



quadcopter  
autonomous



# Voice Controlled Quadcopter

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**FINAL**

**PRESENTED BY: TEAM PURSUIT E9**

# Team And Faculty

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## TEAM MEMBERS

**RUBEN MARLOWE III**

*(COMMUNICATION)*

**NANDI SEVILLIAN**

*(IMAGE PROCESSING)*

**LUDGER DENIS**

*(HARDWARE)*

**KEVIN POWELL**

*(SPEECH PROCESSING)*

## FACULTY

- **DR. SHONDA BERNADIN**
- **DR. MIKE FRANK**
- **DR. HUI LI**

# Introduction

- ❖ Flight
- ❖ Operational Manual
- ❖ Safety Concerns
- ❖ Budget
- ❖ Blade Protection
- ❖ Future Work
- ❖ Questions



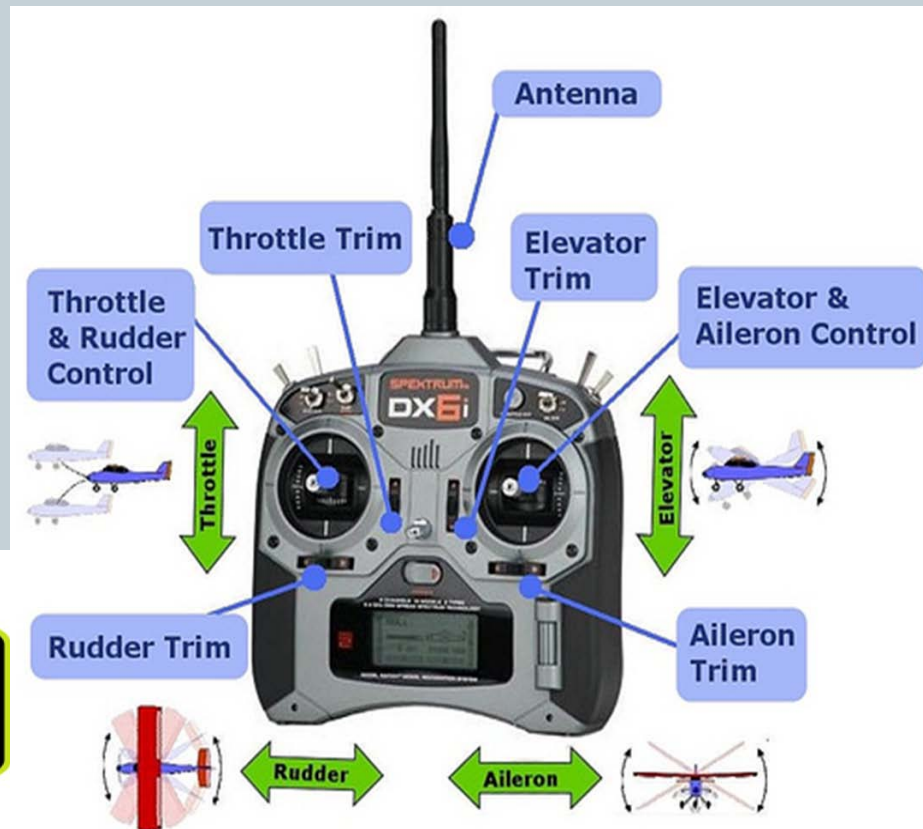
# Purpose

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# Manual Flight

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Arming Copter



Disarming Copter

# Autonomous Flight

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# Setting Autonomous Mode

7

Current Mode: Land  
Current PWM: 5: 1126

Flight Mode 1	Land	<input checked="" type="checkbox"/> Simple Mode	<input type="checkbox"/> Super Simple	PWM 0 - 1230
Flight Mode 2	Loiter	<input type="checkbox"/> Simple Mode	<input type="checkbox"/> Super Simple	PWM 1231 - 1360
Flight Mode 3	Auto	<input type="checkbox"/> Simple Mode	<input checked="" type="checkbox"/> Super Simple	PWM 1361 - 1490
Flight Mode 4	Auto	<input type="checkbox"/> Simple Mode	<input type="checkbox"/> Super Simple	PWM 1491 - 1620
Flight Mode 5	AltHold	<input type="checkbox"/> Simple Mode	<input type="checkbox"/> Super Simple	PWM 1621 - 1749
Flight Mode 6	Stabilize	<input checked="" type="checkbox"/> Simple Mode	<input checked="" type="checkbox"/> Super Simple	PWM 1750 +

[Save Modes](#)

[Simple and Super Simple description](#)



# Set Home

8



Home Location	
Lat	30.4224815
Long	-84.3175274
Alt (abs)	77

**Action** >>

GEO

30.426788  
-84.317279  
33.47m

☐ Grid [View KML](#)

GoogleHybridMap

Status: loaded tiles

Load WP File

Save WP File

...

Read WPs

Write WPs

Home Location

Lat 30.4224815

Long -84.3175274

Alt (abs) 77



# Setting Autonomous Functions

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Waypoints

WP Radius

6

Loiter Radius

45

Default Alt

10

☐ Verify Height

Add Below

Alt Warn

0

☐ Spline

	Command	Delay				Lat	Long	Alt	Delete	Up	Down	Grad %	Dist	AZ
1	WAYPOINT ▾	0	0	0	0	0	0	0	X	⬆	⬇	0	0	0
2	WAYPOINT ▾	0	0	0	0	0	0	0	X	⬆	⬇	0	0	0

WAYPOINT  
 LOITER\_UNLIM  
 LOITER\_TIME  
 LOITER\_TURNS  
 RETURN\_TO\_LAUNCH  
 LAND  
 TAKEOFF  
 CONDITION\_DELAY  
 CONDITION\_DISTANCE  
 CONDITION\_CHANGE\_ALT  
 CONDITION\_YAW  
 DO\_SET\_MODE  
 DO\_JUMP  
 DO\_CHANGE\_SPEED  
 DO\_SET\_RELAY  
 DO\_REPEAT\_RELAY  
 DO\_SET\_SERVO  
 DO\_REPEAT\_SERVO  
 DO\_CONTROL\_VIDEO  
 DO\_SET\_ROI

# Upload to Copter

10

**Action** >>

GEO ▾

30.426788  
-84.317279  
33.47m

☐ Grid [View KML](#)

GoogleHybridMap ▾

Status: loaded tiles

Load WP File

Save WP File

...

Read WPs

Write WPs

Home Location

Lat 30.4224815

Long -84.3175274

Alt (abs) 77

Load WP File

Save WP File

Read WPs

Write WPs

# Operation Manual

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# Safety Concerns

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A graphic of a safety sign. It features a green rectangular bar at the top with the words "SAFETY FIRST" in white, bold, sans-serif capital letters. Below this bar, on a white background, are the words "WORKING SAFELY" and "PREVENTS ACCIDENTS" in black, bold, sans-serif capital letters, stacked on two lines. The entire sign is enclosed in a black rectangular border with rounded corners and has a subtle grey drop shadow.

**SAFETY FIRST**

**WORKING SAFELY  
PREVENTS ACCIDENTS**

# Safety Tips

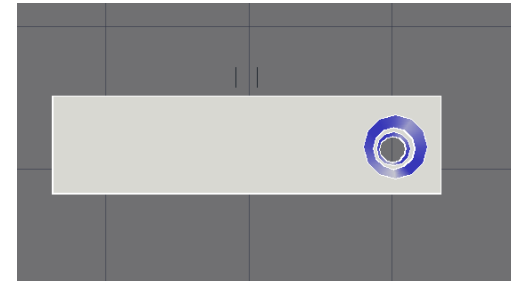
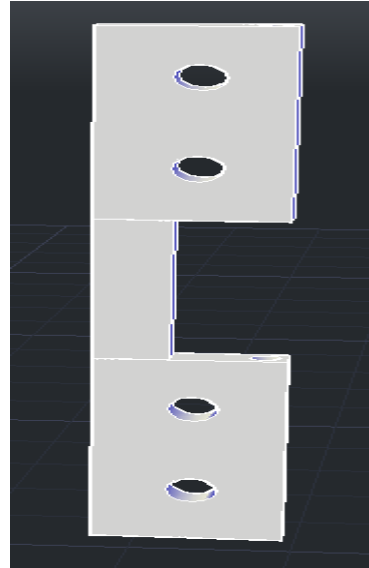
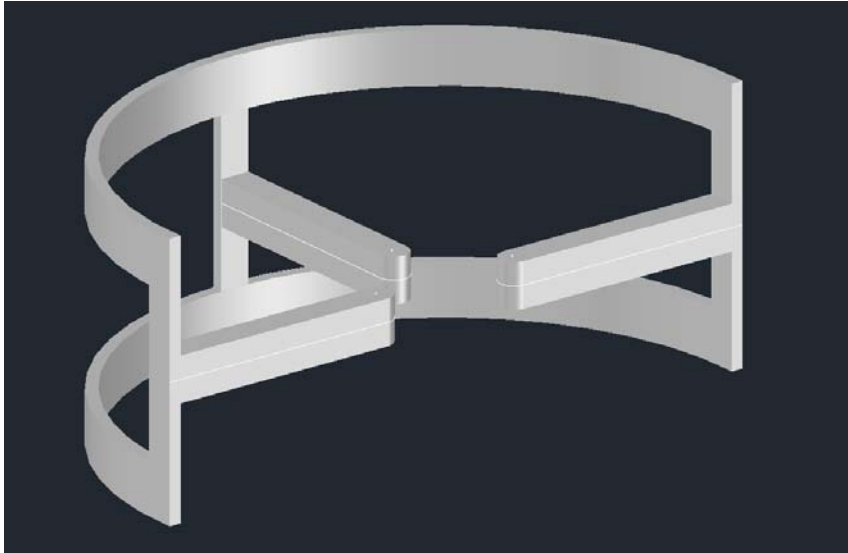
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- Be caution of the hardware and your surrounding
- Work at a safe distance around rotating parts
- Never have hands around copter when powered on
- NO TESTING OR PROGRAMMING WITH PROPS ONBOARD COPTER
- Never work on rotating parts alone
- Take a break when fatigued or stressed
- Wear safety attire when necessary : safety goggles, long sleeves, pants, closed toe shoes
- Keep safety first and communicate



# Blade Protection

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# Budget Expenses

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A. Expense				
Item	Distributor	Quantity	Per Unit Cost	Total Cost
Bluetooth Data Link	Viper Flight Systems	1	\$29.99	\$29.99
GoPro HERO3 Black Edition w/ SD Card	Viper Flight Systems	1	\$368.99	\$368.99
Tarot T-2D Brushless Gimbal Kit	Viper Flight Systems	1	\$239	\$239
Tarot Gimbal GoPro Video Cable	Viper Flight Systems	1	\$12	\$12
APC Propellers 10X4.7 Push-Pull Set	Viper Flight Systems	4	\$8	\$32
Easy-to-Machine ABS Shapes, 1/2" Thick, 24" X 24", Black	McMaster-Carr	1	\$94.66	\$94.66
Easy-to-Machine ABS Shapes, 1/4" Thick, 24" X 24", Black	McMaster-Carr	1	\$49.74	\$49.74
Easy-to-Machine ABS Shapes, 1/16" Thick, 24"X 24", Black	McMaster-Carr	1	\$12.68	\$12.68

<b>Subtotal</b>	<b>\$839.06</b>
<b>Shipping Total</b>	<b>\$54.56</b>
<b>Expenses Subtotal</b>	<b>\$893.62</b>

# Out-of-Pocket Expenses

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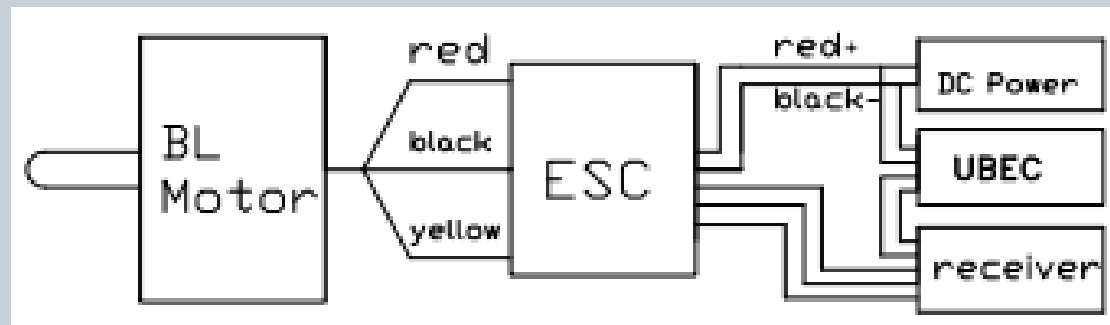
Item	Distributor	Quantity	Per Unit Cost	Total Cost
iAnder USB Bluetooth 4.0 Low Energy Adapter	Amazon	2	\$7.99	\$15.98
LinkS (2 Pack) SuperSpeed USB 3.0 Female Coupler	Amazon	1	\$6.99	\$6.99
Microsoft Xbox 360 Kinect Sensor USB AC Adapter Power Supply Cable Cord	Amazon	2	\$2.99	\$5.98
URBEST Plastic Shell Batteries Holder Box for 10 x 1.5 AA Battery	Amazon	1	\$7.25	\$7.25
HDVD New 10 pack 10 inch 2.1 x 5.5mm DC Power Pigtail Female	Amazon	1	\$5.69	\$5.69
Gardner Bender 19-AWC Wire Gard Wire Connector Assortments, 9-Pack	Amazon	1	\$4.50	\$4.50
HDVD New 10 pack 10 inch 2.1 x 5.5mm DC Power Pigtail Male	Amazon	1	\$5.69	\$5.69
315MHz RF Transmitter and Receiver Link Kit	Amazon	1	\$5.00	\$5
BitVoicer Software	BitSophia	2	\$9	\$9
AA Batteries	Dollar General	1	\$12.36	\$12.36
3 Cell LiPo Battery Charger	HobbyTown	2	\$21.49	\$42.98
DF13 6 Position to 5 Position Connector	3DR	1	\$5	\$5

<b>Subtotal</b>	<b>\$126.42</b>
<b>Shipping Total</b>	<b>\$29.27</b>
<b>Expenses Subtotal</b>	<b>\$155.69</b>

# Data Sheets

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- Motors
- 3DR uBlox GPS



# Operation Manual

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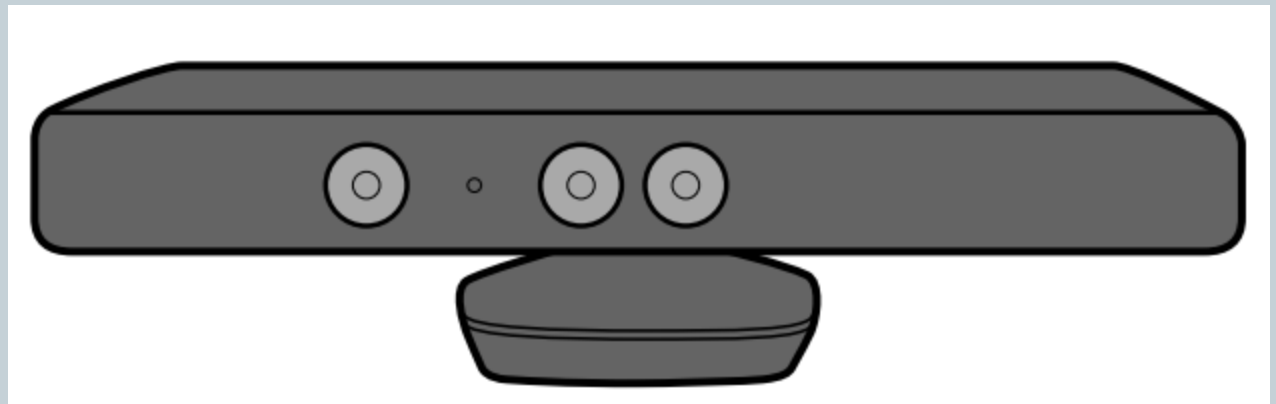
- 2013 RTF X8
- APM 2.6
- 3DR Radio
- 3DR uBlox GPS
- Tarot Gimal Kit



# Operation Manual

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- AR8000
- DX8
- Xbox Kinect
- 2013 RTF X8

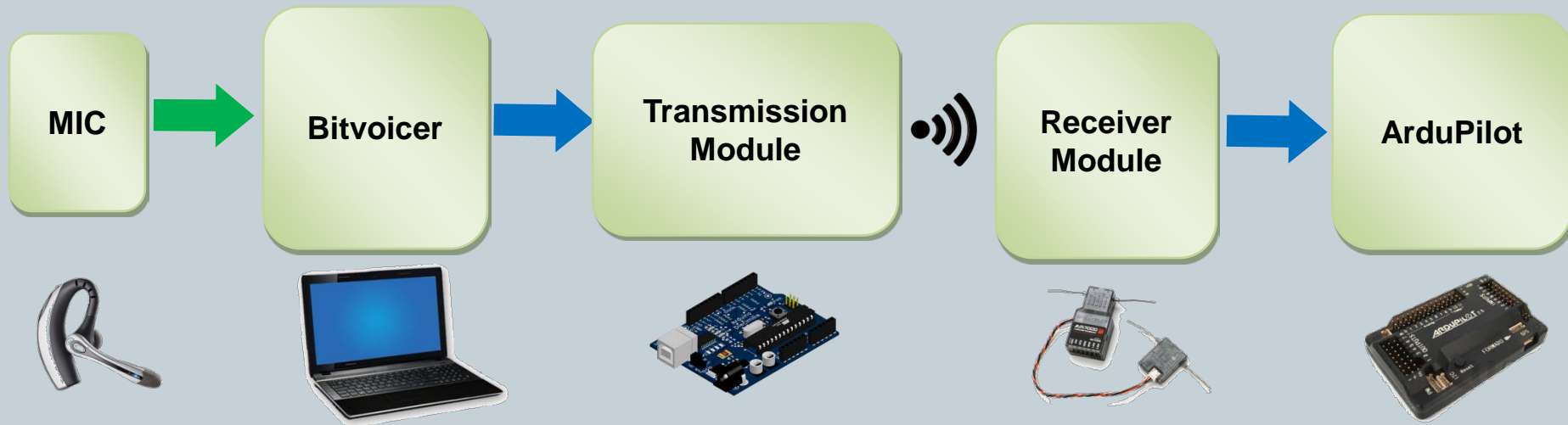


# Software/Communication System Overview

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Base Station

OctoCopter





# Test Plans

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With the exception of the last two, all software & voice control tests were completed successfully.

- Command Recognition Test
- ArduPilot Communication Test (USB)
- ArduPilot Communication Test (RF)

## Not Completed

- Flight (Airborne) Test
- Mission Test

# Operation Manual

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- **BitVoicer**
- **Arduino**
- **RF Modules**
- **ArduPilot Pin Mapping**

# Future Work

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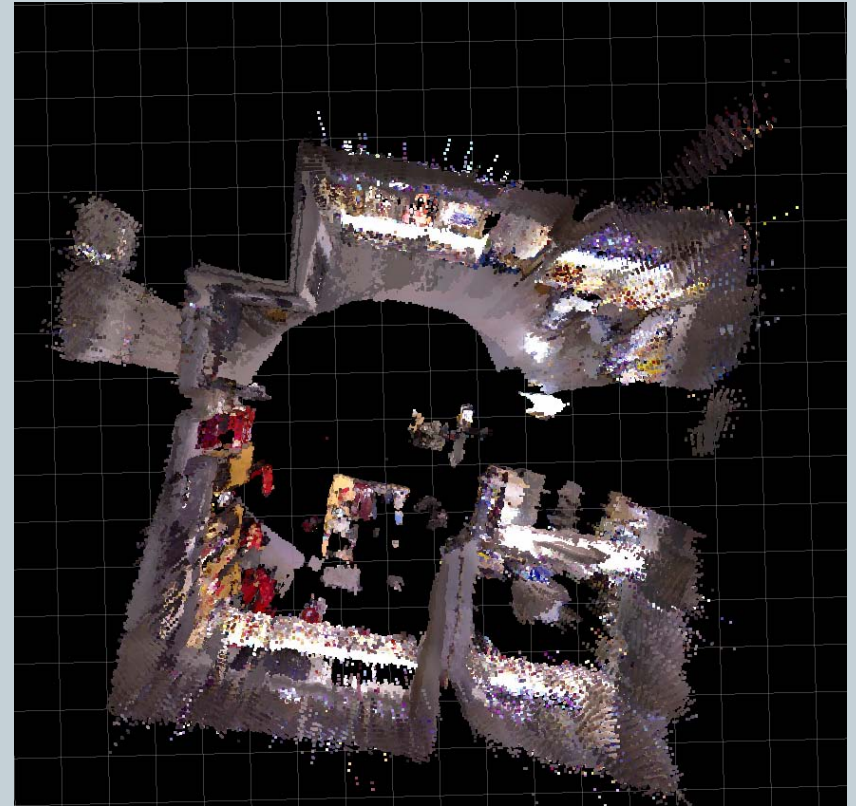
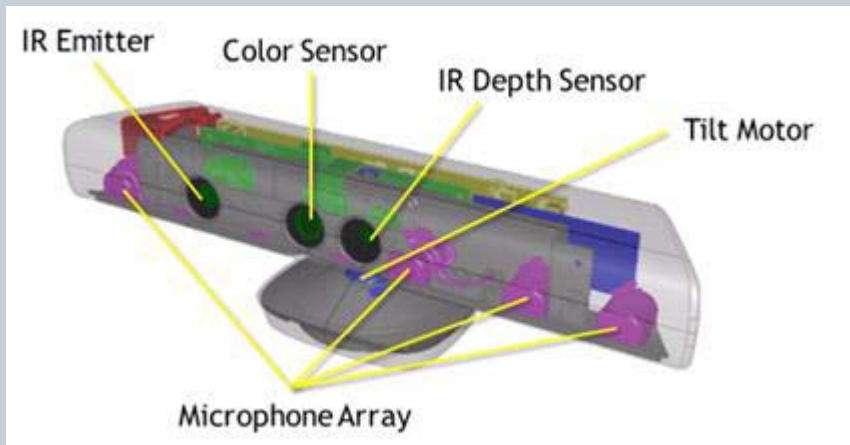
- **Arduino code development for flight & mission commands**
- **Safety protocols implemented in code for unintended commands or faulty actions**
- **Bluetooth headset included for accuracy and flexibility when voicing command**

# Image Processing Overview

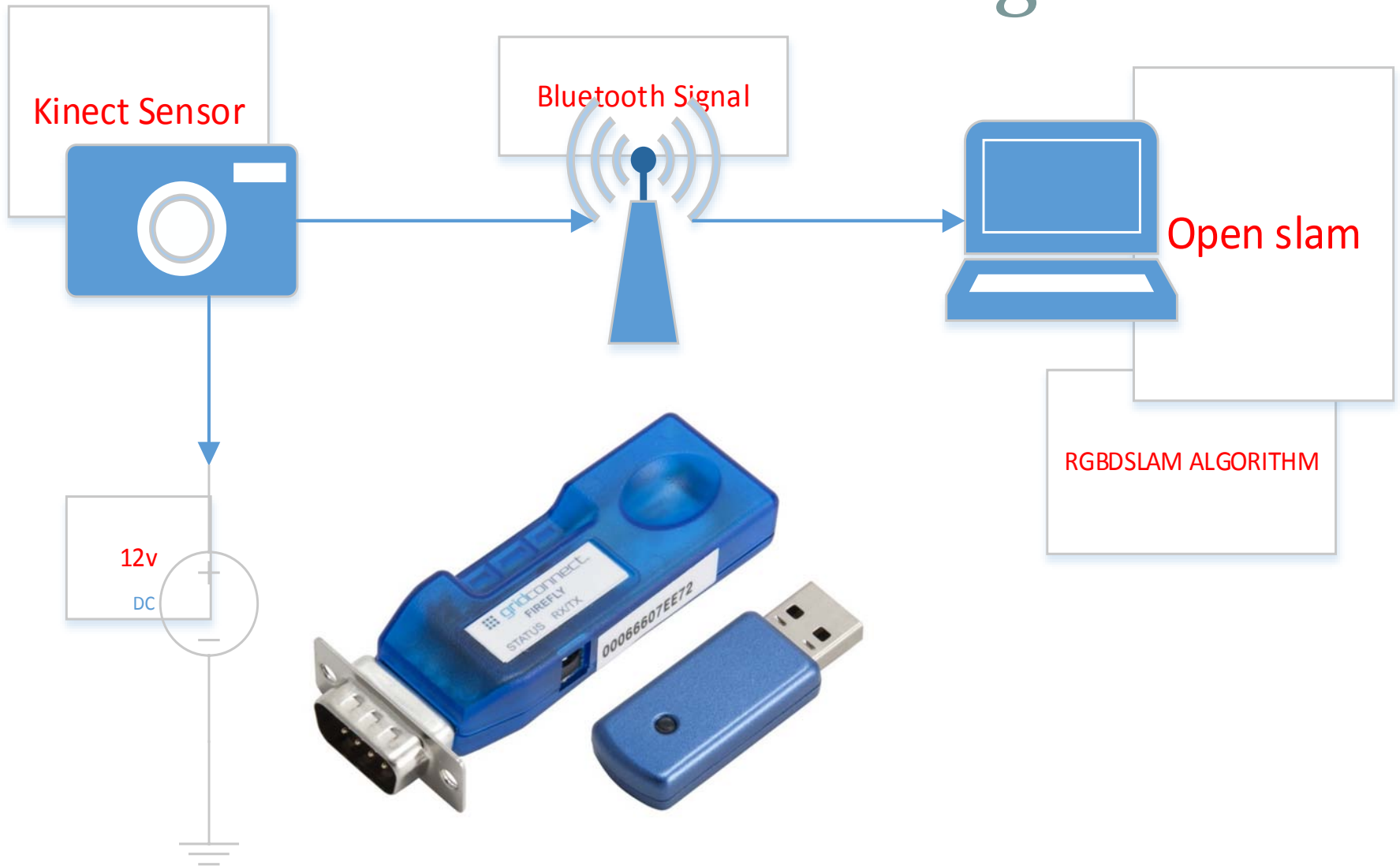
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## RGB-D SLAM

- UBUNTU
- ROS-HYDRO
- OPEN NI LAUNCH



# Flow Chart of Design



# Test Plans

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## Passed

- Live Feed (USB & Wi-Fi)
- RGBD Slam Demonstration
- Battery Pack Power Supply

## Failed

- RGBD SLAM (Windows & Micro SD)
- Bluetooth Module

## Not Completed

- Gimbal
- Blade Protection

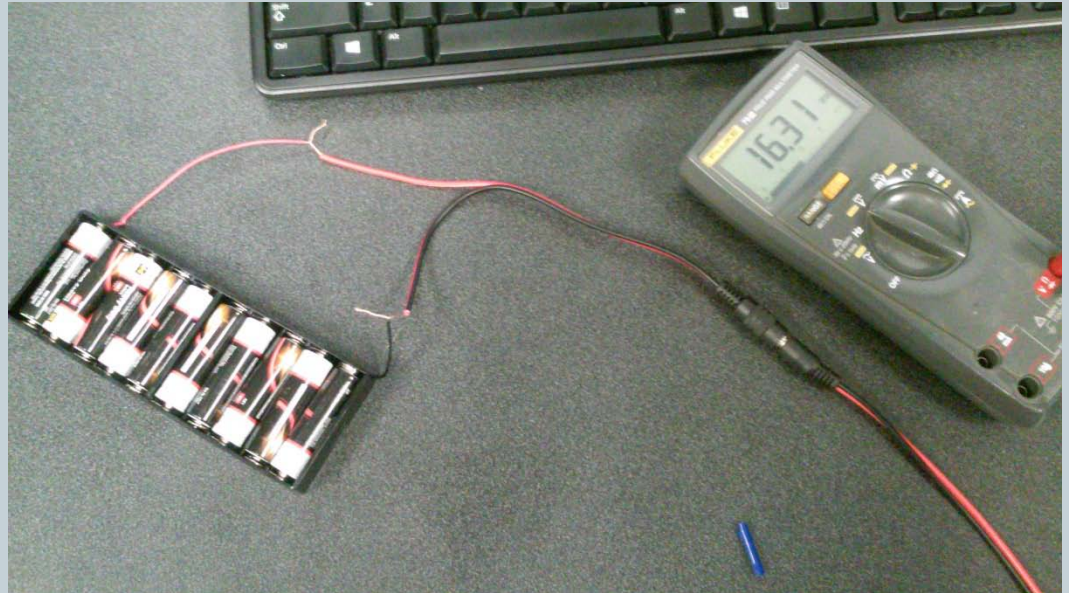




# Operation Manual

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- Battery Pack
- RGB-D SLAM
- GoPro Live Feed
- GoPro App



# Future Work

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- Manipulate the Python code to fit the preference of the user
- Not “reinventing the wheel” but echoing the Kinect sensor with the GoPro Camera
- Blade Protection constructed and displayed

# The End

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- **QUESTIONS**
- **CONCERNS**
- **SUGGESTIONS**

**THANK YOU**