Mid-year Design Review

Team 14: SumoRoll

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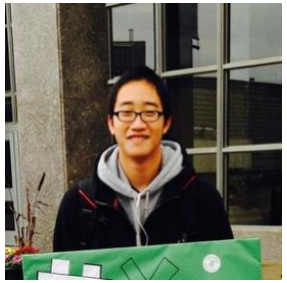
Linghang Zeng, and Sana Gilani

Team Advisor: Prof. Janaswamy

Meet the Team



Xi Kun Zou
(CSE)

HongGao
Chen (EE)

Linghang
Zeng (ME)

MengLing Shi
(CSE)

Sana Gilani
(EE)

Problem Statement

- Create an interactive experience for our players using Motion technology
- Motion Technology that connects to a physical, mechanical object
- Intuitive
- More versatile compared to a remote control
- More enjoyable experiences versus remote control for gaming
- More exercise chances versus remote control
- Possibilities of using gesture-based control to operate transportation vehicles (e.g., a wheel chair)

Project Overview

- 2 player game
- Objective of the game is to use your hand motions to control a gyrosphere, which will be used to attack other player's gyrosphere.
- Whoever knocks the other players gyrosphere out of arena, wins
- Two Leap Motion Controllers tracks each player's hand gesture which gets decoded into motion commands by a custom designed microcontroller and sent via a transmitter to the receiver inside the Gyrosphere

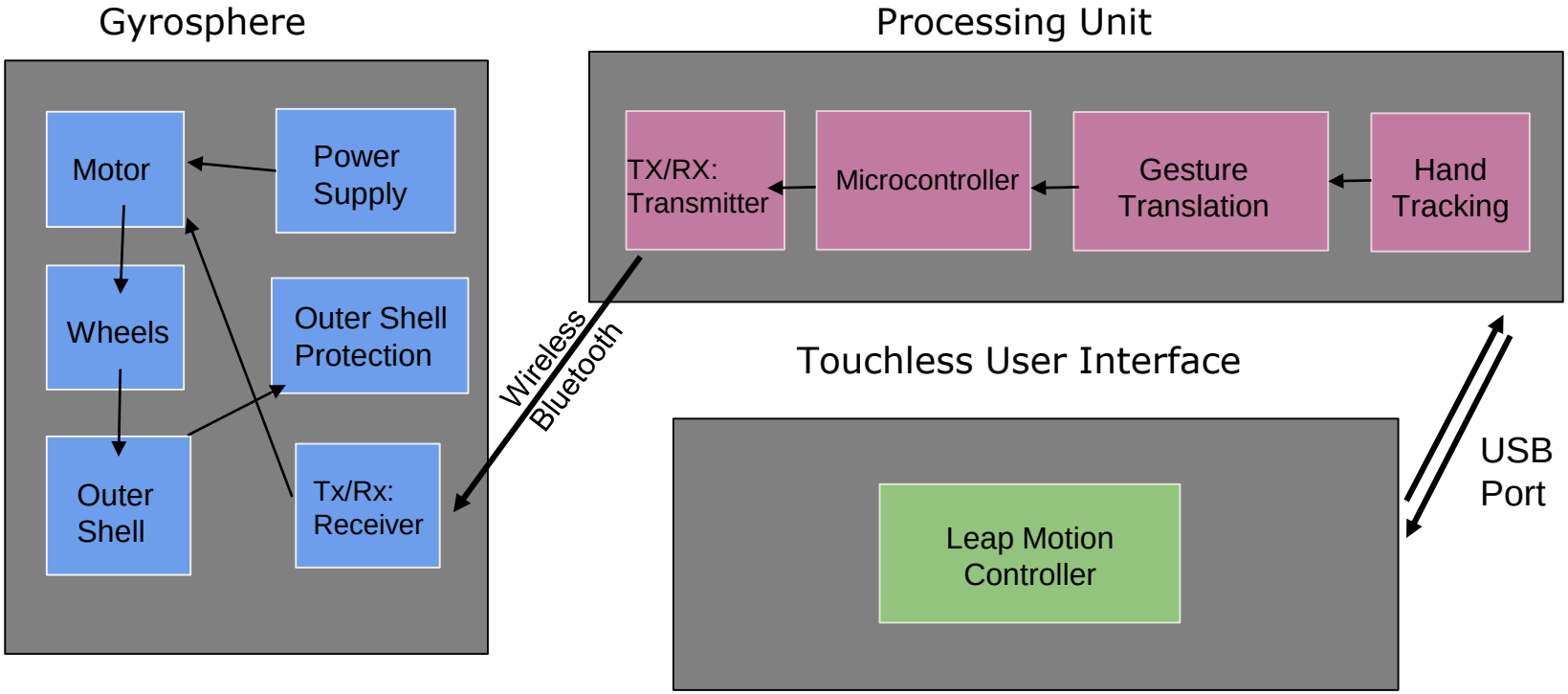
System Requirements

1. Gyrosphere will be able to move forward, backward, left, right, and spin.
2. Gyrosphere will be able to stop right after stop button
3. Gyrosphere should respond to User commands quickly
4. Two Gyrosphere signals will not interfere with each other
5. Gyrospheres will be able to endure collisions of same mass with pedestrian speed
6. Gyrosphere should be portable
7. We want the entire system to be able to run for at least 30 mins

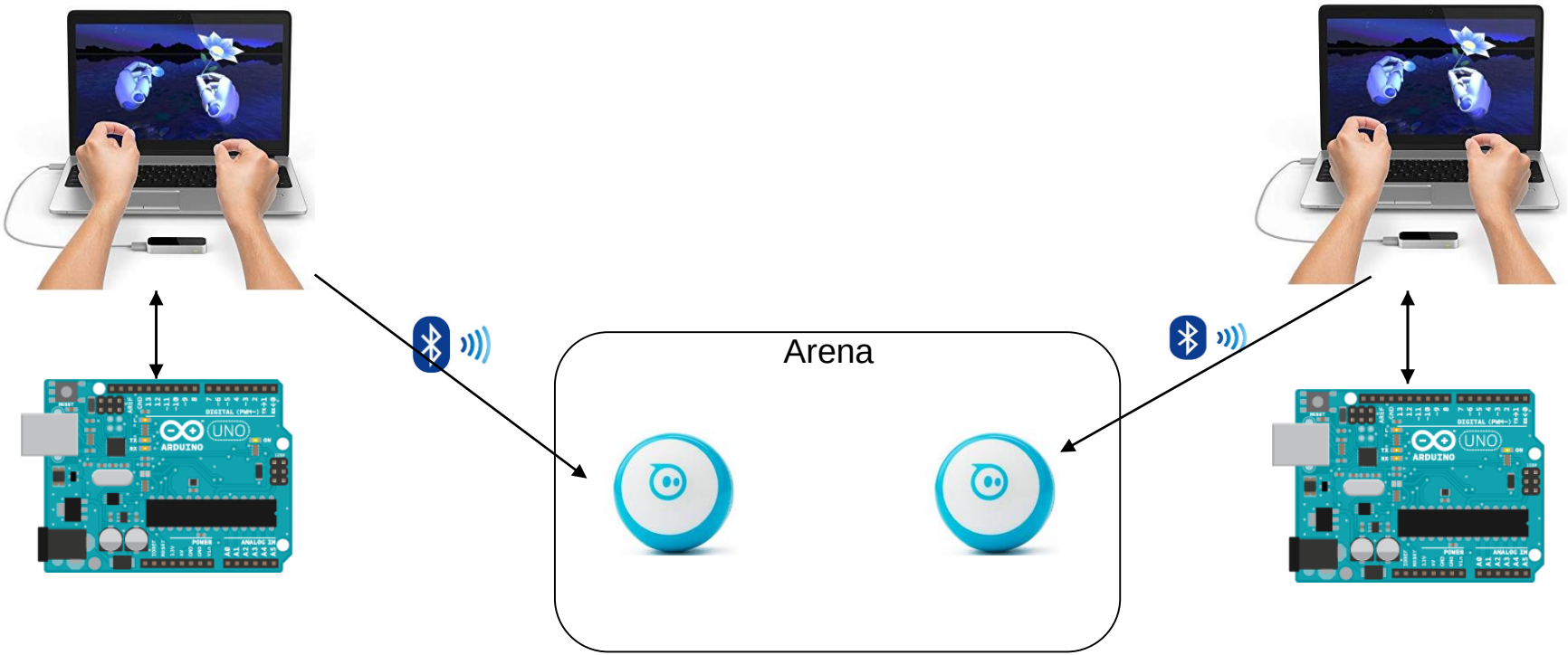
System Specifications

1. Speed of Gyrosphere: pedestrian speed ~2mph
2. Material of Gyrosphere: Elastic coating on the outside of shell to protect and buffer against collisions
3. Final Weight
    - Gyrosphere: < 2 lbs
    - Leap Motion Technology: ~1lb
4. Overall Size
    - Leap Motion Controller: ~typical cell phone
    - Gyrosphere (Diameter): ~typical tennis ball.
5. Power Supply
    - Gyrosphere: Rechargeable battery and last minimum of 30 mins
    - Leap Motion Controller: Stable power source
6. Low delay : <0.25 second latency
7. Non-interference wireless connection
8. Motor : ~1000 rpm for small wheels
9. Range of Gesturing: ~2 ft above Leap
10. Arena: ~10ft^2

Block Diagram



System Topology



MDR Deliverables

We want to be able to have motion recognition coded and one leap motion controller that we have purchased and have it connect to a mechanical output (not necessarily the gyrosphere, perhaps a RC car). We plan to use open-source code to start developing our gesture recognition code.

- Will test signal transmission and motors using Arduino and be able to send Signals via bluetooth to control the set of motors. We plan to use existing motors from M5, as well as Arduinos from M5 to do our testing

- Design outer and inner structure of gyrosphere, ready to 3D print.

Motion Tracking: Joe and Mengling

Two Leap Motion Controller:

Range: An 2 ft radius obtuse half-sphere above the device

Field of view: about 150 degrees

Tracking Speed: about 100 FPS

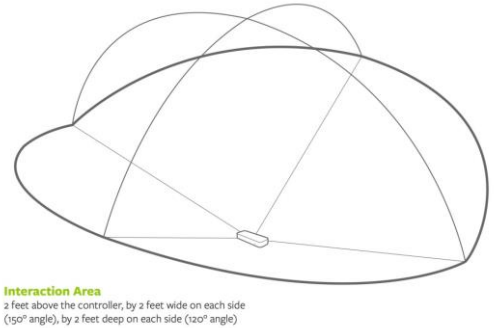
Transmission: USB 3.0 ~640 MBps

Overall:

Accurate

Quick (Sensor to PC)

Problem: loss of tracking occasionally



Open Source Projects:

Cat Explorer

Paint

Sphero Project

Controlling Sphero with Node.js and LeapMotion

Bluetooth connection

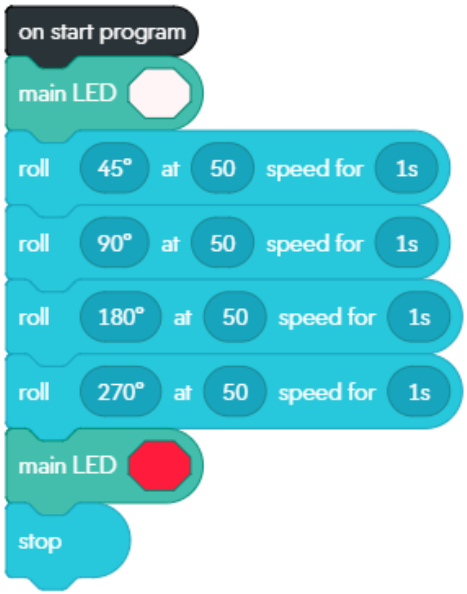
Node.js and Javascripts

Mac or Windows

Open source on github

Sphero Dev App - Ios/Android/PC

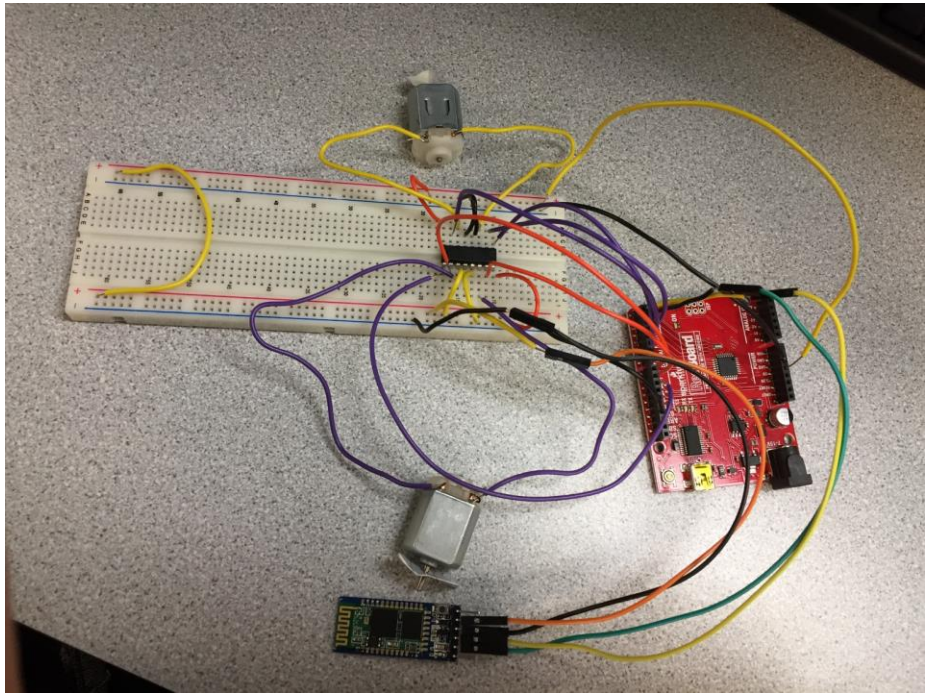
Controlling the Sphero via Bluetooth and App

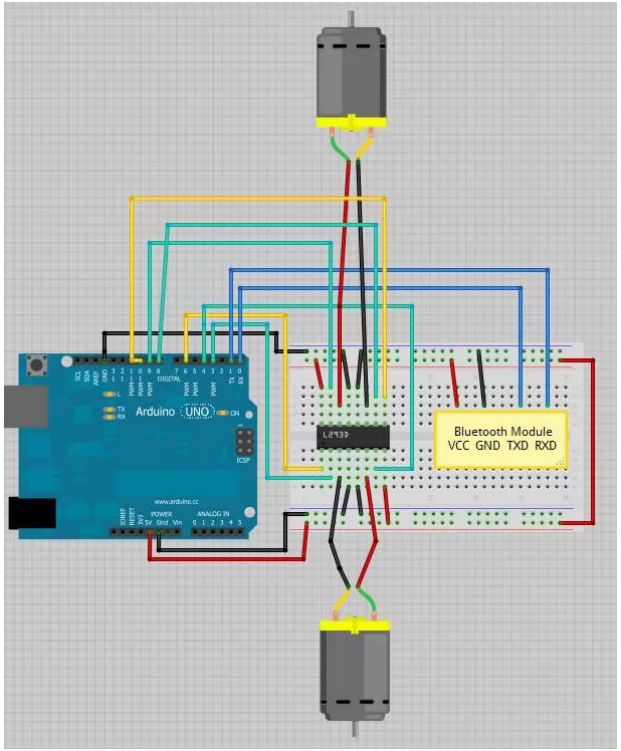


JavaScript Code

```
async function startProgram() {
    setMainLed({ r: 255, g: 244, b: 246 });
    await roll(45, 50, 1);
    await roll(90, 50, 1);
    await roll(180, 50, 1);
    await roll(270, 50, 1);
    setMainLed({ r: 255, g: 27, b: 59 });
    stopRoll();
}
```

Controlling 2 DC Motors via Bluetooth



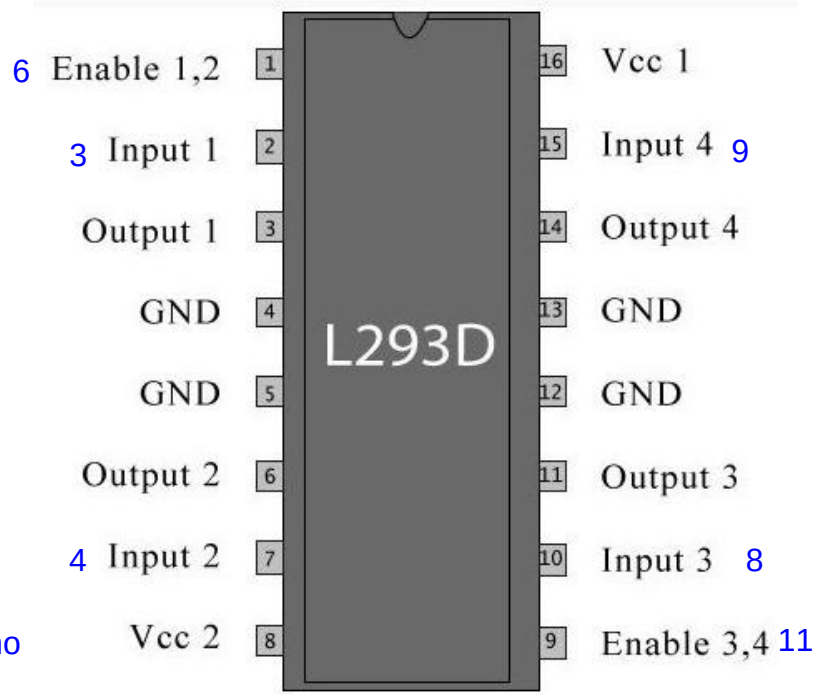


Bluetooth Module HC-05

- Serial Bluetooth module for Arduino and other microcontrollers
- Operating Voltage: 3.6V to 6V (Typically +5V)
- Range: ~100m
- Works with Serial communication (USART) and TTL compatible
- Uses Frequency-Hopping Spread spectrum (FHSS)

L293D Motor Driver

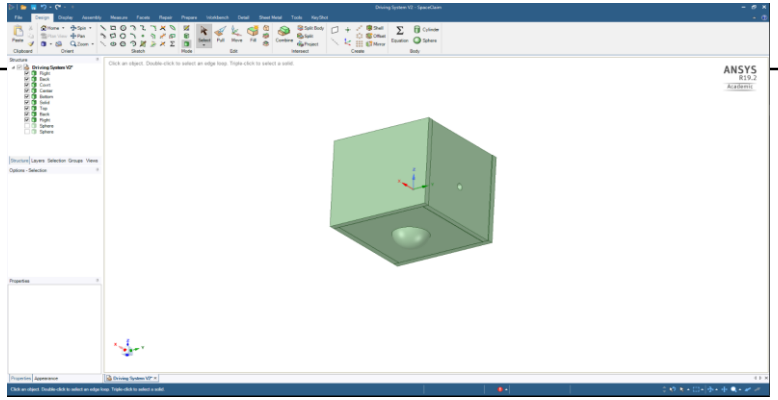
- Enable- The Switch & Speed
- Input- Direction

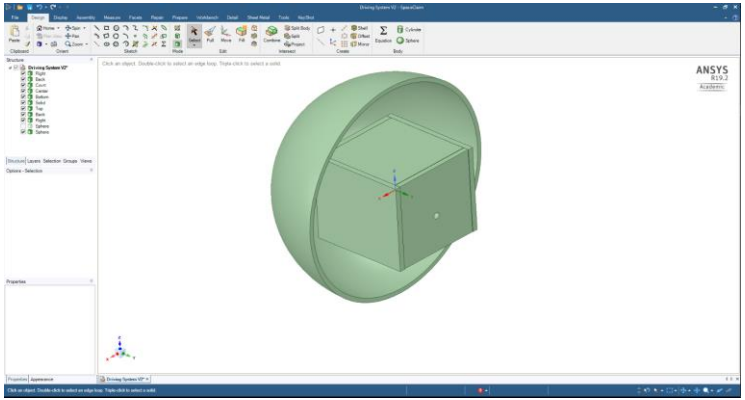


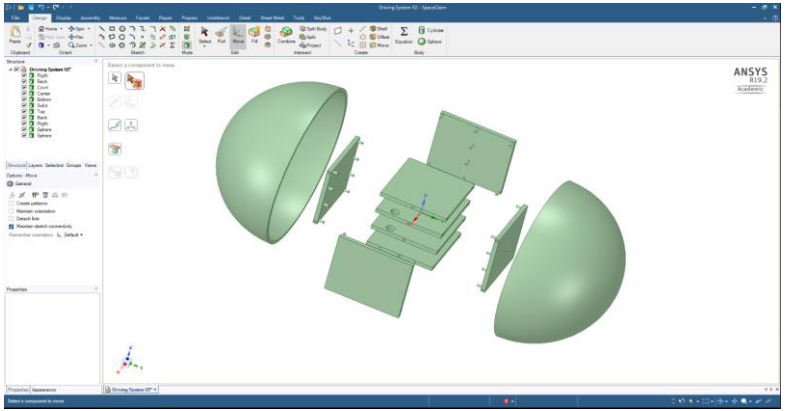
*Corresponding Arduino pin connection

Structural Design

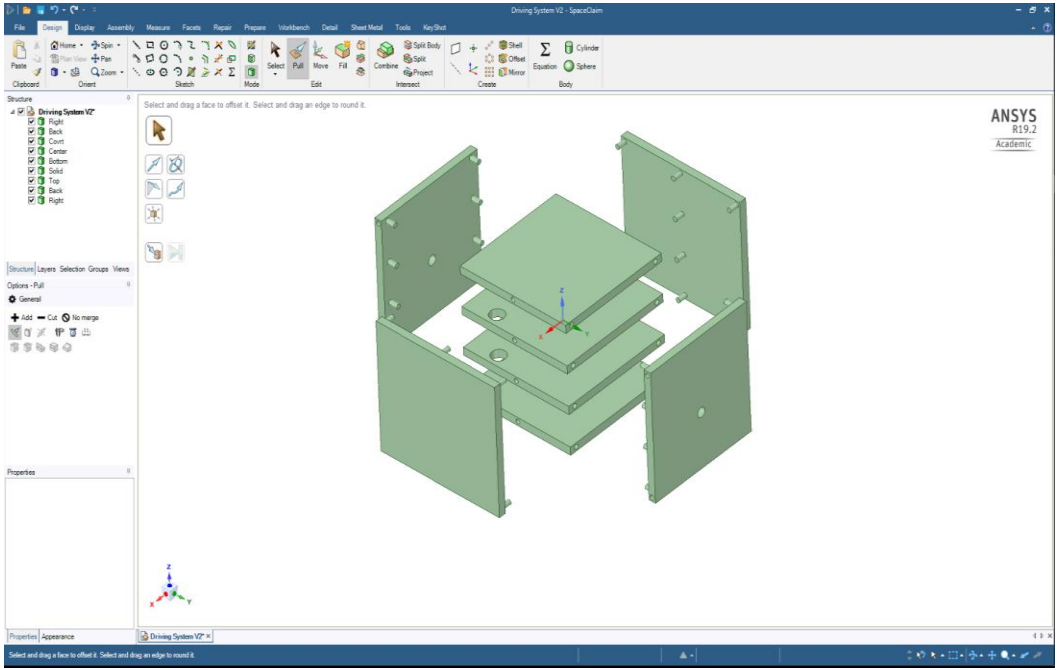
- 3D printing shell, base
- Purchase Rubber wheels
- Leap Motion Controller
- Switch - On/Off the device
- Inner structure is non-rolling





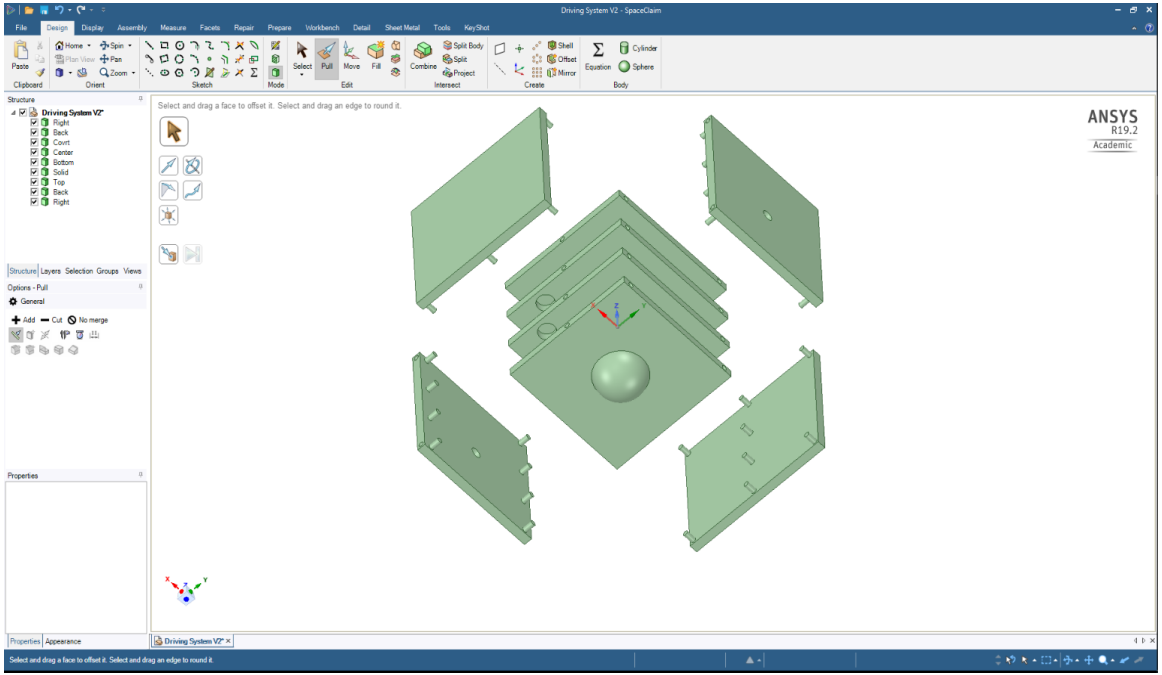


Inner Structure of Gyrosphere (Top View)



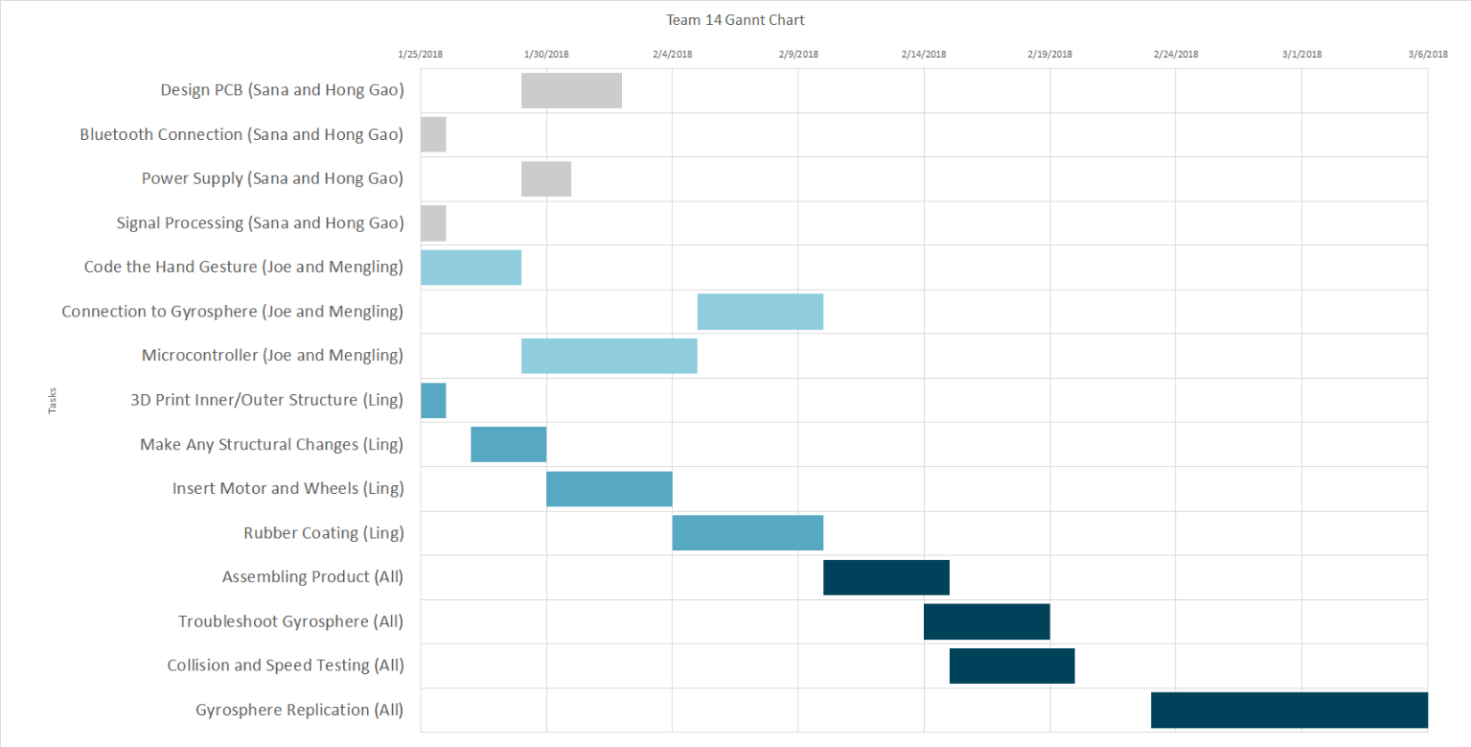
- The whole structure is 4x4x4 cubic inches
- Each plane is 4x4x.25 cubic inches
- There is hole on the top and center level for wire connection
- It will use screw to connect all planes

Inner Structure of Gyrosphere (Bottom View)



- Three level of the structure
- Top level-for control system
- Second level-driving system
- Lowest level-power supplies, center of mass

Team Roles: Gantt Chart



CDR Deliverables

- One fully constructed gyrosphere that would be able to receive and execute simple hand gesture commands via Leap Motion Controller
- Failsafe will be tested and implemented

(Gyrosphere should stop when loses connection)

Demo

Thank you!

Questions?