Homework 4 - System Overview

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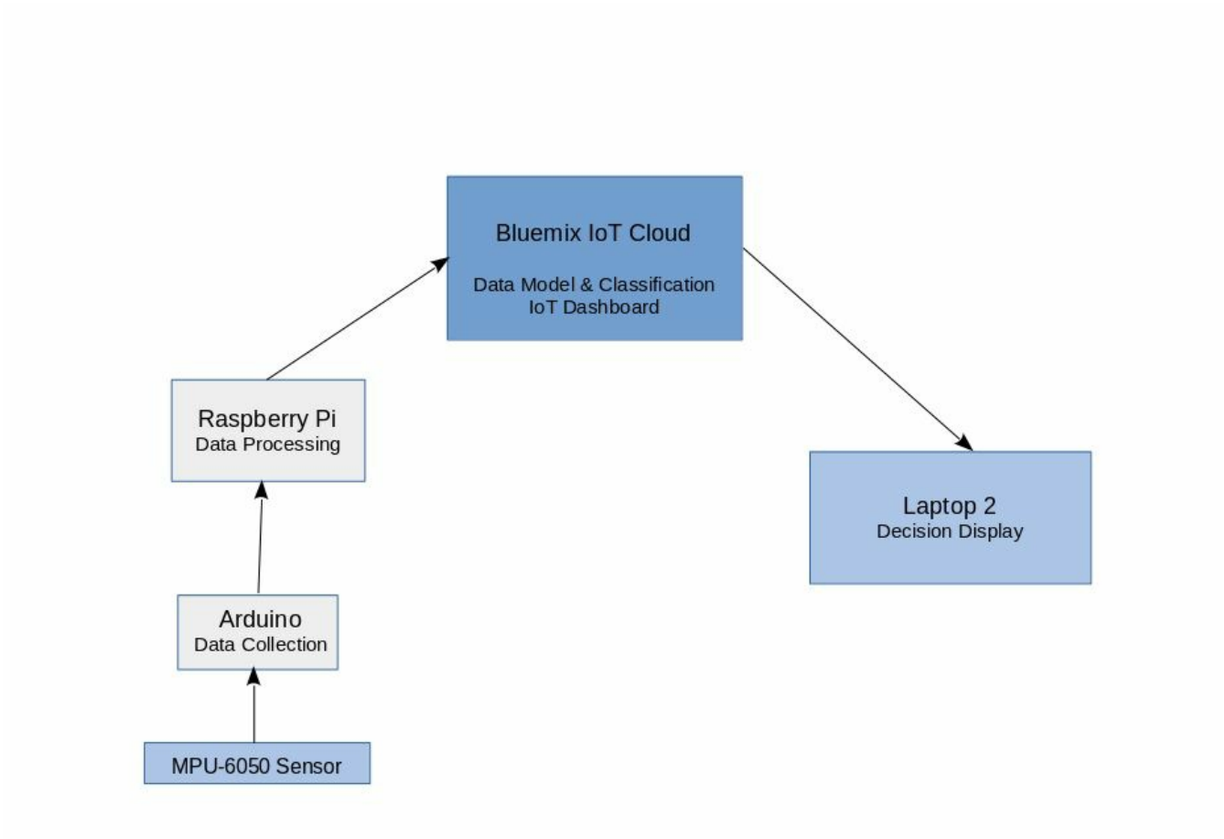
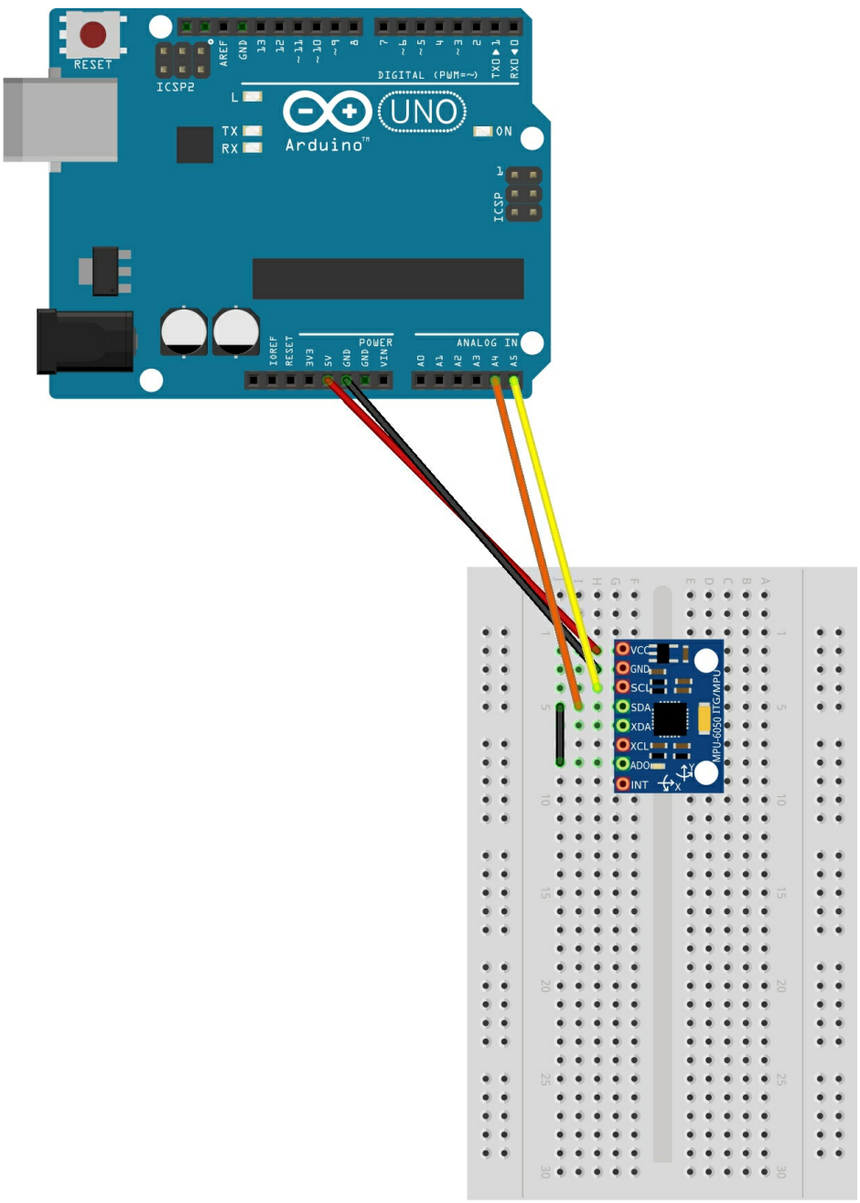
System Overview

The system is composed of four modules: an Arduino and a connected accelerometer/gyroscope sensor, which reads the values from the sensor and passes them up; a Raspberry Pi, which receives the values for a set period of time, packages them, and sends them on; a SVM webapp running on Bluemix which performs data analysis, determines whether a door opening or door closing event was recorded, and passes that decision on; and a receiver application, running on a second laptop, which displays the decision and a timestamp to the user.

System schematic



IoT device schematic



Explanation of feature extraction and selection methods

The Raspberry Pi sends a buffer of 50 values to the webapp hosted on Bluemix, as soon as the webapp receives the 50 value buffer, it calculates the mean of the values, the values are pushed into a larger buffer of 800, and makes a decision as to when to push the larger buffer to the classifier. This decision is made based on the moving average of the smaller buffer and its relationship with a threshold value.

Explanation of classifier training method

The classifier divides the larger buffer into 20 bins and the mean value of each bin and the resulting vector is of dimension 20. The decision to use 20 bins was predicated by the number of samples for a typical door event. Once the vector is received, it is passed to the model which analyzes the vector and assigns a label, +1 for Door Open event and -1 for Door Close.

Approximately 800 samples were collected for each training event. All of the training events were run through these calculations and the resulting vectors were collated with labels and used to train the SVM model, which was used to label the experimental events.