OMICS Group Conferences
Accelerating Scientific Discovery

International Conference and Exhibition on
Biosensors & Bioelectronics

May 14-16, 2012   Embassy Suites Las Vegas, USA

Remote accelerometer based hand gesture recognition

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Traditional ways for human-machine interactions are through keyboard, mouse and remote infrared control. The simpler and more effective way nowadays is through non-contact gesture recognition, which is especially useful for handicapped people. Moreover, it is also useful for doctors who are trying to avoid physical contact with medical equipment. With the fast development of the integrated circuit industry, the small size, low power and low cost MEMS (Micro Electrical Mechanical Systems) based accelerometers have become available and they have triggered great interest among researchers. This design interfaces an ADXL345 tri-axis digital accelerometer with the Rabbit 3000 microprocessor to collect hand motion data. The Rabbit 3000 serves as a web server so that sensor data can be accessed and stored in remote PC sites in real time through C# program. For gesture recognition, there are reported methods from other researchers including DTW (Dynamic Time Warping), HMM (Hidden Markov Model) and SVM (Support Vector Machine), and all of them require intensive CPU computing time. To speed up the recognition, this design first converts ADXL345 outputs to tilt angles, and then digitally encodes each signature hand position based on threshold for particular angle range. Next, define hand gestures as transition between signature hand positions, and use only one byte to store information. The occasional outlier accelerometer outputs are thrown away as pulse noise. Then the angle codes are compared with the training gesture values stored in the library for hand gesture recognition in real time in remote sites with high successful rate.

Biography

Jing Pang has completed her Ph.D in 2003 from Ohio University. Currently she is Associate Professor in Department of Electrical and Electronic Engineering and Computer Engineering Program at California State University, Sacramento. Her major research interests include embedded system design, digital signal processing, FPGA, and ASIC.

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