

Person Identification Using Kinect Skeleton Data



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Abstract

In this talk, we first review existing work on using Kinect skeleton data for person identification. The dominant approach is to exploit the dynamic characteristics of a person while walking (such as stride and swing of limbs) for person identification. This is based on an assumption that the dynamic features extracted from gait are more distinctive than static features of people, such as the bone length. We then present our own work on person identification using in-house datasets as well as publicly available datasets. Contrary to other reports, we find that it is very difficult to extract dynamic gait features reliably from the Kinect skeleton data due to two reasons: (1) the field of view of Kinect (especially the first-generation device) is very limited, which is not conducive for obtaining periodic characteristics, and (2) the quality of measurements of skeleton 3D positions is poor while walking. Therefore, we focused on using static features for person identification. We experimented with various combinations of static features and several machine learning methods. We find that in general, the more features are included, the better classification accuracy. The K-nearest neighbors (KNN) method out-performs all others, including the Decision Tree, Naïve Bayes, MLP neural networks, and Support Vector Machine (SVM). By including just the upper and lower extremities and applying a low-pass filter on the raw data, KNN consistently gives higher than 99% accuracy for both our in-house datasets as well as some other public datasets, which are better than all previously published results using either gait features alone or the combination of static and dynamic features.

Bio

Wenbing Zhao received his Ph.D. in Electrical and Computer Engineering at University of California, Santa Barbara, in 2002. Dr. Zhao has a Bachelor of Science degree in Physics in 1990, and a Master of Science degree in Physics in 1993, both at Peking University, Beijing, China. Dr. Zhao also received a Master of Science degree in Electrical and Computer Engineering in 1998 at University of California, Santa Barbara. Dr. Zhao joined Cleveland State University (CSU) faculty in 2004 and is currently a Professor in the Department of Electrical Engineering and Computer Science (EECS) at CSU. Dr. Zhao published over 220 peer-reviewed papers in the area of distributed systems (three of them won the best paper award), smart and connected health, computer vision, machine learning, physics, and education. Dr. Zhao's research is supported in part by the US National Science Foundation, the US Department of Energy, the US Department of Transportation, Ohio State Bureau of Workers' Compensation, Ohio Department of Higher Education, and by Cleveland State University. Dr. Zhao is currently serving on the organizing committee and the technical program committee for numerous international conferences. He is an Associate Editor for IEEE Access and for MDPI Computers. Dr. Zhao is a senior member of IEEE.