SumoRoll Team 14

Meng Ling Shi, Xi Kun Zou, HongGao Chen, Linghang Zeng, and Sana Gilani

Team Advisor: Prof. Janaswamy

## Meet the Team



Xi Kun Zou

(CSE)







Linghang Zeng (ME) MengLing Shi (CSE)

Sana Gilani (EE)



## Problem Statement

- Create an interactive experience for our players using gesturing technology
- Gesturing Technology that connects to a physical, mechanical object

## Design Alternative

- Remote Controlled Gyrosphere
- Only two motions
  - Forward
  - Right Turn



## Where can you see gesturing technology?

- RealSense 3D in Laptops
- Video Games that use Kinect for Xbox
- Hand Tracking in VR Technology
- SDP Project 2018-Helping Hand



## **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 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

## Game Strategy

- Gyrospheres will have same masses
- Key to winning: angle and build up speed



## System Specifications

- Speed of Gyrosphere: 1 m/sec
- Material of Gyrosphere: Plastic
  - Rubber coating on the outside of shell
- Final Weight
  - Gyrosphere: 2 lbs
  - Leap Motion Technology: 1lbs
- Overall Size
  - Leap Motion Controller: 3in x 1.2in x 0.5in
  - Gyrosphere (Diameter):5 inches
- Power Supply
  - Gyrosphere: Lithium Ion Batteries (20A, 3.7V)
  - Leap Motion Controller: USB port
- Low Delay
- Range of Gesturing: ~2in above Leap
- Area of Rink: 2.5" diameter ~5ft<sup>2</sup>
- Minimum activity time:30 mins run time

# <u>Block Diagram</u>

Gyrosphere



## Input/Output

Input:

- Hand motion processed by Leap Motion Controller Output:
- Movement of the Gyrosphere

## Structural Design

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



ANSYS R19.2



## Drive System For Gyrosphere

- One motor for each wheel
- Driving Controls



# Motors in the Gyrosphere

#### Requirements

- Lightweight
- High rpm
- DC 12V, 2A ~20000rpm
- Weight: 64g

#### Power Supply

• SAMSUNG 2500mAh 20A Li-ion Battery

 $Running \, Time \, (h) = rac{Battery \, Capacity \, (mAh)}{Operating \, Current \, (mA)}$ 

Expecting 1.25 hours of battery life



## Tx & Rx

Main Components

SERIAL RF transmitter and RF receiver SERIAL WIRELESS DATA DATA DATA HT12E/HT12D Encoder/Decoder Pair RF RECEIVER RF TRANSMITTER ENCODER DECODER -----Requirements: Quick responses Lightweight Transmitter Receiver Send data within 300 ft Antena Antena Vcc Data GND GND Data Vcc

## Leap Motion Controller

- Optical sensors and infrared light to recognize and track hands and fingers
  - Finger characteristics estimated
- The Leap Motion software combines its sensor data with an internal model of the human hand to help cope with challenging tracking conditions.





## UMassAmherst Motion Processing/Programming

## Leap Motion Controller / Developer

- LeapC is a C-style API for accessing tracking data from the Leap Motion service
- Orion SDK package / Orion Software

## System Requirements

- Leap Motion Service version 3+
- Windows 7 SP1+



Leap Motion C API 4.0.0 The API to the LeapC library.

## Budget

- 2x Leap Motion Controller: \$79.99 each
- 4x Motor: \$14.99 each
- 4x Li-ion Battery: \$4.00 each
- 4x Wheels: \$3.00 each
- 2x Rubber Coating: \$10.00 each
- 2x Gyroscope Structure (3D printed): Free
  - Estimate about .75 lb = 340g\*(\$0.15/gram): \$50
- Extra Hardware: \$50
- Total: \$317.94

## Team Roles

Electrical Engineering	Computer Systems Engineering	Mechanical Engineer
<ul><li>HongGao Chen</li><li>Sana Gilani</li></ul>	<ul><li>Xi Kun Zou</li><li>MengLing Shi</li></ul>	Linghang Zeng
<ul> <li>Tx/Rx</li> <li>Signal Processing</li> <li>PCB</li> <li>Power Supply</li> </ul>	<ul> <li>Leap Motion Configuration</li> <li>Hand Gesture Programming</li> </ul>	<ul> <li>3D Printing Gyrosphere</li> <li>Drive System</li> <li>Materials</li> </ul>

## **MDR Deliverables**

- Final Mechanical Structure Designed
- Gyrosphere Moving
  - Complete Transmitter/Receiver PCB
  - Using Microcontroller
- Initial Hand Gesture Programming

# Thank you!

**Questions?**