**10701 – Group Project: Recognize users of mobile devices from accelerometer data**

**Related Work:**

A human being’s walking gait can reflect the walker’s physical characteristics and psychological state, and therefore the features of gait can be employed for individual recognition. The use of accelerometer data for biometric identification is relatively new but has been increasingly explored in recent years. Existing methods for gait recognition have shown good performance.

Tao et al.[1] focus on the representation and pre-processing of appearance-based models for human gait sequences. Two major novel representation models are presented, namely, Gabor gait and tensor gait. Experiments show that the new algorithms achieve better recognition rates than previous algorithms. However, these algorithms are built based on gait images, which is difficult to get and computing expensive to apply.

Pan et al. [2] proposed algorithm based on signature points, instead of the whole gait signal. They consider acceleration-based gait recognition insensitive to changes of lighting conditions and viewpoint. Their algorithm firstly extracts signature points from gait acceleration signals, and then identifies the gait pattern using a signature point-based voting scheme. The experimental results shows the accelerometer-based gait biometrics is promising.

Gafurov et al. [3] attach multiple sensors to a subject at different body parts. Xu et al. [4] developed an Android App to collect gait acceleration data. With a reasonably sized dataset, by matching gait patterns across different paces, they show preliminary results indicating that not only can smartphones be used to identify a person based on their normal gait but also that there is potential to match gait patterns across different speeds.

Kwapisz et al.[5] collect some data and also perform identification experiments . Based on the 600 raw accelerometer readings, they generated 43 features, which are variations of 6 basic features including average acceleration value, standard deviation, time between peaks and so on. They applied two classification techniques decision trees neural networks to classify and the identification performance turned out to be fairly good. However, their data collection process is having a researcher run the user through a well-defined course with specific activities, instead of collecting all of the accelerometer data from the user’s cell phone, without knowledge of what activity is being performed.

Localization is a fundamental problem in wireless sensor networks. Many related researches have been done with accelerometer data. Xu et al.[6] utilize an accelerometer, which is a standard component in many current motes to detect the movement of the node. If there is a node that is starting to move inside of the network, the accelerometer can detect its acceleration, and then the algorithm will compute the total distance moved based on the acceleration. Kothari et al.[7] came up with a system for robust indoor localization on a smart-phone. They apply localization algorithms of dead reckoning which takes advantage of the on-board accelerometer, magnetometer, and gyroscope sensors to detect motion and estimate orientation.

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[4] F. Juefei-Xu, C. Bhagavatula, A. Jaech, U. Prasad, M. Savvides, Gait-id on the move: pace independent human identiﬁcation using cell phone accelerometer dynamics, in: IEEE 5th International Conference on Biometrics, 2012, pp. 8–15

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[6] D. Kurth, “Range-Only Robot Localization and SLAM with Radio,”Tech. Report CMU-RI-TR-04-29, Robotics Institute, Carnegie Mellon University, May, 2004.

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