

Drone Hunt

feat. Mr. DJ

Group 3

Emmanuel Martinez - CpE

Juammy Lora - CpE

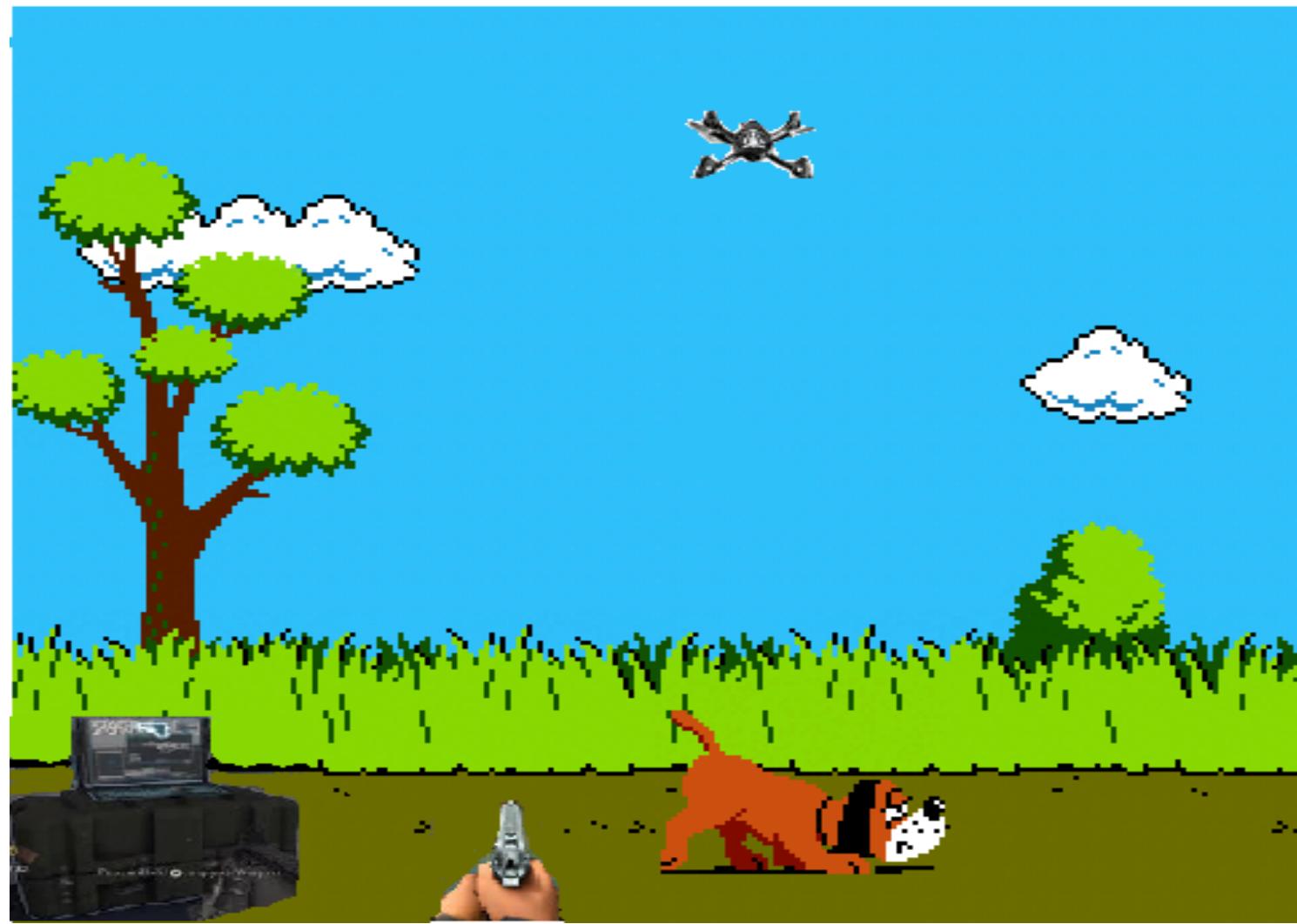
Randy Aybar - CpE

Devesh Maharaj – EE

Introduction

- Introducing a fun new twist to the Drone community.
- Real life competitive multiplayer shooter.
- Sensor equipped semi-autonomous drone.
- Modified laser guns
- Dedicated local server running game Engine.

Drone Hunt = Laser Tag + Duck Hunt + Skeet



Overall Goals

- Satisfy all proposed specifications & requirements before deadline
 - Senior Design
 - TI Challenge
- Remain under budget
- To gain hands-on experience in areas not offered in the classroom
- **Have Fun**

Motivation

- Strong interest in flying robots and photonics
- Seeking a challenging project that can be used as leverage in the job market
- Scalability
- Enjoyable

Specifications & Requirements

- The system must have a functional quadcopter drone with a panel to serve as a receiver for laser beams
- The system must have two modified laser guns
- The system must have a server
- The system must have a presentable ground control station
- The system must have a software to operate the gaming aspects:

Two users: gun shooter 1 & gun shooter 2

Keeps count of winner of the game

Design Approach / Proposed Implementation

2 Subsystems:

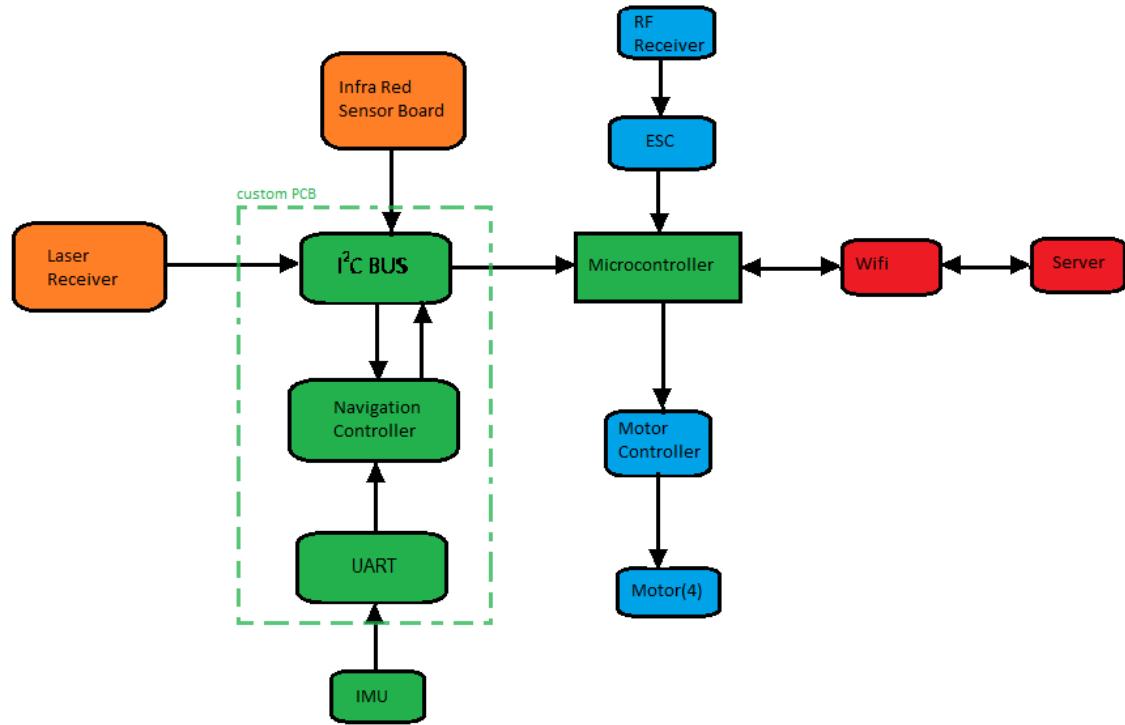
Drone and Hardware (Manny & Juammy)

- Flight & Autonomous behavior
- Ground Control Station

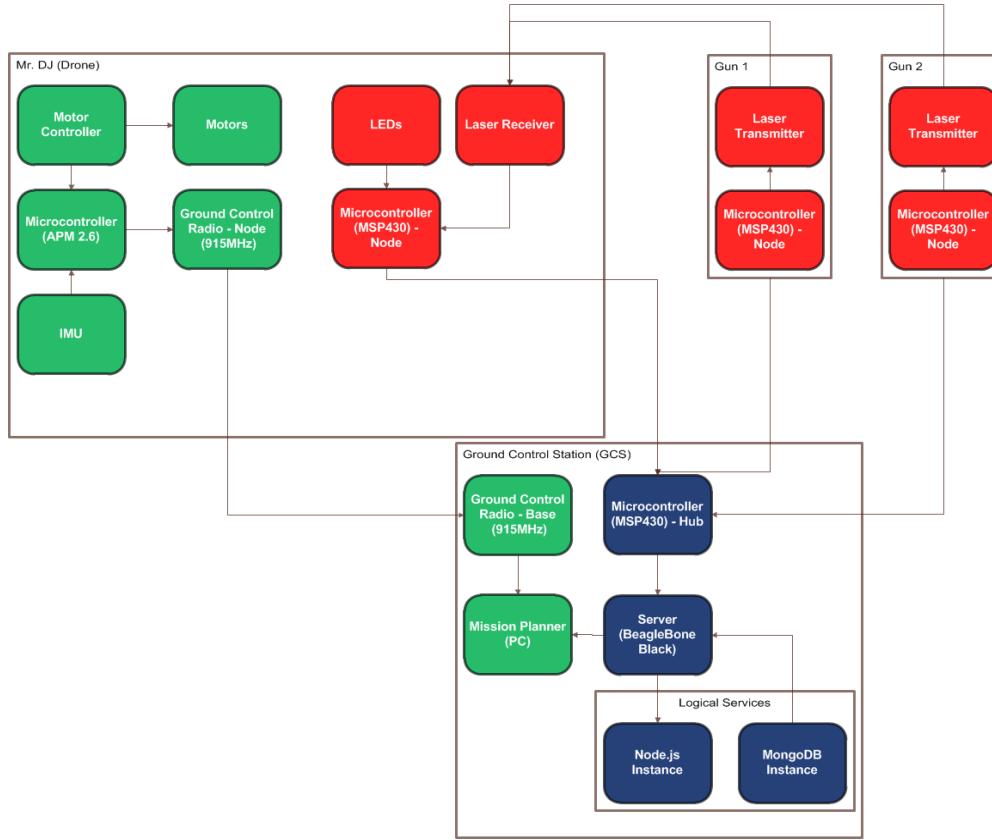
Laser Tag and Servers (Devesh & Randy)

- Lasers and Sensors
- Communication & Game Implementation

This approach allows for easy integration of all subsystems

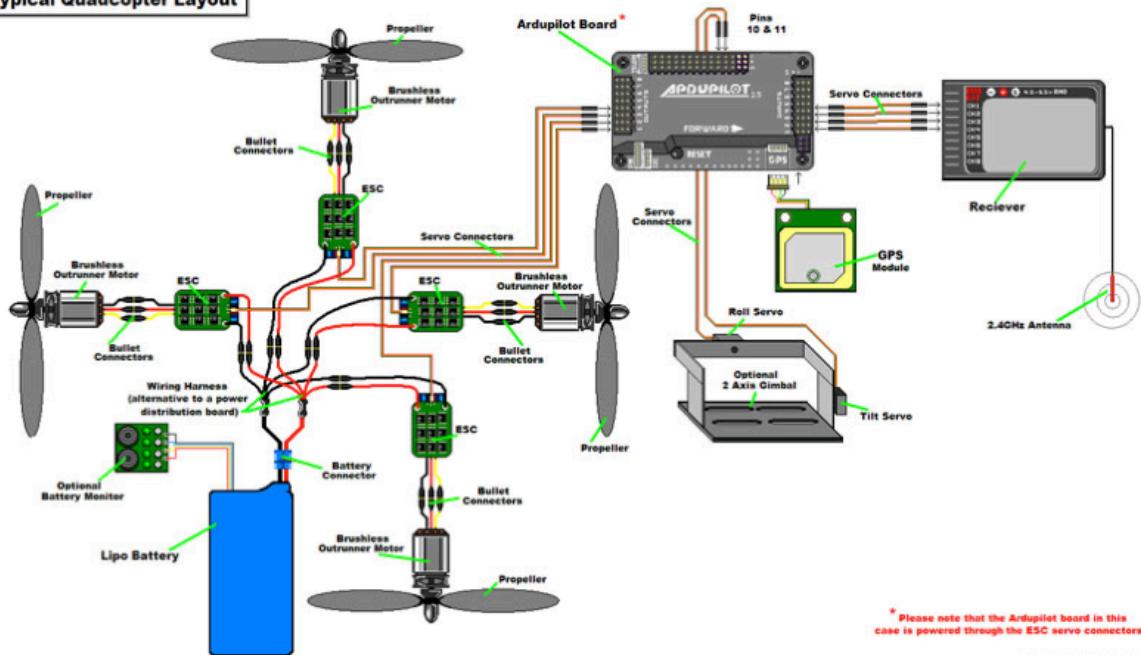


High-Level System Overview



Drone Overview

Typical Quadcopter Layout



By Jethro Hazelhurst

- Derived from ArduCopter
- Quad-Rotor
- GPS-Equipped
- Multiple Flight Modes
- Autonomous capabilities

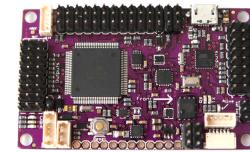
Drone - The Frame



- Hobbyking Z700-V2 Quadcopter Frame - \$30
- Width - 700mm
- Lightweight & Strong
- Flexible Device mounting options
- Easy to obtain replacement parts

Drone - Flight System Components

Flight Controller	Apm 2.6
Quadcopter Battery	Turnigy Nano-Tech 4000 mAh 3S LiPo
Electronic Speed Controller (ESC)	Hobbyking 30A UBEC
Propellers	APC Style 12" x 6" / 12" x 4.5" / 12" x 3.8"
Motors	NTM Prop Drive 28-30S 800kV / 300W Brushless

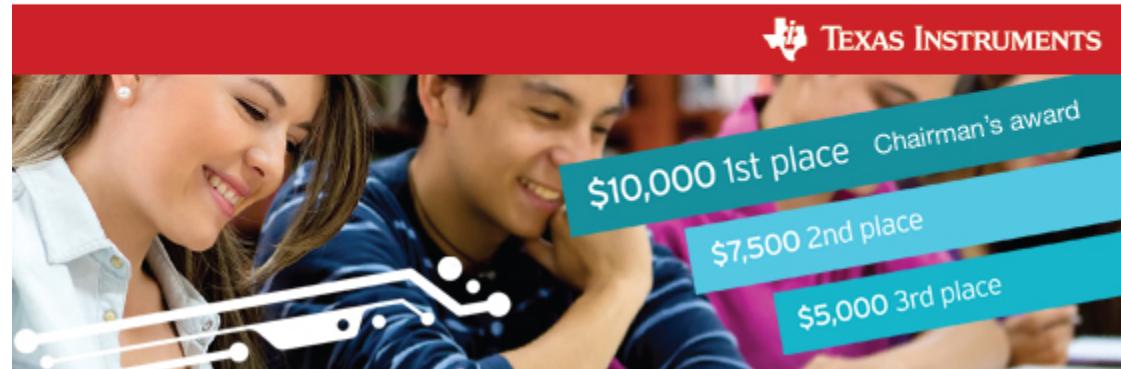


TI Innovation Challenge

- Using TI ICs and microcontroller
- Already meet criteria
- Funded \$200

Texas Instruments
innovation challenge
North America design contest 2014

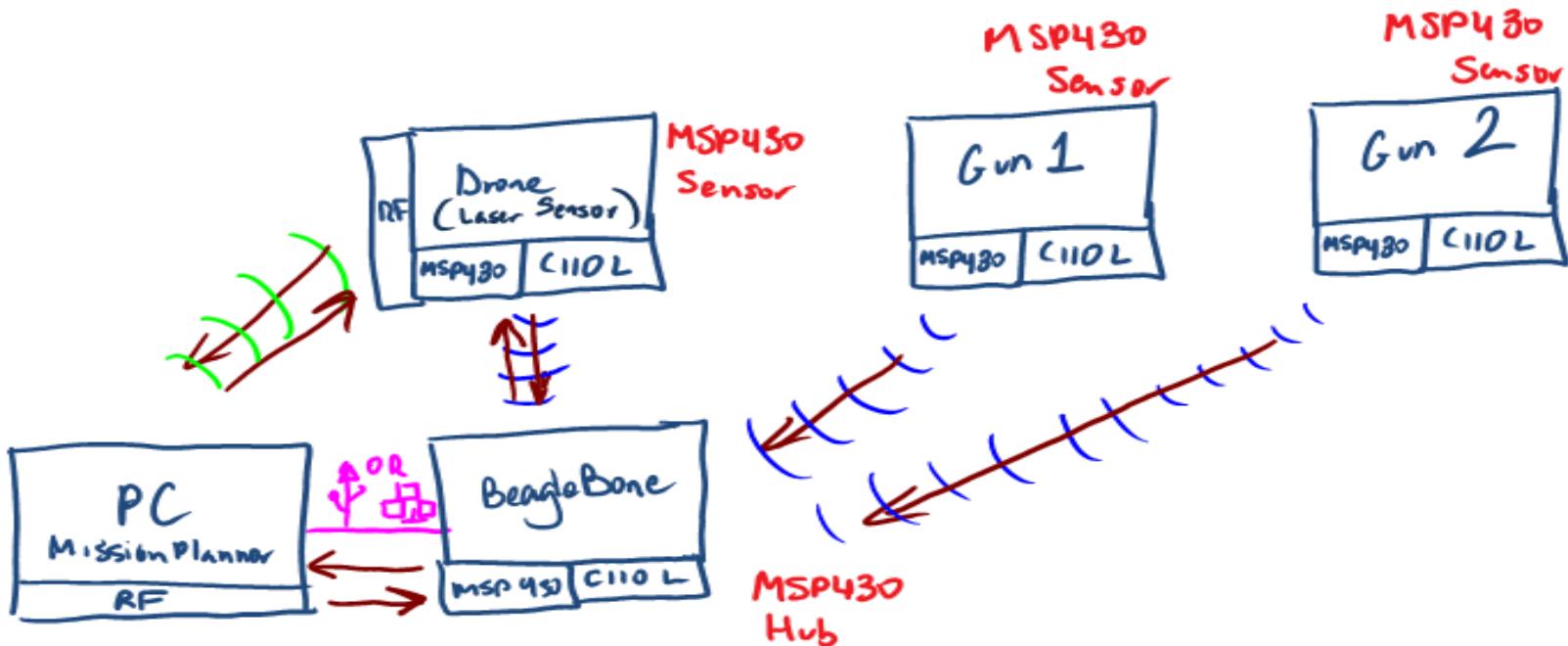
In partnership with



The background image shows two people, a man and a woman, smiling and looking at a screen together. A white circuit board graphic is overlaid on the bottom left. In the top right corner, there is a Texas Instruments logo with the text "TEXAS INSTRUMENTS". On the right side, there are three blue callout boxes containing award information:

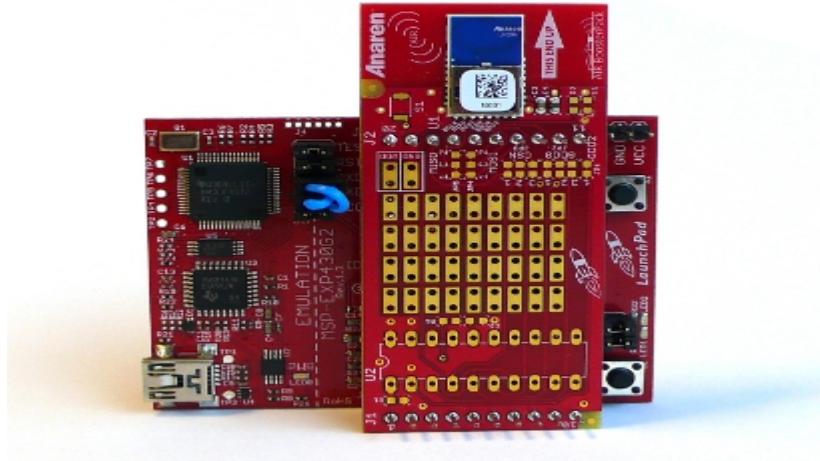
- \$10,000 1st place Chairman's award
- \$7,500 2nd place
- \$5,000 3rd place

Server & Communication Overview



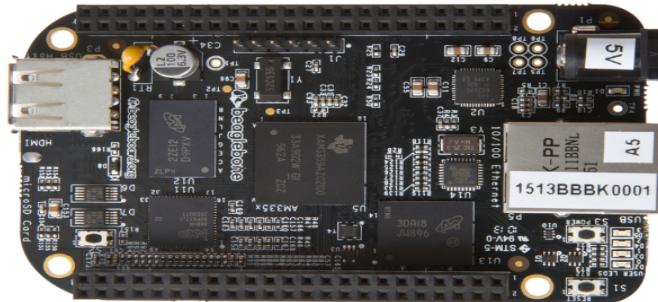
Server & Communication

- MSP430 Microcontroller
- Low Power
- Cost effective
- Wireless RX/TX capable



Server & Communication

- BeagleBone Black
- Low Power
- Linux-based
- Networkable via LAN or USB



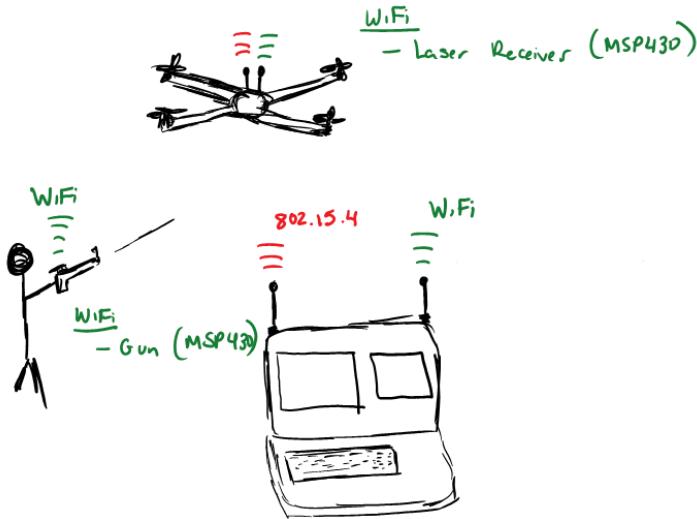
Server & Communication

- Web-based application for game management
- JavaScript framework node.js w/MongoDB

The screenshot shows a web-based application interface. At the top, there is a header with the text "Logo Here" and "Drone Hunt". Below the header is a navigation bar with three tabs: "Gameplay" (which is currently selected), "Override", and "Diagnostics". The main content area displays two player statistics: "Player 1" and "Player 2". Player 1 has a score of "Score: 70" and is identified as the "Current Leader". Player 2 has a score of "Score: 55". Below the player stats, there are two messages: "Player 2 got a headshot! +10" and "Player 1 is on a hit streak! +5".

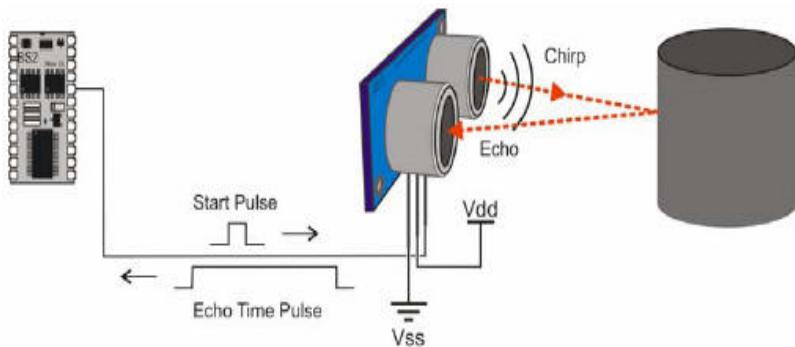
Drone Hunt		
Gameplay	Override	Diagnostics
Player 1	Player 2	
Score: 70	Score: 55	
Current Leader: Player 1		
Player 2 got a headshot! +10		
Player 1 is on a hit streak! +5		

Lasers Overview



- 2 Laser Guns.
(Player1 and Player2)
- MSP430 controlled
50 mW laser
modules.
- CC110L Wi-Fi
adapter.
(communication with
G.C.S.)
- Solar Panel
Receivers.

Ultrasonic Proximity Sensor Overview



- MB1200 XL-
MaxSonar®-EZo™ High
Performance
Ultrasonic Rangefinder
- Connects directly to
Ardupilot Module

Ultrasonic Proximity Sensor Details

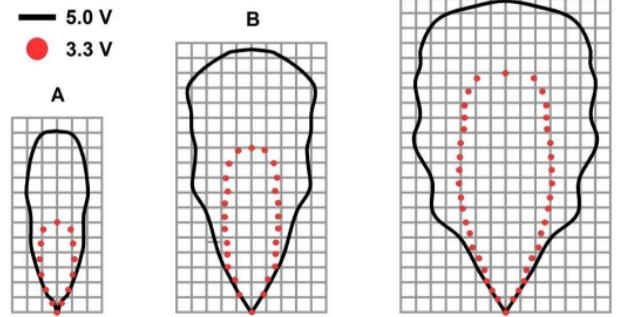
MB1200-MB1300

XL-MaxSonar®-EZ/AE0™ Beam Pattern

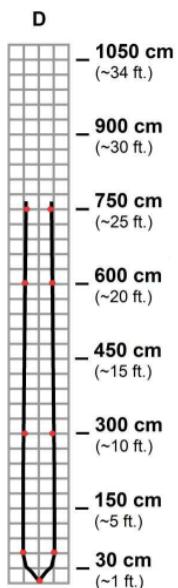
Sample results for measured beam pattern are shown on a 30-cm grid. The detection pattern is shown for dowels of varying diameters that are placed in front of the sensor
A 6.1-mm (0.25-inch) diameter dowel
B 2.54-cm (1-inch) diameter dowel
C 8.89-cm (3.5-inch) diameter dowel

D 11-inch wide board moved left to right with the board parallel to the front sensor face.
This shows the sensor's range capability.

Note: For people detection the pattern typically falls between charts A and B.

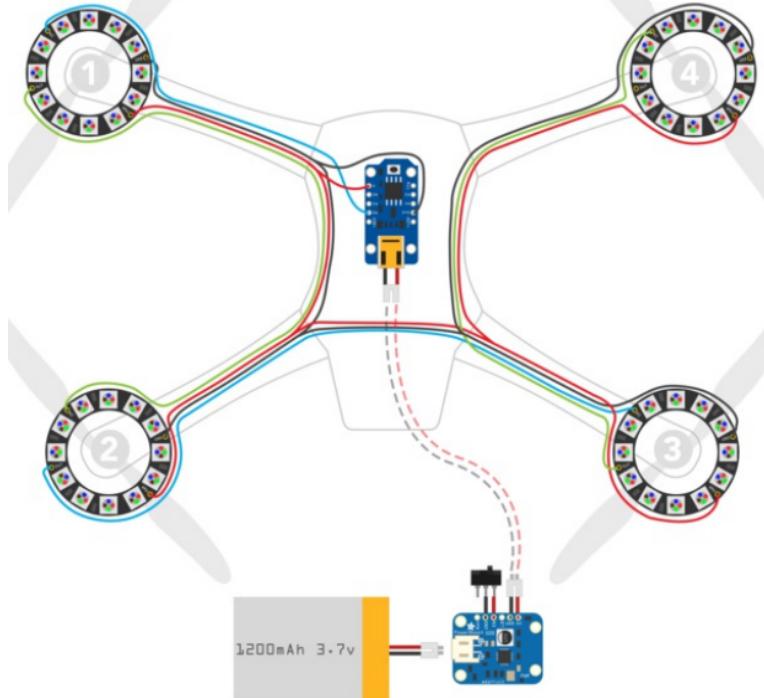


Beam Pattern drawn to a 1:95 scale for easy comparison to our other products.



- Range 5ft min to 25 feet max.
- Detect people up to approximately 18 feet.
- 3.3V to 5V operational voltage.
- Low power consumption.
- Widest and most sensitive beam pattern in XL-MaxSonar-EZ/AE line.

LED System Overview



- “May Haves”
- Adafruit Neopixel Digital RGB LED Strip.
- 60 LED per meter.
- Multiple flash modes.
- Require a microcontroller (MSP430) and some programming.

LED System Details



- WS2812 LED with individual driver chips.
- Controlled by microcontroller through a single wire.
- You can set the color of each LED's RGB component.
- 3.3V to 5V operational voltage.
- 18 Watts max (~3.5 Amps @ 5V) per meter.

Ground Control Station Overview

- The main goal is to display a professional and presentable end product.
- Combining all components into one system



Ground Control Station

- Durable & Portable.
- Can be operated anywhere, anytime.
- No maintenance required.



Series	Model	Weight	Price
Pelican	1500	6.39 lbs.	\$124.00
Pelican	1510	11.99 lbs.	\$177.00
Pelican	1520	8.29 lbs.	\$136.00
Pelican	1550	10.58 lbs.	\$154.00
Pelican	1560	17.00 lbs.	\$190.00
Pelican	1600	13.00 lbs.	\$182.00
Pelican	1610	19.50 lbs.	\$235.00



INTERIOR LENGTH: 29.00 in

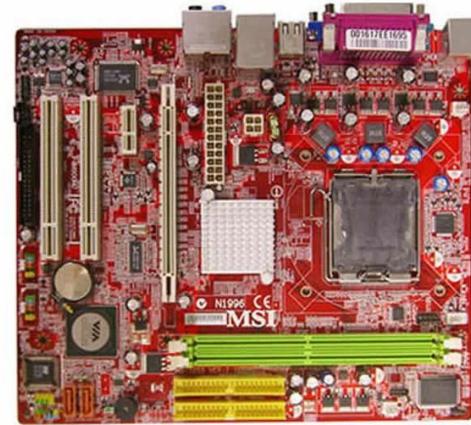
INTERIOR WIDTH: 18.00 in

INTERIOR DEPTH: 10.85 in



Ground Control Station

- The Mission Planner Machine
- MSI P3M900M3-L motherboard equipped with an Intel Pentium Dual Core E2180 CPU
- An eMachines LCD monitor will be used as the main screen of the GCS



eMachines®



Ground Control Station

■ NON-PORTABLE

- Use an old PC Power Supply
- Plug in if available
- Doesn't waste the batteries



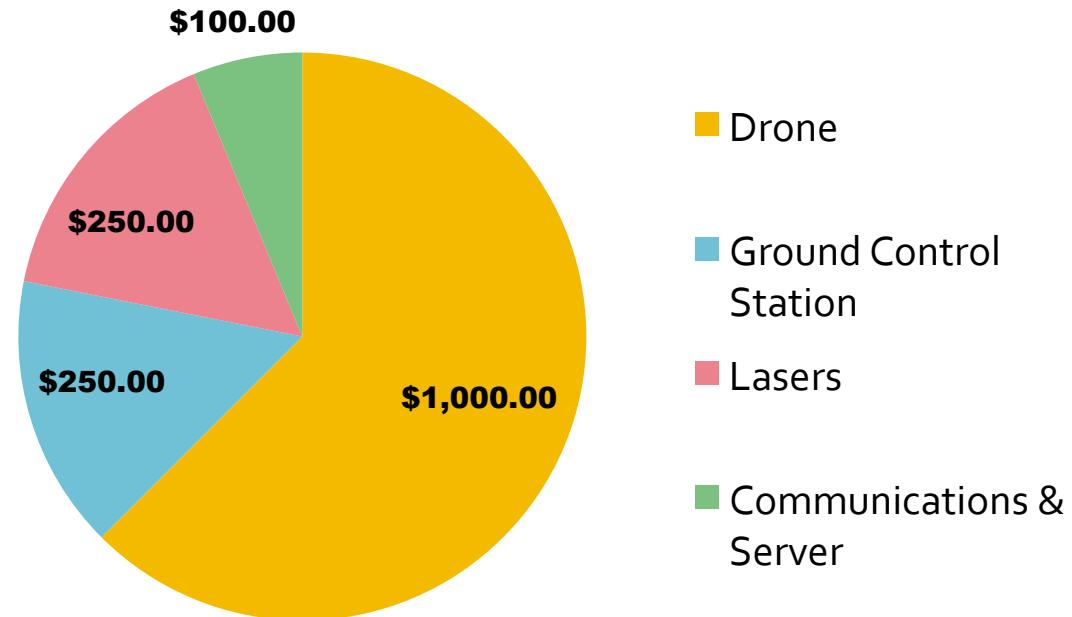
■ PORTABLE

- Don't rely on power from wall
- Fully portable
- Provides: 12V @ 7Ah
- Powers a computer for about 2 hours
- Rechargeable

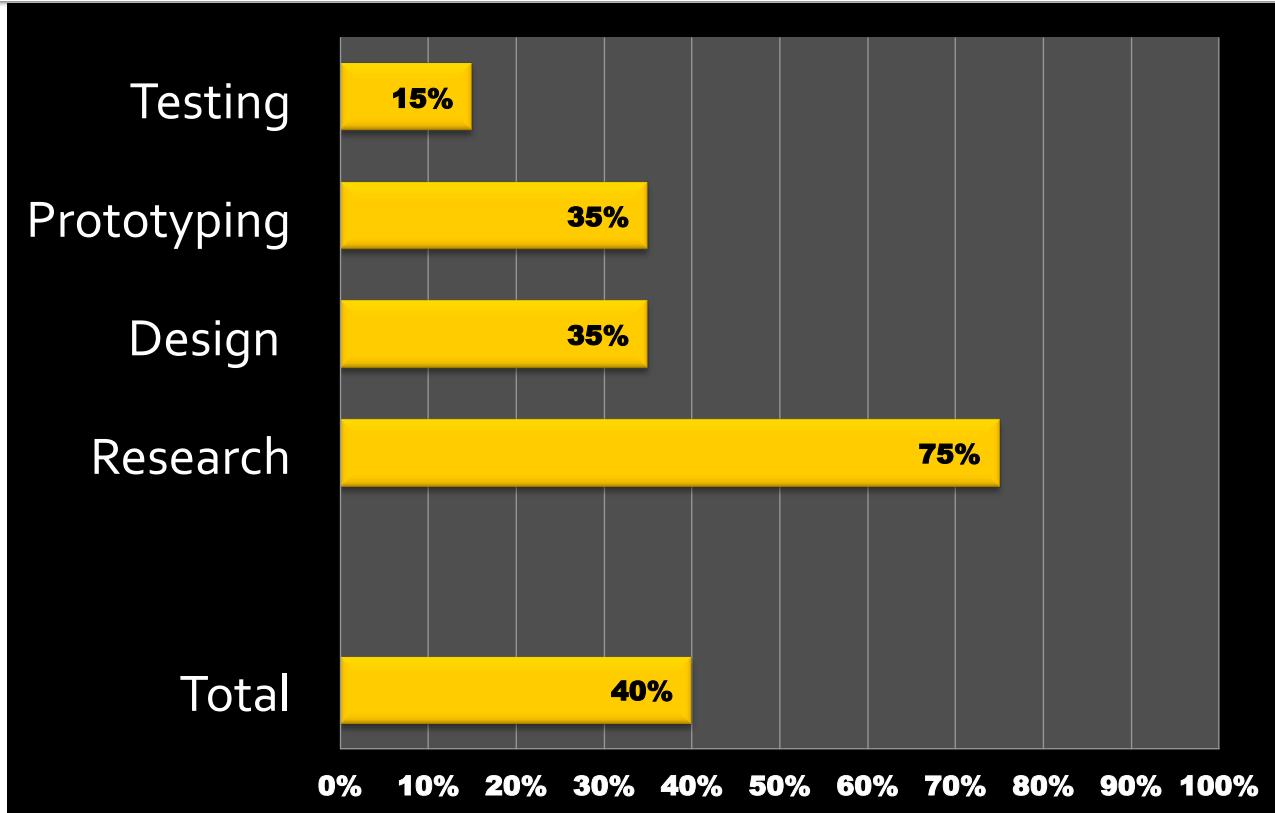


Overall System Budget

- Original Budget
- Self-Funded
- Donations
- \$200 TI Store



Current Progress



Tasks Remaining & Future Plans

- Resume Research, Design & Development
- Complete Prototyping and Testing before project deadlines
- Construct our committee

Future Plans:

- Weekly progress reports

SYSTEMS	SUCCESES
DRONE:	Individual parts purchased
	Successfully built quadcopter
	Fully tested individual components
	Maiden flight complete
LASER GUNS:	Successfully control laser module with microcontroller
	Found online libraries and open source code for the ultrasonic proximity sensor
	Found open source libraries for the Neopixel LEDs and already successfully tested the strips
SERVER & COMMUNICATION:	BeagleBone flashed with latest OS
	MSP430 in hand and tested wireless modules (Hub/Server)
GROUND CONTROL STATION:	Fully modified the PC power supply
	Tested the motherboard and screen

SYSTEMS	DIFFICULTIES
DRONE:	Unstable Flight
	Vibration
	PID Tuning
	Custom Flight Patterns
LASER GUNS:	Difficulty communicating information through laser module
	Data transmission using lasers in the daytime
SERVER & COMMUNICATION:	MSP430 air modules may not provide the needed range
	BeagleBone (ARM) performance with web application.
GROUND CONTROL STATION:	Switching between power outlet and DC battery

Suggestions & Questions

- SKB cases Info
- Thank You!!!
- Help us improve our project!
- Any input will be greatly appreciated!