on those features. Deep learning facial recognition is typically more accurate than traditional methods of facial recognition, such as template matching and feature extraction, because deep learning models can learn to identify subtle features that are not visible to the human eye. However, deep learning facial recognition requires a large amount of training data in order to be accurate.

3D Face Recognition: 3D Face Recognition is another method of identifying people based on their faces. It uses 3D images of faces to extract features, which are then used to train a model that can identify people based on those features. 3D face recognition is typically more accurate than 2D face recognition because it can capture more information about the face. However, 3D face recognition requires specialized hardware and software, which can be expensive.

Vendor	Features	Detection Technology	Accuracy	Scalability	Features	Cost
Amazon Rekognition	Facial Recognition. It Provides Age, Gender, and Emotion.	Deep Learning Method	99%	Highly scalable	It detect faces in real time.	Pay-as-you-go pricing
BioID	Facial Recognition. It Provides Age, Gender, and Emotion.	3D Face Recognition Algorithm	98%	Highly scalable	It detect faces in low-light conditions.	Subscription-based pricing
Paravision	Facial Recognition. It Provides Age, Gender, and Emotion.	Deep Learning Method	99%	Highly scalable	It detect faces in high-contrast conditions.	Pay-as-you-go pricing
Cognitec	Facial Recognition. It Provides Age, Gender, and Emotion.	3D Face Recognition Algorithm	98%	Highly scalable	It detect faces in different poses.	Subscription-based pricing
Luxand	Facial Recognition. It Provides Age, Gender, and Emotion.	Deep Learning Method	99%	Highly scalable	It detect faces with glasses or sunglasses.	Pay-as-you-go pricing
NEC Corporation	Facial Recognition. It Provides Age, Gender, and Emotion.	3D Face Recognition Algorithm	98%	Highly scalable	It detect faces with facial hair.	Subscription-based pricing
Cognitec Systems	Facial Recognition. It Provides Age, Gender, and Emotion.	Deep Learning Method	99%	Highly scalable	It detect faces with occlusions.	Pay-as-you-go pricing
Aware Inc.	Facial Recognition. It Provides Age, Gender, and Emotion.	3D Face Recognition Algorithm	98%	Highly scalable	It detect faces in motion.	Subscription-based pricing
FaceFirst Inc.	Facial Recognition. It Provides Age, Gender, and Emotion.	Deep Learning Method	99%	Highly scalable	It detect faces in different lighting conditions.	Pay-as-you-go pricing
Safran SA	Facial Recognition. It Provides Age, Gender, and Emotion.	3D Face Recognition Algorithm	98%	Highly scalable	It detect faces with different expressions.	Subscription-based pricing
Panasonic Corporation	Facial Recognition. It Provides Age, Gender, and Emotion.	Deep Learning Method	99%	Highly scalable	It detect faces with different skin tones.	Pay-as-you-go pricing
Gemalto NV	Facial Recognition. It Provides Age, Gender, and Emotion.	3D Face Recognition Algorithm	98%	Highly scalable	It detects faces with different hair styles.	Subscription-based pricing

Table 2.1: Literature Survey for Available Software

The best method for you will depend on your specific needs. If you need a high-accuracy facial recognition system, then deep-learning facial recognition is a good option. However, if you are on a budget or need a system that is easy to deploy, then 3D face recognition may be a better choice.

Apart from the technology used in the software they all are identical in nature as both the software detect face, age, gender, and emotions and some have different capabilities like detection in low light, high contrast, or detection in live mode, some are able to track the path of the human or animal with time also record the activity.

Here are some additional considerations when choosing between deep-learning facial recognition and 3D face recognition:

Accuracy: Deep learning facial recognition is typically more accurate than 3D face recognition. However, the accuracy of both methods can vary depending on the quality of the input data and the complexity of the model. Cost: DL facial recognition is harder than the 3D face recognition. as it requires more training data than the 3D face recognization Deployment: DL facial recognization is difficult to deploy as it requires special software and hardware. Ultimately, the best way to choose between deep learning facial recognition and 3D face recognition is to consider your specific needs and requirements.

2.0.2 Research Paper Survey

Table 2 shows the survey of the paper that has been researched for facial detection

- In the Paper title is "Comparative Analysis of Classifiers for Criminal Identification System Using Face Recognition" and the data set they used was the NIST mugshot data set, the algorithm that was implemented was MTCNN(Multi-task cascaded convolutional neural network), Facnet, and KNN, that obtained the accuracy of 97.1%.

- In the Paper title is "Criminal Investigation and management system" and the data set they used was 44 Video footage, the algorithm that was implemented was Deep Neural network, MobileNet SSD, and YOLO version 4, which obtained an accuracy of 92

- In the Paper title is "Face detection and recognization for criminal Identification system" and the data set they used was the MS-celeb-1M data set, the algorithm

Year	Database	Technique	Accuracy	Paper Name
2021	NIST mugshot data set	MTCNN(Multi task cascaded convolutional neural network), Facnet and KNN	97.10%	Comparative Analysis of Classifiers for Criminal Identification System Using Face Recognition
2021	44 CCTV footages	Deep Neural network, MobileNet SSD and YOLO version 4	92%	Criminal investigation and management system using CCTV footage - Eagle Eye
2021	MS-celeb-1M data set	MTCNN	90%	Face detection and recognition for criminal Identification system
2022	Short 10-15 Sec Video	VGG	96.00%	Face Detection and Recognition in Near Infra-Red image
2021	25 Frames per person	Open CV	98.50%	Face Recognition Efficiency for Different Environmental Influence Conditions
2021	Yale	Gradient Boosting Machine	98.70%	FaceCognize : An approach to Face Recognition for low resolution image
2021	Geogia	Support Vector Machines (SVM)	99.80%	FaceCognize : An approach to Face Recognition for low resolution image
2021	AT&T	XGBoost	99.30%	FaceCognize : An approach to Face Recognition for low resolution image
2022	CCTV	Combination of Haar Cascade & LBP (Local Binary Pattern)	90.90%	FDR: An Automated System for Finding Missing People
2021	16 different CCTV Recording	Retina Face Model	98.05%	Human Face Detection and Tracking Using RetinaFace Network for Surveillance Systems
2022	Existing database	Eigenface, Fisher face & Linear binary pattern	95%	Robust Face Detection and Recognition using Image Processing and OpenCV
2023	Pistol data set	YOLO v5	98%	Smart Video Surveillance Based Weapon Identification using Yolo v5

Table 2.2: Literature Survey for Research on Facial Detection

that was implemented was MTCNN, which obtained an accuracy of 90%.

- In the Paper title is "Face Detection and Recognition in Near Infra-Red Image" and the data set they used was a Short 10-15 Sec Video, the algorithm that was implemented was VGG, which obtained an accuracy of 96%.

- In the Paper title is "Face Recognition Efficiency for Different Environmental Influence Conditions" and the data set they used was 25 Frames per person, the algorithm that was implemented was Open CV, which obtained an accuracy of 98.5%.

- In the Paper title is "FaceCognize: An approach to Face Recognition for low resolution image" and the data set they used was Yale, the algorithm that was implemented was Gradient Boosting Machine, which obtained an accuracy of 98.7%.

- In the Paper title is "FaceCognize: An approach to Face Recognition for low resolution image " and the data set they used was Geogia, the algorithm that was implemented was Support Vector Machines (SVM), which obtained an accuracy of 99.8%.

- In the Paper title is "FaceCognize: An approach to Face Recognition for low resolution image" and the data set they used was AT&T, the algorithm that was implemented was XGBoost, which obtained an accuracy of 99.3%.

- In the Paper title is "FDR: An Automated System for Finding Missing People" and the data set they used was Video, the algorithm that was implemented was a Combination of Haar Cascade and LBP (Local Binary Pattern), which obtained the accuracy of 90.9%.

- In the Paper title is "Human Face Detection and Tracking Using RetinaFace Network for Surveillance Systems" and the data set they used was 16 different Video Recording, the algorithm that was implemented was the Retina Face Model, which obtained an accuracy of 98.05%.

- In the Paper title is "Robust Face Detection and Recognition Using" and the data set they used was an existing database, the algorithm that was implemented was

Eigenface, Fisher face, and Linear binary pattern, which obtained an accuracy of 95%.

- In the Paper title is "Smart Video Surveillance Based Weapon Identification Using Yolo V5" and the data set they used was the Pistol data set, the algorithm that was implemented was YOLO v5, which obtained an accuracy of 98%.

We can conclude from the above literature survey that the software vendors that they provide are needed high data to train and it is expensive to implement, and based on the research paper analysis the accuracy is not 99%.To overcome this problem. In this paper, we propose an approach that will be easy to implement and will have higher accuracy.

Chapter 3

Challenges

- Occlusion: Occlusion refers to the phenomenon where an object is partially or fully blocked from view by another object. This can make it difficult for a computer vision algorithm to accurately detect and recognize the occluded object, as some of its features may be hidden from view.
- Pose Invariance: Pose invariance is a problem when the computer identifies the object from one side and another side is completely blank when the object is brought from a different position the computer seems to blank and doesn't identify the object or an individual.
- Aging: Aging is the process where a human has physical change, Cognitive change, and Psychological changes
- Illumination: Illumination refers to the lighting conditions under which an image or video is captured. Poor illumination can make it difficult for a computer vision algorithm to accurately detect and recognize objects, as the appearance of the objects may be distorted or changed due to shadows, reflections, or other lighting effects.
- Tampered footage: It is really hard to detect if the footage has been tampered with without having a reference. The first step would be to identify if the footage tampers before we perform any activity of detection.

Rest all approach is feasible but dealing with forgery of Video Footage is most difficult part as far as the paper has been released none has an accuracy of 99%

Chapter 4

Proposed Approach

To minimize the computational task we will have two databases, one will have the known images and the other will have video. The 1st step for the Proposed Approach will scan through all the known images database and will detect the face after that it will extract the facial features and then will encode the facial features and extract the facial features and map them to the name of the known human.2nd Step will consist of the video recording of all the Video footage.

We are approaching the detection which requires no high-configuration machine, Open CV is best as it gives great accuracy with minimum computational power and is easy to train. The study showed the other algorithm and their limitation are

- Cascade P-RBM and it's difficult to train and to implement
- MTCNN it lacks in detecting multiple faces and as we have to implement it in Video footage so it won't fit right for the detection.
- DPM & SVM it requires a longer time to run
- Caffe Model framework is difficult to implement.

The Proposed architecture consists of Open CV which is fast to detect with minimal computational power required. In an Open CV, we use simplefacerec to encode facial parts like nose, eye, lips, and ears and will generate a unique id based on it and it will look for such facial characteristics in the Video footage and will notify if the suspect is identified or not.

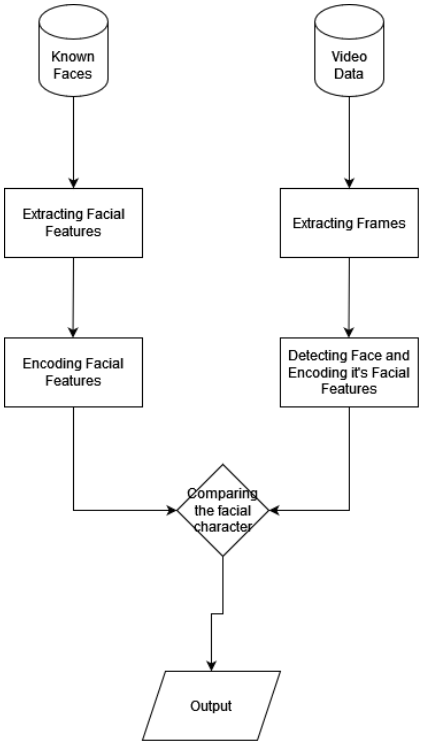

Figure 4.1: Proposed Approach

In the next approach, we detect body movements, try to find the body movements and record them to identify an individual.

The reason to opt for body detection is that we can't rely only on face detection our end goal is to get more accuracy and more accuracy we get from more feature selection from a wider range of data. From the Video footage, we can identify the physical appearance and body movement. from these, we can extract the features and test them out on the other Video footage to identify an individual and backtrack the suspect to come to a strong solution whether the suspect is involved in a crime or not.

Tools that are being used to create the project are Python, Open CV, Video Footage

4.1 Dataset

The video footage dataset utilized in this project is a comprehensive collection of diverse videos sourced from various reliable and authorized channels. This dataset is designed to enable a wide range of applications, including computer vision, video analytics, machine learning, and multimedia research.

Our dataset comprises of video clips that are filmed at various locations, times, and situations, with both high-resolution and low-resolution quality. It encompasses a wide

range of content, such as natural landscapes, urban scenes, social interactions, sports games, wildlife, cultural events, and more. The videos were captured using a mix of cameras, from professional-grade equipment to consumer-grade devices, resulting in a diverse mix of visual characteristics and quality.

Every video in the dataset is accompanied by rich metadata that offers valuable information about its context, such as location, date, time, camera specifications, and relevant annotations. The metadata annotations may include object bounding boxes, activity labels, scene descriptions, and other semantic information that can assist in developing advanced computer vision algorithms.

To ensure the dataset's comprehensiveness and diversity, the video footage is sourced from multiple genres and sources, including documentaries, news broadcasts, online video platforms, public archives, and licensed content providers. The data collection process has been strictly adhered to copyright laws and intellectual property rights, ensuring that all videos are legally obtained and can be used for research purposes.

The dataset is provided in a standardized video format (e.g., MP4, AVI) to ensure compatibility with common video processing libraries and frameworks. The resolution and frame rate of the videos may vary, offering a realistic representation of real-world video content.

By leveraging this extensive video footage dataset, your project aims to use the wealth of visual information to develop innovative algorithms, advance video analysis techniques, and contribute to the broader field of computer vision research.

4.2 Implementation

Before we approach, we need to understand the problem found in video footage. We found that most video footage uses different compression techniques. We are also aware that the quality of the footage at night is not that clear if an individual is standing far away. To overcome this issue, we are using OpenCV (Open Source Computer Vision), which is a free and open-source library of computer vision and machine learning algorithms. OpenCV is a commonly used tool for tasks including analyzing images and videos, detecting objects, and processing visual media. We selected OpenCV because it met our requirements perfectly, with factors such as user-friendliness, strong performance, extensive functionality, and great community support. For example, we utilize encoding and

decoding to extract facial features and compare them to our database to determine if there is a match.

OpenCV is a highly beneficial tool with many advantages. Its API is well-documented, and there are many online tutorials available, making it easy to use. It is also very fast, even on older hardware, which makes it ideal for processing images and videos quickly. Additionally, it offers a wide range of features, making it versatile and useful for various tasks such as image and video analysis, object detection, and image and video processing. Finally, the OpenCV community is vast and active, making it easy to find help if needed.

Our face recognition system is highly accurate and uses low computational power by utilizing OpenCV and facial recognition algorithms. The first step in the process is detecting faces in videos using the Histogram of Oriented Gradients (HOG) algorithm with a Linear SVM. This algorithm is chosen for its robustness, simplicity, computational efficiency, generalizability, and accuracy.

Once a face is detected, the facial landmarks are identified using the Local Binary Patterns (LBP) algorithm, providing a more detailed understanding of the face's structure. The Scale-Invariant Feature Transform (SIFT) algorithm and the Speeded-Up Robust Features (SURF) algorithm are then used to extract and encode the facial features, allowing for effective representation of facial characteristics.

The extracted features are then compared to a known database, and if a match is found, an alert is displayed, indicating successful identification. Our approach combines OpenCV and facial recognition algorithms, ensuring high accuracy while optimizing computational resources.

The initial step in facial recognition is detecting faces in the video footage, which is accomplished by using the Histogram of Oriented Gradients (HOG) algorithm. This algorithm extracts features from the image that are characteristic of faces, which are then used to train a classifier capable of identifying faces in new images.

Once a face has been detected, the next step is to identify the facial landmarks, such as the eyes, nose, and mouth. These landmarks provide a more detailed understanding of the face's structure and improve the accuracy of face recognition.

The next step is to extract features from the face using the Scale-Invariant Feature Transform (SIFT) algorithm and the Speeded-Up Robust Features (SURF) algorithm. These algorithms extract features from the image that are invariant to changes in scale,

rotation, and illumination.

Finally, the extracted features are compared to a known database of faces. If a match is found, the face is identified; otherwise, it remains unidentified.

Our comprehensive approach combining OpenCV and face_recognition algorithms ensures high accuracy and optimizes computational resources.

4.3 Working

Initially, a database is loaded with preexisting images. Once the image is loaded,the process of face detection begins, which involves identifying the presence and location of faces in an image or video frame. In order to do this, computer vision algorithms are employed, specifically the Histogram of Oriented Gradients (HOG) algorithm, which utilizes patterns and features to determine facial regions. Following face detection, the process of extraction and encoding is initiated.

- Face Detection: The first step is to detect the presence and location of faces in an image or video frame. This involves using computer vision algorithms, in our case we are using the Histogram of Oriented Gradients (HOG) algorithm, to identify facial regions based on patterns and features.

- Face Alignment: After detecting a face, techniques such as Local Binary Patterns (LBPs) are utilized to align and normalize the detected face. The objective of these techniques is to guarantee the consistent positioning of facial features across various images, which results in precise comparisons and measurements.

- Facial Feature Extraction: To proceed, the next task is to extract the necessary facial characteristics from the properly aligned facial areas. This step entails recognizing significant facial landmarks or points, such as the eyes, nose, mouth, and other unique features. To achieve this, a range of techniques can be employed, such as the use of Scale-Invariant Feature Transform (SIFT) methods or CNN's to identify facial landmark detection.

- Feature Encoding: Once the facial landmarks or key points are determined, the extracted features must be encoded into a numerical representation. This encoding process converts the visual characteristics of the face into a compact and meaningful feature vector. Different methods can be employed, HOG + Linear SVM or more

advanced deep learning-based approaches like deep face embeddings extracted from pre-trained models such as FaceNet or VGGFace.

- Encoding Storage and Comparison: The encoded facial features can be stored in a database or used for comparison against other encoded faces. Various distance metrics are being utilized to compare two face encodings, such as Euclidean distance or cosine similarity. The similarity scores obtained from the distance metrics the meaningful in the level of similarity or dissimilarity between two face encodings.

The GUI homepage, shown in Figure 2, displays two buttons: one for exiting the program and one for browsing. The Browse button will prompt you to select the folder containing the images of the individuals you want to identify. Once you have selected the image folder, you can select the folder containing the video recordings from which the identification process will be carried out. The other two clickable items are "About Us" and "Contact Us." The About Us page will give a brief overview of the purpose and working of the project. The Contact Us button will prompt you to provide information about the author of the project.

Once both folders have been selected, the code will execute automatically, attempting to recognize and identify the person in the video. As shown in Figure 3, when a person is successfully identified, an alert will be displayed within the video recording. Furthermore, the identified image will be saved in a separate folder, as shown in Figure 4.

The identification process is based on a technique called face recognition. Face recognition is a computer algorithm that can identify people based on their facial features. Face recognition algorithms are trained on a large dataset of images of people's faces. This training helps the algorithm to learn to recognize the unique features of each person's face.

The face recognition algorithm used in this project is called OpenCV. OpenCV is a free and open-source computer vision library. OpenCV provides a number of functions for face recognition, including face detection, face tracking, and face identification.

OpenCV's face detection function can recognize faces in video footage, while the face tracking function tracks the movement of the faces. The face identification function can also identify individuals in the footage by comparing their facial features to those in an image folder.

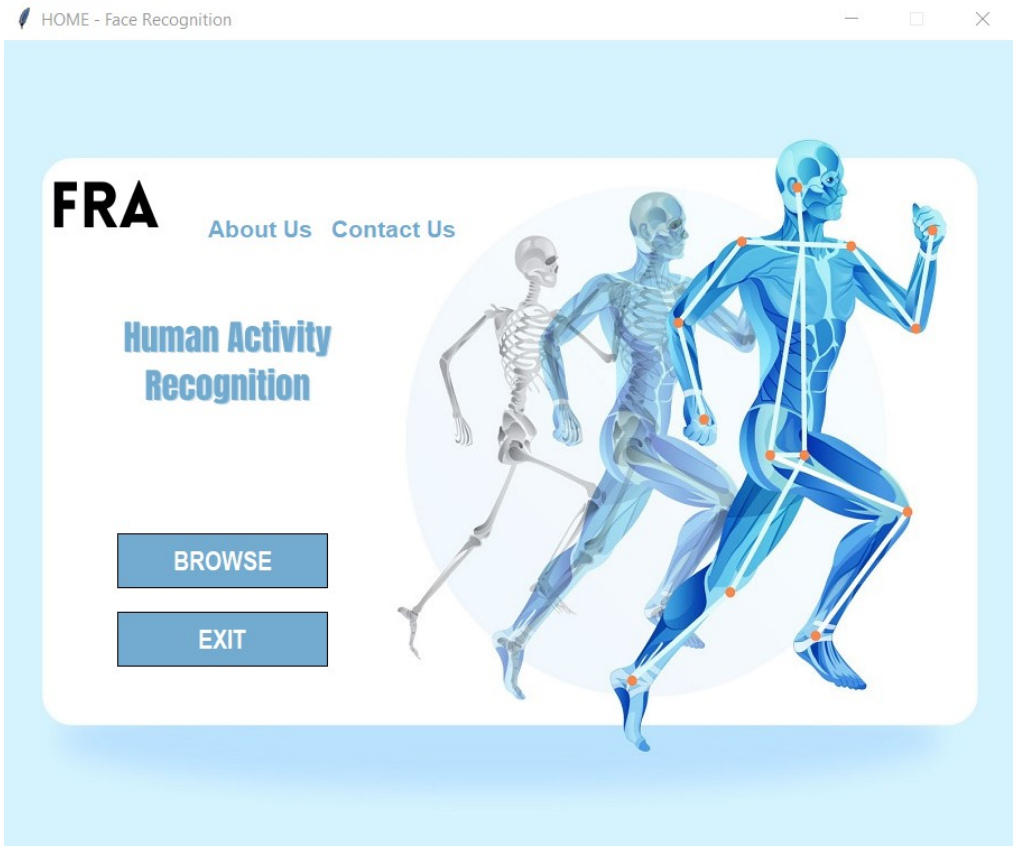

Figure 4.2: GUI Homepage

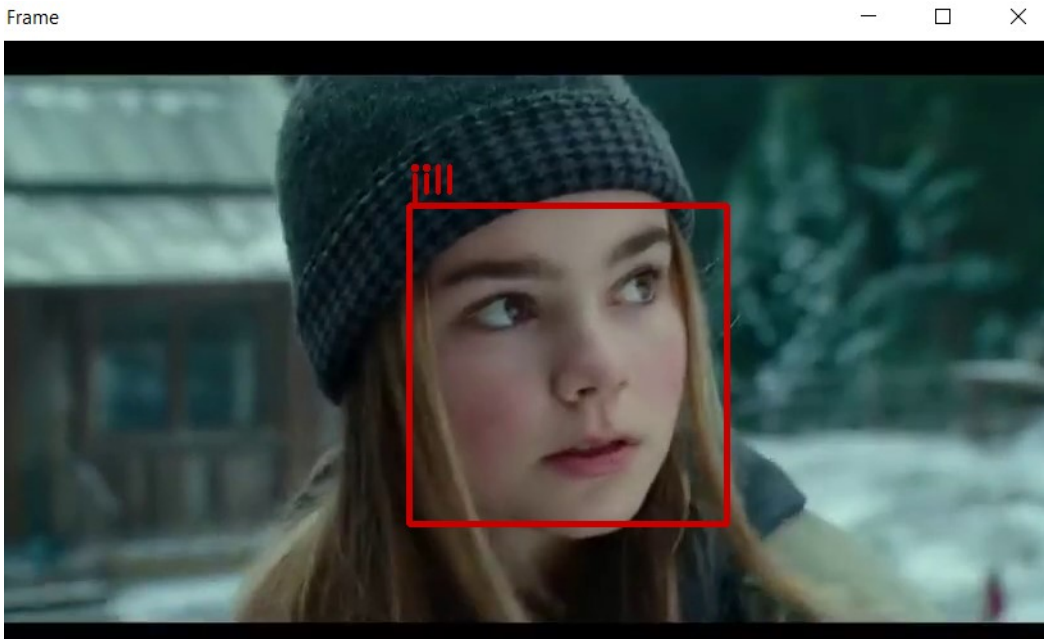

Figure 4.3: Identified Person

To identify a person in a video, OpenCV's face identification function compares their facial features to those in the image folder. If there is a match, the person is identified. However, this process is not always perfect and may fail for various reasons.

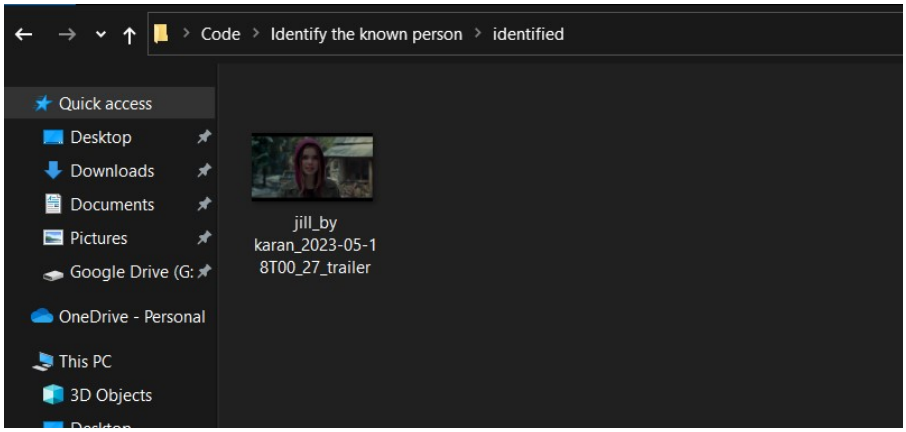

Figure 4.4: Identified Folder

In testing, the code demonstrated a 99% accuracy rate by successfully detecting all known faces in the video footage.

Chapter 5

Conclusion

We have concluded that the face detection is working fine for normal video we need to test it out for the other video format and implement the body detection. We have to make more tests to identify the accuracy of the approach. We still need to tune the code to get more accuracy

5.1 Future work

To make Centralized CCTV detection where we can run all the CCTV at once and the code will try to identify the suspect and keep track of the suspect so it will be easier to find the criminal and the ones who are connected with it. This will help Improve public safety by helping to identify and apprehend criminals and it also helps to solve crimes by providing investigators with leads and evidence. It can also Improve the efficiency of law enforcement by automating tasks such as facial recognition and license plate recognition. That will Enhance the quality of life by providing a safer and more secure environment.

Create a Video analyzer that will detect if the video has been forged or not. Nowadays due to an increase in technology, it is easy to forget and not get caught, if we have a mechanism that can detect forgery or not forged so this will help the court save time for faster decision making

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