
Defining Gestures from Optical Flow: Week 10

Jon Harter

University of Central Florida

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Current Progress and Goals

Recent Progress

- ▶ Expanded Gestures from 4 to 15
- ▶ Collected Brand New Dataset (750 Gesture Instances)
- ▶ Completed Classifier (Phil)
- ▶ Improved Convergence

Current Goal: Create a working gesture recognition system

- ▶ Recognize gestures from a continuous stream of input

Gestures

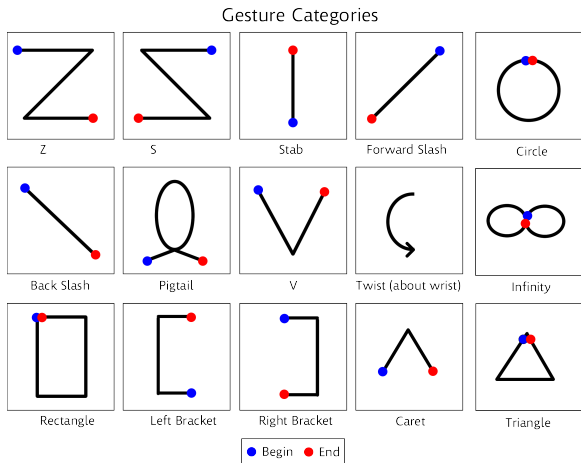


Figure: 15 Gestures to Recognize

New Dataset

Training Examples

- ▶ 15 Gestures
- ▶ 40 Instances of Each
 - ▶ Half in one location, half in another
 - ▶ Within each room, half from one person, half from another

Testing Examples

- ▶ 15 Gestures
- ▶ 10 Instances of Each
 - ▶ Half in one location (same room as training), half in another (different room as training)
 - ▶ All performed by same person (different person from either in training)

Results

	Ba	Ca	Ci	Fo	In	Le	Pi	Re	Ri	S_	St	Tr	Tw	V	Zo
Ba	20	80	0	0	0	0	0	0	0	0	0	0	0	0	0
Ca	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0
Ci	0	0	80	0	20	0	0	0	0	0	0	0	0	0	0
Fo	0	0	0	40	0	10	0	50	0	0	0	0	0	0	0
In	0	0	0	0	90	0	10	0	0	0	0	0	0	0	0
Le	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0
Pi	0	0	60	0	0	0	0	0	0	0	0	0	0	0	40
Re	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0
Ri	0	0	10	0	0	0	0	0	90	0	0	0	0	0	0
S_	0	0	0	0	0	0	0	0	0	80	0	20	0	0	0
St	0	10	0	0	0	20	10	0	0	0	50	0	10	0	0
Tr	0	0	0	0	10	0	10	0	0	0	0	80	0	0	0
Tw	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0
V	0	70	0	0	0	0	0	0	0	0	0	0	0	30	0
Zo	0	0	20	0	0	0	0	0	0	0	0	0	0	0	80

Features:

- ▶ 15,625 Rotation and Translation Values
- ▶ Signed and unsigned magnitude and average from top half, bottom half, and entire gesture

Mean Convergence:

- ▶ 69.33%

Results

	Ba	Ca	Cl	Fo	In	Le	Pi	Re	Ri	S_	St	Tr	Tw	V	Zo	
Ba	20	80	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ca	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cl	0	0	80	0	20	0	0	0	0	0	0	0	0	0	0	0
Fo	0	0	0	70	0	0	0	0	30	0	0	0	0	0	0	0
In	0	0	0	0	90	0	0	10	0	0	0	0	0	0	0	0
Le	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0	0
Pi	0	0	50	0	10	0	0	0	0	0	0	0	0	0	40	0
Re	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0	0
Ri	0	0	10	0	0	0	0	0	90	0	0	0	0	0	0	0
S_	0	0	0	0	0	0	0	0	0	70	0	30	0	0	0	0
St	0	0	0	0	0	10	10	0	0	0	80	0	0	0	0	0
Tr	0	0	0	0	10	0	10	0	0	0	0	80	0	0	0	0
Tw	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0
V	0	60	0	0	0	0	0	0	0	0	0	0	0	40	0	0
Zo	0	0	20	0	0	0	0	0	0	0	0	0	0	0	80	0

Features:

- ▶ 15,625 Rotation and Translation Values
- ▶ Signed and unsigned magnitude and average from top half and bottom half only

Mean Convergence:

- ▶ 73.33%

Results

	Ba	Ca	Ci	Fo	In	Le	Pi	Re	Ri	S_	St	Tr	Tw	V	Zo
Ba	20	80	0	0	0	0	0	0	0	0	0	0	0	0	0
Ca	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0
Ci	0	0	80	0	20	0	0	0	0	0	0	0	0	0	0
Fo	0	0	0	90	0	10	0	0	0	0	0	0	0	0	0
In	0	0	0	0	90	0	10	0	0	0	0	0	0	0	0
Le	0	0	0	0	0	100	0	0	0	0	0	0	0	0	0
Pi	0	0	30	0	10	0	0	0	0	0	0	0	0	0	60
Re	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0
Ri	0	0	10	0	0	0	0	0	90	0	0	0	0	0	0
S_	0	0	0	0	0	0	0	10	0	70	0	20	0	0	0
St	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0
Tr	0	0	0	0	10	0	10	0	0	0	0	80	0	0	0
Tw	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0
V	0	60	0	0	0	0	0	0	0	0	0	0	0	40	0
Zo	0	0	10	0	10	0	0	0	0	0	0	0	0	0	80

Features:

- ▶ 15,625 Rotation and Translation Values
- ▶ Only signed and unsigned magnitudes from top and bottom halves

Mean Convergence:

- ▶ 76%

Results

	Ba	Ca	Cl	Fo	In	Le	Pi	Re	Ri	S_	St	Tr	Tw	V	Zo
Ba	20	80	0	0	0	0	0	0	0	0	0	0	0	0	0
Ca	0	100	0	0	0	0	0	0	0	0	0	0	0	0	0
Cl	0	0	100	0	0	0	0	0	0	0	0	0	0	0	0
Fo	0	0	0	90	0	0	10	0	0	0	0	0	0	0	0
In	0	0	0	0	90	0	0	10	0	0	0	0	0	0	0
Le	0	0	10	0	0	90	0	0	0	0	0	0	0	0	0
Pi	0	0	0	0	10	10	80	0	0	0	0	0	0	0	0
Re	0	0	0	0	0	0	0	100	0	0	0	0	0	0	0
Ri	0	0	0	0	0	0	0	0	100	0	0	0	0	0	0
S_	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0
St	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0
Tr	0	0	0	0	0	0	10	10	0	0	0	80	0	0	0
Tw	0	0	0	0	0	0	0	0	0	0	0	0	100	0	0
V	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0
Zo	0	0	0	0	20	0	0	0	0	0	0	0	0	0	80

Features:

- ▶ 15,625 Rotation and Translation Values
- ▶ Signed and unsigned magnitude from four sections of gesture

Mean Convergence:

- ▶ 88.67%

Results

	Ba	Ca	Ci	Fo	In	Le	Pi	Re	Ri	S_	St	Tr	Tw	V	Zo	
Ba		20	80	0	0	0	0	0	0	0	0	0	0	0	0	
Ca	0		100	0	0	0	0	0	0	0	0	0	0	0	0	
Ci	0	0		90	0	10	0	0	0	0	0	0	0	0	0	
Fo	0	0	0		90	0	0	10	0	0	0	0	0	0	0	
In	0	0	0	0		90	0	10	0	0	0	0	0	0	0	
Le	0	0	0	0	0		100	0	0	0	0	0	0	0	0	
Pi	0	0	0	0	0	10		70	0	0	0	0	0	0	20	
Re	0	0	0	0	0	0	0		100	0	0	0	0	0	0	
Ri	0	0	0	0	0	0	0	0		100	0	0	0	0	0	
S_	0	0	0	0	0	0	0	0	0		100	0	0	0	0	
St	10	0	0	0	0	0	0	0	0	0		90	0	0	0	
Tr	0	0	0	0	10	0	0	30	0	10	0		50	0	0	
Tw	0	0	0	0	0	0	0	0	0	0	0	0		100	0	
V	0	0	0	0	0	0	0	0	0	0	0	0	0		100	
Zo	0	0	0	0	10	0	0	0	0	0	0	0	0	0		90

Features:

- ▶ 117,649 Rotation and Translation Values
- ▶ Signed and unsigned magnitude from four sections of gesture

Mean Convergence:

- ▶ 86%

Results

	Ba	Ca	Cl	Fo	In	Le	Pi	Re	Ri	S_	St	Tr	Tw	V	Zo			
Ba		50	40	0	0	0	10	0	0	0	0	0	0	0	0			
Ca	0		100	0	0	0	0	0	0	0	0	0	0	0	0			
Cl	0	0		100	0	0	0	0	0	0	0	0	0	0	0			
Fo	0	0	0		80	0	0	0	0	20	0	0	0	0	0			
In	0	0	0	0		100	0	0	0	0	0	0	0	0	0			
Le	0	0	0	0	0		100	0	0	0	0	0	0	0	0			
Pi	0	0	0	0	0	30		30	0	0	0	0	0	0	40			
Re	0	0	0	0	0	0	0		100	0	0	0	0	0	0			
Ri	0	0	0	0	0	0	0	10		90	0	0	0	0	0			
S_	0	0	0	0	0	0	0	0	0		100	0	0	0	0			
St	0	0	0	0	0	0	0	0	0	0		100	0	0	0			
Tr	0	0	0	0	0	0	10	10	0	10	0		70	0	0			
Tw	0	0	0	0	0	0	0	0	0	0	0	0		100	0			
V	0	0	0	0	0	0	0	0	0	0	0	0	0	0		100		
Zo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		100

Features:

- ▶ 729 Rotation and Translation Values
- ▶ Signed and unsigned magnitude from four sections of gesture

Mean Convergence:

- ▶ 88%

Analysis

- ▶ Improved Convergence by 19.34% (Best: 88.67%)
- ▶ Increasing optical flow cases by a factor of 10 reduced convergence 2.67%
- ▶ Decreasing optical flow cases by a factor of 10 reduced convergence 0.67%

Future Goals

- ▶ Increase convergence
- ▶ Determine suitable confidence thresholds for each gesture
- ▶ Gather test cases from more individuals in more environments
- ▶ Recognize gestures from constant input stream

