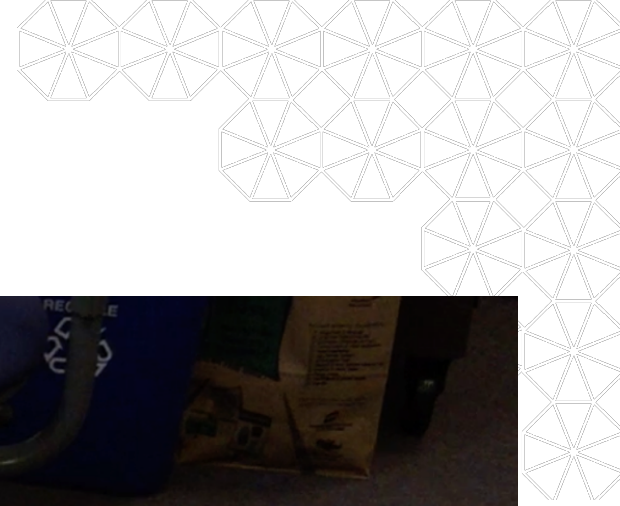# Cubic Hand

**Kevin Albers, Robert Bui,
José Oyola, Naren Vasanad**

Berkeley
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Objective

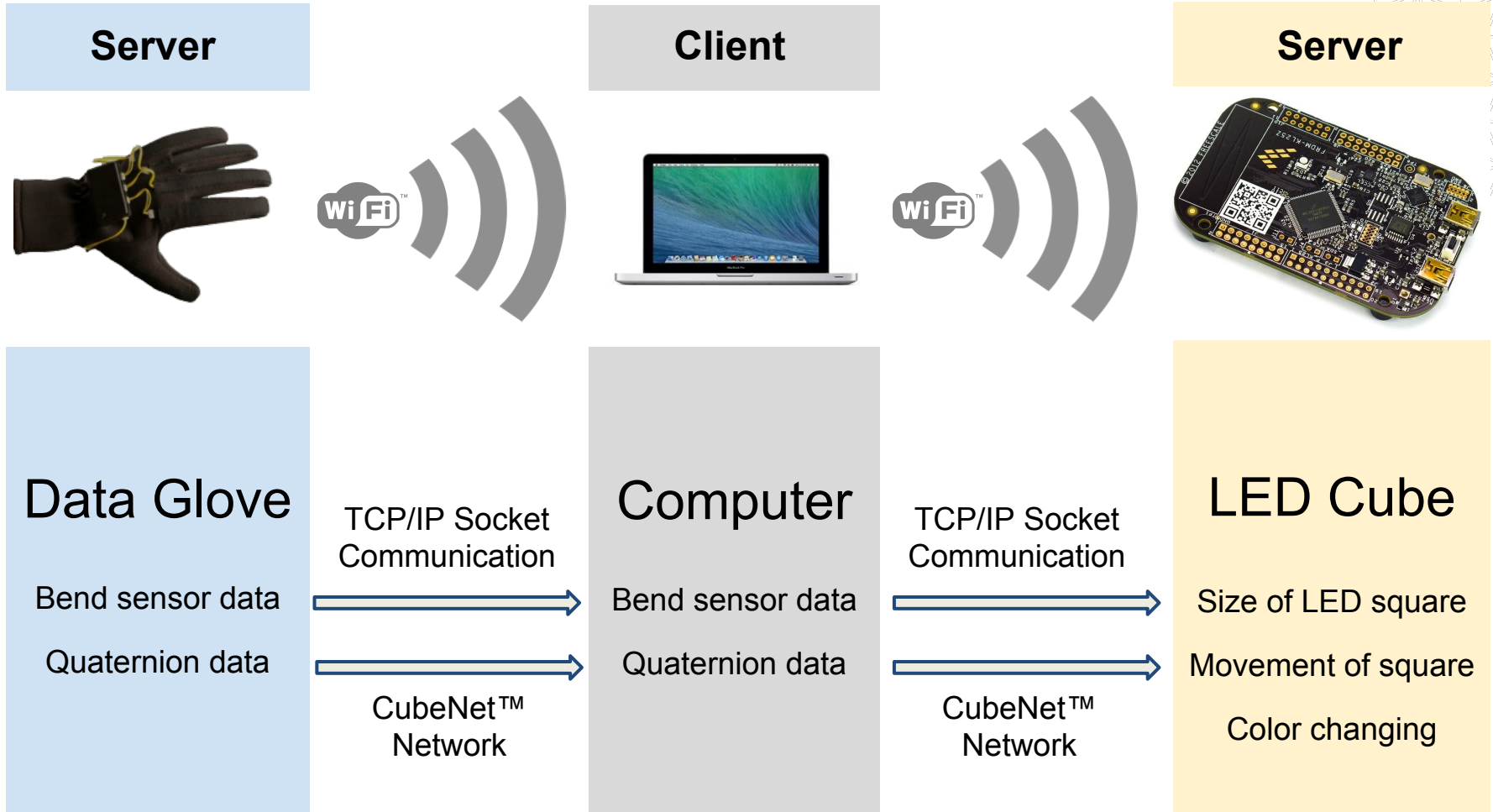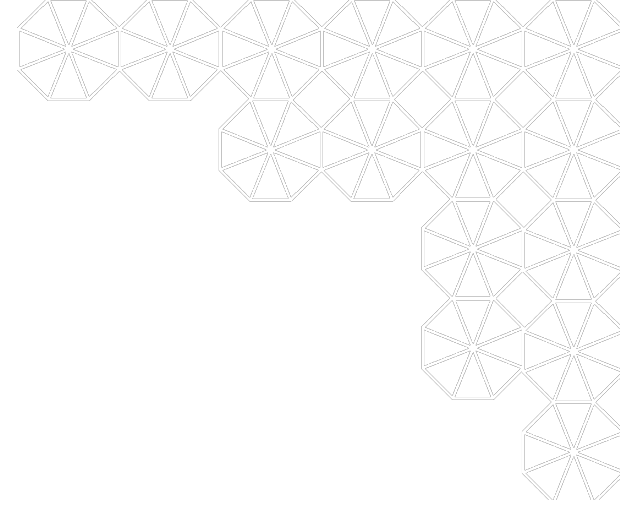Create an LED cube with lighted squares that can be controlled by hand gestures sensed by a data glove.
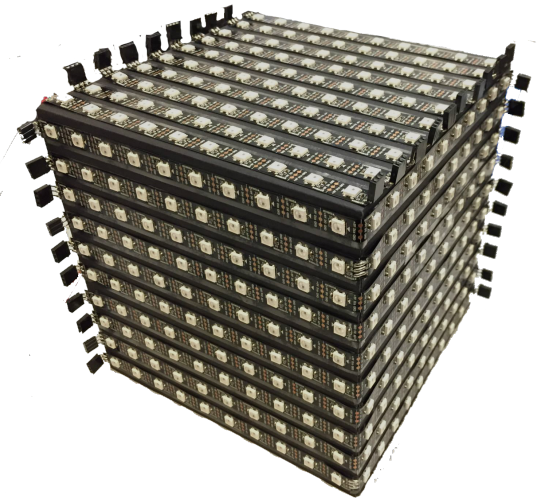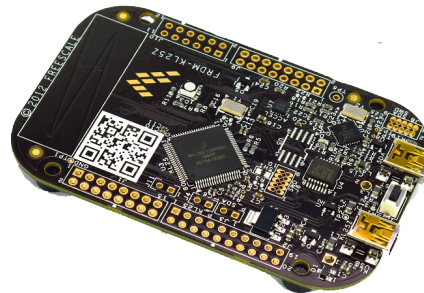
Focus Areas
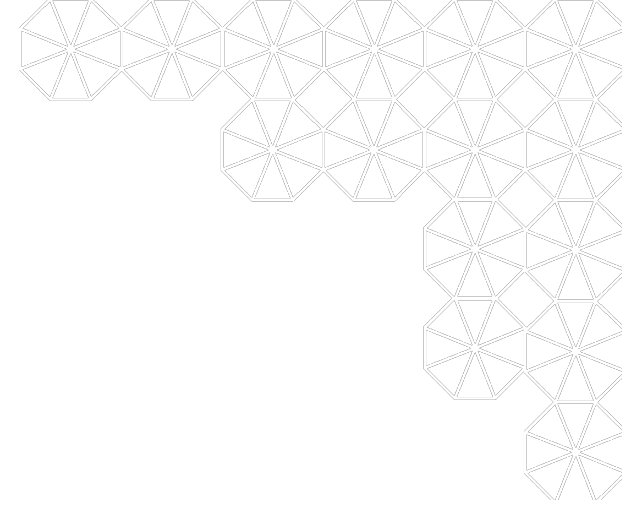
- Real time networks
- Classification of gestures
- Model-based design of systems

Real Time Networks

Server

Client

Server

Data Glove

TCP/IP Socket
Communication

Computer

TCP/IP Socket
Communication

LED Cube

Bend sensor data → Bend sensor data → Size of LED square

Quaternion data → Quaternion data → Movement of square

CubeNet™
Network

CubeNet™
Network

Color changing

Berkeley
UNIVERSITY OF CALIFORNIA

4

DEMO

Modeling Gestures

Sensor Data Specifications				
	Minimum	**Maximum**	**Precision**	**Units**
Finger Sensors	0	1000	1	0.1%
Roll	-90.00	90.00	0.01	degrees
Pitch	-90.00	90.00	0.01	degrees
Yaw	-90.00	90.00	0.05	degrees
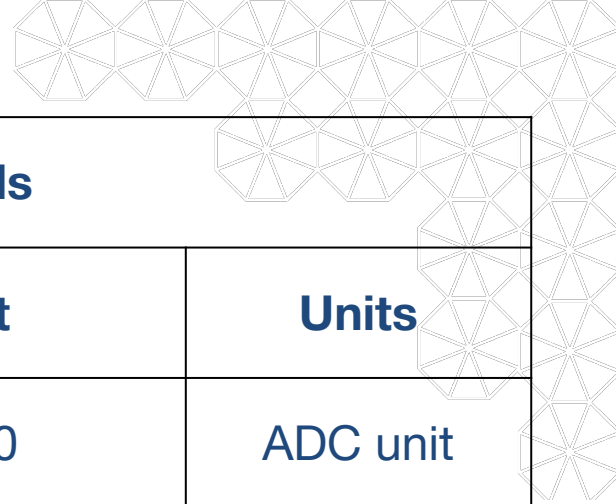
Gesture Recognition Thresholds

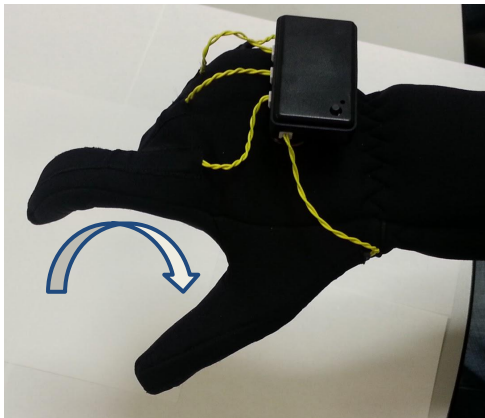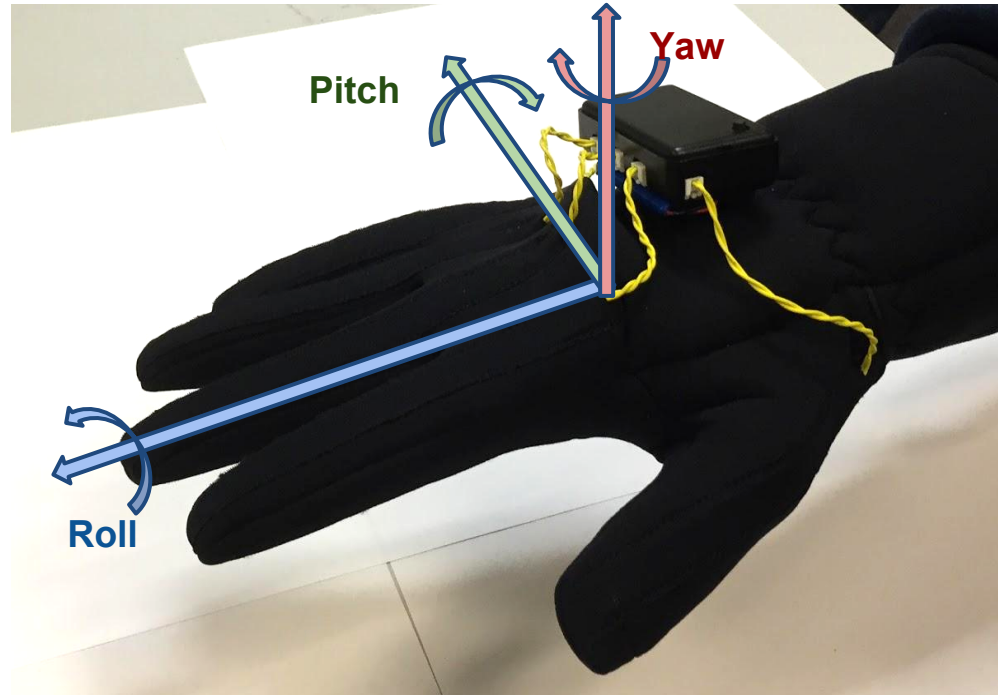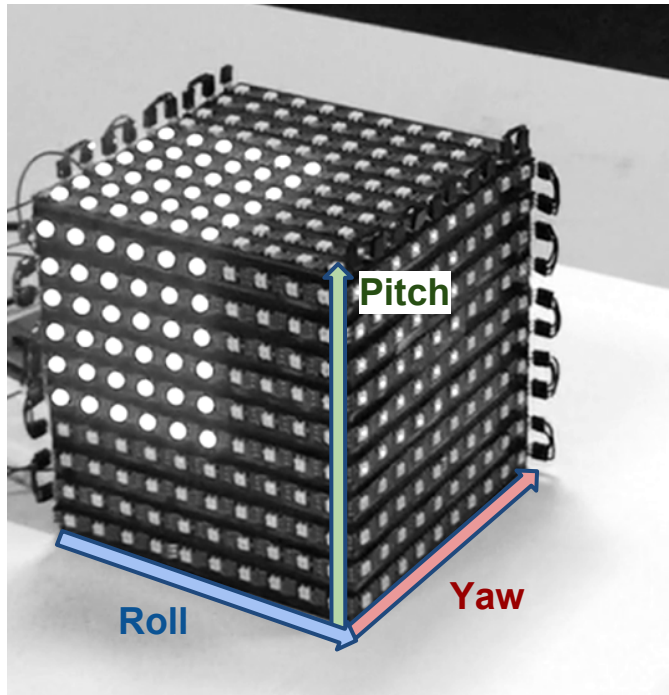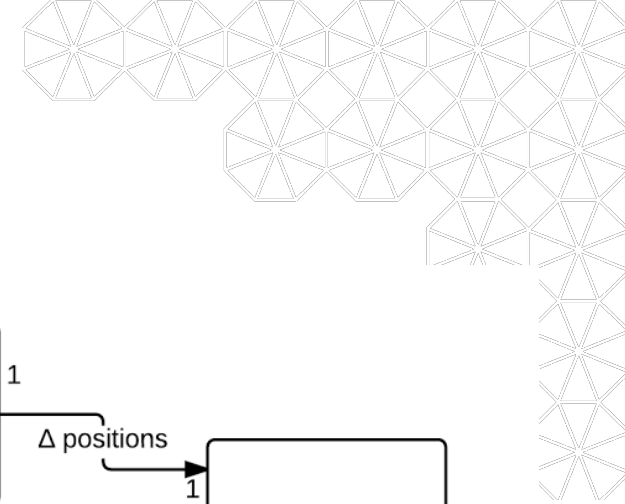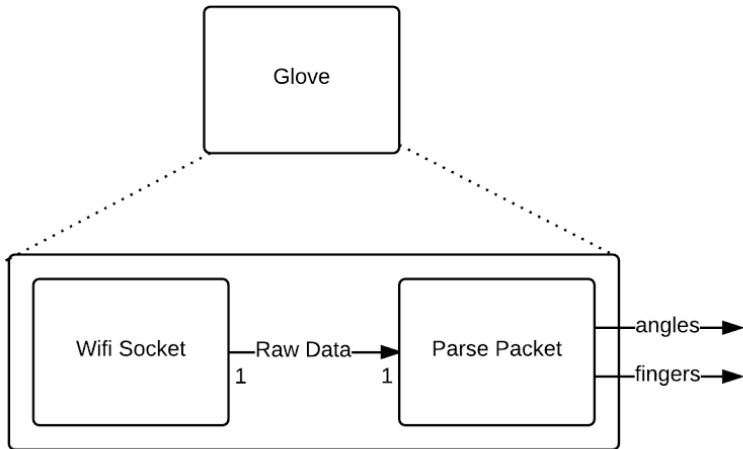|	Unbent	Bent	Units
Fingers 0-3	< 350	≥ 350	ADC unit
Finger 4 (Thumb)	< 200	≥ 200	ADC unit
	Neg. Movement	**Pos. Movement**	**Units**
Roll, Pitch, Yaw	< -10	> 10	degrees

Gesture Classification: Size & Color
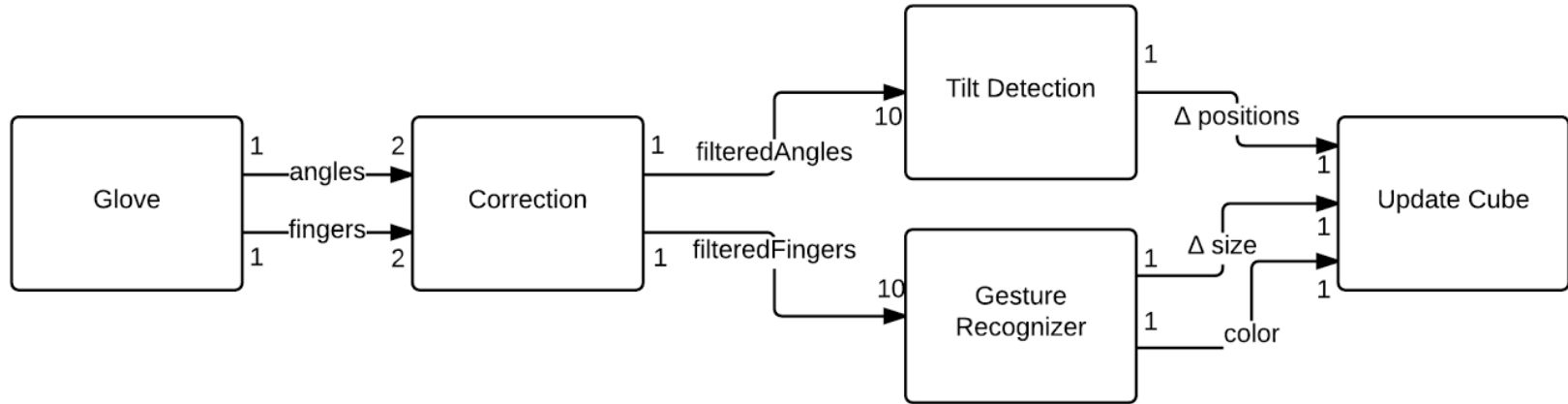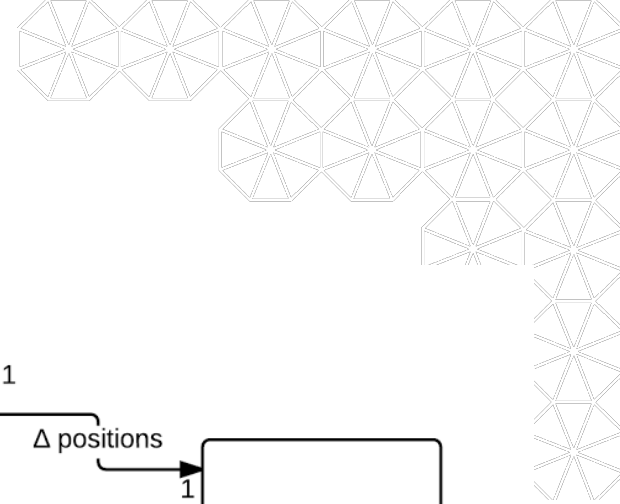

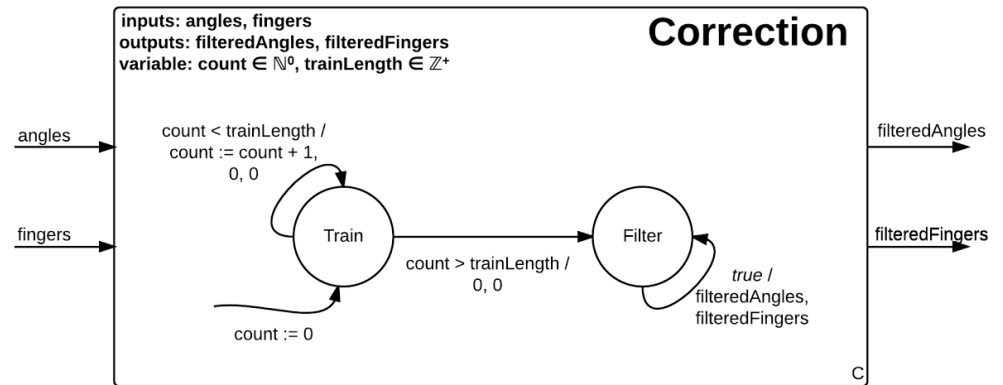Neutral
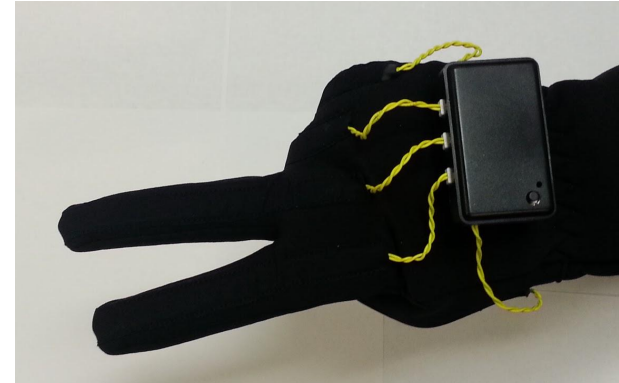
Increase Size

Change Color
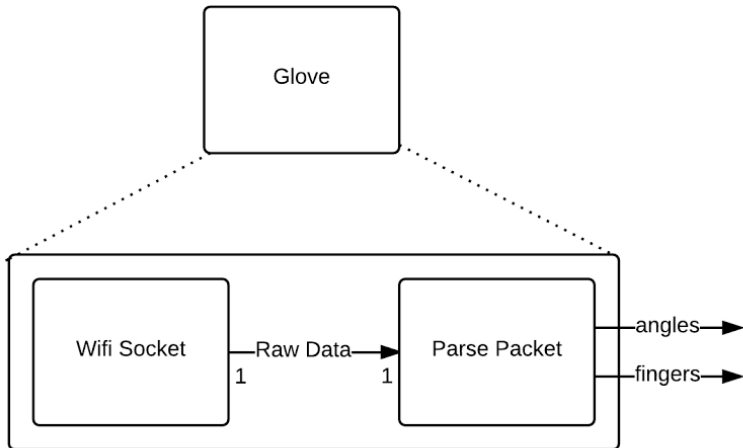

Decrease Size

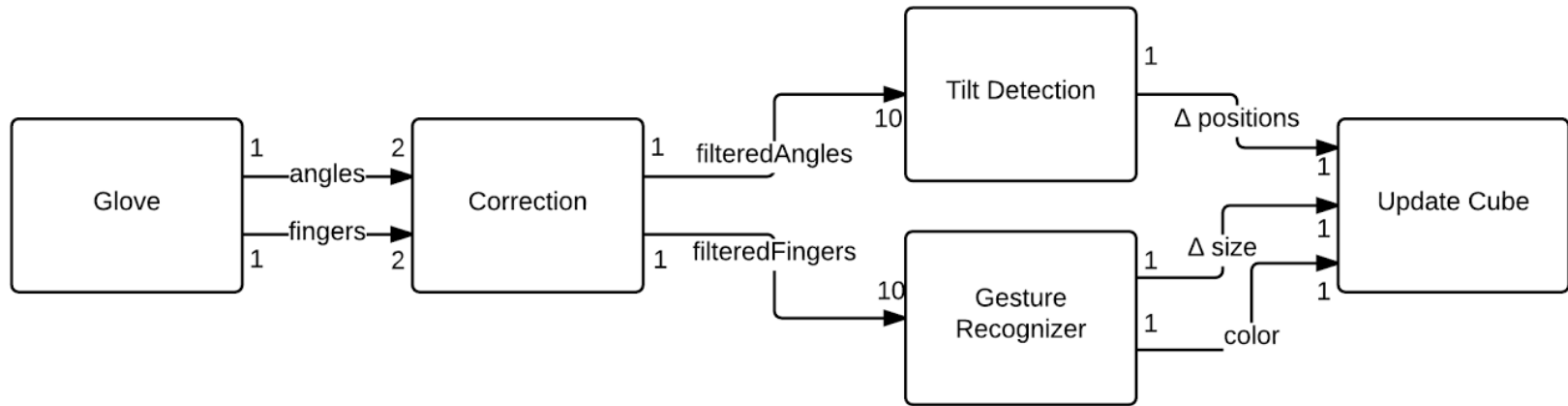# Gesture Classification: Movement

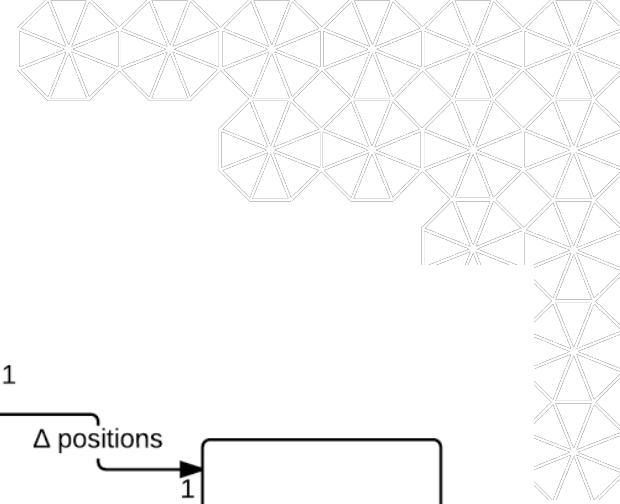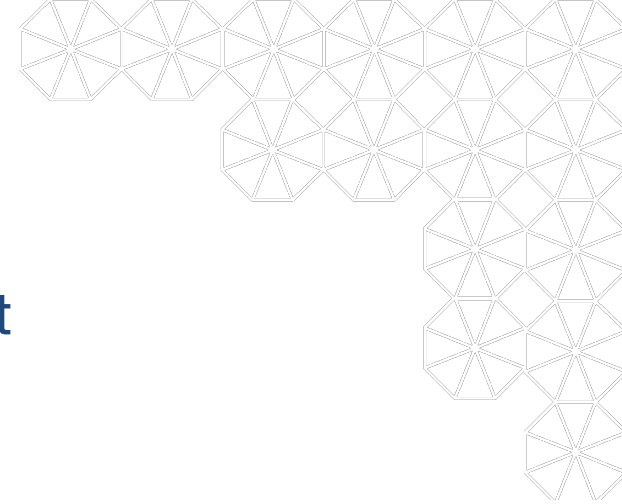# Design Methodologies
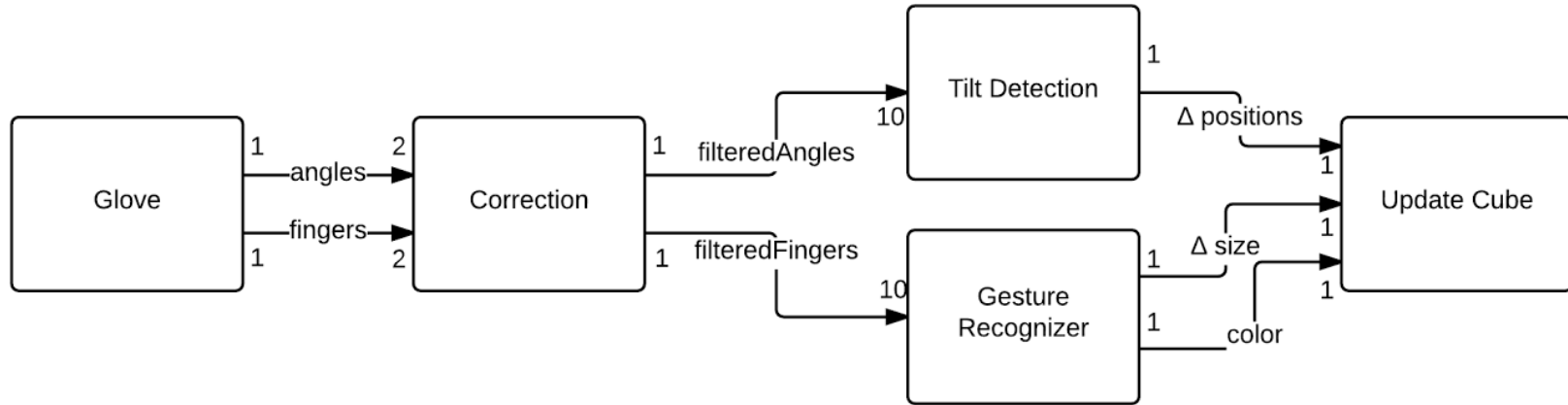
Design Methodologies
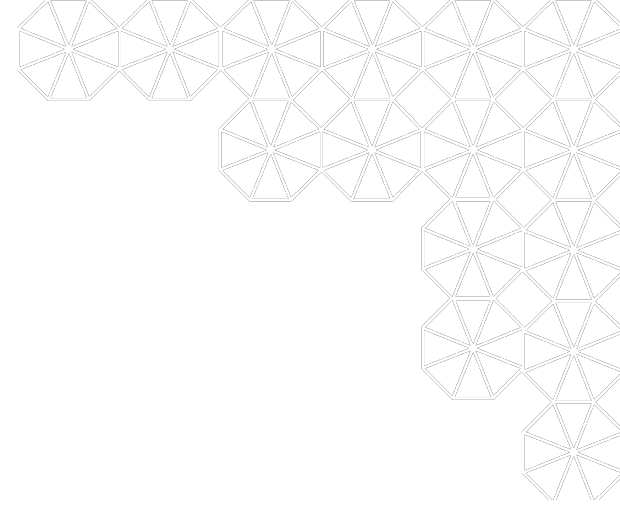
Design Methodologies

mbed Libraries Used

- CC3000: cc3000_hostdriver_mbedsocket

    By: Martin Kojtal

- NeoPixel LEDs: Multi_WS2811

    By: Richard Thompson

Acknowledgements

- Professor Edward Lee
- Professor Sanjit Seshia
- John Finn, Antonio Iannopollo and Ben Zhang
- Embedded Systems Laboratory
- Invention Lab
- Virtual Realities
- TerraSwarm Research Center

Questions?

Materials

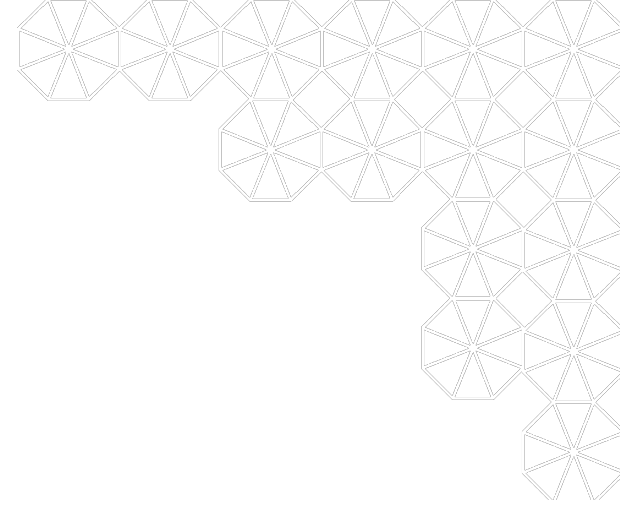Embedded Platform: Freescale FRDM-KL25Z

Wi-Fi Module: CC3000

Neo Pixel LED Strips: 300 for 10x10 LED Cube

Data Glove: VirtualRealities DG5

Data Glove Sensor	Action
Accelerometer	Movement of Square
Gyro	Change Color
Flex Sensor	Change Size of Square

Demo Video