IR SCOUT

Scouting Hazardous Environments With Thermal Imaging

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Background

First responders, law enforcement, and military are tasked with entering dangerous, often unknown environments on a daily basis. Moreover, many of these dangerous situations present environments with limited or no visibility. Due to this lack of visibility, the people entering these environments are less likely to gain an accurate understanding of their surroundings. The IR Scout addresses these issues by performing remote, thermal reconnaissance of hazardous environments.

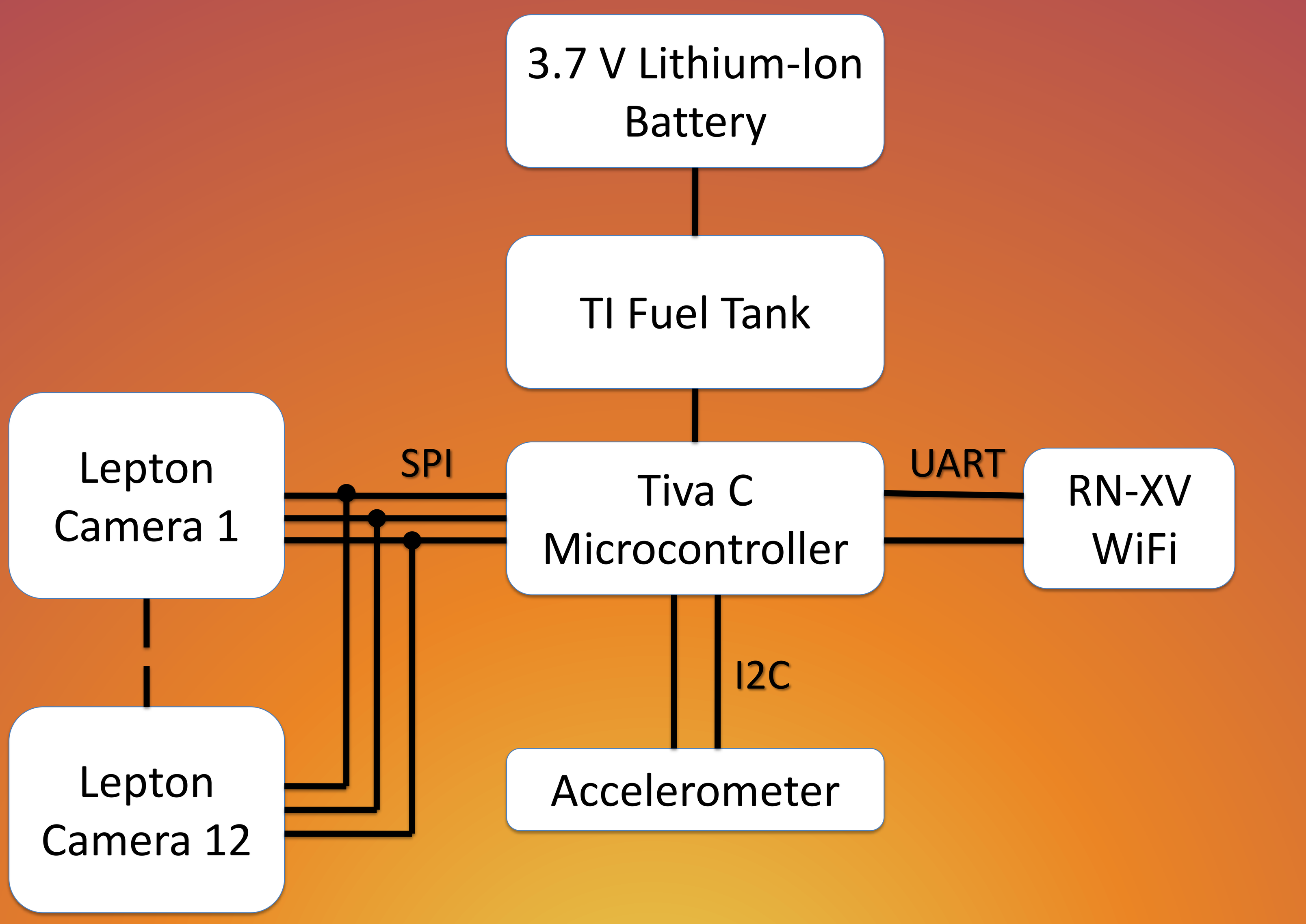
Overview

The IR Scout is a highly durable sensor package that wirelessly transmits high-quality, thermal images to a remote user. The system is composed of a throw-able sensor package and a laptop that displays the thermal images. The device requires minimal user operation: simply turn it on and throw it into the area of interest. Once the sensor package reaches a stable position, the appropriate cameras on the device each snap an infrared image and wirelessly transmit the data to a laptop. The laptop then performs the necessary image processing to display multiple images neatly on the user interface. With these features, the IR Scout provides first responders with knowledge of a hazardous environment prior to entering, regardless of visibility.

Throw-able Sensor: Composed of 12 FLIR Lepton Cameras, an accelerometer, a RN-XV WiFly Module, a Tiva C microcontroller, a TI Fuel Tank Booster Pack, and a 3.7 V Lithium Ion Battery

User Interface: Uses MATLAB to automatically receive, process, and display the images sent from the throw-able sensor

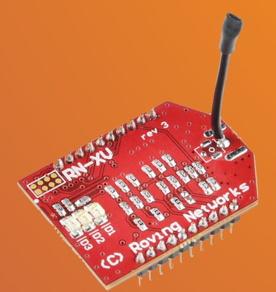
Hardware Block Diagram



Hardware

FLIR Lepton Thermal Camera
- Remarkably small Long Wave Infrared camera
- 60x80 pixel resolution

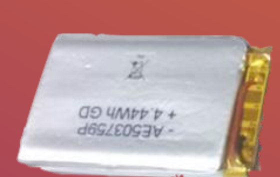
FreeScale Semiconductor MMA8452Q Accelerometer
- Communicates with microcontroller using I2C
- 3-axis, ±2g resolution



Microchip RN-XV WiFly Module
- Sets up a network for the laptop
- Transmits and receives data from the laptop using UDP

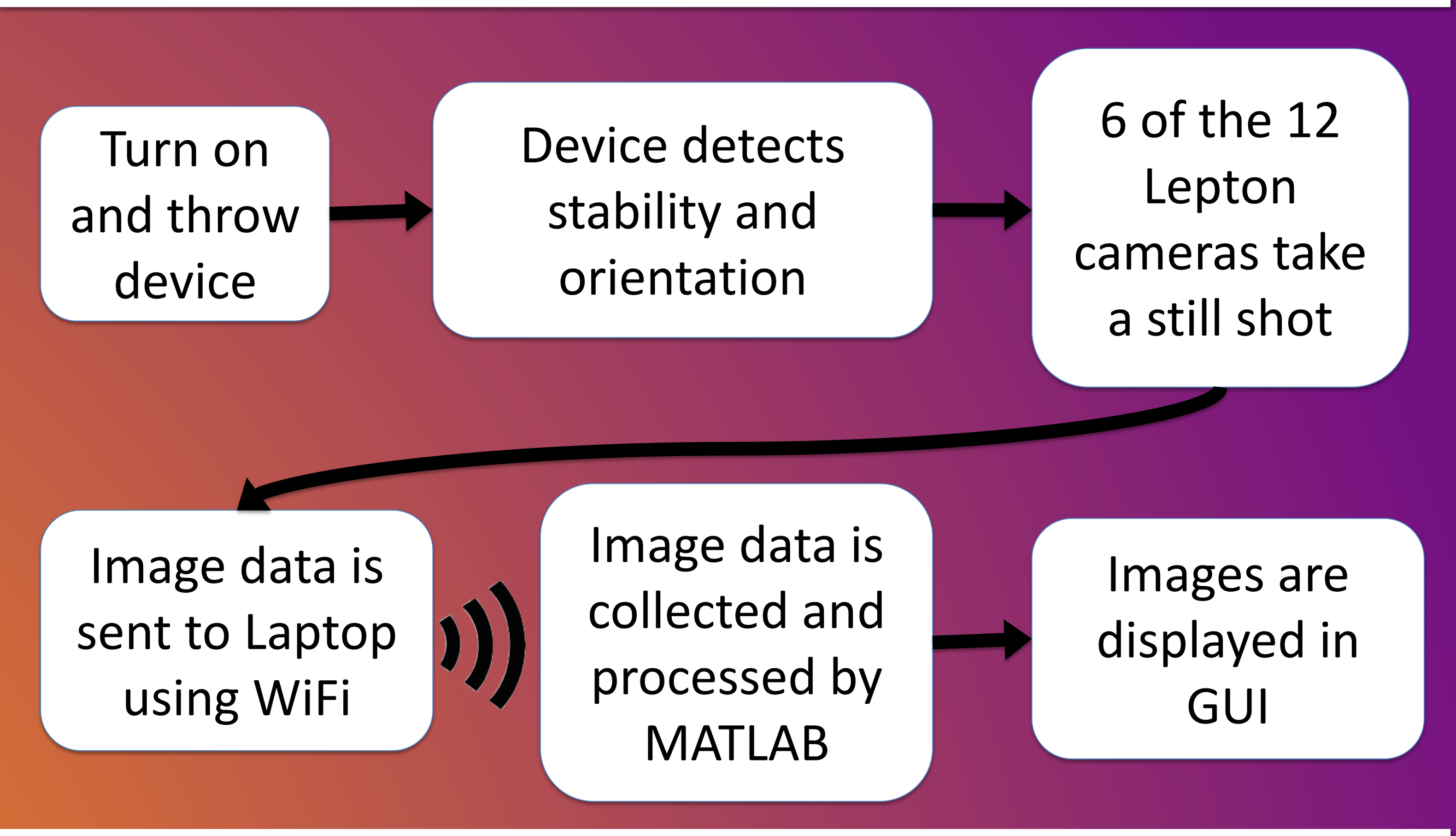
Texas Instruments Tiva C Launchpad
- Responsible for processing all sensor data
- Clock speed of 80 MHz

Texas Instruments Fuel Tank
- Regulates the battery voltage to 3.3 V and 5 V
- Charges the battery via a micro-USB port



•3.7 V Lithium Ion Battery
- Capacity of 1200 mAh
- Active battery life of approximately 30 min

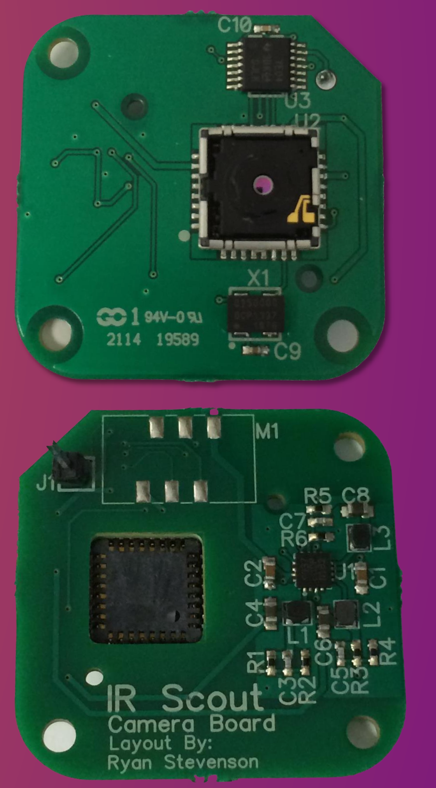
Flow Chart



Device

The final product is a combination of the outer shell designed by a 5 person ME team as well as the internal electronics designed by us.

Diameter: 7.1 inches
Weight: 1.75 lbs



Board Dimensions:
1.3 x1.3 in

Future Goals

- Convert the MATLAB user interface into a mobile application. This will allow for a more compact, practical product.
- Expand on the number of cameras in the throw-able sensor package for an increased field of vision.
- Combine both visual and thermal cameras in the device and then use FLIRs MSX blending algorithm to give a more detailed view
- Add video streaming for one camera module at a time.
- Rotate the images so that they are all oriented correctly

Acknowledgments
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