Memo

To: Professor Pisano

From: OccuSense ECE Senior Design Team

Team: OccuSense: Team 11

Date: 11/15/16

Subject: First Deliverable Test Plan

16X4 Thermopile Array Extraction

Description & Goal:

In order to extract the 16X4 thermopile array we needed to build a C++ script that processes the raw data given by the MLX90621 sensor, translate the raw data into ambient temperature measurements, and

Figure 1: MLX90621 Sensor Schematic

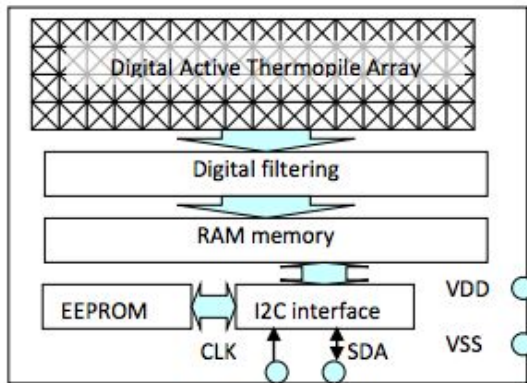access these measurements to build the final heat array. The MLX90621 contains 64 IR pixels (16X4) that detects objects moving in front of the sensor and a PTAT (Proportional to Absolute Temperature) sensor to measure the ambient temperature of the chip. The outputs of these sensors are stored in internal RAM and can be accessed via I2C (Figure 1). This process begins by reading the EEPROM calibration data that is used to prep the thermal sensor data points to be processed into ambient temperature (Ta) readings. The measurement data stored in the internal ram of the sensor, which is made up of the PTAT and IR readings, are then read and used to calculate the Ta values of the thermopile array. The significance of this thermopile array is to be able to use it to detect objects moving in and out of a doorway their respective heat measurements to distinguish whether or not the object is a person.
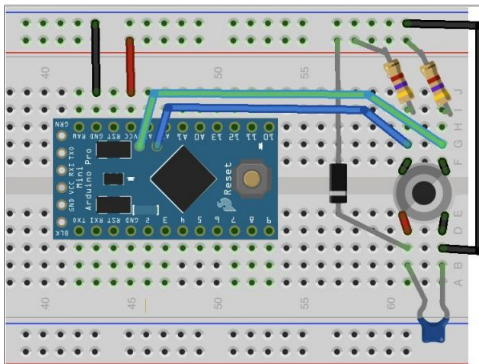

Figure 2: Arduino Sensor Schematic

Procedure:

In preparation for running the thermopile array script, the 4-pin MLX90621 thermal sensor must be soldered and wired correctly to integrate with an Arduino microcontroller (Figure 2). The SCL and SDL pins of the thermal sensor correspond to the analog clk and DATA pins on the Arduino (Figure 3). The MLX90621 thermal sensor needs to be powered by 2.6V coming from a diode through pin 3 (VDD) and finally pin 4 (GND) is to be wired to ground on the circuit. The Arduino should be powered by 5.0V coming from the power source.

The pullup resistor values that should be used for this test are 10k ohms for each resistor. Once the circuit is prepared, make sure that the "wireMLX90621.h" file, "MLX90621.cpp" file, and "mlx90621" arduino file are in the same directory before compiling the program. Once the project is compiled for the arduino, the 16x4 thermophile matrix will be printed to the monitor and different temperatures can be plotted serially as well.

Verifiable Result:

By running the "MLX90621.cpp" file we should be able to translate the raw data given to us by the MLX90621 thermal sensor into a real-time 16X4 thermopile array of temperatures in degrees celsius that we are able to use to measure the temperatures of moving objects that are passing in front of the sensor. We should be able to determine if a hand is passing over the sensor at any given time in real-time.
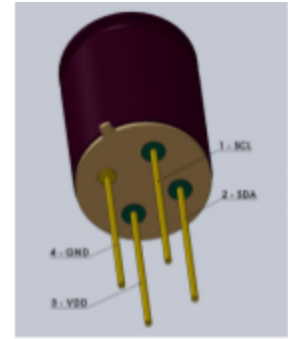
Figure 3: 3D Render of the MLX90621 Thermal Sensor