J. Parera, C. Angulo. Accelerometer signals analysis using SVM and decision tree in daily activity identification. Gerontechnology 2008; 7(2):184. The purpose of this work is to implement methods that perform events classification of user activity based on accelerometer signals using two machine learning techniques (Support Vector Machines and Decision Trees). The events of interest are sitting down, standing up, walking and running. The signals measured by an orthogonal triaxial accelerometer sensor node located at the trunk of the user body are sampled each 12 ms (80 Hz). Training patterns for the learning techniques are created by visually identifying the events in the graphs obtained from some experiments on several users. Next, learning techniques are trained on the stored sequence of acceleration signals that describe each event. The signals are processed using a 'fusion' function that uses the three signals to get some significant features, for instance, the arctangent of Z and XY, the module of increments and the module of original signals, hence improving the separability of the training data for each classifier. Each action is performed on different amounts of time: standing up and sitting down takes about 2000 ms, a walking step 700 ms, a running step 400 ms. A time widow for each event is used by the classifiers: for each event the classifier is trained to identify positively an action, then all the other training data from other actions belong to the negative group. Poor performance has been obtained with the use of a SVM to classify these vectors, mostly due to the small size of the training data. For instance, in the case of running the training vector has 35 instants of time, while the training data is 18 positive vectors and 24 negative vectors. The Decision Tree using the same training groups used in SVM has performed better, especially in walking and running events. The classifier is capable of identifying different events from the training group even with a small set of training data. Moreover, the processor load to implement a tree classifier is much smaller than a SVM implementation, so it enables online signal processing by small microprocessors. The next objective is to implement this classifier in a sensor node that measures and process online while it is being used. This interactive device can give some feedback to the user like giving advices or reporting a schedule to be complete in rehabilitation.

References

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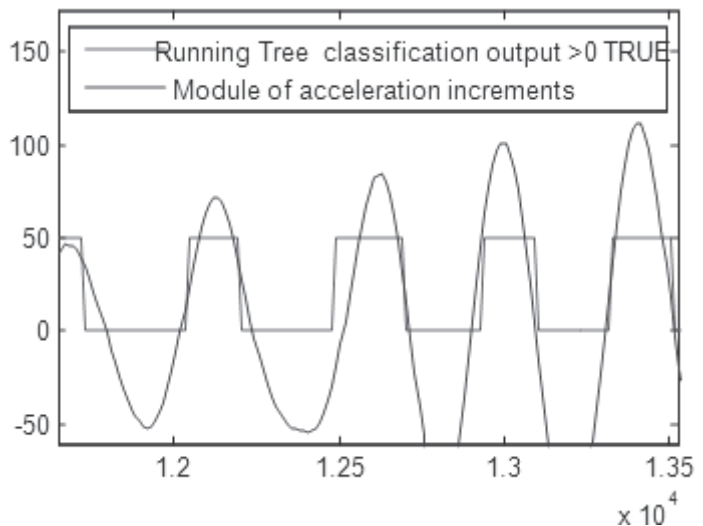
Figure 1 Result of running tree classifier