

Face Recognition using Edge Distances

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Abstract

In this paper, we propose a novel two-stage face recognition method using edge distances. In the first stage, an edge map is obtained from the input face image. We then find the most invariant parts of a face under variation in orientation using two eye blocks to contain these parts. Since the widths of eye blocks for different face images may be different, we take a fixed number of sampling lines in each of the eye blocks. After removing unreliable edges, we record edge distances consisting of spatial and structural information as features in each vertical sampling line. A face is accordingly represented by a series of sequences which record edge distances. In the second stage, we use these edge distances as features to recognize human faces based an optimization criterion. We add a merge penalty in matching sequences. A person could be recognized by identifying the series of sequences with the minimum matching distance. In our experiments, we test the system performance using the ORL and IIS face databases. The recognition rate is 97% in the ORL face database and 92.1% in the IIS face database.

利用點間距離以達成人臉辨識目的

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摘 要

在此篇論文中，我們提供了一個利用點間距離以達到人臉辨識的方法。在這篇論文中，共可分為人臉描述以及人臉辨識兩個階段。

在人臉描述階段，我們提出一個以點間距離來描述人臉的想法。為了取出點間距離，首先我們必須將人臉影像透過一些影像處理轉換成點圖 (edge map)。將影像轉成點圖之後，我們想找出在人臉區域中，找出具有象徵性的部分，並且人臉小幅轉動下，這些部分仍具有其象徵性。我們利用眼睛區塊標示出我們所找到的部分。由於每個人的眼睛區塊大小不一，為了之後人臉辨識的方便，我們採用固定的垂直採樣線，使代表眼睛區塊的資料大小一致。在點圖中去除掉某些不可信任的點後，我們將垂直取樣線中的點與點間的距離一一的紀錄起來。因此，這些紀錄點間距離的序列串，代表一張人臉影像。

在抽出點間距離後，我們利用點間距離當成特徵來達成人臉辨識的目的。這方法的構想，主要是因為相似的人臉影像，亦有相似紀錄點間距離的序列串。所以，人臉辨識可以達成藉由計算不同序列串間的距離。然而，來自同一人的兩張相似人臉影像所得到的序列串，其長度往往不同在實際的情況裡；我們根據最佳準則使序列比對，進而得到最小差值。除此之外，為了避免從不同序列比對得到相同的差值，我們加進了結合懲罰 (Merge Penalty) 的觀念。如此一來，受測者的身分可以經由與資料庫中的序列串比對，而驗證出來。

在我們的實驗裡，我們利用 ORL 以及 IIS 的人臉資料庫以測試系統的正確度。在 ORL 人臉資料庫中，辨識率達到 97%；而在 IIS 人臉資料庫中，辨識率為 92.1%。

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Table of Contents

Abstract in English	i
Abstract in Chinese	ii
Acknowledgements	iii
Table of Contents	iv
List of Figures	vi
List of Tables	viii
Chapter 1 Introduction	1
1.1 Motivation.....	1
1.2 Problem Definition.....	1
1.3 Related Work.....	3
1.4 Assumption	7
1.5 System Flow.....	8
1.6 Thesis Organization	9
Chapter 2 Face Representation	10
2.1 Preprocessings.....	10
2.1.1 Normalization	10
2.1.2 Smoothing	10
2.1.3 Edge detection.....	11
2.2 Vertical Line Sampling	12
2.3 Edge Points Removal.....	15
2.3.1 Unreliable Edge Points	16
2.3.2 Close Edge Points	16
2.4 Face Feature Description	18
Chapter 3 Face Recognition	23
3.1 Sequence Matching.....	23
3.2 Assignment of Editing Cost	26
3.3 Optimization Algorithm.....	28
Chapter 4 Experimental Results and Analysis	31
4.1 Face databases.....	31
4.1.1 ORL face database	31
4.1.2 IIS face database	32

4.2 Implementation and Result of Experiment	33
4.3 Error Analysis	40
Chapter 5 Conclusion and Future Work	42
Reference.....	44



List of Figures

Fig. 1.2.1. Examples for four different faces	2
Fig. 1.2.2. Face images under limited side movement.....	2
Fig. 1.5.1. System flow in this paper.....	8
Fig. 2.1.1. Face image after applying edge preserve smoothing.....	11
Fig. 2.1.2. Face image after applying Laplacian edge detector	12
Fig. 2.2.1. Eyes, mouth corners and cheek shape for face distinguishment.	12
Fig. 2.2.2. The information of two eye strips segmented in a face under small variation in orientation.....	13
Fig. 2.2.3. 10 sampling lines in each eye strip.....	14
Fig. 2.2.4. The location of the lower border of hair in a face.	15
Fig. 2.3.1. Two types of unreliable edge points and close edge points in a face	17
Fig. 2.3.2. An example face image after removing unreliable edge points.....	17
Fig. 2.3.3. An example face image after removing one of the edge point with different distance threshold.....	18
Fig. 2.4.1. Edge distances encode implicitly the different structural information for each person.....	20
Fig. 2.4.2. Example1 showing similar edge distances under the limited variation in orientation.	21
Fig. 2.4.3. Example2 showing similar edge distances under the limited variation in orientation..	21
Fig. 2.4.4. Sequences of edge distances in sampling lines.	22
Fig. 3.1.1. Two images from the same person have similar edge sequences.....	24
Fig. 3.1.2. All combination of matching sequences between two sequences.	25
Fig. 3.2.1. Three types of edge distance editing between two series.	26
Fig. 3.2.2. An example the same cost from different sequences occurred.....	27
Fig. 3.2.3. The minimum costs for each sequence compared to the sequences <11, 23, 34>.	28
Fig. 4.1.1. Some examples in the ORL face database.....	32
Fig. 4.1.2. Some examples in the IIS face database.....	33
Fig. 4.2.1. Three error cases for the ORL face database.....	34
Fig. 4.2.2. Three error cases for the IIS face database.....	35
Fig. 4.2.3. Different recognition results obtained from different values of merge-penalty in the ORL face database	36
Fig. 4.2.4. Different recognition results obtained from different edge distance threshold in the ORL face database.	37
Fig. 4.2.5. Different recognition results obtained from different numbers of	

sampling lines in the ORL face database37

Fig. 4.3.1. Imperfect edge maps that error is caused by removing unreliable edges
incorrectly.40

Fig. 4.3.2. Two persons with similar edge distribution.....41



List of Tables

Tab. 4.2.1. Recognition results for ORL and IIS face databases	34
Tab. 4.2.2. Comparative recognition rates for the different information used on the ORL face database.	38
Tab. 4.2.3. Comparative recognition rates for the ORL face database.	38

