

FLIR Helios

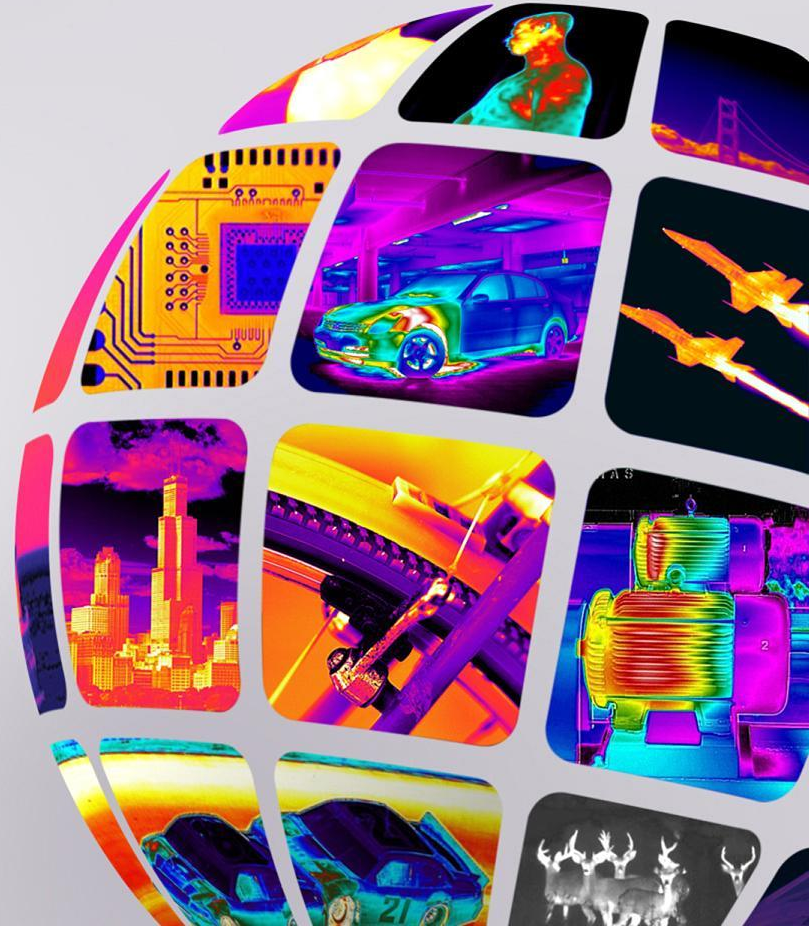
A wireless security camera, powered by the sun

2016-2017 Senior Capstone Engineering
Design Project



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



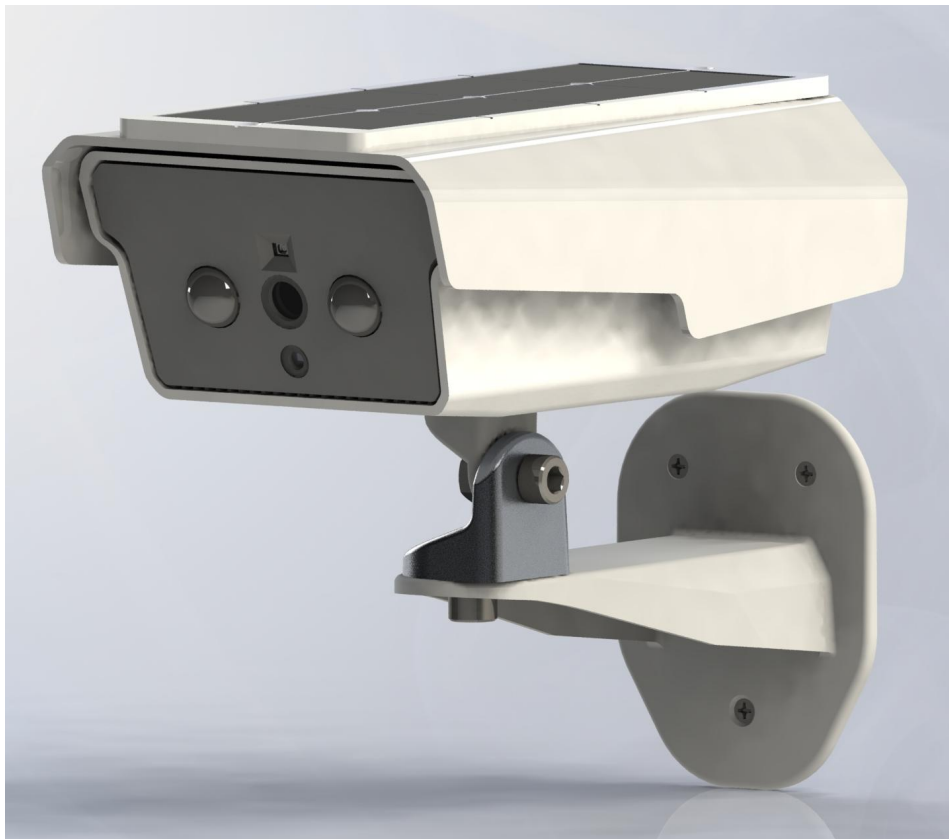
User Experience



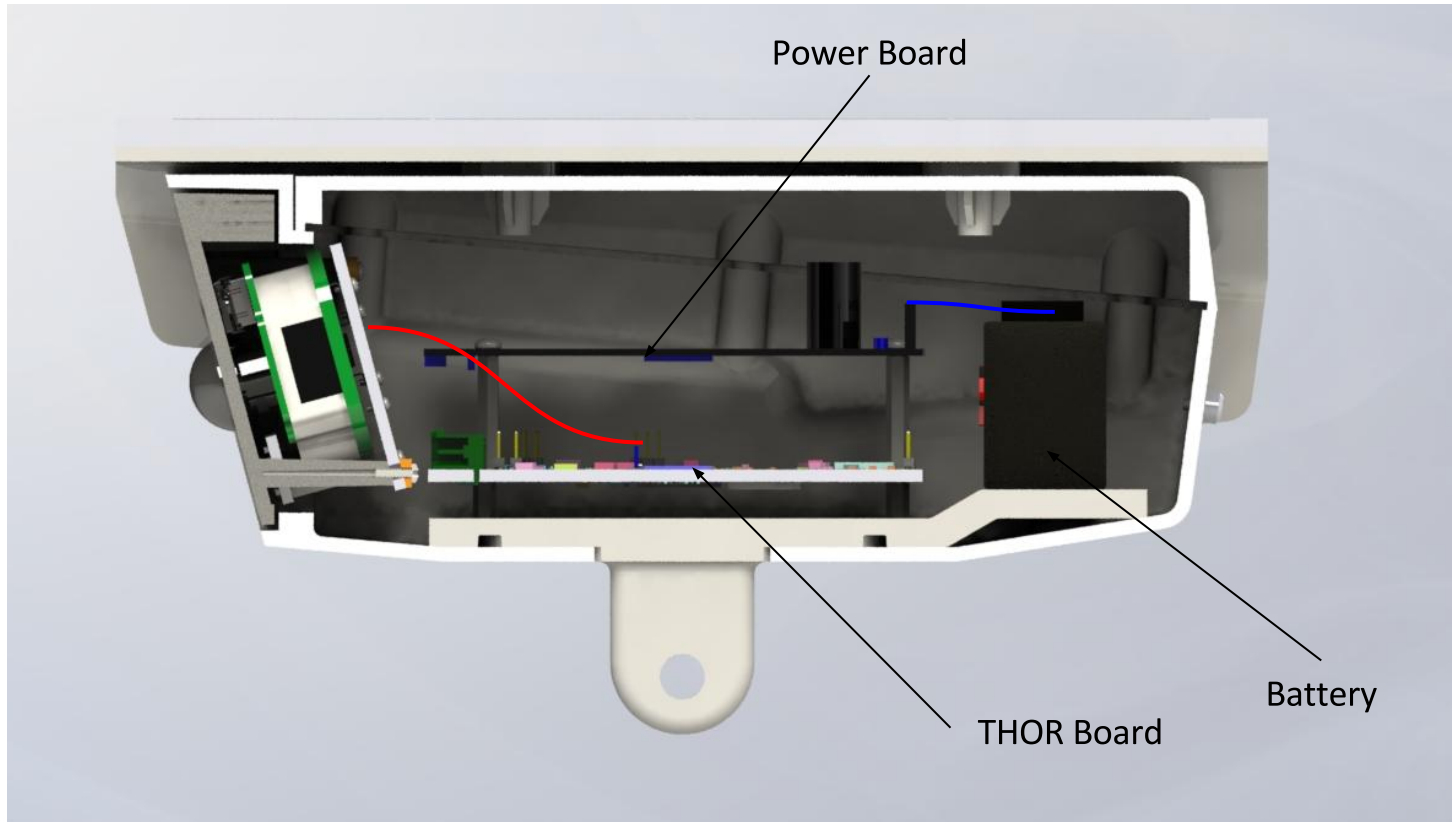
Key Specifications

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

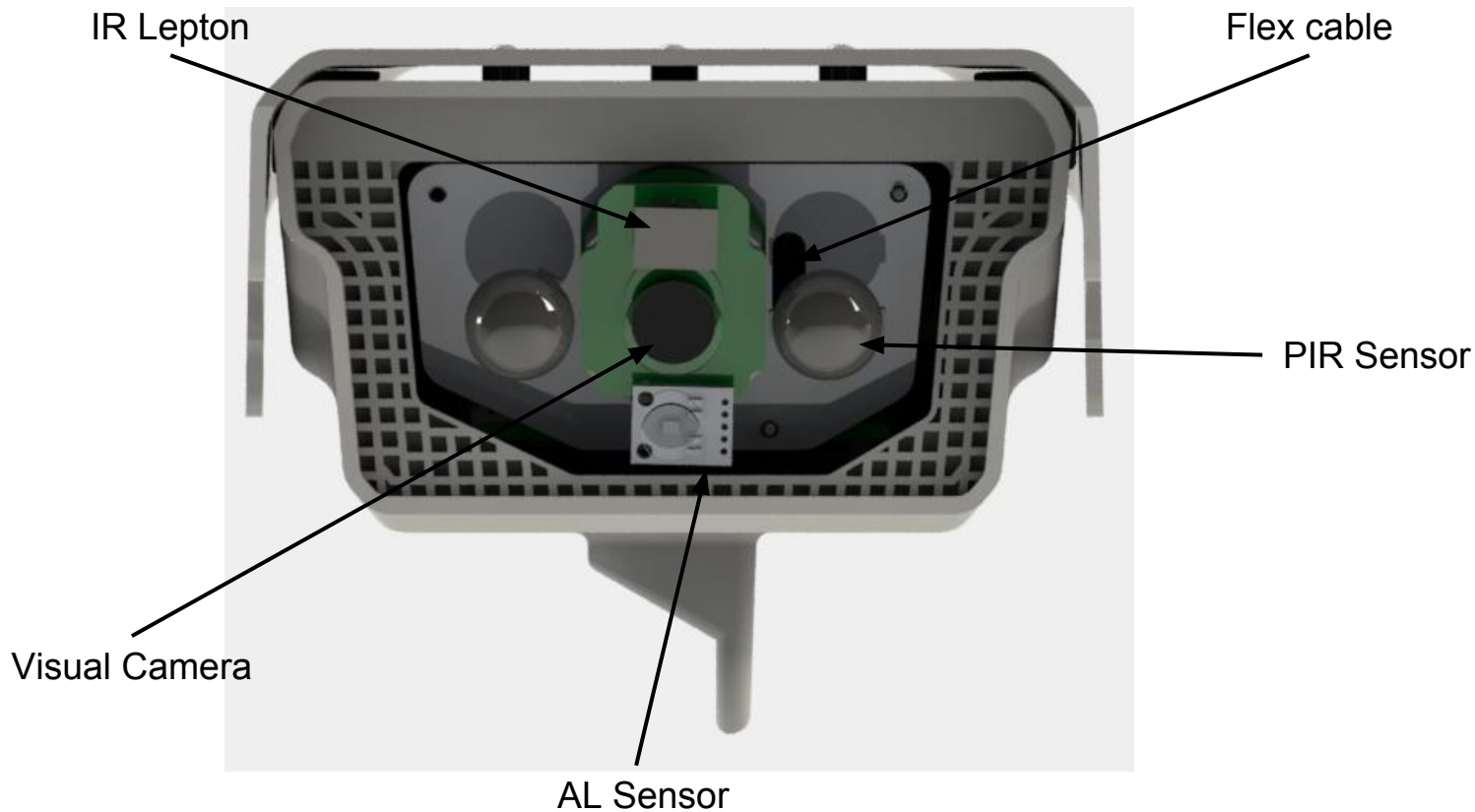
Current Design



Inside Camera Housing

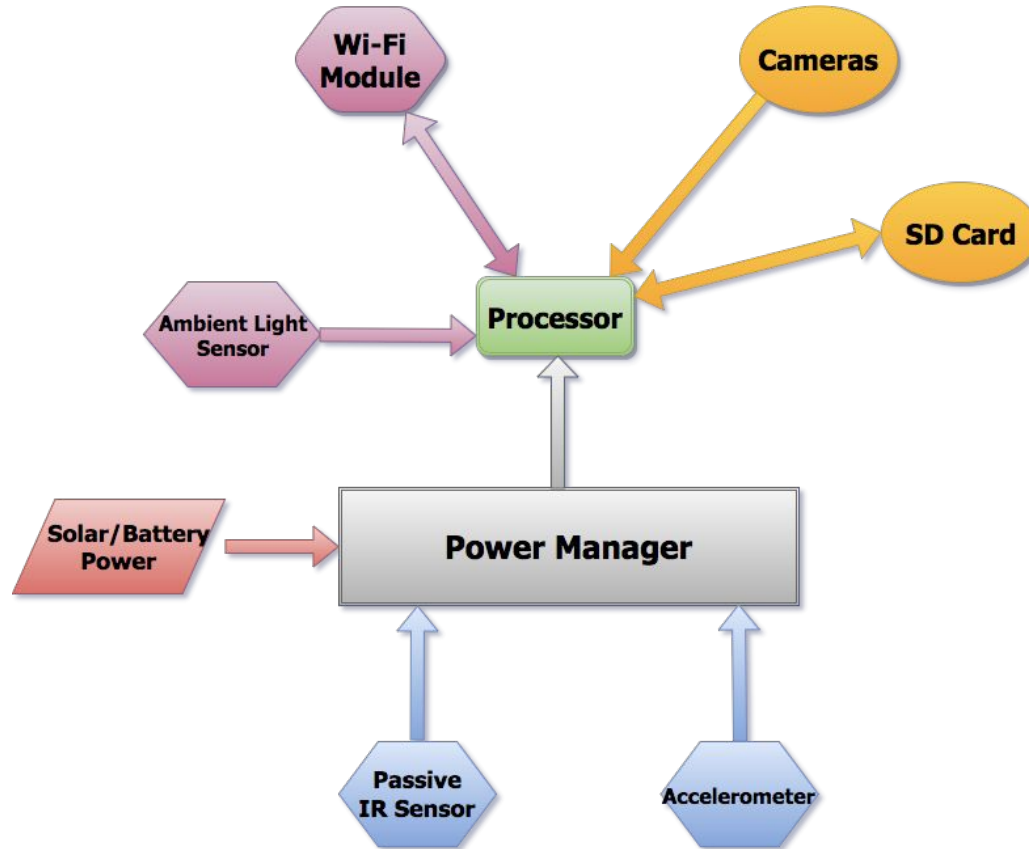


Inside Camera Housing

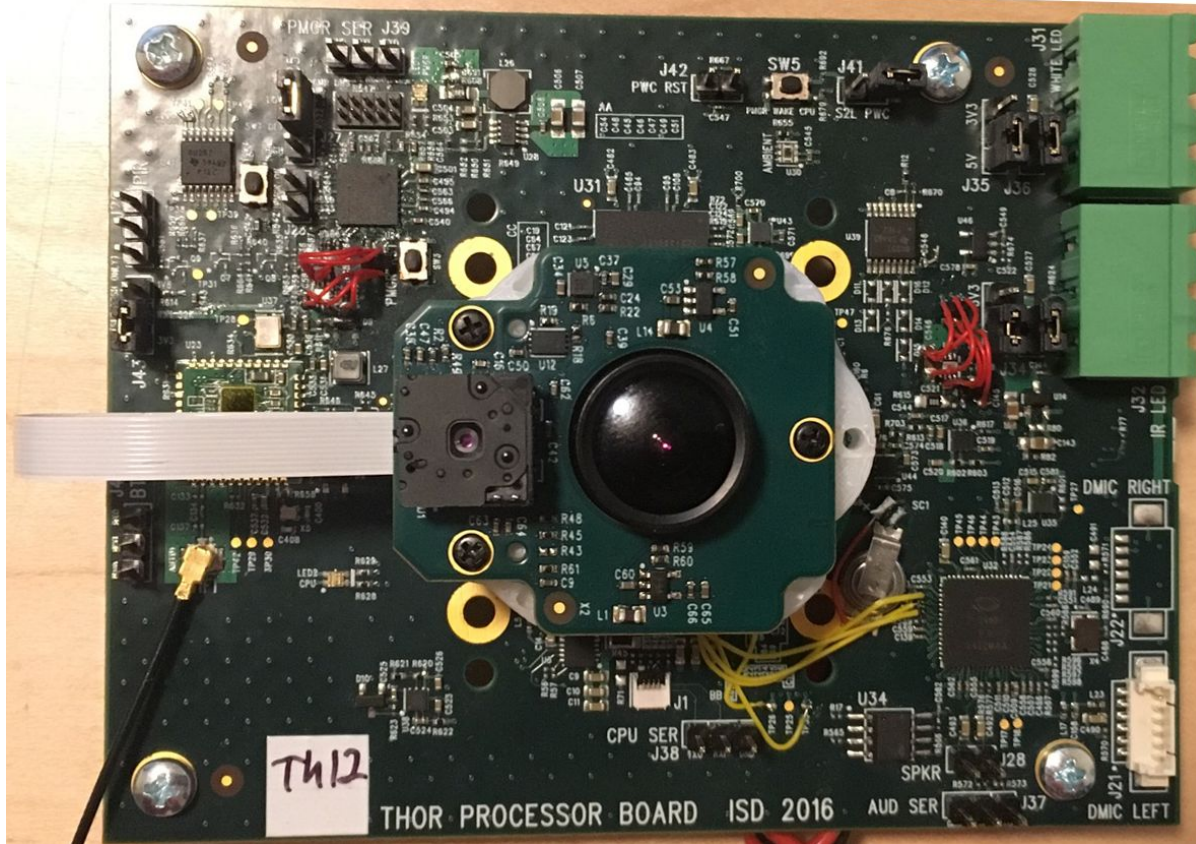


Electronics and Circuits

High Level Block Diagram



THOR Board

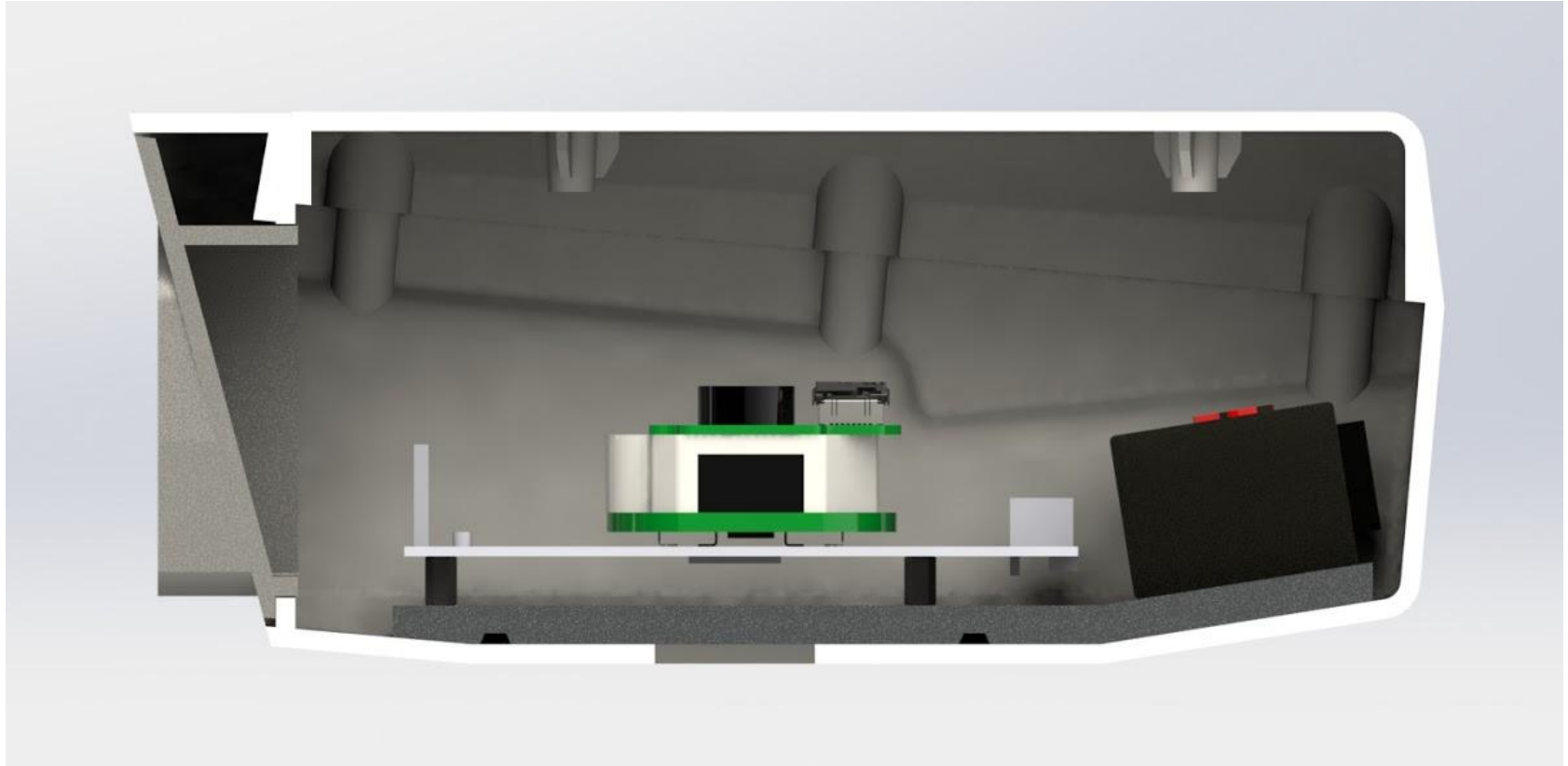


PIR Sensor

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



MIPI Flex Cable



Flex Cable



Front



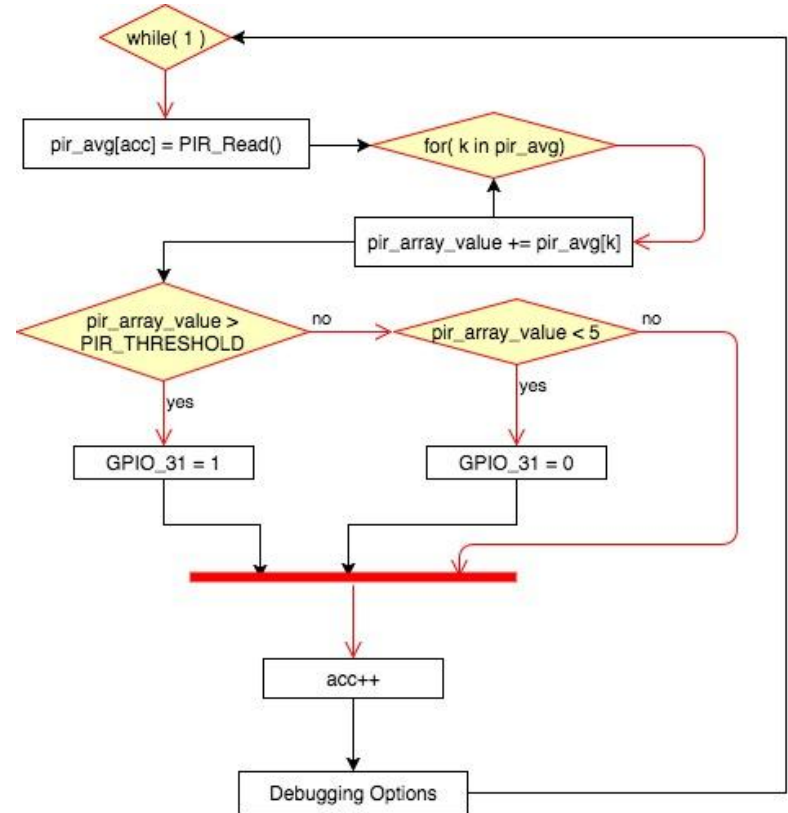
Back

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

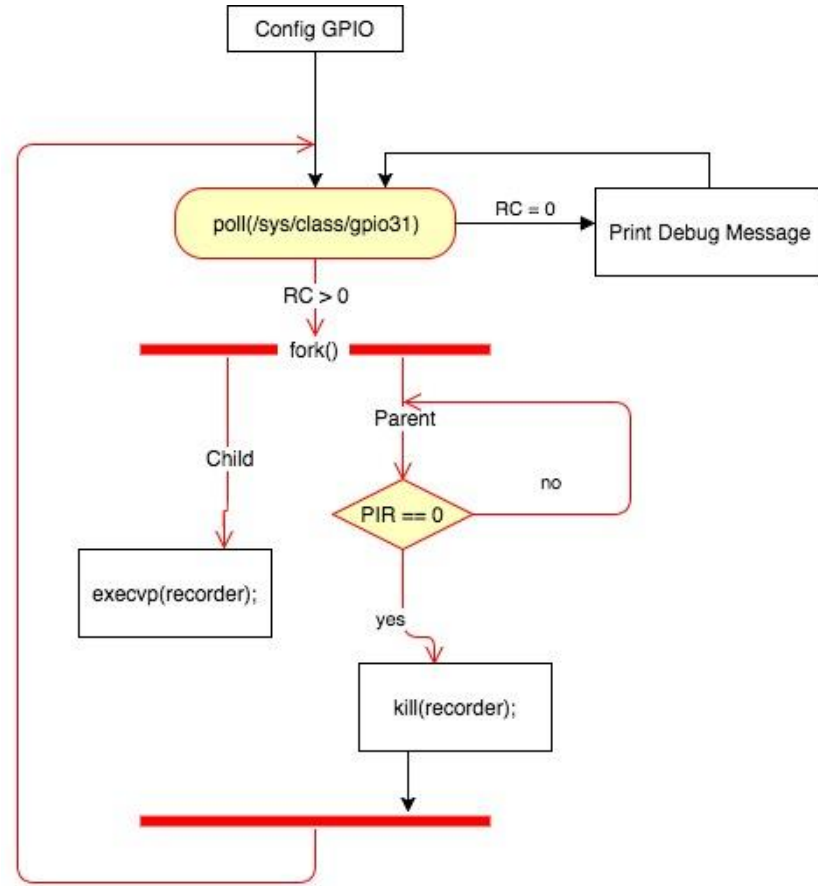
Interrupt Controller (MCU)

- 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

The screenshot displays the FLIR website interface for a camera. On the left is a navigation menu with the following options: LIVE VIEW, GENERAL, EDGE, NETWORK, SECURITY, DATE & TIME, IMAGE QUALITY, VIDEO STREAMS, and MOTION DETECTION. The main content area is titled 'Camera Actions' and 'Status'. The 'Camera Actions' section contains four buttons: Reboot, Restore, Reset Factory, and Update Firmware. The 'Status' section displays the following information:

Camera Date	Wed Dec 31 16:10:33 PST 1969
Uptime	10 min
Code Version	1.2.0111
MAC Address	00:90:4C:11:22:33
IP Address	172.20.10.7
Enet Address	00:00:00:00:00:00
Camera Name	TEB-FL28-4MP
Camera Model	TET-FL28-4MP
SD card 1 size	7.4G

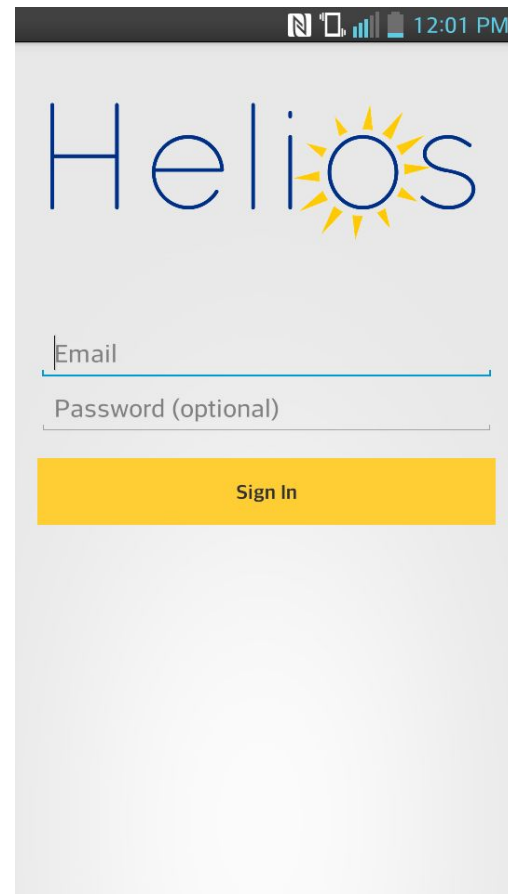
Below the status information is the 'General Settings' section, which includes:

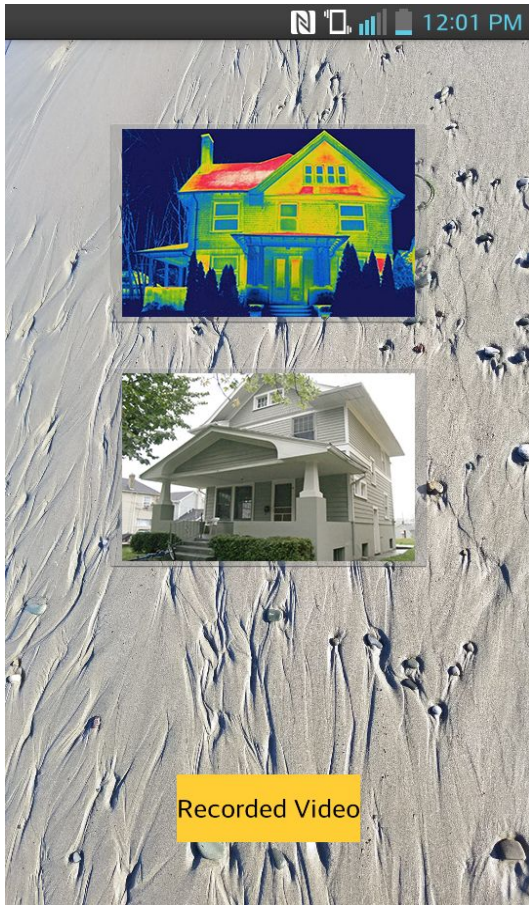
- IR Switching : [Dropdown menu]
- At night use : [Black and White] [Dropdown menu]
- Status LED : [Enabled] [Dropdown menu]

At the bottom of the settings section are 'Apply' and 'Cancel' buttons. The footer of the page reads 'UCSB Capstone Website'.

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



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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!



UC SANTA BARBARA
engineering



PC: FLIR ONE