Defining Gestures from Optical Flow: Week 8

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Current Progress and Goals

Recent Progress

- Generated optical flow database for a given range of rotation and translation
- Clustered data
- Matched optical flow from cameras to database
- Constructed basic gesture

Current Goal: Create a working gesture recognition system

- Create a robust gesture classifier

Generate Optical Flow - Average into Quadrants

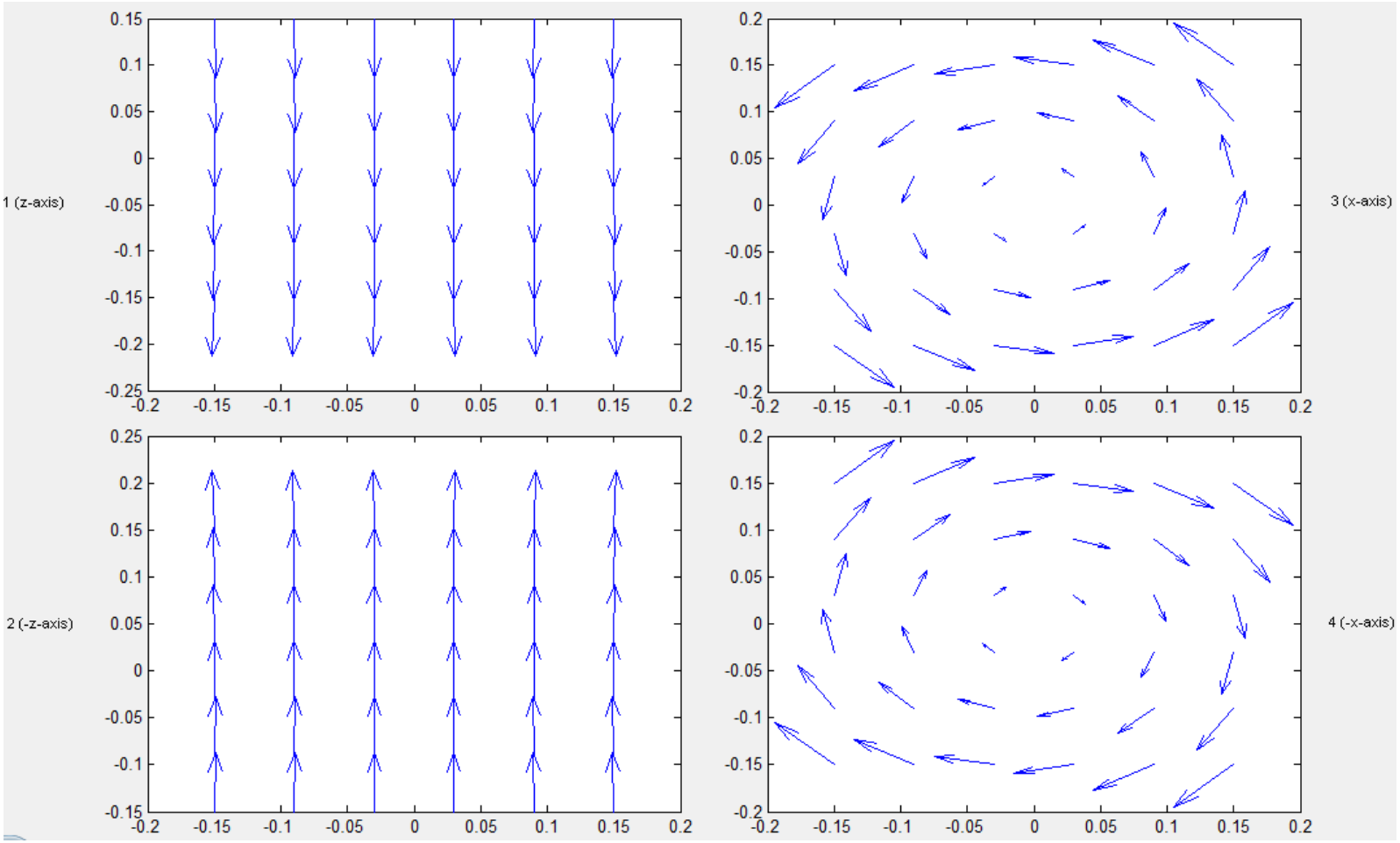

Figure: Synthetic Optical Flow

Generate Optical Flow - Average into Quadrants

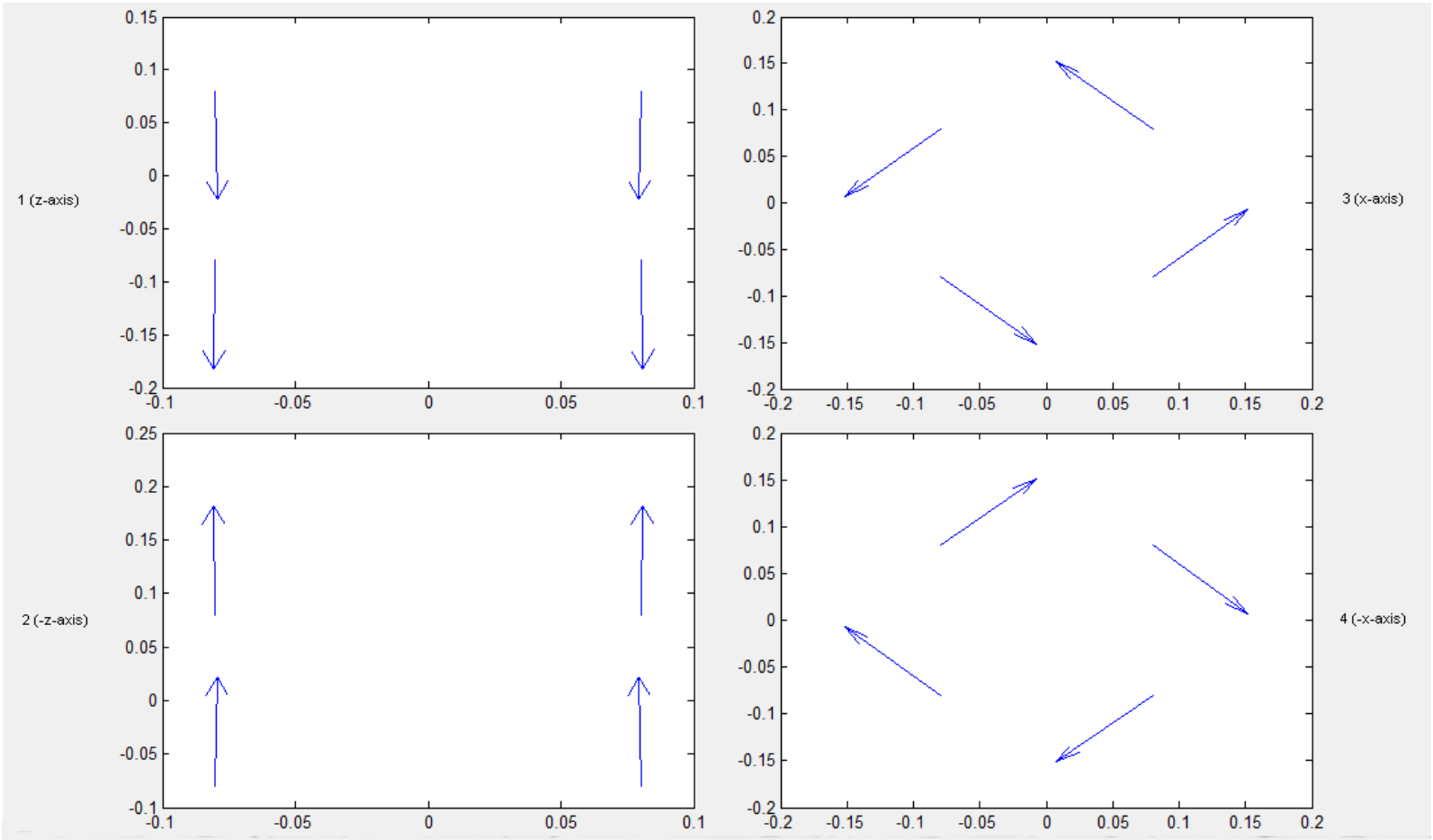

Figure: Averaged Optical Flow

Cluster Optical Flow - Using k-means

Clustering

- **Feature Vectors:** - Synthetic u and v values from each camera, one vector for each choice of rotation and translation (15625 cases)
- **Clustering:** - use k-means with (150 clusters)
- **Why:** - Decrease search space for mapping camera data to synthetic data

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Matching Real Data to Simulated

- Retrieve optical flow from cameras for a duration of a gesture
- Average optical flow using same technique as with synthetic
- Find closest cluster to each set of frames (euchlidian distance)
- Find closest case within each respective cluster

Compute Real Optical Flow

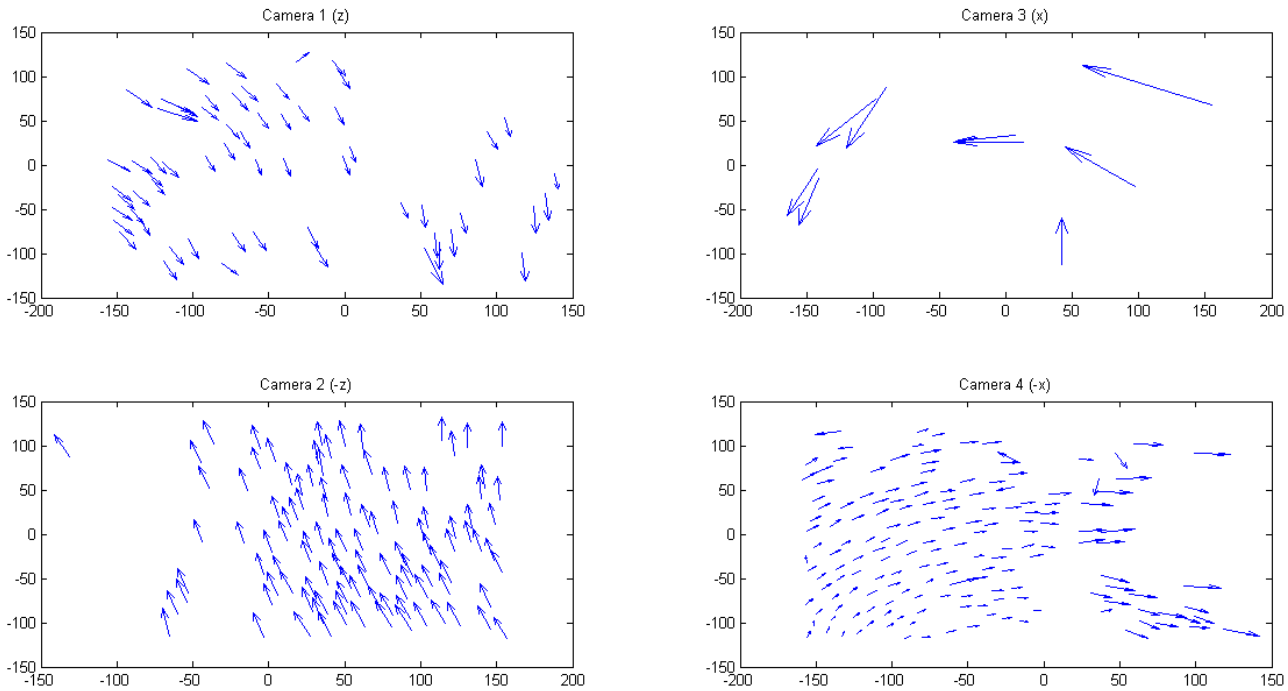

Figure: Real Optical Flow

Best Fit from Database - Find Nearest Cluster

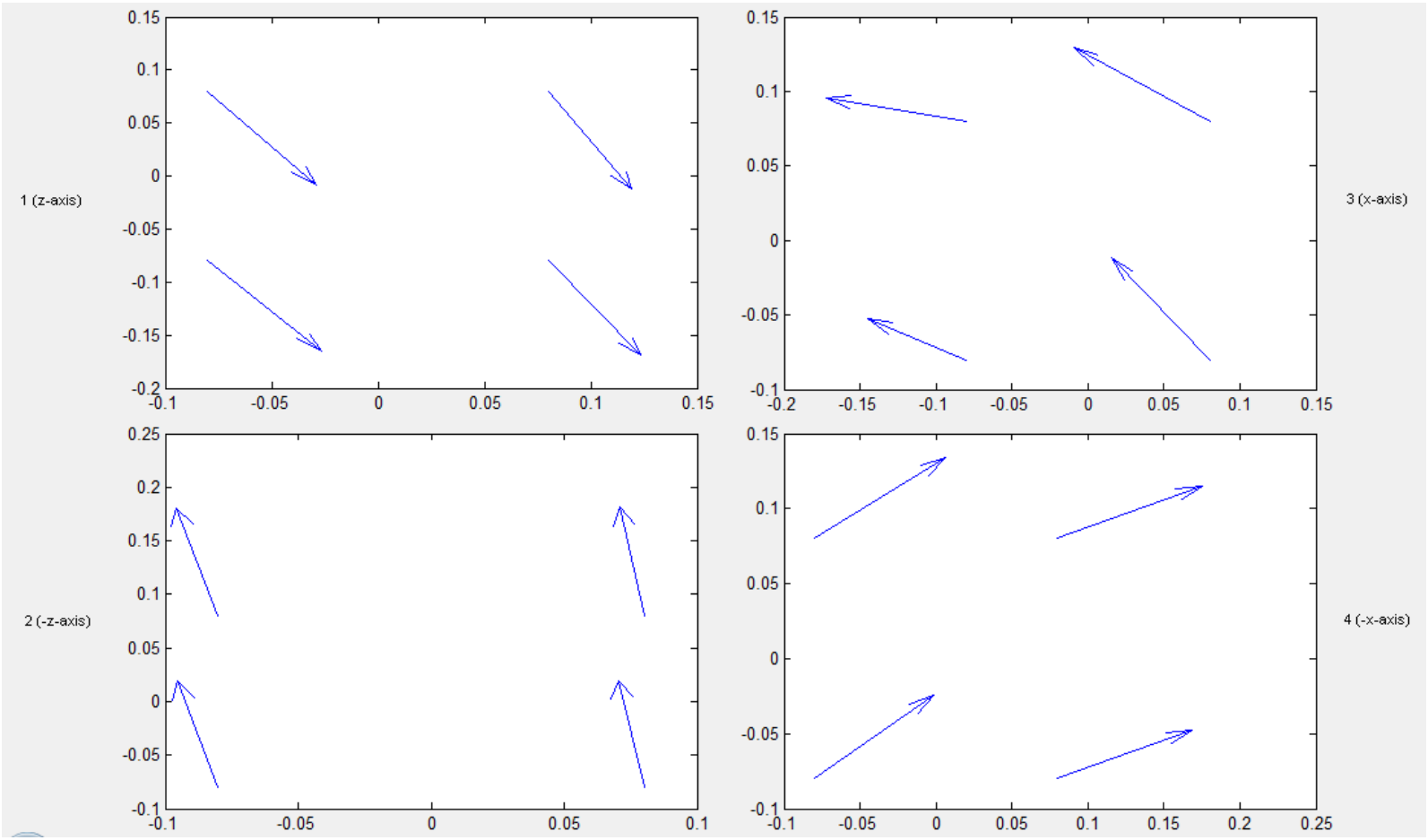

Figure: Optical Flow from Cluster Base of Closest Distance

Best Fit from Database - Find Nearest Entry in Cluster

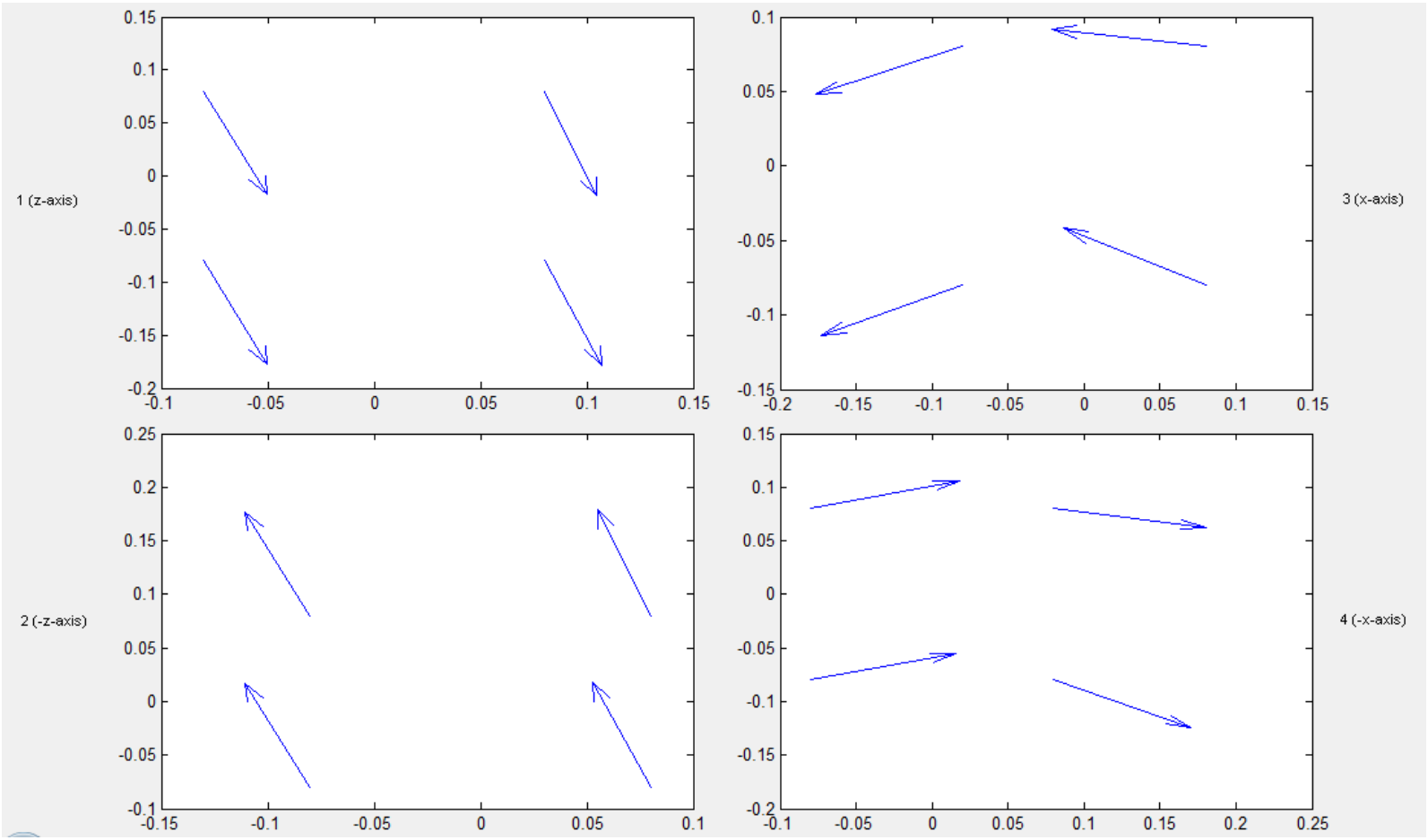

Figure: Optical Flow from Data of Closest Distance

Gesture Representation

Gesture 1: Zorro

C	R_x	R_y	R_z	t_x	t_y	t_z
51	2	0	0	-1	0	-1
51	2	1	-1	1	-2	-2
104	1	0	1	0	-1	-2
5	1	0	2	0	-1	-2
104	1	0	1	0	-1	-2
5	1	0	2	0	-1	-2
136	-1	-1	0	-1	0	2
136	-1	-1	0	-1	0	2
136	-2	-1	0	-1	0	2
136	-1	-1	0	-1	0	2
136	-1	-1	0	-1	0	2
136	-1	-1	0	-1	0	2
136	-1	-1	0	-2	0	2
139	-2	0	-1	0	-1	1
116	1	1	-2	2	-2	-1

Gesture 2: S-Shape

C	R_x	R_y	R_z	t_x	t_y	t_z
136	-1	-1	0	-2	0	2
136	-1	-1	0	-2	0	2
136	-1	-1	0	-1	0	2
51	1	0	0	0	-1	-2
51	1	1	0	1	0	-2
80	1	0	1	0	-2	-2
51	2	1	0	1	0	-2
99	1	1	0	2	0	-2
51	2	1	-1	1	-2	-2
61	2	-1	0	2	0	1
51	1	1	0	1	0	-2
51	1	1	0	1	0	-2
51	2	1	0	1	0	-2
51	2	1	0	1	0	-2
51	2	1	0	1	0	-2

Comparing Two Gestures

Simple Method

- Examine only cluster values cooresponding to each set of optical flow values for each gesture
- Calculate minimum difference in cluster values

Comparing Zorro

Zorro-1 to Zorro-2

51549

Zorro-1 to Zorro-3

41328

Zorro-2 to Zorro-3

48484

Zorro-1 to S-1

117970

Zorro-1 to S-2

132910

Zorro-2 to S-3

142810

Comparing S-Motion

S-1 to S-2

48613

S-1 to S-3

36973

S-2 to S-3

69910

S-1 to Zorro-2

77797

S-1 to Zorro-3

106980

Future Goals

- Design a more complex/intelligent gesture classifier
- Incorporate antipodal information into gesture description