Smart Glove Control System

Team 2
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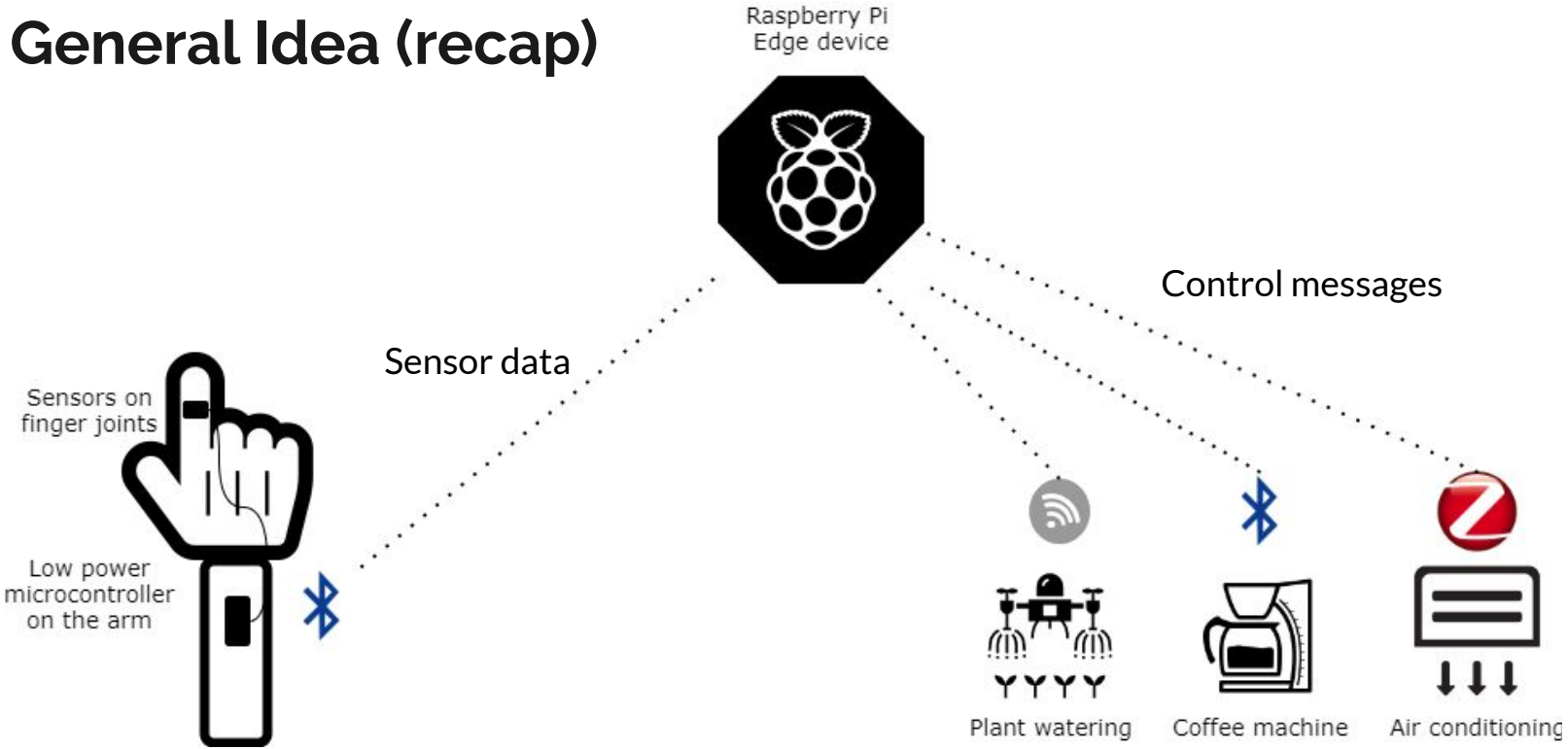
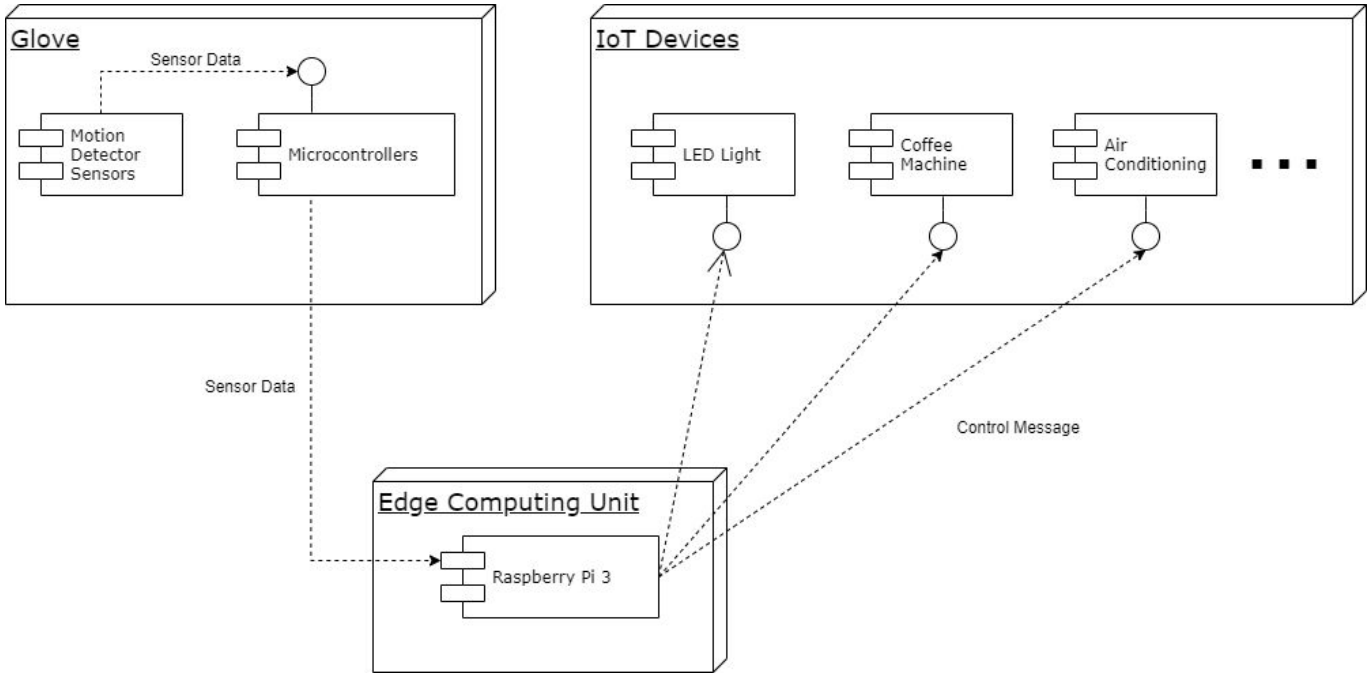
General Idea (recap)



Architecture Diagram



Progress Plan

- **Sprint 1 (8 May - 21 May)**

  Configure movement sensors, connect them to edge device, and build first prototype of the glove

- **Sprint 2 (22 May - 4 June)**

  Recognize and interpret hand movement patterns on edge device

- **Sprint 3 (5 June - 25 June)**

  Control simple IoT devices using commands from finger movements

- **Sprint 4 (26 June - 9 July)**

  Recognize more gestures, and control more advanced IoT devices and Provide framework add new devices

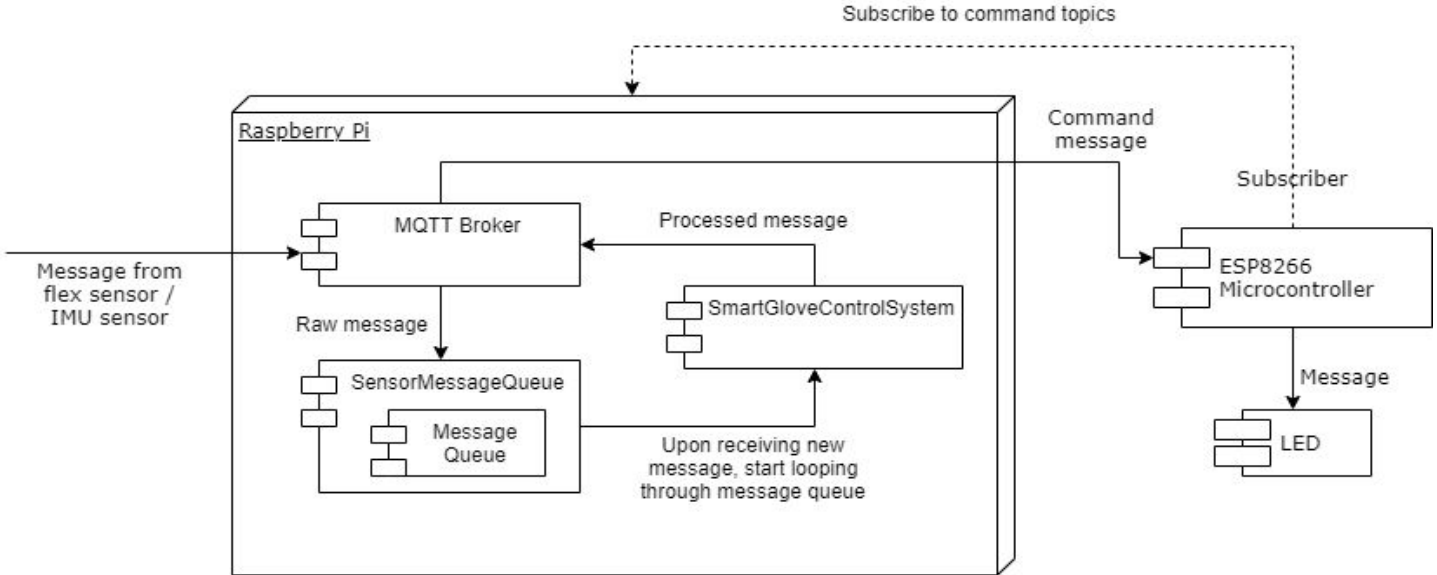
Sprint 2 Recap

What has been done:

- Received flex sensors and IMU sensors, and built the first prototype for the glove
- Found 3D printing models for the glove
- Refined flex sensor data receiving method, more accurate ADC voltage value will be received.
- IMU sensor communication via I2C. Processed raw data into more useful formats on ESP32 before sending it via MQTT.
- Implemented message queue in the previous MQTT broker, and ready to implement specific machine learning models based on the messages sent from microcontroller

Sprint 2 Recap

MQTT Message Queue Mechanism:

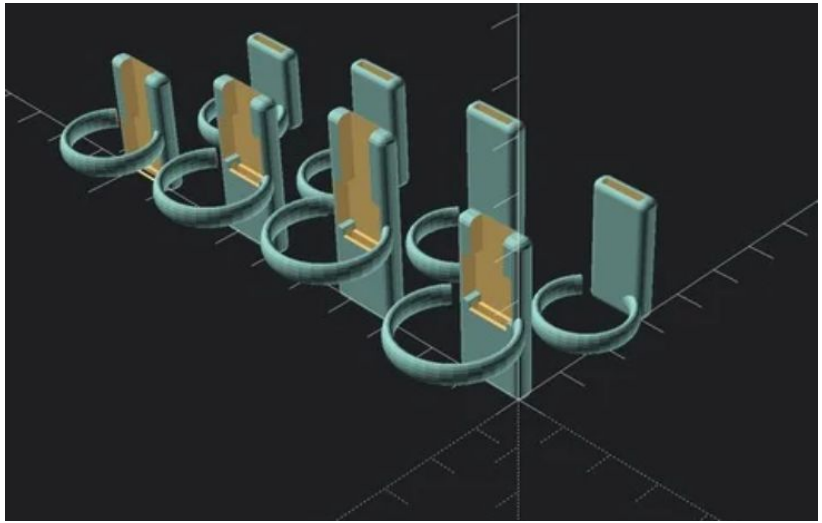


Sprint 2 Recap

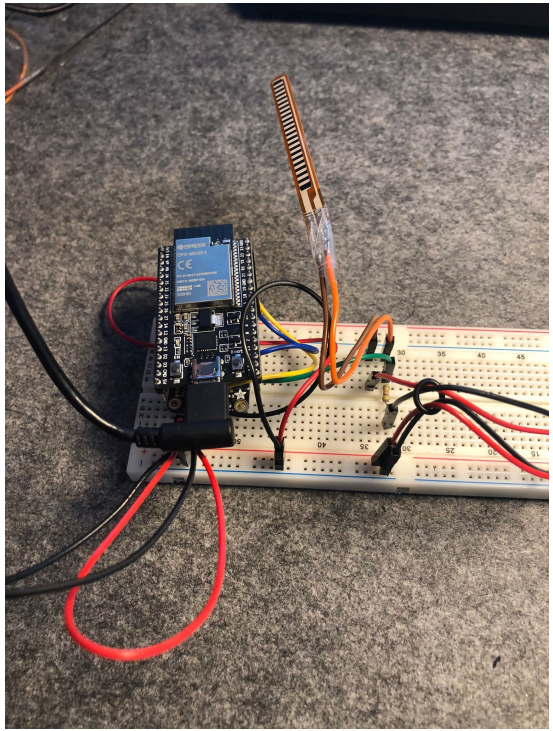
What was missed out:

Implement gesture recognition methods using proper machine learning models, moved to the next sprint

3D Printing plans



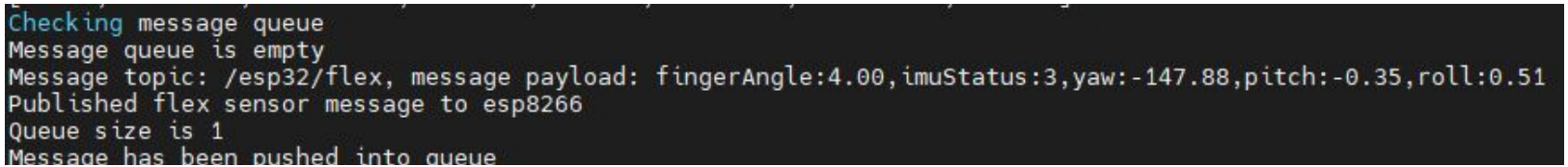
- Found a model on thingiverse for flex sensors.
- Our Friend who owns a 3D printer was not familiar with this file type.
- Getting help from another friend for the next sprint.



Every member has a test kit so that everyone can test while developing.

Only one glove for actual data collection.

Receiving the sensor data via MQTT on Raspberry Pi



Data collection is now possible!

Issues we faced:

- ADC2 gets disabled when using WiFi on ESP32. Not all ADC1 channels are mapped to a pin.
- The value read by the ADC does not linearly map to the voltage values.
- ADC driver with calibration functionality available for ESP-IDF, but not on Arduino.
- Hard to mount sensors to the glove without 3D printed parts.
- Glove is stretchy, sewing on sensors in proper places without wearing it is not trivial.
- The flex sensors are not consistent. Most of them have different min/max resistances.

Sprint 3 Plan

- Implement gesture recognition methods using proper machine learning models.
- Provide data points and train gesture recognition machine learning models
- Improve the glove design. Solder all components into a small package to reduce cables.

Thank you!

Questions?