Writing in the Air

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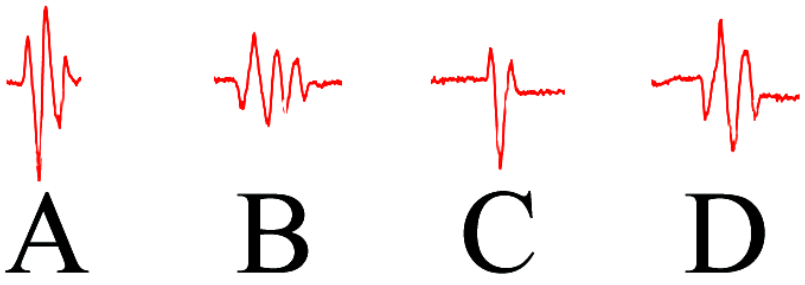

Figure 1. Sample of acceleration data (in dimension Y) obtained from hand movement regarding to each character

The aim of this project is to develop a neural network classification system that converts user's hand gesture, and particularly in our case writing patterns in the air, to the corresponding characters. User's hand movement information will be obtained by attaching a small wireless kinematic sensor (Shimmer wearable kinematics sensor) on the user's wrist. These data will be transmitted through Bluetooth communication to the based system (e.g. user's mobile phone) that is responsible for classifying and converting these data to the corresponding characters. These characters can then be used by other applications for any further use. The obtained kinematic sensor data are 6D data consisting of 3 dimensions for acceleration, and 3 dimensions for gyroscope data.

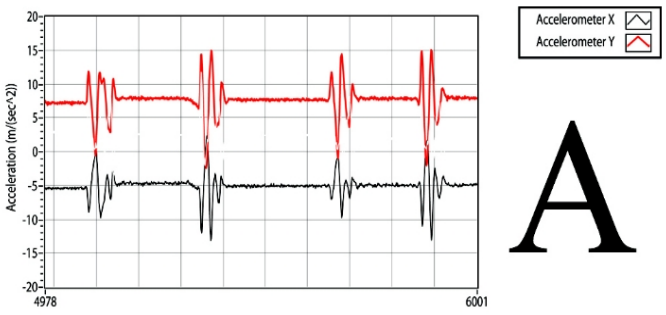

Figure 2. 4 sample sensor data (acceleration across axes X and Y) for character A.

I have obtained 10 sensor raw data for each character (A-Z) with sample rate of 100Hz with a 10cm height of each character drawn in the air by hand.

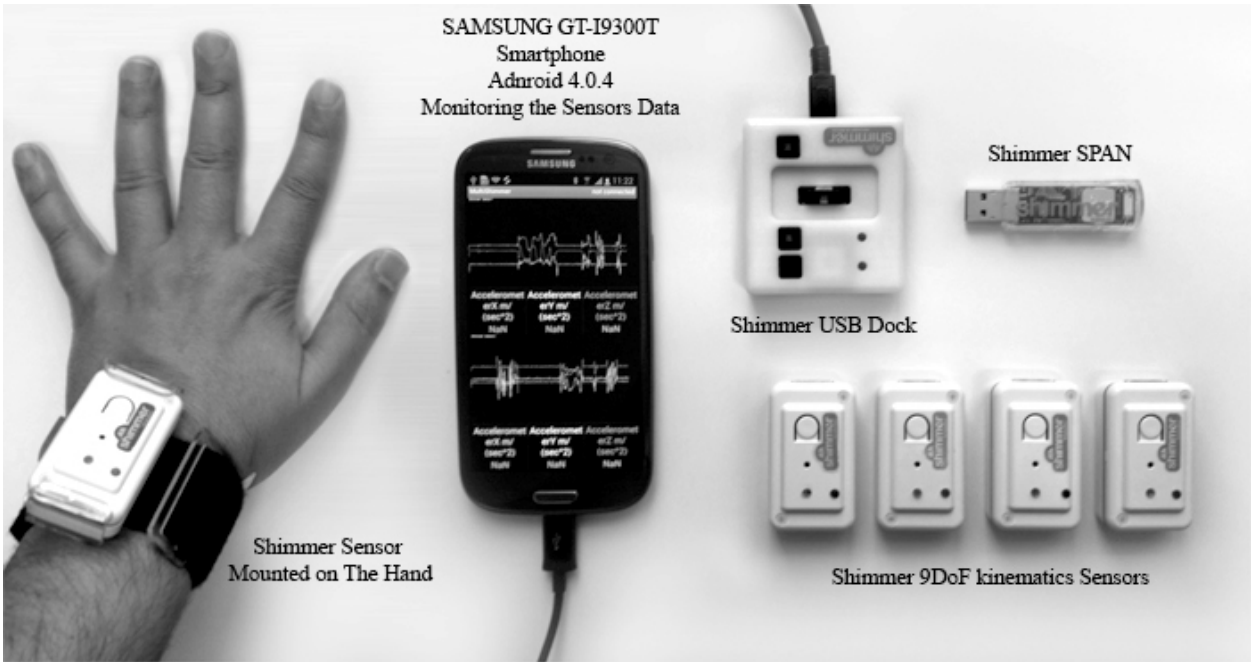

Figure 3. Shimmer 9Dof kinematics sensor platform mounted on user wrist

Challenges:

1) I have a stream of kinematics data as user moves his/her hand in the air. I need to find the boundary of start and end of each character and then I buffer and use the data between these two boundaries to classify the character.

2) I have 6 dimensions of kinematics data that are related to each character. I need to reduce the size of these dimensions. Also I need to find out for which dimension or combination of some of them I have more information gain.

3) Even if I convert all 6 dimensions of kinematics data to one or just select one of them, still I have one other dimension, which is the time. Between the start and end of each character I have about roughly 500 recorded sensor's data for each dimension.