

Project Levitate

Leif Andersen

Daniel Blakemore

Jon Parker



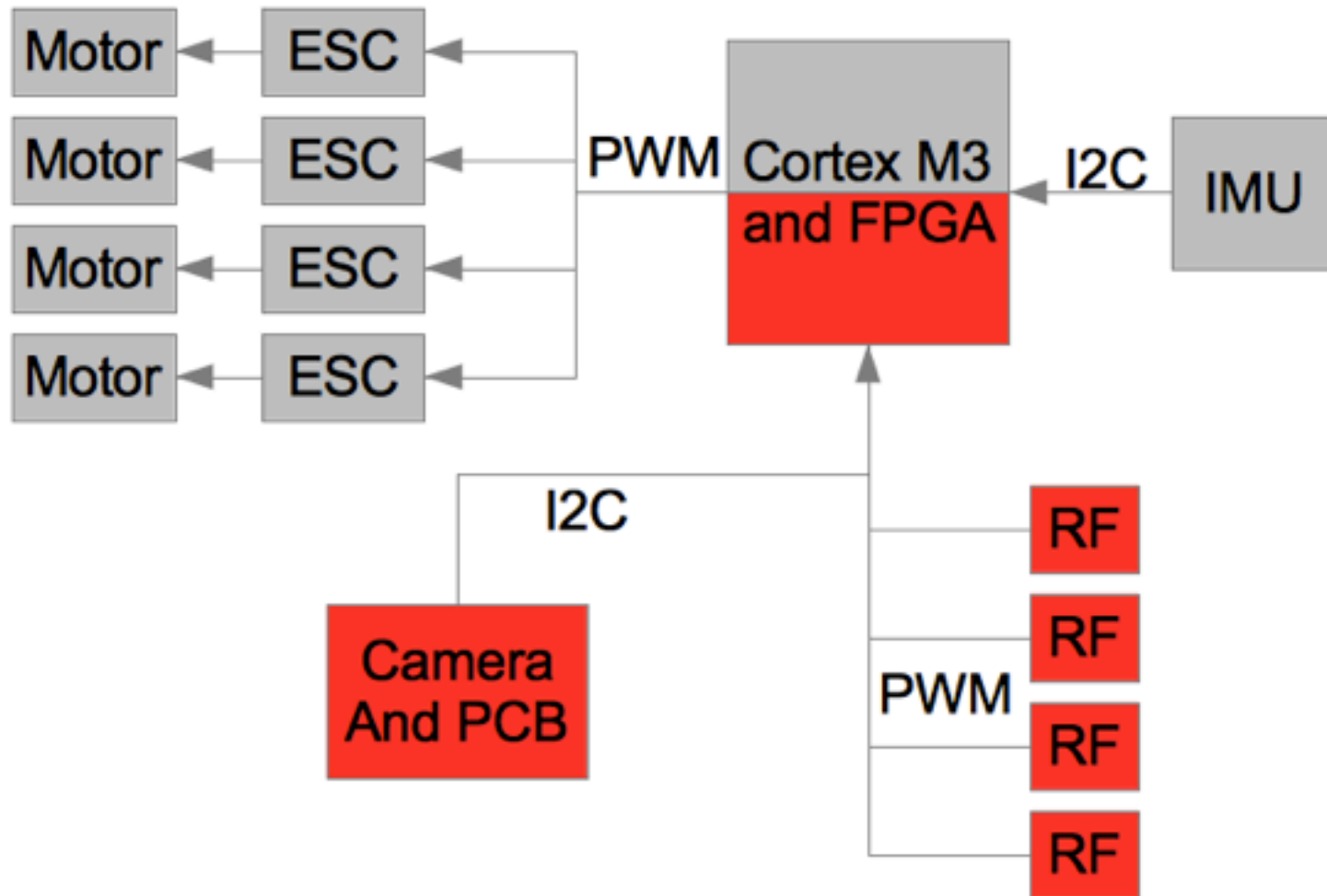
Introduction

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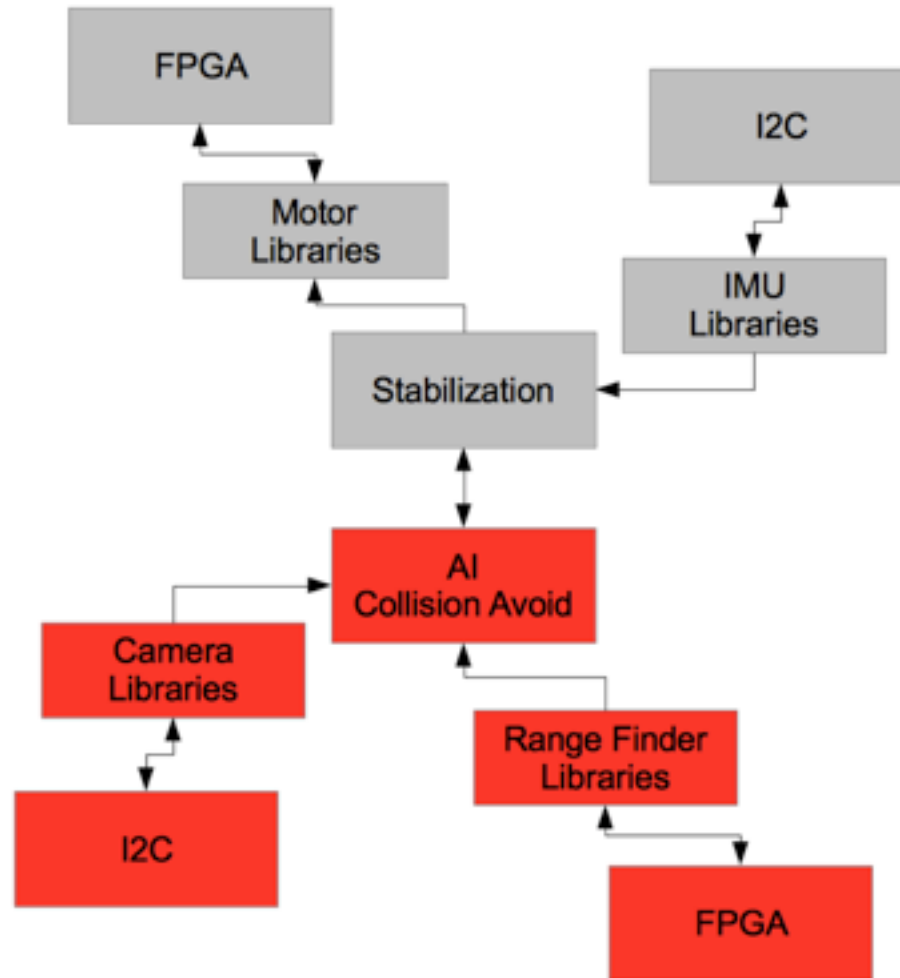


Project Description

Quadrotor Hardware Architecture



Quadrotor Software Architecture





Tasks



Range Finders/Collision Avoidance

- Daniel Blakemore
- Risks:
 - False Positives, False Negatives
 - Additional instrumentation

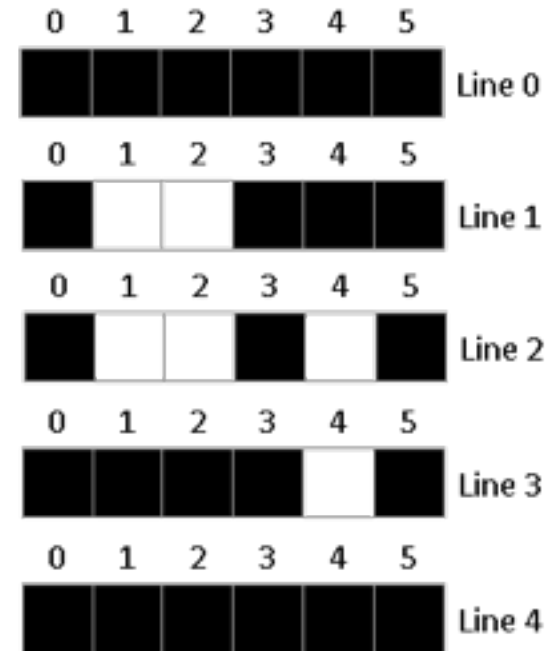
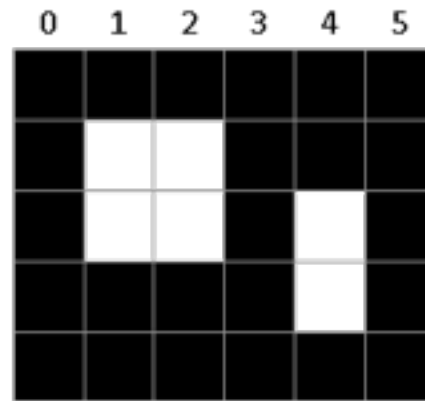


Camera/Image Processing

- Jon Parker
- Risks:
 - No experience with camera drivers
 - Start Early
 - Use BeagleBoard-xM
 - Memory
 - Decrease resolution
 - Store Grayscale Image
 - Fidelity
 - Flexile Parameters

Image Processing

- Blob algorithm



- Barcode

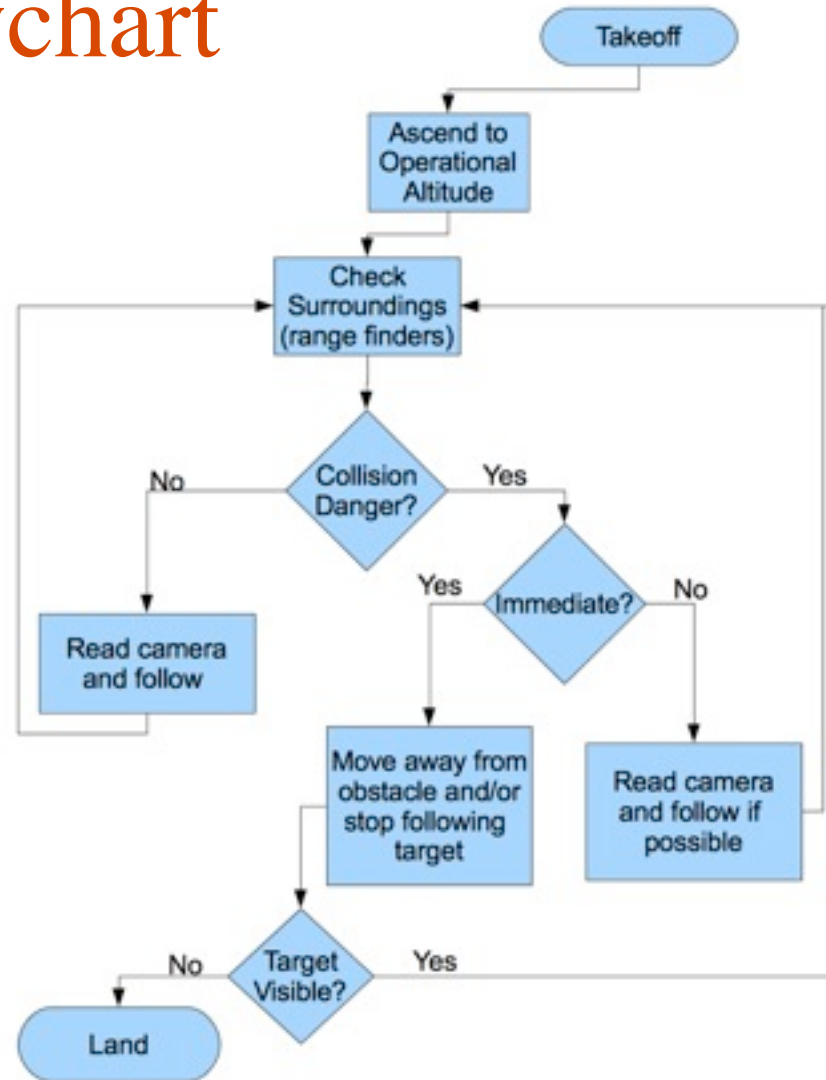
Image source: <http://geekblog.nl/entry/24>



AI

- Leif Andersen
- Risks:
 - Board is too slow
 - BeagleBoard-xM
 - TI ARM Cortex A8 Processor
 - Bugs
 - Simulation
 - Mathematics requires time to understand
 - Find knowledgable advisor

AI - Flowchart





Verification and Simulation

- Leif Andersen
- Mitigates Larger Risks
- Risks:
 - Time Spent on it
 - Simplify Simulation
 - Do without
 - Simulation Inaccurate
 - Still aid in debugging
 - Oohs and Awes



Schedule



Range Finders/Collision Avoidance

- Initial Interfacing
 - May
- Hardware Interface
 - June
- Software Interface
 - August - September
- Mounting
 - October
- Post Mount Troubleshooting
 - November-December



Camera/Image Processing

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AI

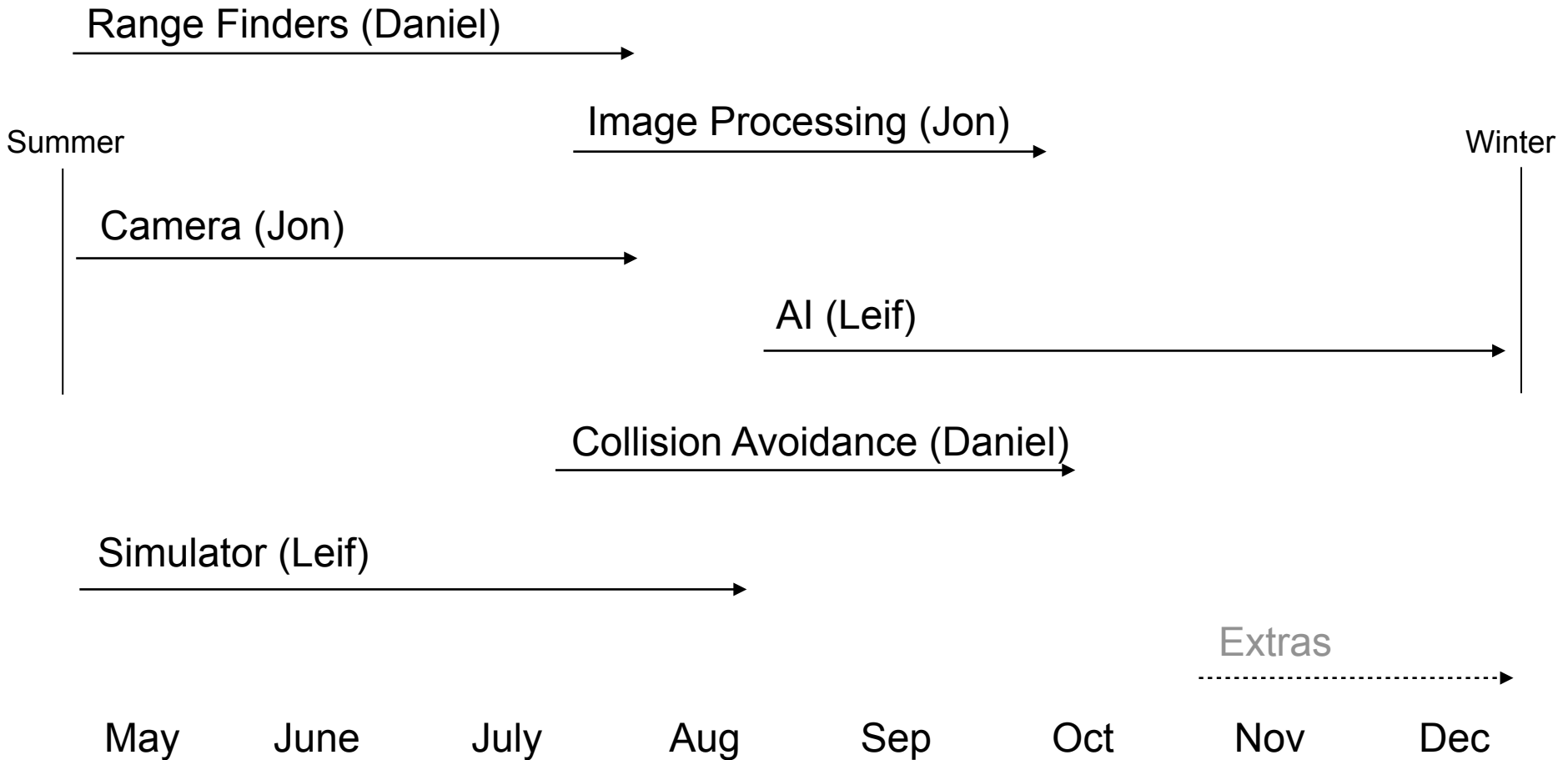
- Writing AI
 - July
- Tightening Constraints
 - August
- Porting to more powerful processor (if needed)
 - September

Verification and Simulation

- Create Simulation Environment
 - May
- Simulate Image Processing Code
 - June
- Simulate AI code
 - July
- Verification of setup
 - Ongoing



Timeline

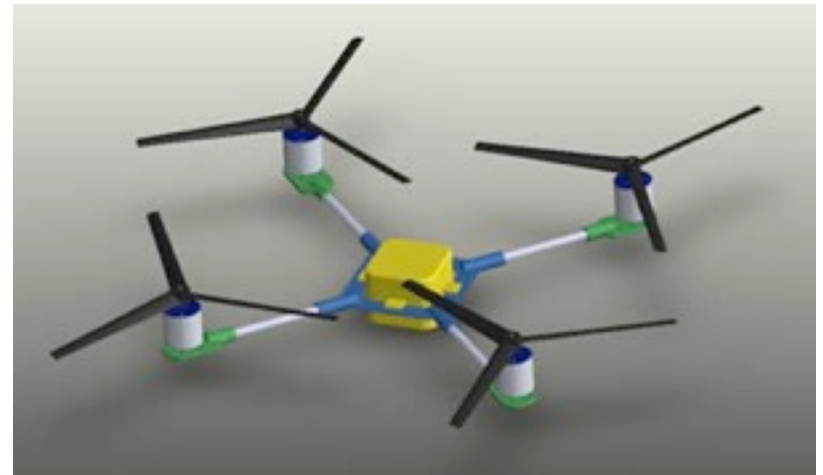




Bill of Materials

Basic Quadrotor Platform

- Designed and built in CS/ECE 5780/6780
- Capable of automatic stabilization
- Built on SmartFusion AF2 Eval Kit



- Quantity: 1
- Provider: ECE 5780 Senior Project
- Cost: \$377

Image source: <http://bit.ly/z8CIC1>

Range Finders - Maxbotix LV-EZ1

- Ultrasonic Range finder
- Range: 0-255 inches
- 2mA current draw
- RS232, PWM, or Analog output

- Quantity: 4
- Provider: Sparkfun
- Const: \$25.95

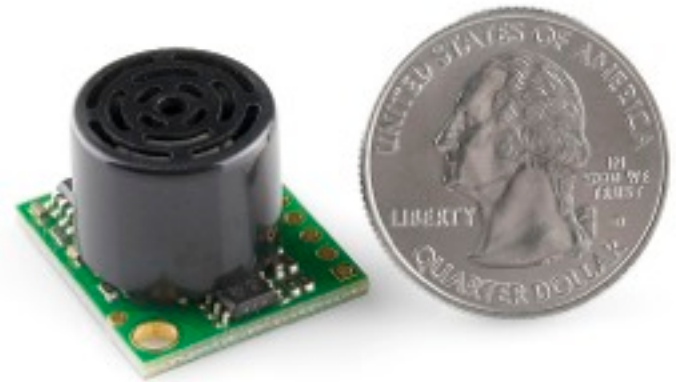


Image source: <http://www.sparkfun.com/products/639>

Camera - TCM8230MD

- CMOS Image sensor and lens
- Resolution: 640x480
- Small and Light
- I2C Communication

- Quantity: 1 + 1 (replacement)
- Provider: Sparkfun
- Cost: \$9.95

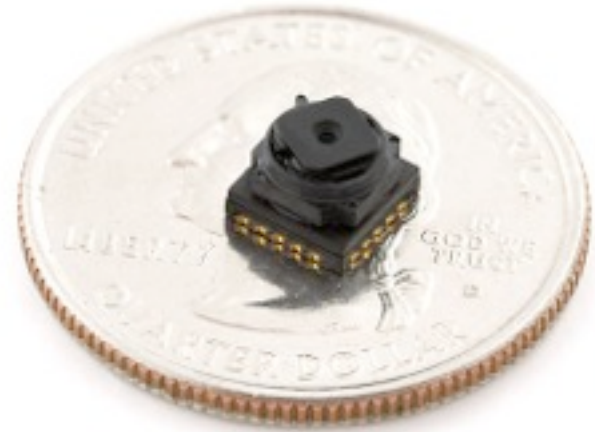


Image source: <http://www.sparkfun.com/products/8667>

Cost

- Basic Quadrotor Platform
 - 1 x \$377
- Range Finders
 - 4 x \$26
- TCM8230MD
 - 2 x \$9.95

Total: ~\$500

Power

- Available Power
 - 24.4 Wh
- Power Draw
 - Electronics: 1.65 W
 - Motors: 165 W



Image source: http://www.hobbyking.com/hobbyking/store/_9394_Turnigy_2200mAh_3



Weight

- Quadcopter Platform
 - 600g
- Electronics
 - 50g
- Target
 - 800g



Conclusion



Questions?