Toward Speed, cloth and Pose Invariant Gait Recognition

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Contents

Introduction

- Gait is the process in which upper and lower body act in unison. It can be loosly understood as person's way of walking. The Gait cycle has two distinct phase. One is stance and other is swing
- The gait recognition aims to differentiate human beings based on the characteristics of their locomotion
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- Gait is the only biometric trait that can identify subject at a distance
- HOG descriptors although being scale and translation invariant are not rotational invariant

Objectives

Gait Analysis is very important in surveillance and identification of person where facial recognition is not possible because of far camera distance.

- Feature extraction techniques like Gait Energy Image(GEI) for cloth invariance, Histogram of gradients(HOG) for Multiview invariance and Zernike Moment with radon Transform for cross view invariance
- Features have been fed into a different machine learning classifier and achieved a state of the art performance
- Test are carried out on CASIA-C and CASIA-B Database
- Only perceivable biometric trait from a great distance is gait.

Related Work

- Wang et al. stated that the combination of both static and dynamic features increases the classification results.
- Li A [1] Adaptive part-based feature selection method is proposed
- Yu [2] model can synthesize gait feature in a progressive way by stacked multi-layer auto-encoders.

Proposed System

- Caluclating HOG for Cloth and Speed Invariance
- Radon Transform of Gait Energy Image for View Invariance followed by Zernike Moment
- Radon Transform is taken from the tomography field which takes the projection of a 2- D image along a direction to give it a 1-D profile
- For investigation purposes different classifiers have been trained ranging from traditional methods like ANN (Artificial Neural Network) to SVM (Standard Vector Machine) to newly discovered techniques including XgBoost which has obtained higher accuracy in recent classification challenges.

Advantage of Gait Over Other Biometrics

Table I
DIFFERENT PHYSIOLOGICAL BASED BIOMETIRC CHARACTERISTICS

Biometric	Universality	Distinctiveness	Permanence	Collectability	Circumvention
Face	High	Medium	Medium	High	Low
Iris	High	High	High	Medium	Low
Palm print	High	High	Medium	Medium	Medium
Fingerprint	High	High	Medium	Medium	High
Retina	High	High	High	Low	Low

Table II
DIFFERENT BEHAVIOR BASED BIOMETIRC CHARACTERISTICS

Biometric	Universality	Distinctiveness	Permanence	Collectability	Circumvention
Gait	Low	Medium	Low	High	Low
Speech	High	Medium	High	Medium	Medium
Signature	High	Medium	Low	Medium	Low
Keystroke	High	Medium	Low	Medium	Low
Device Uses	Low	Medium	Low	High	Low

Figura: Advantage of Gait

Advantage of Gait Over Other Biometrics

COMPARISON WITH STATE OF THE ART MODELS

	Methods	Accuracy
Speed	WBP[21]	91.66
	FDI +2DLDA[22]	89.0
	Proposed Method	99
Cloth	GEI+part-based[23]	85.2
	Golden ratio Segmentation [24]	93.14
	Proposed Method	96
View	Stacked Autoencoder[25] (MultiView)	97.58
	Proposed Method	79.00
	Stacked Autoencoder[25] (CrossView)	63.90
	Proposed Method	67.00

Figura: Advantage of Gait

Conclusion

- In this paper high accuracy is achieved with normal gait and cloth invariant gait. The accuracy associated with cross view invariant gait needs to be improved.
  Gait recognition based person identification becomes challenging in real time due to cloth, different view angle and posture of human.
- High recognition accuracy is achieved. This technique can be used for developing a gait detection system

Model Parameters

Table III
DESCRIPTION OF MODEL PARAMETERS

Model Used	Parameters
SVM	Kernel=Linear,Penalty Parameter (C)=1 height Solver = Limited Memory Broyden–Fletcher–Goldfarb–Shanno (LBFGS),
ANN	Hidden Layers=4, Neurons=(3000,4000,4000,3000), Alpha (Regularization L2)=0.001
XGBoost	Booster=Dart

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The End