Capstone Design 1

Presentation 2

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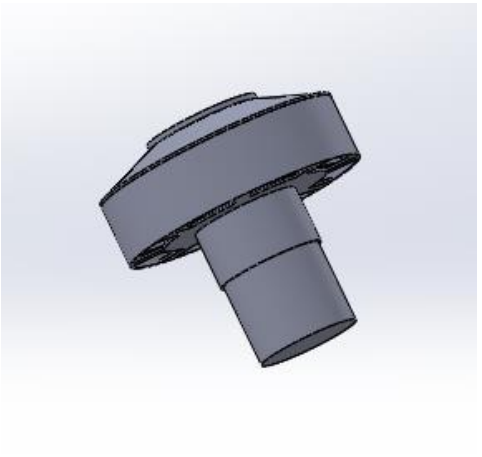
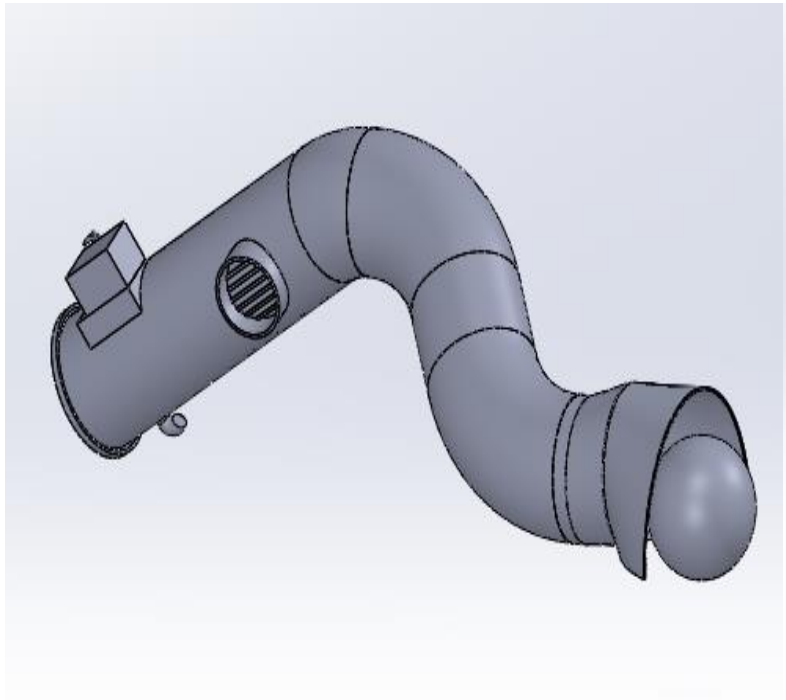
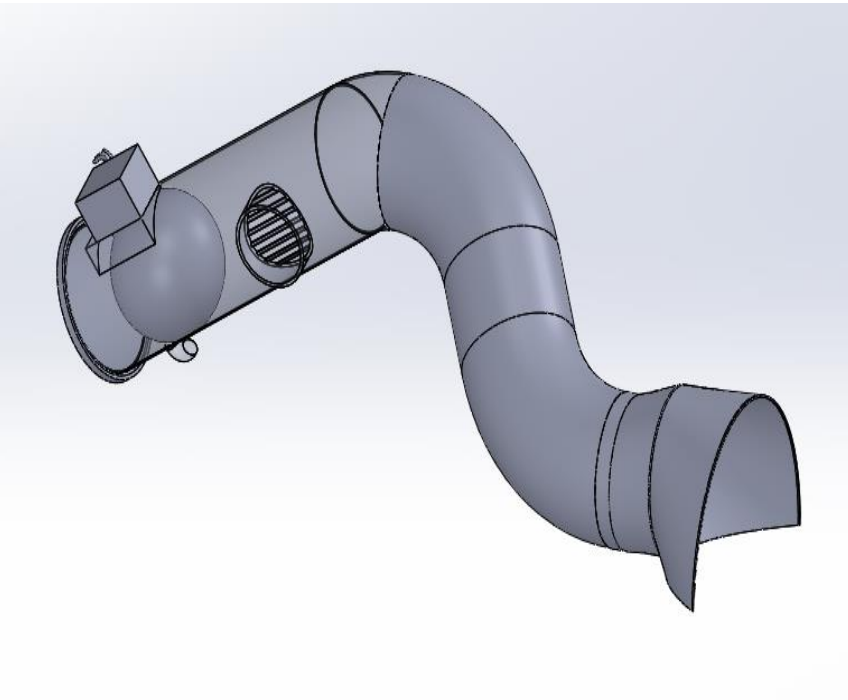
Designing vacuum system - vacuum cleaner

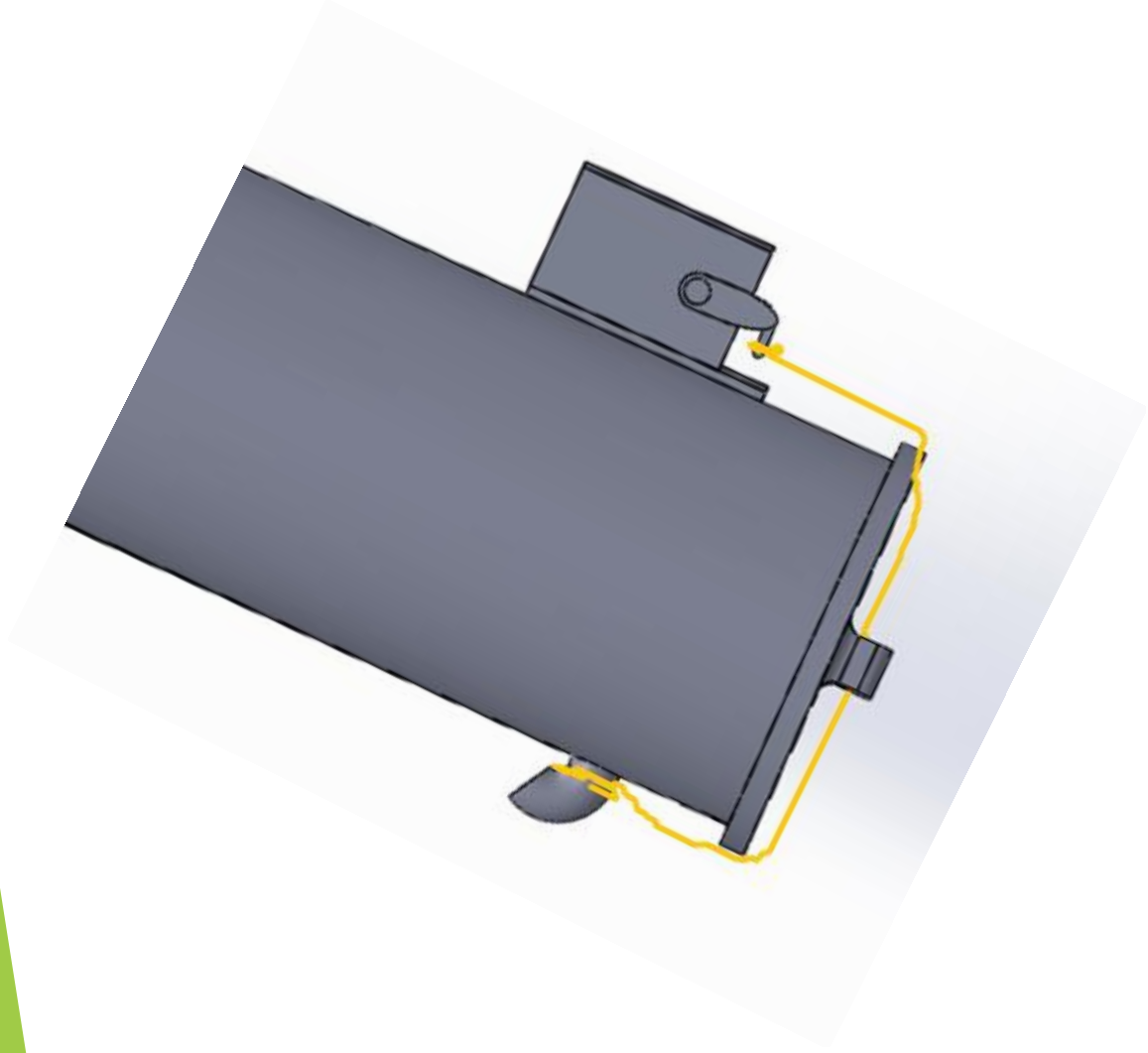


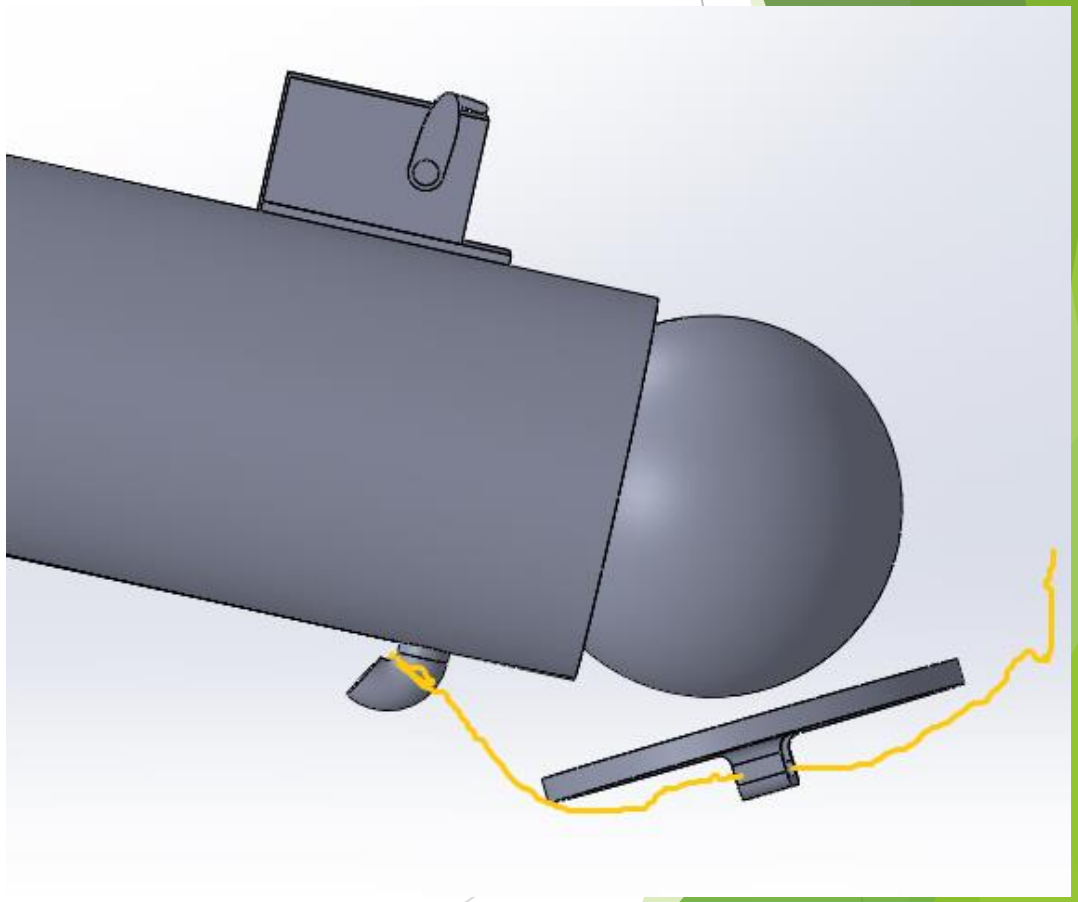
Designing vacuum system - vacuum pipe



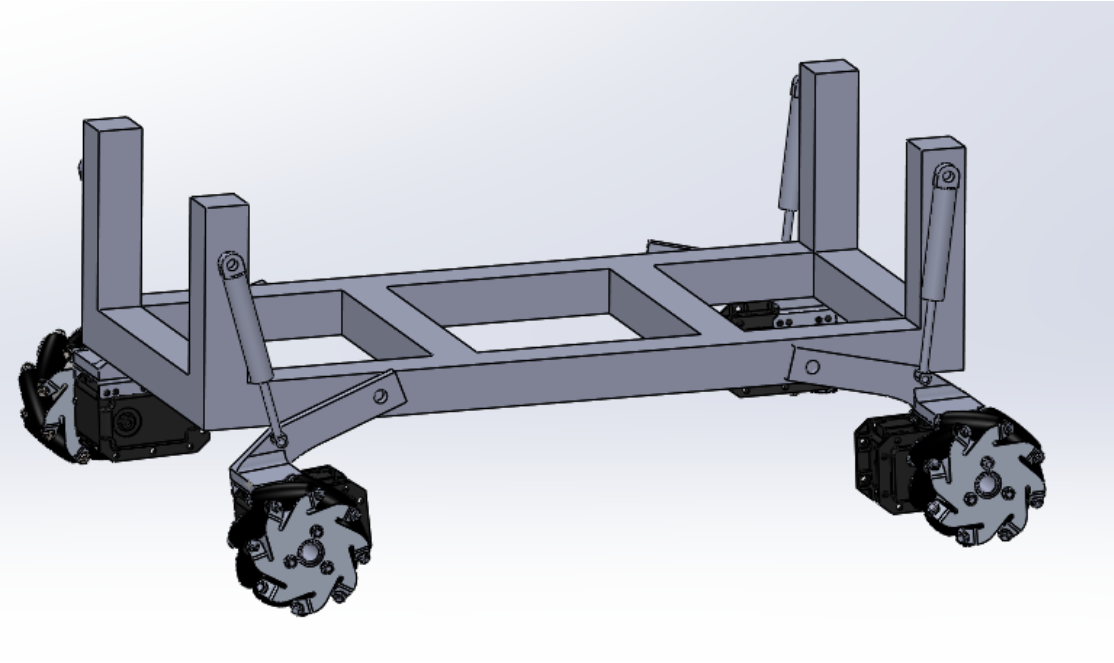


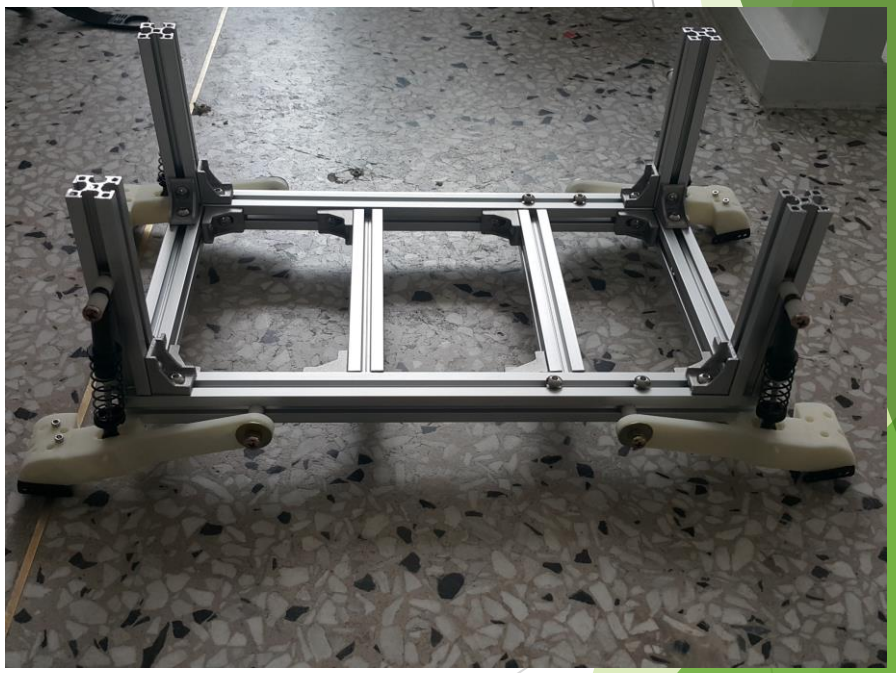
Designing vacuum system - releasing balls



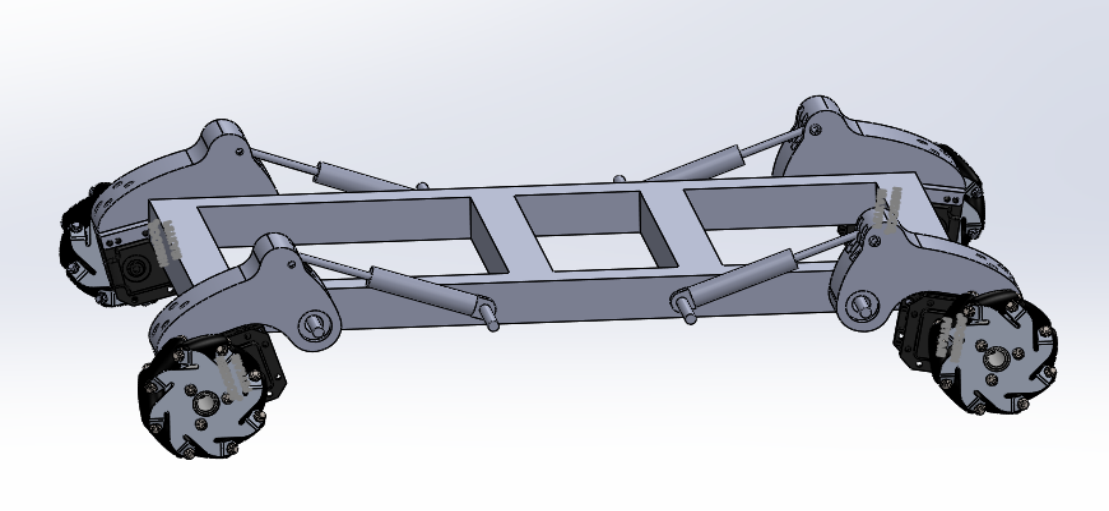


Designing suspension system - first design





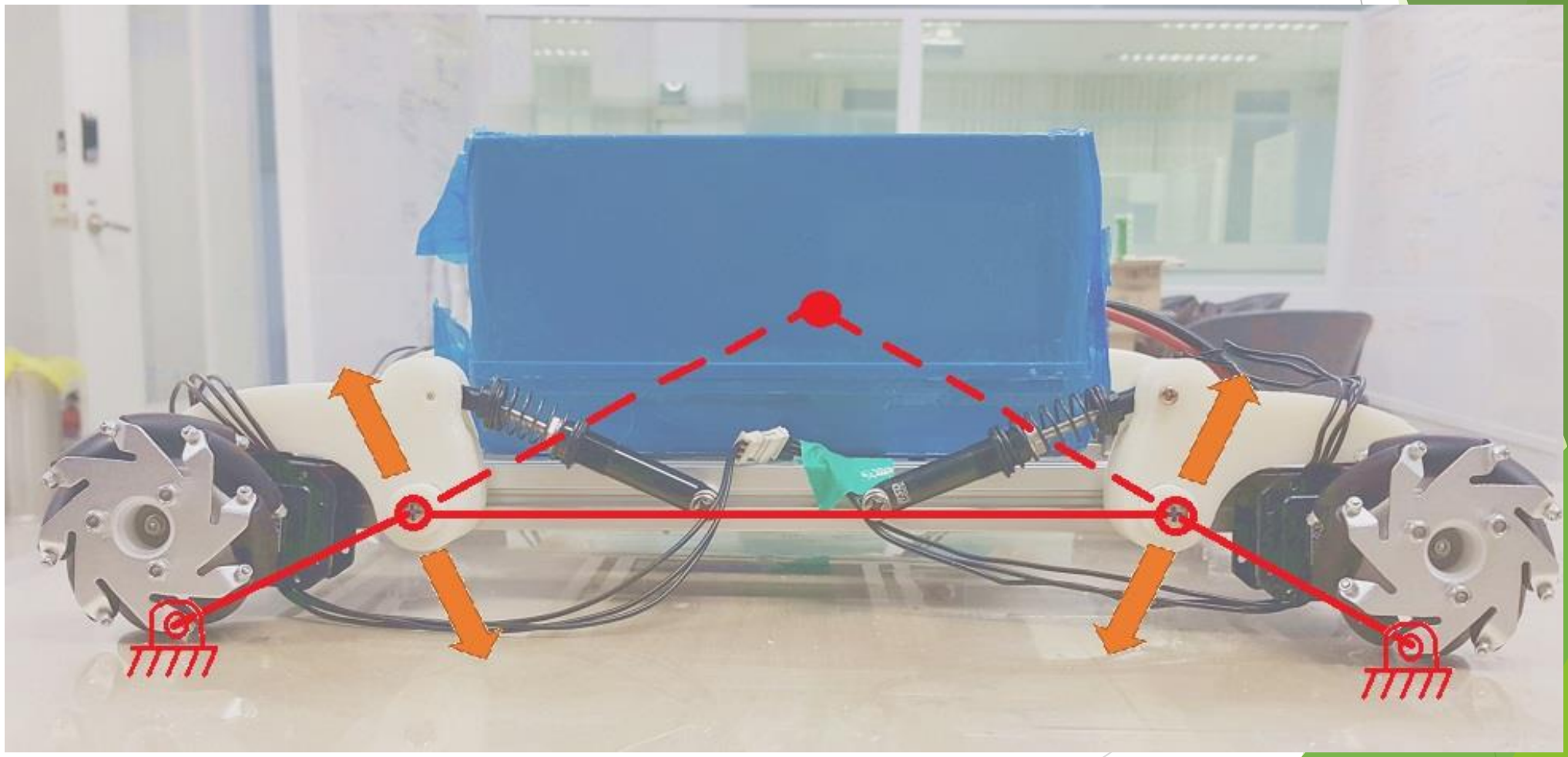
Designing suspension system - second design



Designing suspension system - 1:8 scale

- We assumed about 3 kg for the whole robot
- The weight of a car is about 1500kg
  - 1:8 scale suspension will support about 1500/(8^3)≈3 kg

Designing suspension system
- Preventing the pitching motion



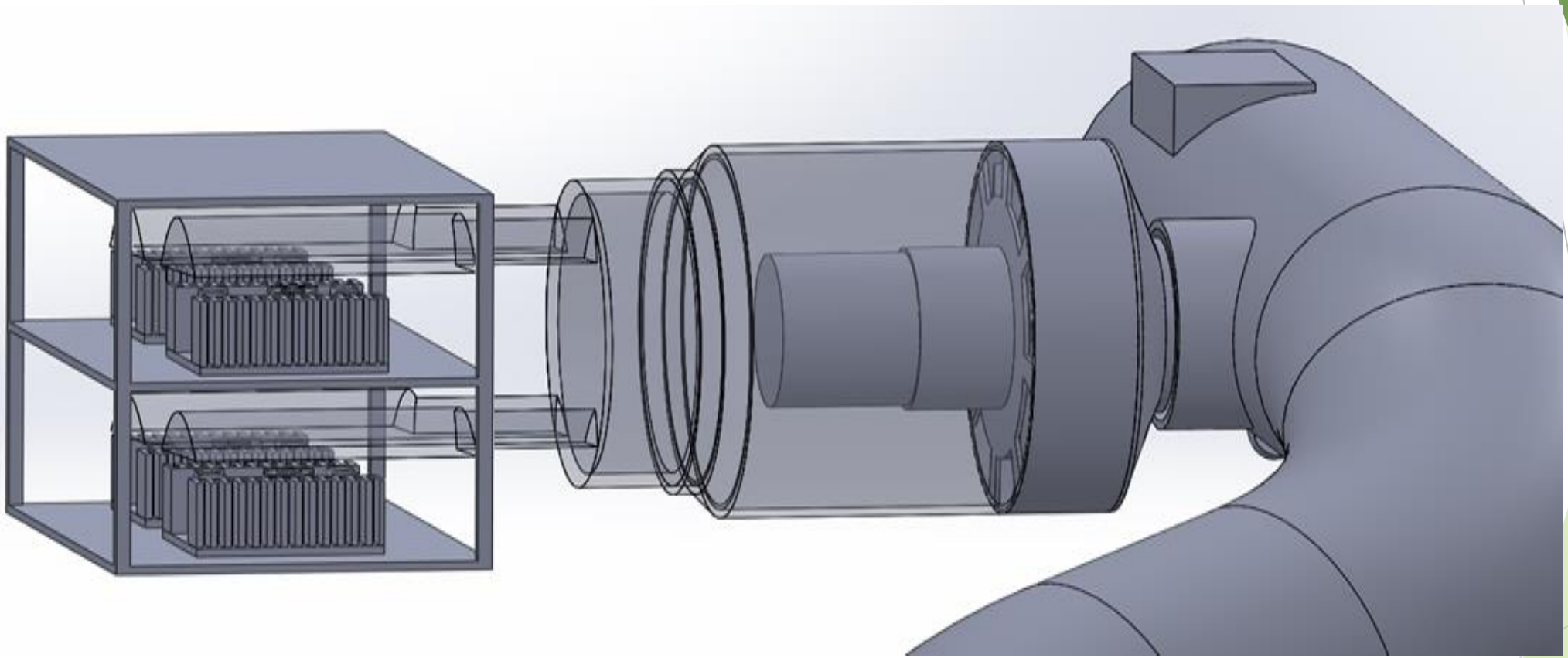
Designing suspension system - Experiment

- Vibration reduction experiment video

Camera video with No suspension

Camera video with suspension

Designing the cooling system



OpenCV PART

OpenCV

- Main Problems and Potential Solutions
  - Problem : Overlapping detection of the balls
  - Possible reasons :
  - Thresholding
  - Edge detector
  - False detection due to variety of light intensity

Solutions

- Change the order of the main algorithm and move thresholding to later stages (Thresholding)
- Enhance the Accuracy by changing the boundary values

- # Work in Progress

Editing the code in order to address the multiple detection problem in ROS

Increase the correspondence between the contour and the ball

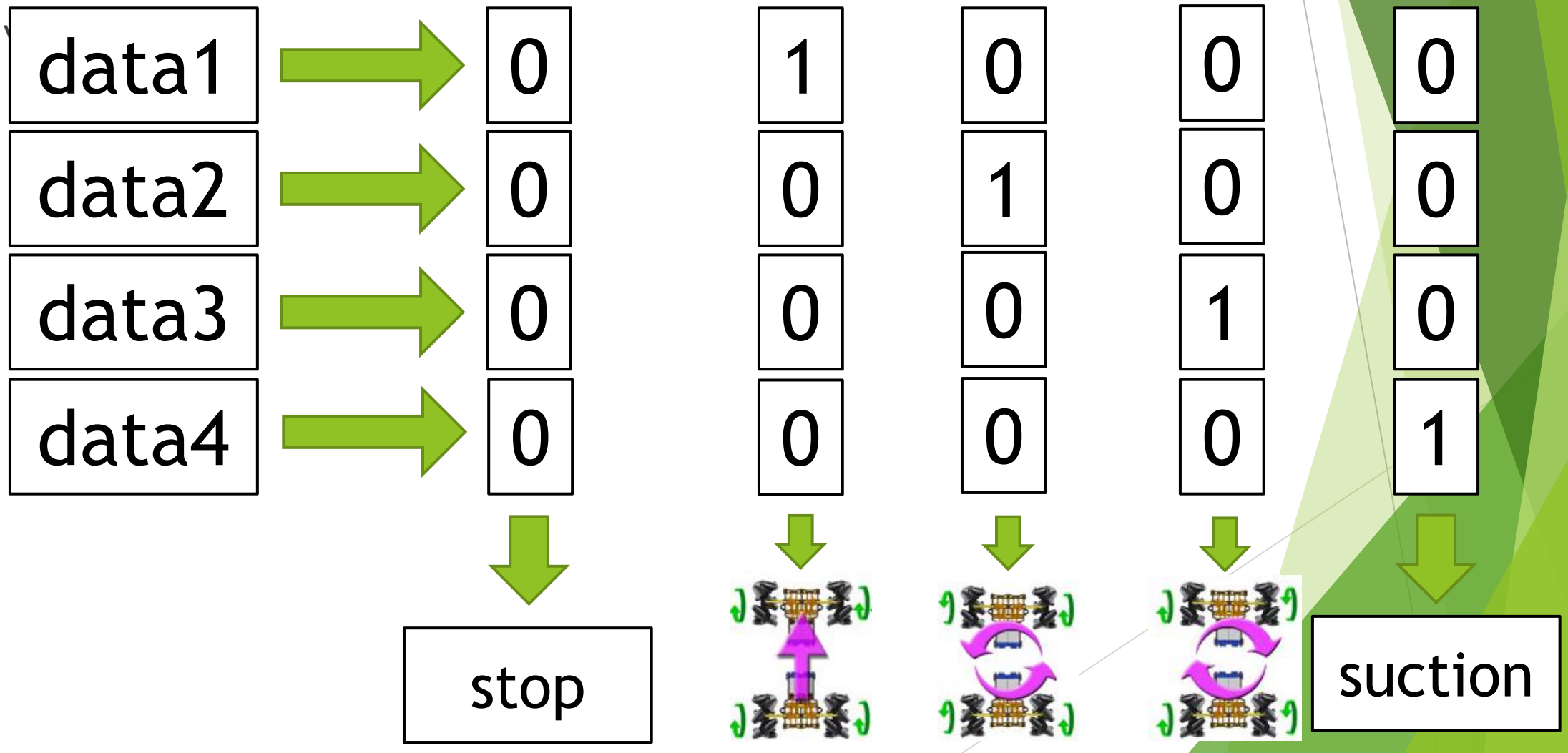
LabVIEW PART

1.LabVIEW part

- Apply Real time Application
  - Runs automatically when power is on
- Set byte size
  - 4 float data -> 16 byte
- Select moving motions
  - 4 motion – forward, CW rotation, CCW rotation, suction

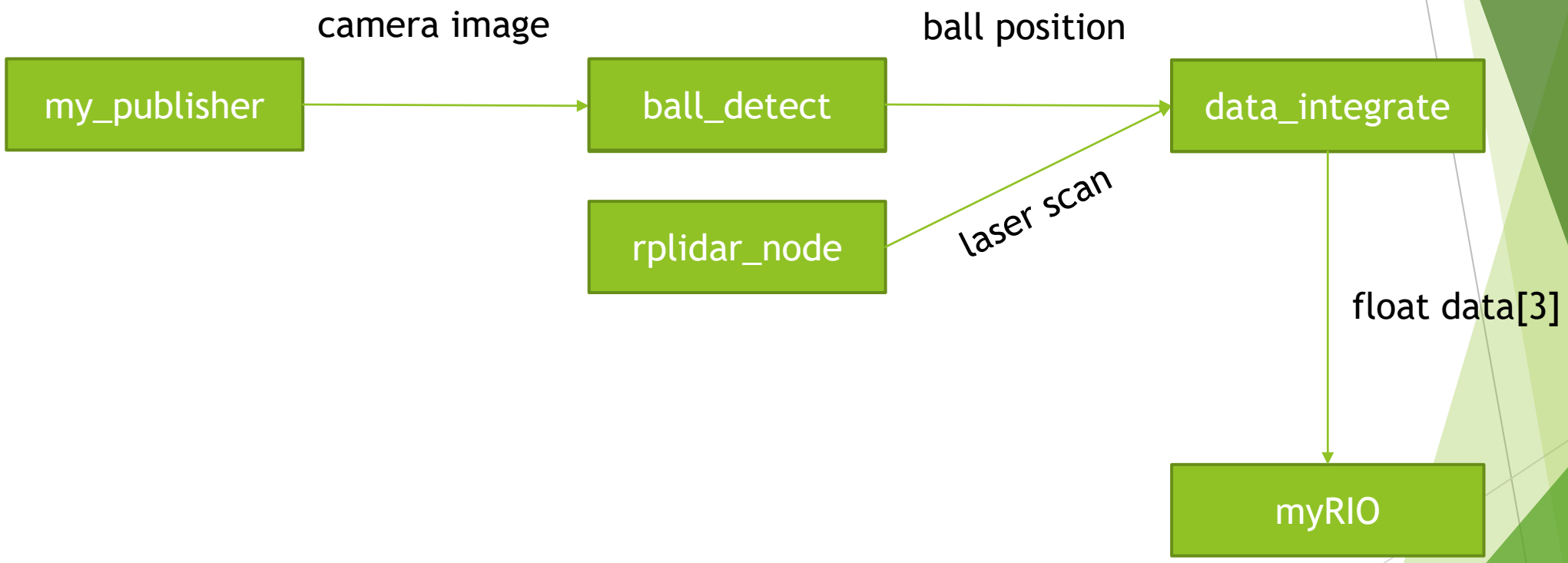
2. LabVIEW part

- Float Data[4]



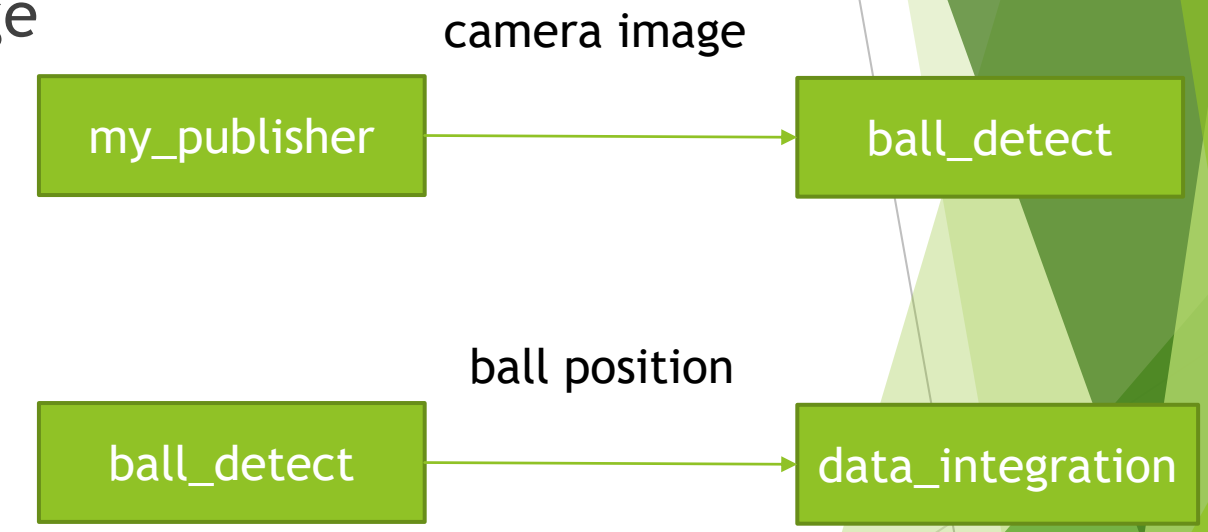
ROS PART

0. Overview of algorithm



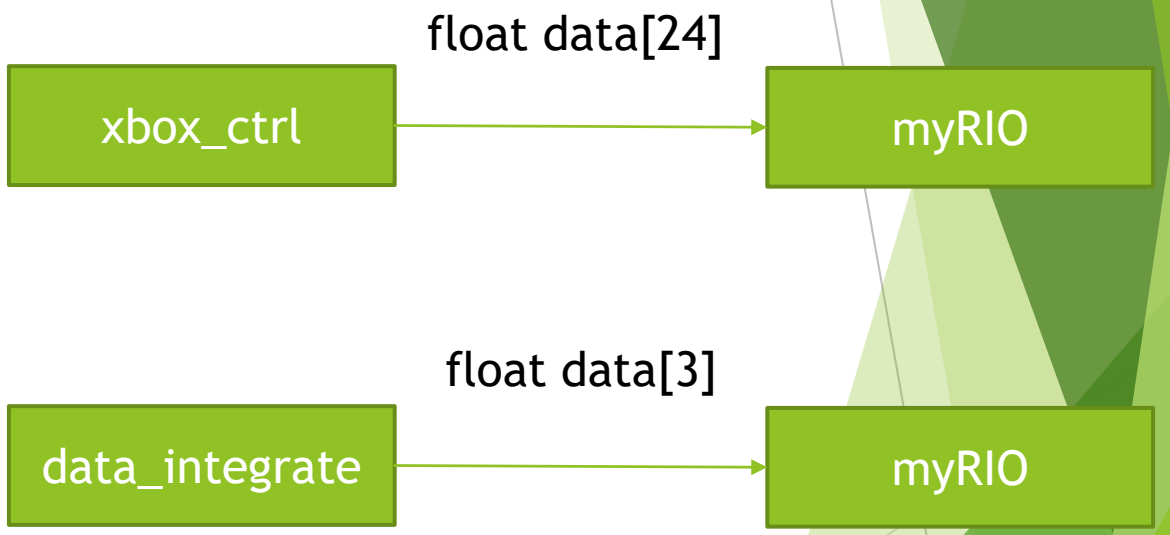
1. Integration with OpenCV part

- Integration of ball_detect_node.cpp in ROS and main.cpp in OpenCV
- Process for sending camera image
  - Publisher: my_publisher
  - Message: camera image
  - Subscriber: ball_detect
- Process for sending ball position
  - Publisher: ball_detect
  - Message: ball position
  - Subscriber: data_integrate

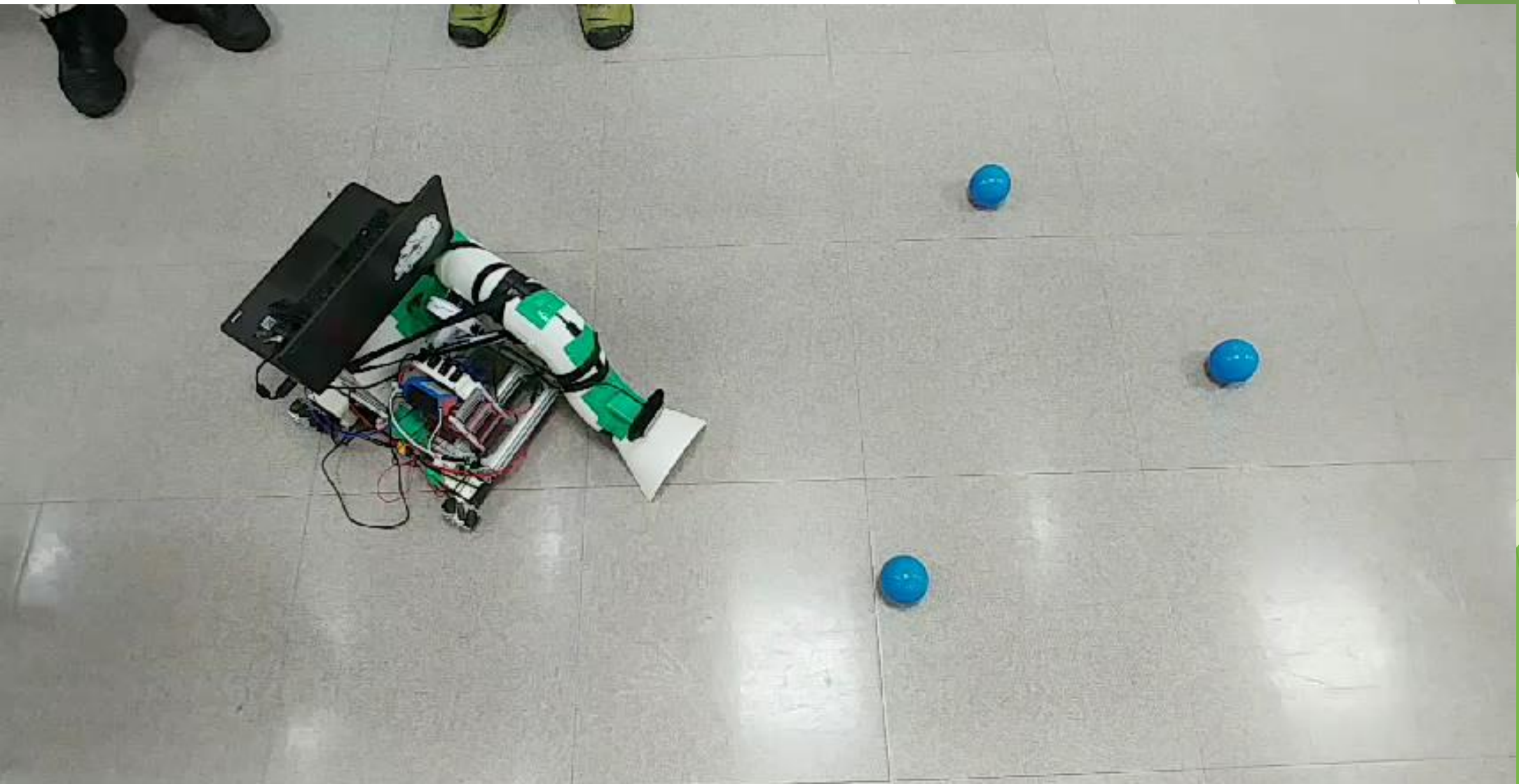


2. Integration with LabVIEW part

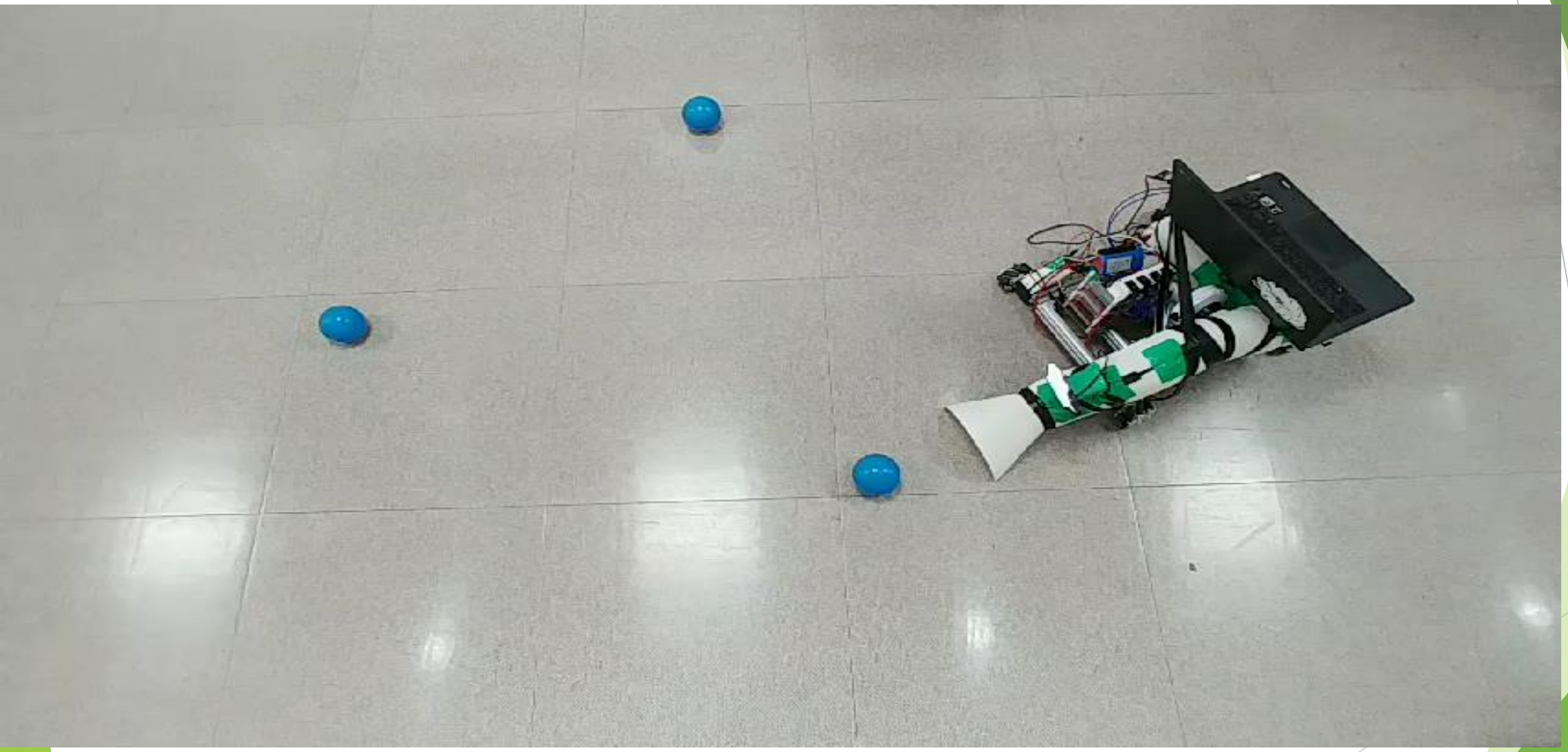
- TCP/IP socket communication
- With a xbox-controller,
  - Client socket: xbox_ctrl
  - Message “float data[24]”
  - Server socket: myRIO
- Without a xbox-controller,
  - Client socket: data_integrate
  - Message “float data[3]”
  - Server socket: myRIO



4.Suction with Xbox



Final Video, Suction with ROS



5. Future Work

- Make the cooling system and balls releasing system
- Servo motor control
  - Storage Control
  - Use myRIO
- Suction motor control
  - On and off
  - Use motor drive
- Path planning
  - Algorithm to move our robot when no ball is detected.