Proposal for SNOW DEPTH MEASUREMENT PROJECT

Implement details:

Part A: measure the snow depth

Goal: Firstly, we need to store the base distance, which is the height of our device from the flat ground. When the snow accumulates, we subtract the current measured distance from the base distance and get the depth of snow. For example, our sensor is 100 cm from the ground, and after snow settles, the current distance from our sensor to surface of snow is 85, we can say the depth of snow is 15. Besides, we will set a threshold for snow depth and send alert email using Gmail SMTP once the snow depth is over the threshold.

Hardware:

a. HC-SR04, an ultrasonic sensor connected to raspberry Pi.
   It uses ultrasonic to determine distance, it ranges from 2cm to 400cm.
   We could calculate the distance by the following formula:
   D = VT / 2
   D: distance, V: sound speed, T: measured time for trigger signal to perform the round trip.
b. DHT22, a temperature detection module.
   We know the sound speed will be affected by temperature and we have the following formula:
   C = (331.3 + 0.606 * T) m/s
   C: sound speed in air, T: temperature in degrees celsius.

Part B: Display the measurement result.

Goal: Build a server on Pi using Flask Framework store history data in SQLite. Then Build a web interface to visualize the snow-depth and make it accessible from internet.

Time Line:

Nov.18th - 24th:
-> Set up RPi as server using Flask and build basic GUI on monitor;
-> Read GPIO input from HC-SR04 and DHT22 and do the encoding and calculation;
-> Display GPIO data on GUI.

Nov.25th - Dec 1st:
-> Set up SQLite on RPi, store and display history data and test indoor;
-> Build framework and basic protection for RPi to function in snowy weather;
-> Test SnowPi outdoor and record video footage;
-> Refine data visualization and GUI.

Dec 2nd - Dec 8thL
-> Set up Gmail SMTP on RPi and send alert email to user;
-> Add calibration feature for first-time use;
-> Build project website.