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BIOMETRIC IDENTIFICATION USING GAIT ANALYIS BY DEEP LEARNING

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Abstract – *Traditionally, biometric authentication has been done on human characteristics like fingerprint, voice, face-id, and iris scan. People often feel that they can identify a familiar person afar simply recognizing the way that the person walks. This collective experience is combined with new biometrics, has led to the development of Gait Recognition as a form of biometric identification. The ultimate aim is biometric identification using Gait Parameters. Our project can be used in security systems and various organizations, financial institutions, military and defense sectors, and aerospace industry. The result will be an unsupervised machine that will be able to authenticate humans based on their Gait Cycle. The end result of our project will be an unsupervised learning machine that will be able to identify humans based on their Gait patterns. It should recognize the person irrespective of their color or attire. Many people try to change their look by doing some new hairstyles or makeup or walking in a weird manner, despite that our system should detect that person and authenticate them correctly.*

Key Words: **Machine Learning, Deep Learning, Artificial Intelligence, Biometric Identification, Gait Analysis, Gait Cycle, Silhouette, Human Gait.**

1. INTRODUCTION

In this project, we aim to explore the ways in which these varying approaches have previously been applied to achieve gait biometric recognition, while also highlighting important possible areas of concern in their usage with respect to practicality, privacy, and security. The project will eliminate the need for a person to manually make an entry into the biometric recognition system. The project that will be based on unsupervised learning will itself recognize a person from the Gait Cycle. The project can be used for biometric recognition as well as security purpose. Such a system might as well be used in combination with the CCTV cameras to recognize a person automatically.

2. PROPOSED SYSTEM

Biometric Gait Analysis has demonstrated potential promises as an alternative or complementary identifier for use in human recognition systems. There are several analysis techniques for human gait. The techniques involve visual approaches comprising of multi-view cameras, which can capture various angles of gait cycle from a distance, which collect information about gait parameters while in contact with the subject being analyzed. The project will eliminate the need for a person to manually make an entry into the biometric recognition system. The project that will be based on unsupervised learning will itself recognize a person from the Gait Cycle. The project can be used for biometric recognition as well as security purpose. Such a system might as well be used in combination with the CCTV cameras to recognize a person automatically. The system will work in such a way that firstly a video of person walking (in multiple directions) will be taken for training. Training will be done by fragmenting the video into multiple frames wherein these frames will be given as input to the pre-trained models which will generate an identification vector. Then using identification vector and Support Vector Machine (SVM) training will be done. Once trained a sample video will be compared to test the machine's accuracy wherein the actual biometric identification will be done by considering human gait parameters and if the person's biometric gait cycle matches then person will be authenticated successfully.

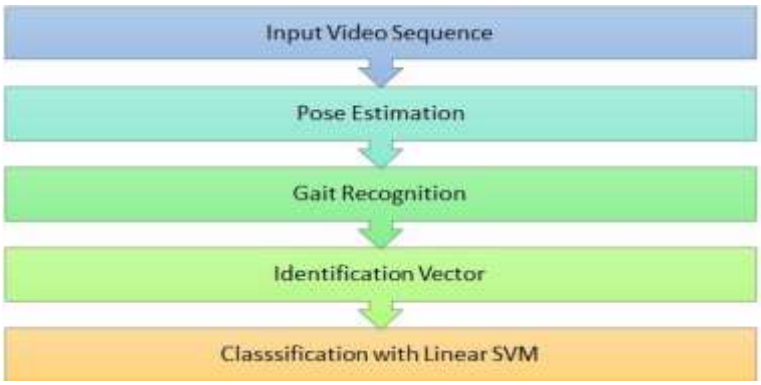

Fig. 1. The Flowchart of System

3. HUMAN POSE ESTIMATION

Human pose estimation is done with the help of neural network which is trained on Human3.6m dataset. This dataset is labeled precisely using motion capture system due to which errors are less and the estimation of human pose is more accurate. Probabilities of the following human gait parameters which are obtained from this neural network as output are as follows: -

- Right Ankle
- Right Knee
- Right Hip
- Left Hip
- Left Knee
- Left Ankle
- Pelvis
- Thorax
- Upper Neck
- Head Top
- Left Elbow
- Left Wrist
- Left Shoulder
- Right Shoulder
- Right Wrist
- Right Elbow
- Gait Energy Image

Fig. 2. Input Sequence Frames

4. GAIT RECOGNITION

Gait refers to the walking pattern of human. In this we pro-pose use of descriptors based on the local motion of points that is motion descriptors and use custom spatial configurations of the descriptors of target people [3]. From human pose neural network, we obtain spatial features which include descriptors containing pose of human. These spatial features are used by the second sub-network for generating pose descriptor which are passed into recurrent cells. Average temporal pooling is used which is basically aggregating the data received. Output is assigned into an iden-tification vector which includes unique features of multiple human subjects. Identification vector is generated with the help of pose descriptors with the use of a residual convolution network. Using linear SVM we perform classification. The purpose of linear SVM is that it can deal with extra large datasets with maximum efficiency and also works well with high dimensional data with dense format.

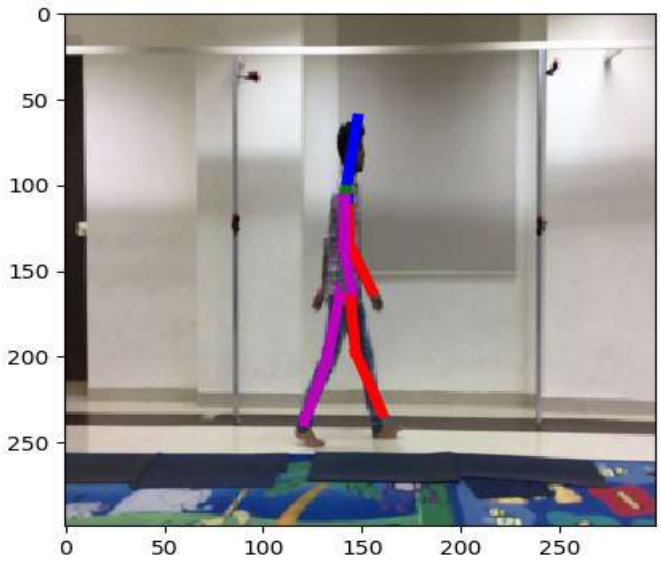

Fig. 3. Pose Estimation Result

5. GAIT RECOGNITION

Extension of this project will be to implement it on real time continuous input from multiple cameras at a single time of reference. This will ensure 24x7 security and can be used in real world surveillance systems in various organizations. Bank vaults, Nuclear reactors, Reserve Banks, Research labs, Military confidential areas are major application areas which require high level access control systems. Gait data of dangerous criminals can be recorded and used in real time CCTV systems to detect them and alert the concerned authorities.

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