FLIR Helios

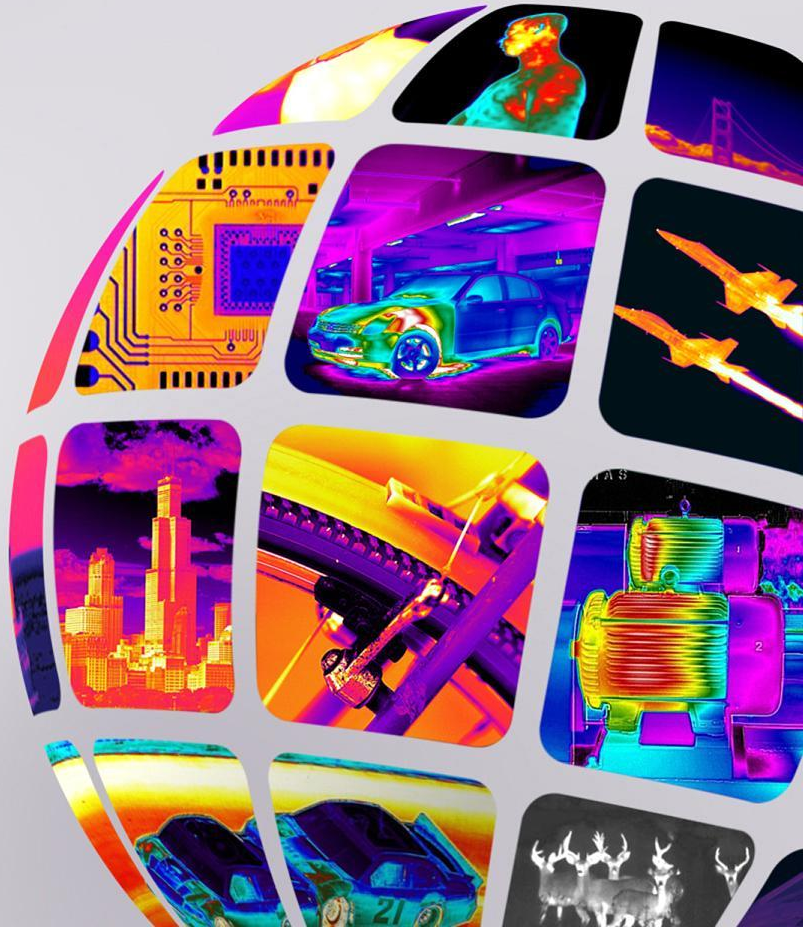
A wireless security camera, powered by the sun

2016-2017 Senior Capstone Engineering Design Project

FLIR®

The World's Sixth Sense™

6/8/2017



Agenda

- Design History
- System Aesthetics/Specifications
- Power Management
- Web and Android Application
- Unit Costs
- Plans for Production

Introducing

Helios

with FLIR Lepton

A wireless security camera,
powered by the sun

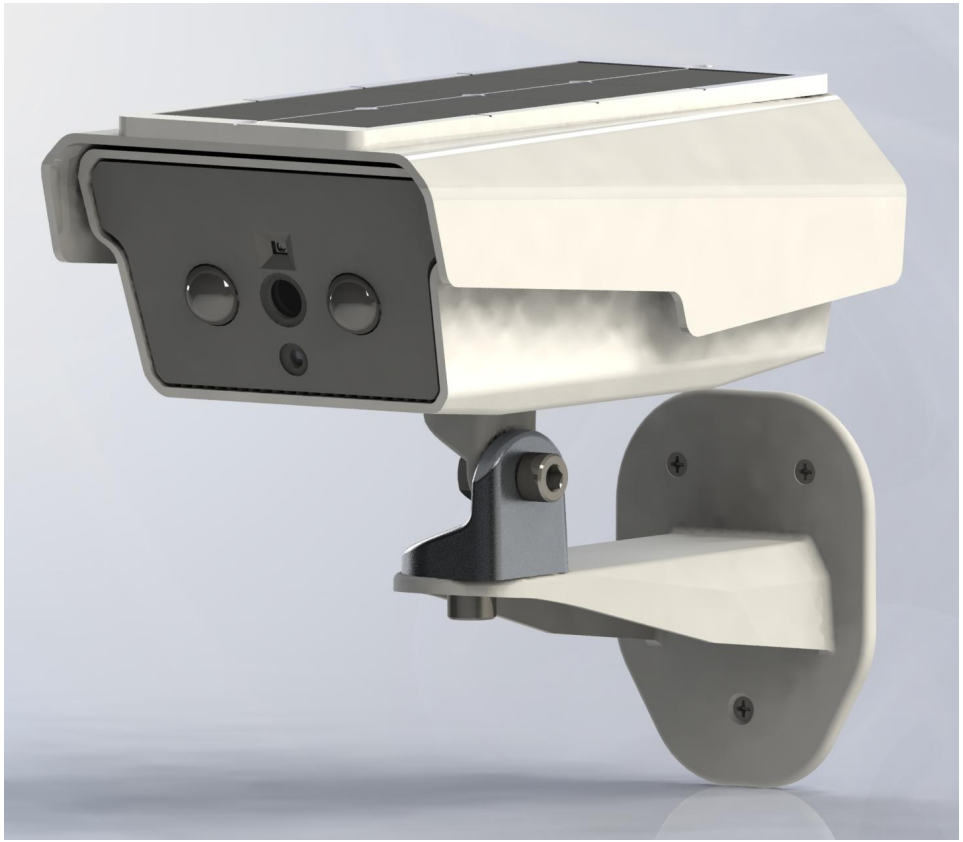
High Level Overview

User Experience

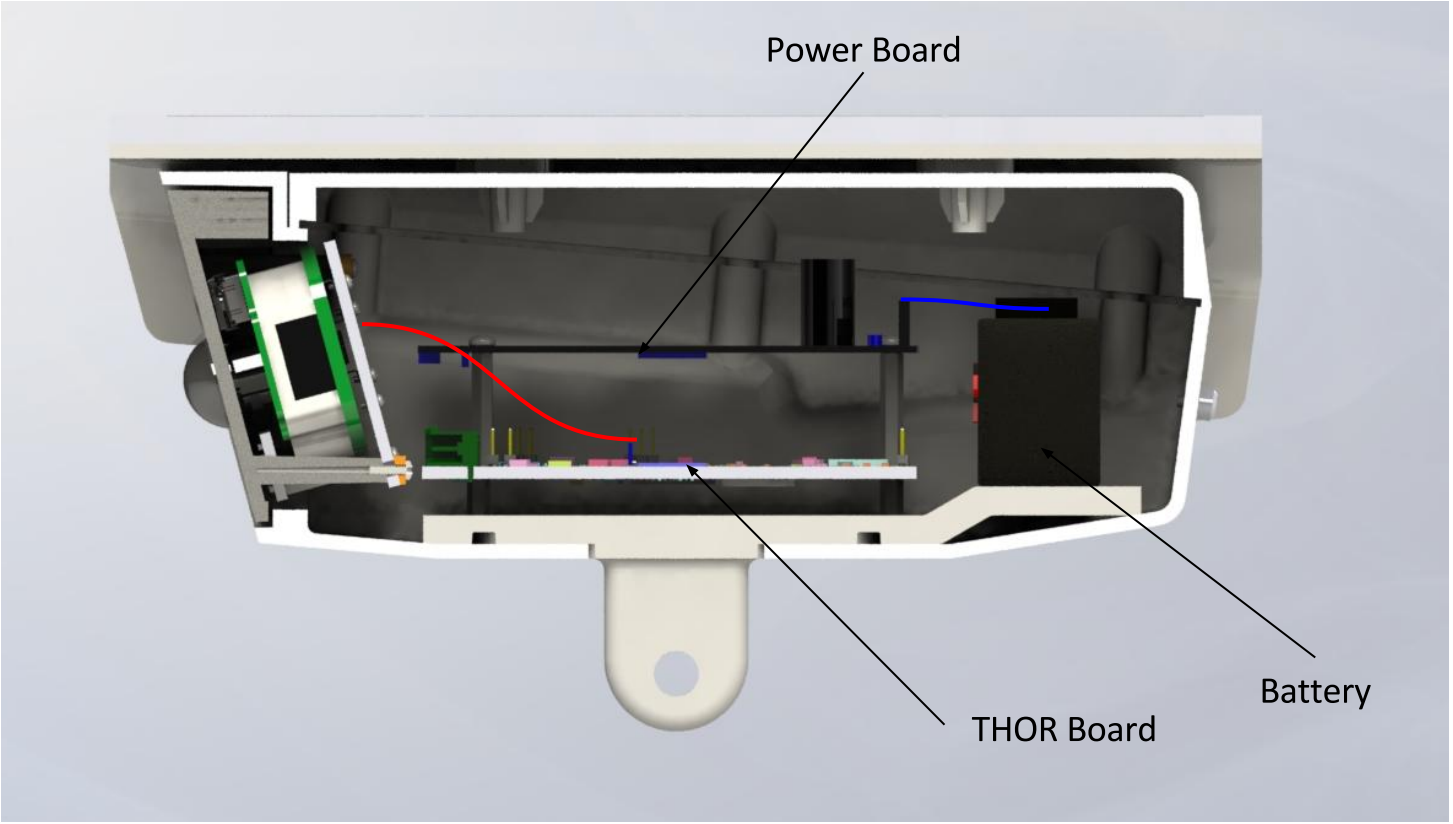
Key Specifications

Engineering Characteristic	Target Spec (Minimum requirement)	Tested Spec
Submerged in 1m Water	30 min*	30 min
Dust tight	8 hours*	8 hours
Minimum Solar levels	2.9 hours/day	2 hours/day
Temperature Range	-20 to +50 °C	-30 to +60 °C
Weight	15 pounds	10 pounds
Connectivity	WiFi	WiFi (large range)
Battery Life	2.5 hours**	3.7
Price (in bulk)	$500	$300

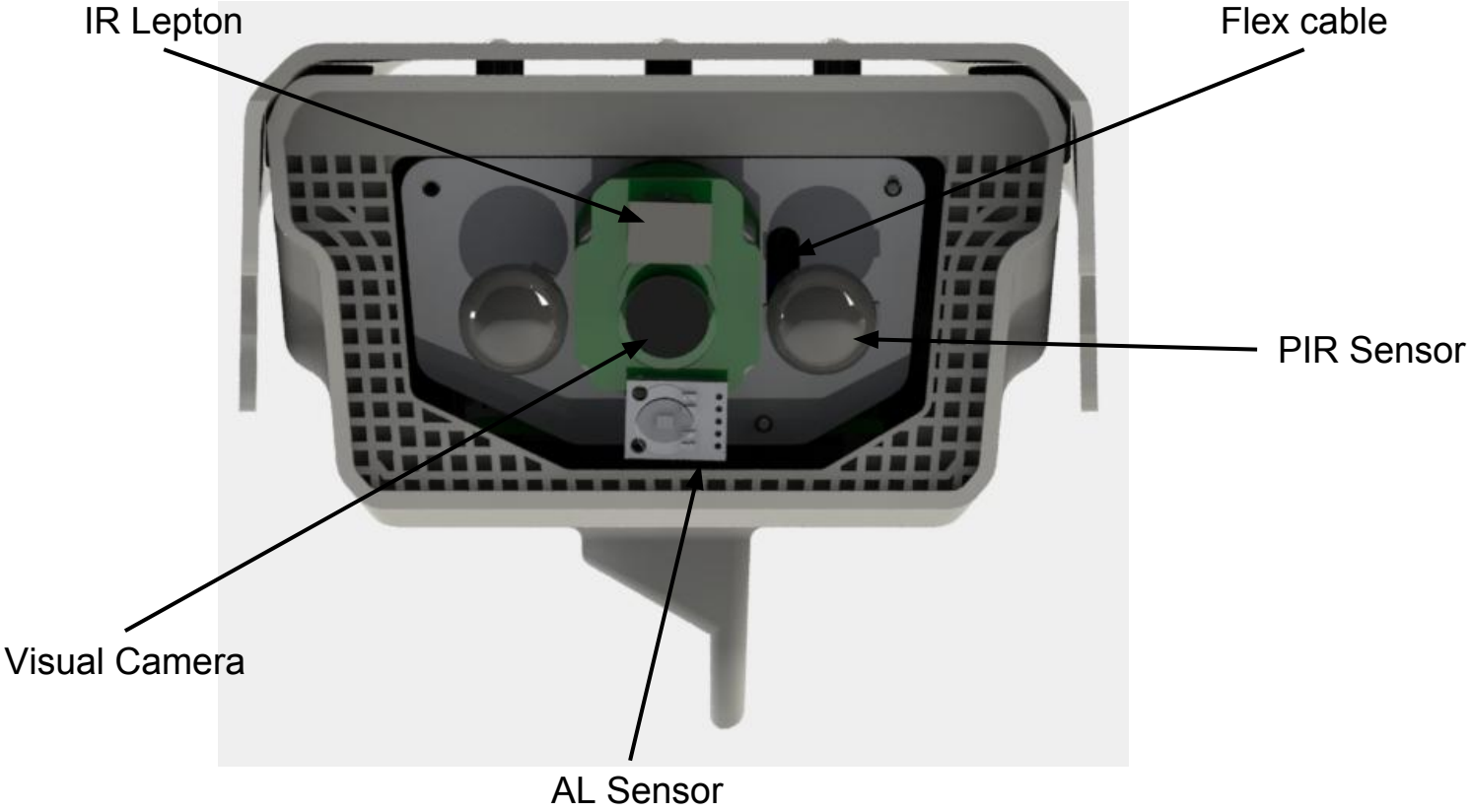
Current Design



Inside Camera Housing

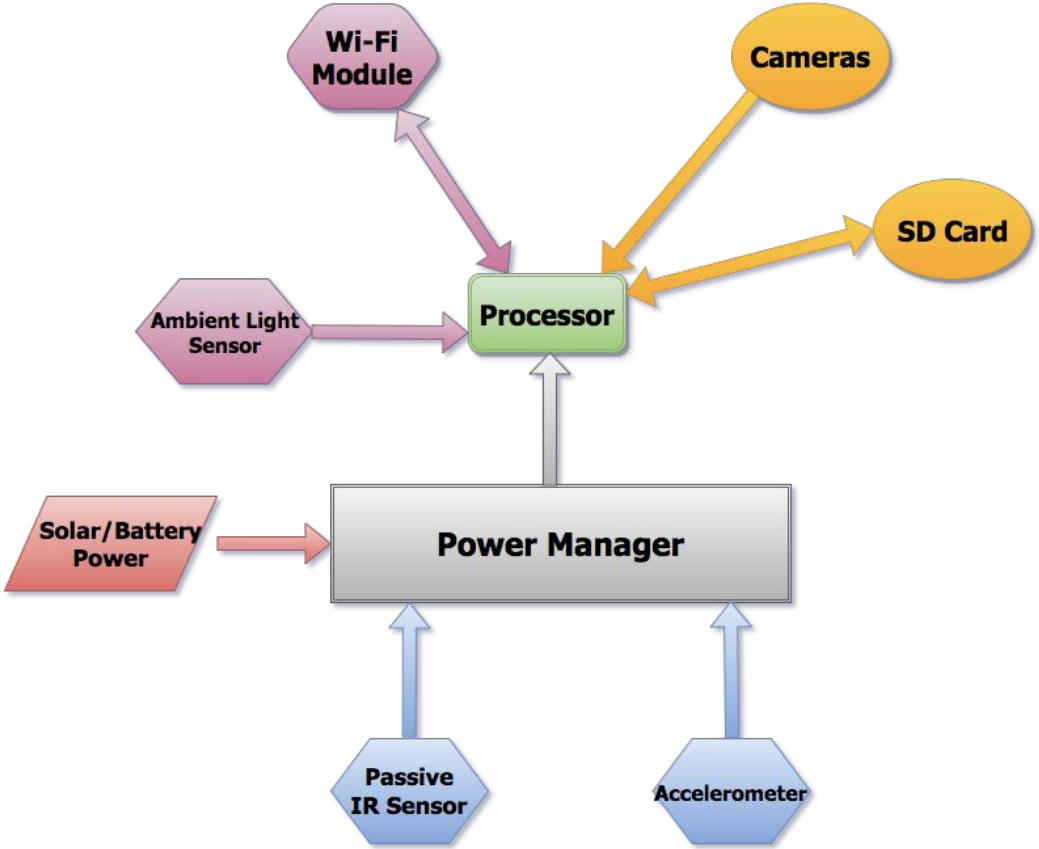


Inside Camera Housing

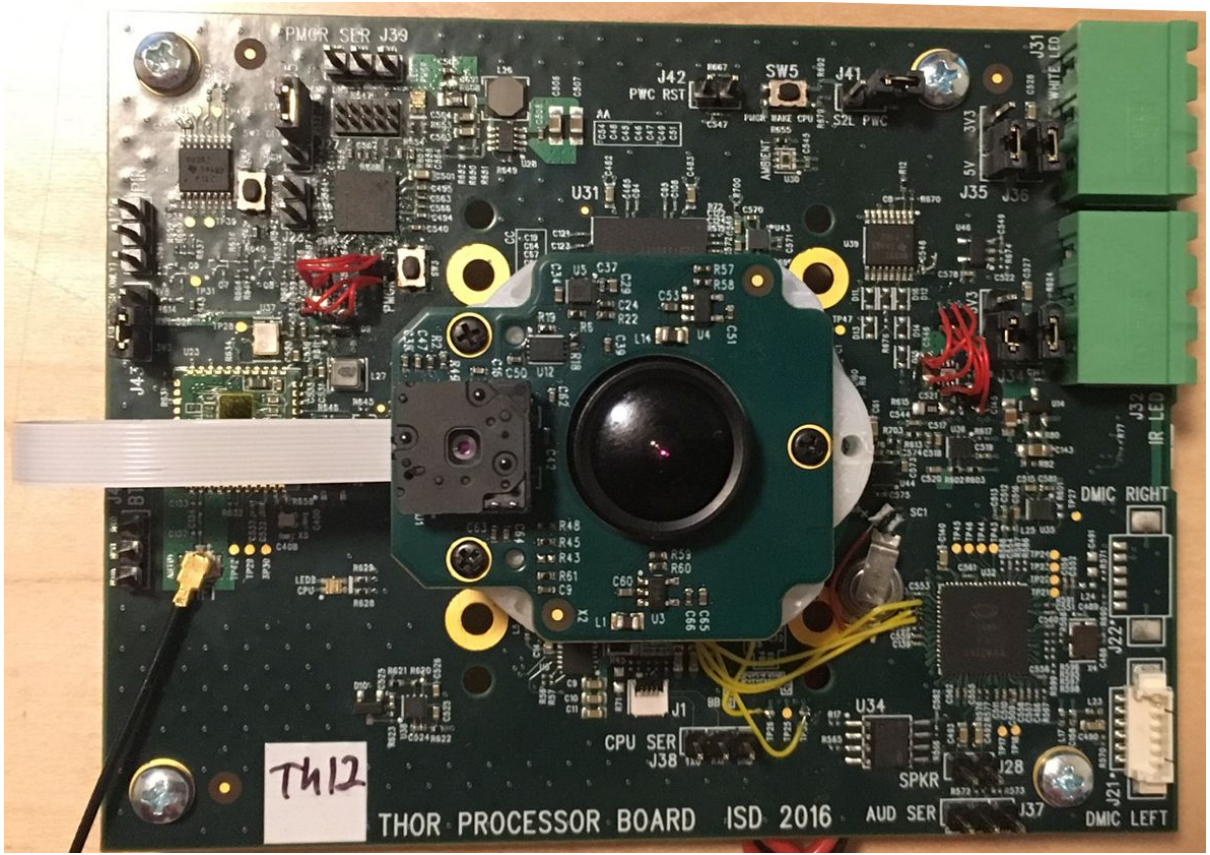


Electronics and Circuits

High Level Block Diagram



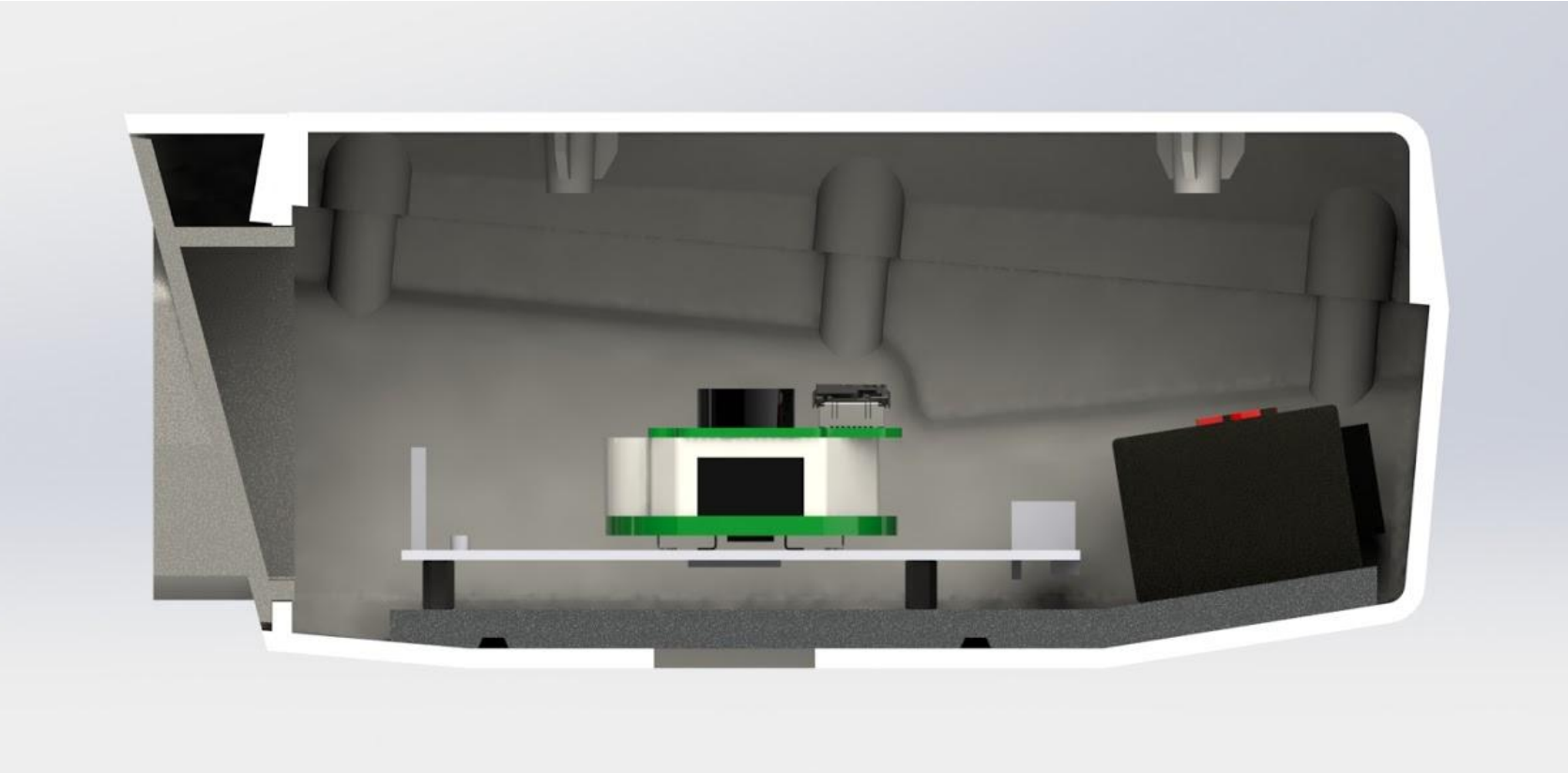
THOR Board



PIR Sensor

- Detect motion within a 105° field of view
- Alerts THOR board through MCU:
  -CPU: Low power mode → Record

MIPI Flex Cable



Flex Cable

Front

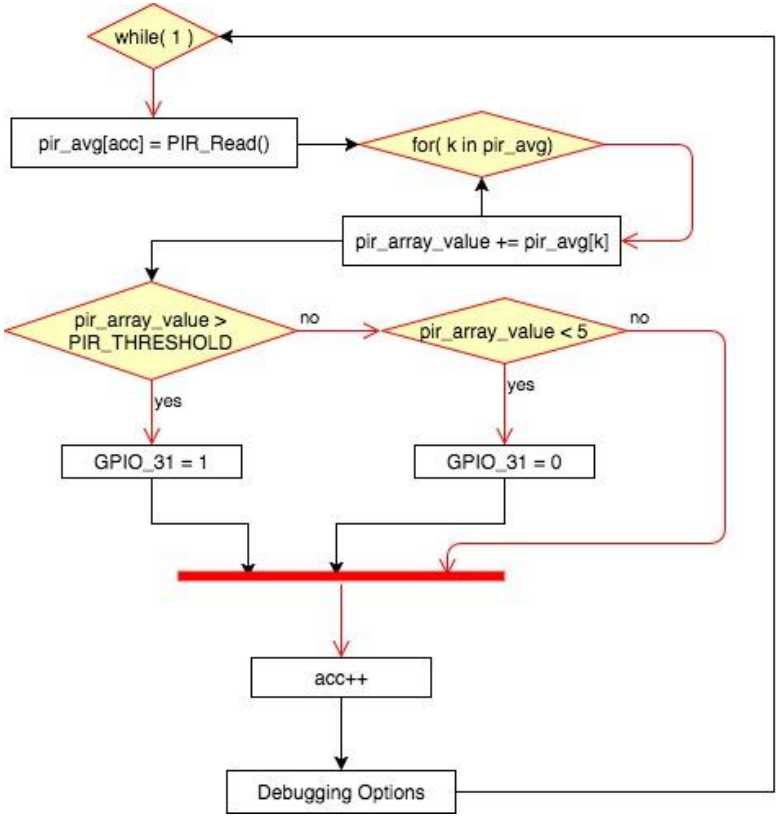
Back

Interrupt Controller

- Communication between sensors and camera
  - Integral to camera's success
- Keep SoC in low power mode to preserve battery life
- Fast response time
  - Old solution: 18 sec delay
  - New solution: 200ms delay

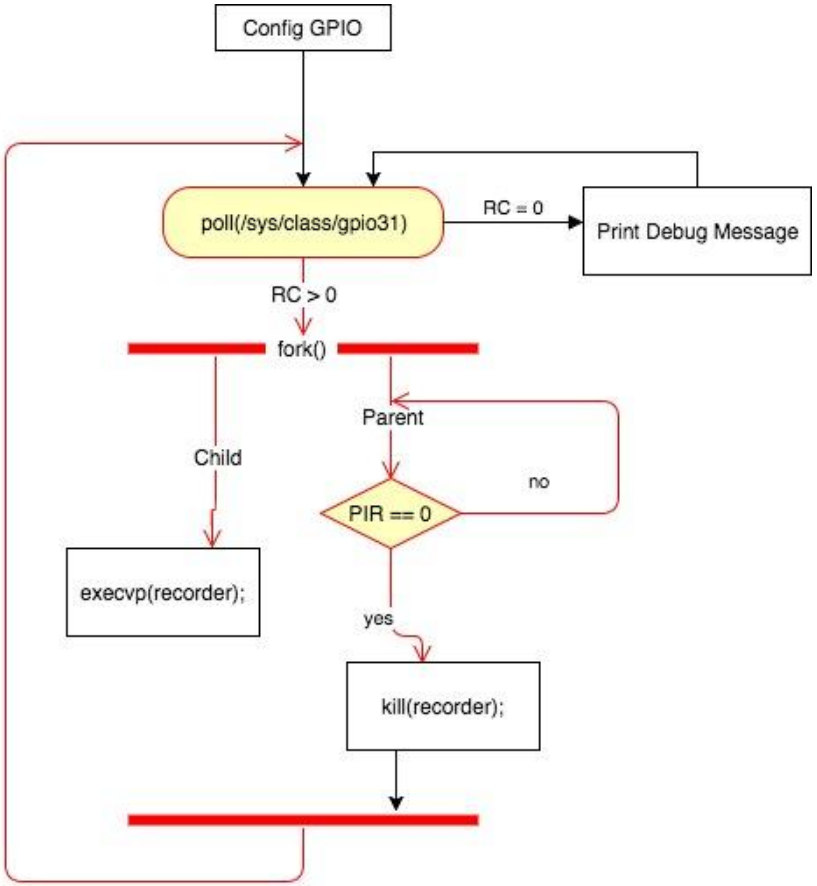
Interrupt Controller (MCU)

- PIR V_out as input to MCU pin PE12
  - Pulse for each beam (square wave)
- MCU C program stably mirrors PE12 sensor to GPIO31
  - GPIO31 reconfigured to push-pull
  - software debouncing
  - feed watchdog when necessary
- Reduced FSM to readily accept PIR wakeup signals
  - “Wave hello to your Helios”



Interrupt Controller (C Program)

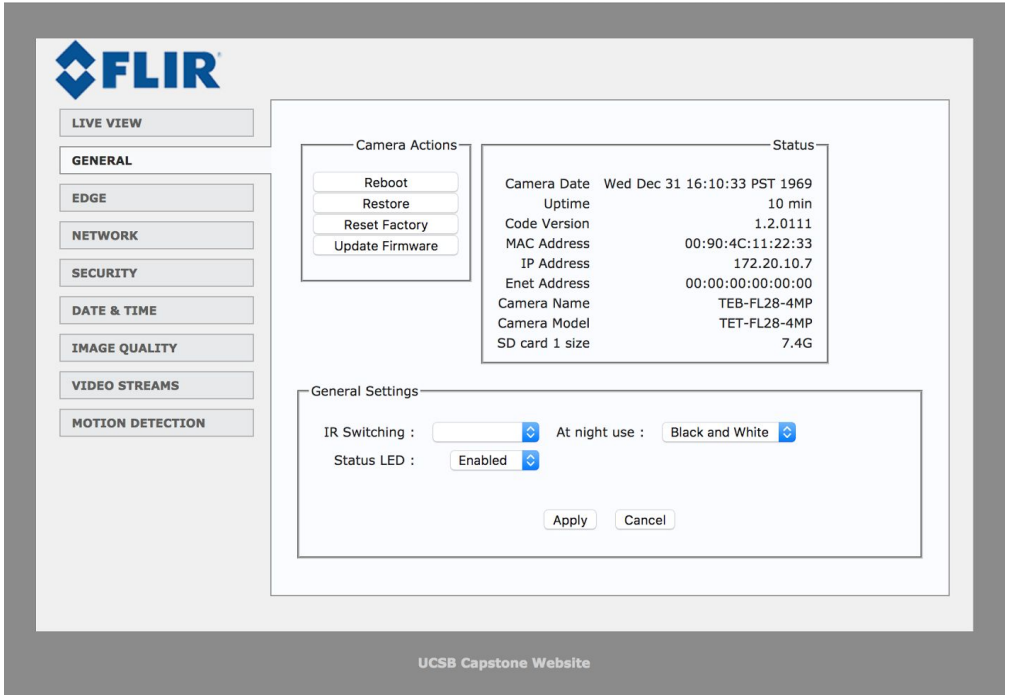
- Read GPIO31 through file description and system call
- Prune the SD card filesystem
- Recording remains active while GPIO31 is high



Website and App Support

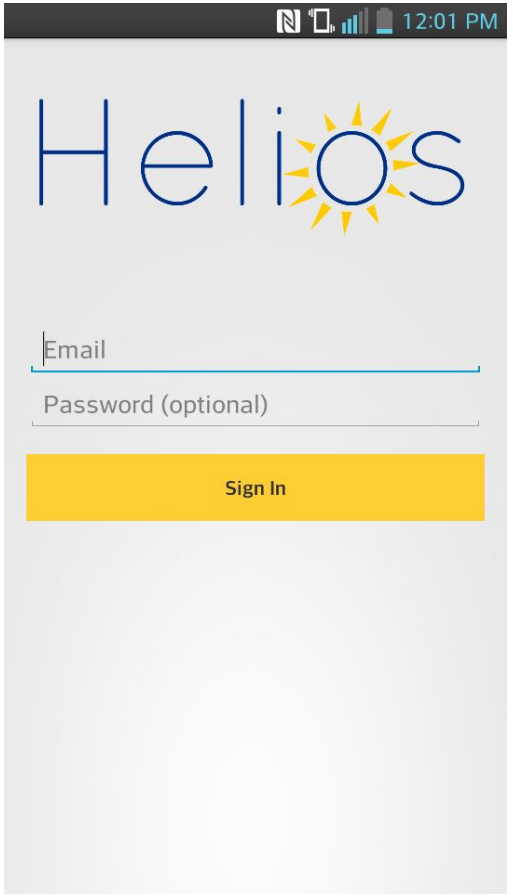
Website

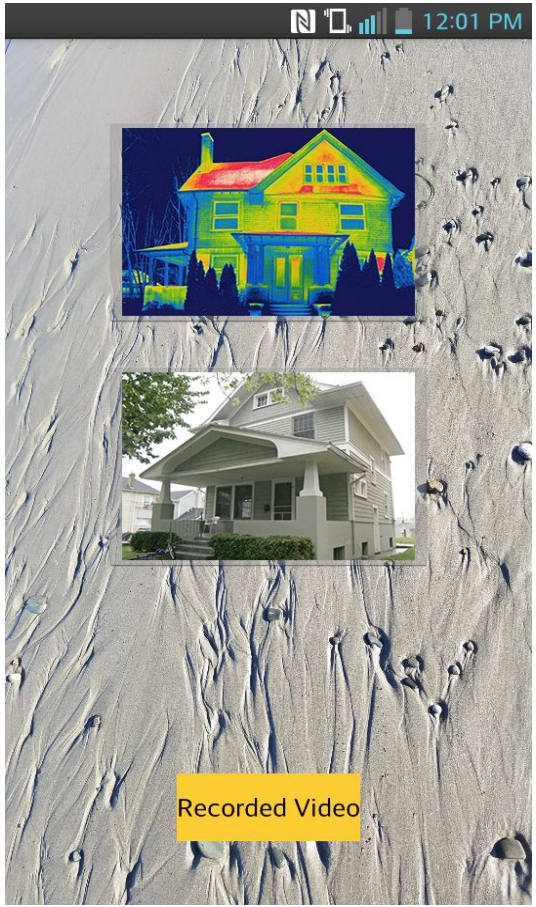
- Javascript and CGI provide a dynamic experience
- Simple and complex features easily accessible
- integrated live view



App: Login

- User-friendly Android app integration
- Login for remote security surveillance





App: Stream Selector

- Access livestream feed via WiFi
- Switch Between Visible and Infrared with a press of a button

Production

Production Steps

THOR board

- Send plans to mass producer
- Removing all prototype pins and debug ports
- Integrated flex cable
- Permanent PIR and ambient light sensor mounts

Unit Cost

Item	Supplier	Single Price	Price Quantity 10,000	Price Quantity 100,000
Housing	Strata-Systems	$3,298.00	$206.13	$103.06
Electronics	Miscellaneous	$98.60	$6.16	$3.08
Sourced Parts	DigiKey/McMaster	$210.02	$13.13	$6.56
THOR Board Assembly		$3,000.00	$187.50	$93.75
Total Raw		$6,606.62	$412.91	$206.46
Net Total Estimated Materials		$8,588.61	$536.79	$268.39
Total with Tooling	$200,000.00	$208,588.61	$556.79	$270.39

Closing Remarks

Special thanks: Marcel, Kai, Sean, Ian, Andy, and Jim at FLIR

Program Advisors: Professors Johnson, Ben-Yaacov, Susko, and Yoga Isukapalli

On Campus: Celeste Bean, Will Miller, Caio Motta, and Megan Chang

Thank you!

PC: FLIR ONE