A Comprehensive Study on Cross-View Gait Based Human Identification with Deep CNNs

Abstract:

This paper studies an approach to gait based human identification via similarity learning by deep convolutional neural networks (CNNs). With a pretty small group of labeled multi-view human walking videos, we can train deep networks to recognize the most discriminative changes of gait patterns which suggest the change of human identity. To the best of our knowledge, this is the first work based on deep CNNs for gait recognition in the literature. Here, we provide an extensive empirical evaluation in terms of various scenarios, namely, cross-view and cross-walking-condition, with different preprocessing approaches and network architectures. The method is first evaluated on the challenging CASIA-B dataset in terms of cross-view gait recognition. Experimental results show that it outperforms the previous state-of-the-art methods by a significant margin. In particular, our method shows advantages when the cross-view angle is large, i.e., no less than 36 degree. And the average recognition rate can reach 94 percent, much better than the previous best result (less than 65 percent). The method is further evaluated on the OU-ISIR gait dataset to test its generalization ability to larger data. OU-ISIR is currently the largest dataset available in the literature for gait recognition, with 4,007 subjects. On this dataset, the average accuracy of our method under identical view conditions is above 98 percent, and the one for cross-view scenarios is above 91 percent. Finally, the method also performs the best on the USF gait dataset, whose gait sequences are imaged in a real outdoor scene. These results show great potential of this method for practical applications.