

Knowledge Based Activity Recognition System: Results of a Study

Sophia Gerlach, Gerd Krassnig, Thomas Wittenberg, Matthias Struck*

Department of Image Processing and Medical Engineering, Fraunhofer Institute for Integrated Circuits IIS, Erlangen, Germany

Monitoring and recognition of daily activities of people can provide valuable information for health care and prevention of cardiovascular diseases.

A physical active lifestyle can not only prevent or inhibit the progress of diseases, it also supports improvement of physical fitness, muscular strength and the quality of life. Scientific studies have identified certain types of behavior that contribute to the development of noncommunicable diseases and early death. The parameters of movement can provide information about health status, functional ability, effectiveness of rehabilitation, falling risks and other potential clinical data. The goals of this study are the classification of postures and activities using knowledge-based methods as well as the evaluation of the accuracy of these methods. The acceleration data are gained by a single triaxial accelerometer that is mounted near the hip. Different data sets for training and testing were gained by collecting data from subjects performing different postures and activities, e.g., sitting, walking, running, etc. Three different knowledge-based (decision tree and neural network) classification methods and a hybrid classifier have been implemented, tested and evaluated. Based upon training and testing of the classifiers with the different settings, it can be concluded, that the classifiers trained and tested with gender-specific data performed with larger sensitivity and specificity rates than classifiers trained with data sets from a specific gender and tested with data sets from another gender. With knowledge-based methods it is possible to exchange the knowledge base without adapting the classifier structure. This study shows that posture and activity recognition with a single accelerometer can be performed with a high sensitivity and specificity rate when the sensor is positioned near the center of mass on the human body. Knowledge-based methods facilitate the use of activity recognition systems because the training of the methods for each single user is not longer required.