Memory-based Gait Recognition

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In this paper, inspired by the mechanism of memory and prediction in our brains [2], we propose a straightforward and effective memory-based gait recognition method (MGR) to realize the memory and recognition process of the gait sequences. Because of various covariates including carrying, clothing, surface and view angle, we extract the robust 2D joint location information via the joint extraction model as the gait features. Compared to the traditional neural network, the memory neuron network (MNN), for example, the Long Short-term Memory (LSTM) architecture, simulates the human brain and stores the objects in the weights of neural connections. Besides, by the large-scale parallel computing, MNN can repair the incomplete and tainted data (the extracted 2D gait feature is dirty). It is the first time that we utilize the MNN to address the gait recognition issue. This maybe empower a fresh orientation for solving gait recognition problem. Fig.1 shows the overall framework of the method.

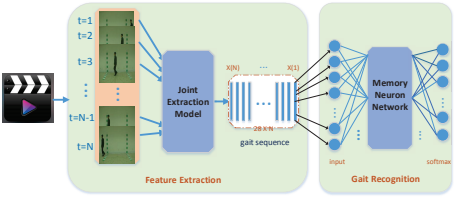

Figure 1: The Memory-based gait recognition framework. Obviously, the process is divided into two stages: feature extraction and gait recognition. *N* denotes the length of a gait sequence.

We compare our method against others on the CASIA A and CASIA B gait datasets. Tab.1, Tab.2 show some experimental results. Getting enlightenment from [1], the longer sequences do not improve the algorithm performance in some cases. Therefore, we reduce the length of sequences to about 45 in average. In Tab.2, Exp1, Exp2 and Exp3 indicate different conditions, respectively. The details can refer to our full paper. Though the presented network configuration is simple, the proposed method still obtains the relatively satisfactory and comparable results.

Methods	0°-view	45°-view	90°-view	avg
Wang1 [4]	65.00	63.75	77.50	68.75
Wang2 [4]	65.00	66.25	85.00	72.08
Wang3 [4]	75.00	81.25	93.75	83.33
Orig-results	82.50	83.75	92.50	86.25
Length-red	**85.00**	**87.50**	**95.00**	**89.17**

Table 1: The comparisons of some algorithms on the CASIA A (0°,45°,90°) dataset. Wang1, Wang2 and Wang3 indicate that the different classifiers and similarity measures are used in the same method.

Methods	Exp1	Exp2	Exp3	Avg
Martin [3]	70.16	74.19	58.60	67.65
Orig-results	83.06	85.48	80.11	82.88
Length-red	**83.87**	**85.48**	**81.72**	**83.69**

Table 2: Algorithms comparisons on the CASIA B dataset on Exp1, Exp2 and Exp3.

[1] Armand Joulin and Tomas Mikolov. Inferring algorithmic patterns with stack-augmented recurrent nets. In *Advances in Neural Information Processing Systems 28*.

[2] Christof Koch and Joel L. Davis. *Large-scale Neuronal Theories of The Brain*. MIT press, 1994.

[3] Raul Martin-Felez and Tao Xiang. *Computer Vision – ECCV 2012: 12th European Conference on Computer Vision, Florence, Italy, October 7-13, 2012, Proceedings, Part I*, chapter Gait Recognition by Ranking. 2012.

[4] Liang Wang, Tieniu Tan, Huazhong Ning, and Weiming Hu. Silhouette analysis-based gait recognition for human identification. *IEEE Transactions on PAMI*, 25(12):1505–1518, Dec 2003.