Feasibility Study: Using the FLIR Lepton for Data Collection

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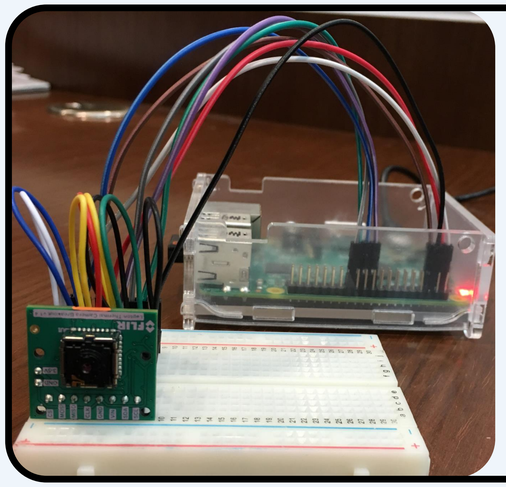
Objective

Determine whether FLIR Lepton infrared sensors can be used as alternatives to large and expensive infrared cameras for quantitative data collection.

Procedure

A computing system integrating multiple Lepton sensors is being developed along with a modified code base that allows for immediate processing of data so that the output images contain temperature data rather than color data. Once this system is in place, comparisons will be made between the Lepton data and the data from infrared cameras already in use.

Photo of Jaime's coffee taken using the FLIR Lepton
Size: 60x80 Pixels



The FLIR Lepton connected to the Raspberry Pi 2 via a breadboard.

Applications of FLIR Lepton

- Stress Analysis
  - FLIR products are used by many entities working on studying how stress affects materials. The FLIR Lepton can provide the same data collection capability at a much cheaper price.
- Gas Detection
  - Similar Thermal sensors have been used in studies determining gas concentrations in the atmosphere. It is believed that the FLIR Lepton can be applied to this research.
- Safety and Security
  - FLIR products have been used as thermal sensors for commercial and personal security systems. The Lepton sensor can be used to collect heat signatures needed for any security system.
- Micro and Nano UAV Systems

  The small and compact size of the FLIR Lepton allows for it to be used in UAV systems in order to collect data for them.

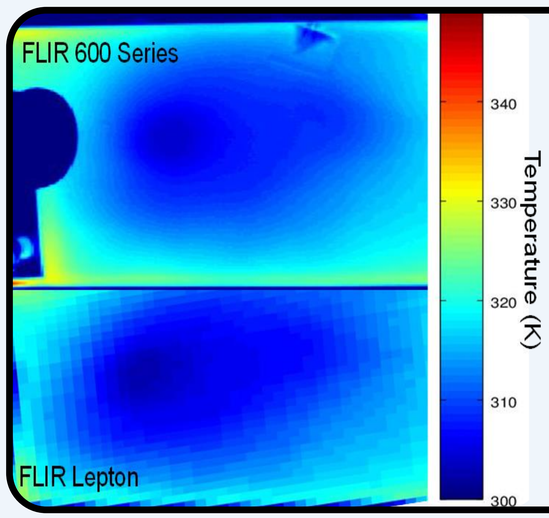
Advantages of FLIR Lepton

- Size
  - The FLIR Lepton when mounted on the breakout board occupies a space of only 25 mm x 24mm.
- Cost
  - The price of the FLIR Lepton is $175 per unit for the sensor and $58 for the breakout board, which puts the total for interfacing one camera at $233.
- Ease of Use
  - The Lepton is easily interfaced with a Raspberry Pi using the SPI ports on the Pi, and a base of open-sourced software.
- Multiple Camera Integration
  - Many cameras can be integrated into one system for a more complete picture of what is going on with the test object for a lower cost than with a single full-sized IR camera.

FLIR Lepton with a dime for size comparison.

Plans for the future

- Multiple camera integration
  - Work is being done to integrate multiple Lepton cameras in order to observe a test subject from multiple angles and multiple positions. This will be done through an FPGA board to allow for scalability of the design.
- Code
  - Work is being done to rewrite the post-processing code into C++ to have one uniform code running that collects the data and processes it when needed.
- Graduate Research application
  - After multiple cameras function correctly at time and the code is all written in C++, it is expected to use the Lepton cameras to collect data in conjunction with a graduate student to prove that the data collected by the FLIR Lepton is usable for scientific applications.
- Image overlay
  - With multiple cameras operating at a time, it may be possible to overlay images next to each other in order to increase the area being observed when testing.



Comparison between output from FLIR 600 Series and the Lepton.
(Provided by Dr. Ricklick)

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