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Survey paper on Person Identification Using Python

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Abstract—This survey paper explores the use of Python for Person Identification in Computer Vision Applications. The paper reviews recent research papers and articles related to person identification using Python and discusses the different techniques and algorithms used for this task. We are implementing Person Identification using Python, in this project Person Identification is highly desirable in application such as Security Monitoring, Authentication, Criminal Investigation, etc. There are different ways for doing Person Identification including Face Recognition System, Voice Recognition System, Fingerprint Recognition System and Iris Recognition System. We are using Face Recognition and Voice Recognition system. In face recognition system, we are identifying a person through face. But, for this we need to use different face recognition algorithms with high efficiency. We are using Python programming language for implementing this project. Advantages of using Python for this project is that easy implementation and easy to understand. Also, Python has also some predefined libraries which also helps in implementation. In this project, specifically, for face recognition we are using OPENCV library in python. OPENCV is an OPEN SOURCE COMPUTER VISION library which supports programming languages like C++ and Python. This technique also provides biometric security. Also, as we mentioned earlier we are using different algorithms for implementing this project.

Keywords: Face Recognition System, Voice Recognition System, Face Recognition Algorithms, Voice Recognition Algorithms.

I. INTRODUCTION

We are implementing Person Identification using python in this project. For this implementation we are using Face Recognition and Voice Recognition System. Face Recognition is the ability to recognize people by their facial characteristics. Face Recognition is becoming popular for recognizing face of human and it also has become a popular area of research in Computer Vision. Generally, the Face Recognition commonly includes Feature extraction, Feature Reduction and Recognition or Classification. We are also using Voice recognition technique for Person Identification. Voice Recognition is a deep learning technique used to identify, distinguish and authenticate a particular person's voice. It

evaluates an individual's unique voice biometrics, including frequency and flow of pitch, and natural accent. Although, the term "Voice Recognition" and "Speech Recognition" are often used interchangeably, they are distinct, Speech Recognition recognizes spoken words; whereas Voice Recognition recognizes speaker.

1) Face Recognition System: Face Recognition is a method of identifying or verifying the identity of an individual using their face. Face recognition system can be used to identify people in photos, videos, or in real-time. Face Recognition uses computer algorithms to pick out specific, distinctive details about a person's face. These details, such as distance between the eyes or shape of the chin, are then converted into a mathematical representation and compared to data on other faces collected in face recognition database. Some face recognition systems, instead of positively identifying an unknown person, are designed to calculate a probability match score between the unknown person and specific face templates stored in the database.

2) Voice Recognition System: Voice Recognition is a deep learning technique used to identify, distinguish, and authenticate a particular person's voice. It evaluates an individual's unique voice biometrics, including frequency and flow of pitch and natural accent. Voice Identification uses biological characteristics of a person's voice to create a voiceprint that is unique to that person. Voice Recognition is most often used as a security measure to confirm the identity of a speaker. Voice Recognition is a contactless, software-based technology, making it one of the most convenient and readily accepted types of biometrics, and it is commonly paired with facial recognition for higher levels of security. It is increasingly utilized for user verification on mobile applications and devices. "Speech Recognition" and "Voice Recognition" are used interchangeably, they are distinct; Speech Recognition recognizes only spoken words; whereas Voice recognition recognizes person's unique voice.

3) Face Recognition Algorithms: There are different types of algorithms that can be used for face recognition, some of them are listed below

i) Haar Cascade: Haar Cascades is an object detection method

used to locate object on images. The algorithms learn from a large number of positive and negative samples – The former contains an object of Interest and the latter contains anything other than the Object that you are looking for. After training, Classifier can find an object of interest on new images. The method was used in Criminal Identification in Combination with the Local Binary pattern algorithm to recognize faces. The haar cascade Classifier uses 200 (Out of 6000) features, which ensures an 85-95% recognition rate even with varying expressions.

ii) Local Binary Pattern Histogram (LBPH): A person's face can be recognized using the Face recognition algorithm called as Local Binary Pattern Histogram (LBPH). It is renowned for its effectiveness and for being able to identify person's face. This method uses Local Binary Pattern (LBP), a simple, effective texture operator in computer Vision that marks pixels in an image by setting each pixel's neighborhood threshold and treating the result as a binary number. At the learning stage, LBPH algorithms creates histograms for each image that is labeled and classified. Each histogram represents each image from the training set. This way, the actual recognition process implies comparing the histograms of any two images.

iii) Convolutional Neural Network (CNN): Convolutional Neural Network (CNN) is one of the breakthroughs of Artificial Neural Networks (ANN) and AI development. It is one of the most popular algorithms in deep learning, a type of machine learning in which model learns to perform classification tasks directly on image, video and Text or sound. The model Shows impressive results in several fields including Computer Vision, Natural Language Processing, and the largest Image classification Dataset.

iv) Principal Component Analysis (PCA): Principal component analysis is an unsupervised, non-parametric statistical technique primarily used to dimensionality reduction in machine learning. PCA is the way of reducing the dimensions of a large dataset by transforming it into a smaller dataset, but ensuring that smaller dataset contains more information than the larger dataset. By reducing the dataset, we are also reducing the accuracy. However, PCA works on the principle of trading little accuracy for simplicity. This is because smaller datasets are easier to explore and visualize, thus making data analysis easier and faster for machine learning algorithms. Eigen Vectors and Eigen values are linear algebra concepts that are used to compute the covariance matrix to determine the Principal Component of the Data. Face Recognition is the Process of Identifying an individual using their face.

4) Voice Recognition Algorithms: There are different types of Algorithms that can be used for Voice Recognition in Person Identification which are as follows

i) Pitch Detection algorithm (PDA): Pitch Detection algorithm (PDA) is an algorithm designed to estimate the pitch or fundamental frequency of a oscillating signal using digital recording of a speech.

ii) Gaussian Mixture Model (GMM): GMM is another statistical model that is commonly used for Voice recognition. It works by modelling the distribution of speech features, such as spectral density or pitch, and comparing them with predefined speech models.

III CONCLUSION AND FUTURE SCOPE

A. Conclusion

In this Survey, We Studied various Face and Voice Recognition algorithms. Advantages of the Face Recognition algorithms are as follows:

1) Haar Cascade Classifier

- i) Detect objects in images, irrespective of their scale in image and location.
- ii) Less Complexity.
- iii) Can run in Real time as well.

2) Linear Binary Pattern Histogram (LBPH)

- i) Very Easy to Implement.
- ii) LBPH can recognize both Side and Front faces.
- iii) Performance of Face recognition results are found to be more accurate.

3) Convolutional Neural Network (CNN)

- i) Very accurate at Image recognition and Classification.
- ii) Minimizes Computation in comparison with the regular neural network.
- iii) Make use of the same knowledge across all image locations.

4) Principal Component Analysis (PCA)

- i) Simple, Fast and Robust.
- ii) Image without disturbance are recognized Fast.
- iii) Raw Intensity data are used for Learning and Recognition.

In this Survey we also understood various Voice recognition algorithms for Implementing this project. These algorithms are Pitch detection algorithm and Gaussian Mixture Model.

Hence, After doing a survey on Person Identification using python we understood that, For Face Recognition Haar Cascade classifier and Local Binary Pattern Histogram (LBPH) have high efficiency and accuracy as compared to that of the Principal Component Analysis (PCA) and Convolutional Neural Network (CNN). Also, we understood that both of these algorithms have less complexity and are easy to implement. For Voice Recognition algorithm, Pitch detection algorithm and Gaussian Mixture Model have a good accuracy. These both can easily recognize voice of a person uniquely. Pitch detection algorithm can identify pitch or fundamental frequency of a oscillating signal. It also detects the intensity of the voice. GMM algorithm is also a Voice recognition Algorithm and recognize the speech features.

B. Future Scope

Person Identification is rapidly evolving field, and with the increasing availability of data and advances in machine learning and computer vision, we can expect to see many exciting developments in the coming years. Python is already

a widely used language in the field of computer vision and machine learning, and it is likely to remain so in the future. Python provides a wide range of powerful libraries and frameworks for image and video processing, such as OPENCV, sci-kit image and Tensor flow, which can be used for person Identification tasks. One area where we can see a significant progress is in Facial Recognition technology. Facial recognition can already be used to identify individuals in images and videos, and we expect these algorithms to become even more accurate and reliable in the future. Additionally, we can expect to see more widespread adoption of facial recognition technology for security and surveillance purposes, as well as for applications in the marketing and advertising. In the near Future, Face recognition Technology will likely become more ubiquitous. It may be used to track individual's movement out in the world like automated license plate readers, track vehicles by plate numbers.

Another area where we can expect to see advances is in the use of Biometric data for person identification. Biometric data, such as fingerprints and iris scans, are already commonly used for identification purposes, and we can see more sophisticated algorithms developed to analyse and match these data. Overall Future of person identification is likely to be characterised by the development of more advanced and accurate algorithms, as well as the increasing adoption of these technologies in a wide range of applications. However, it will also be important to ensure that these technologies are used ethically and with appropriate safeguards to protect individuals privacy and civil rights.

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