

# ESE 650 Homework 3 - HMM Gesture Recognition

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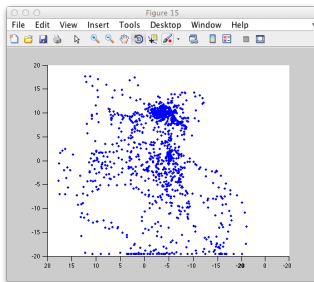
March 4, 2014

# Data Processing

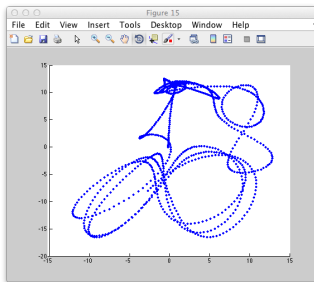
Accelerations only Using gyro did not improve results

Band-Pass Filter 0.2Hz - 10Hz

K-Means Clustering to generate codebook



(a) Unfiltered



(b) Band-pass filtered  
(0.2-10Hz)

Figure: 3D plot of figure8 (#1) acceleration data. Horizontal axis is X, vertical is Z.

# HMM Results

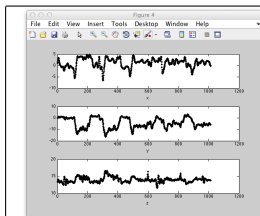
**Cyclic HMM** Left-to-right, but loops back to start at end

**Parameters** 6 clusters (emission symbols), 2 hidden states

## Results

- ▶ Training: about 10% LOOCV error
- ▶ **Test Untrimmed:** circle, hammer, wave, pend, figure8, figure8
- ▶ **Test Trimmed:** circle, hammer, wave, pend, wave, figure8

# Analysis



Circle

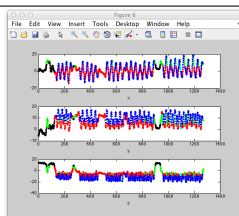
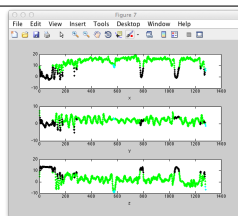
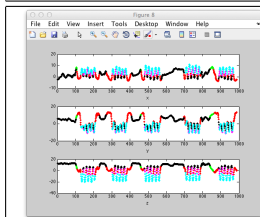


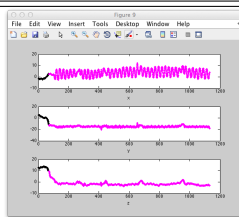
Figure 8



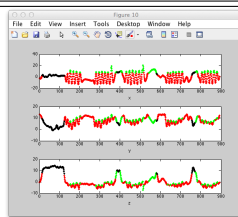
Fish



Hammer



Pendulum



Wave

Figure: Clustered acceleration data for the six gestures