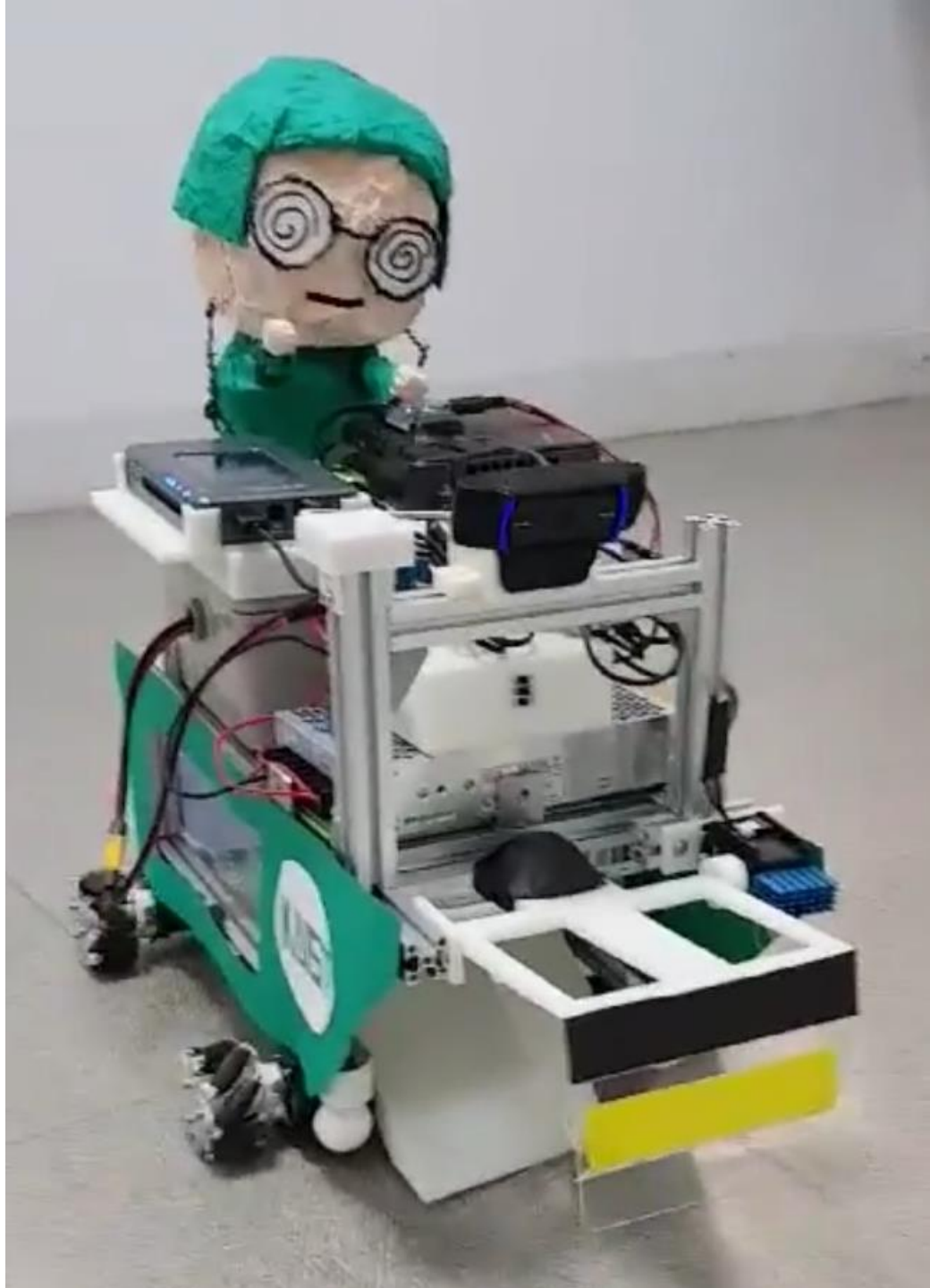
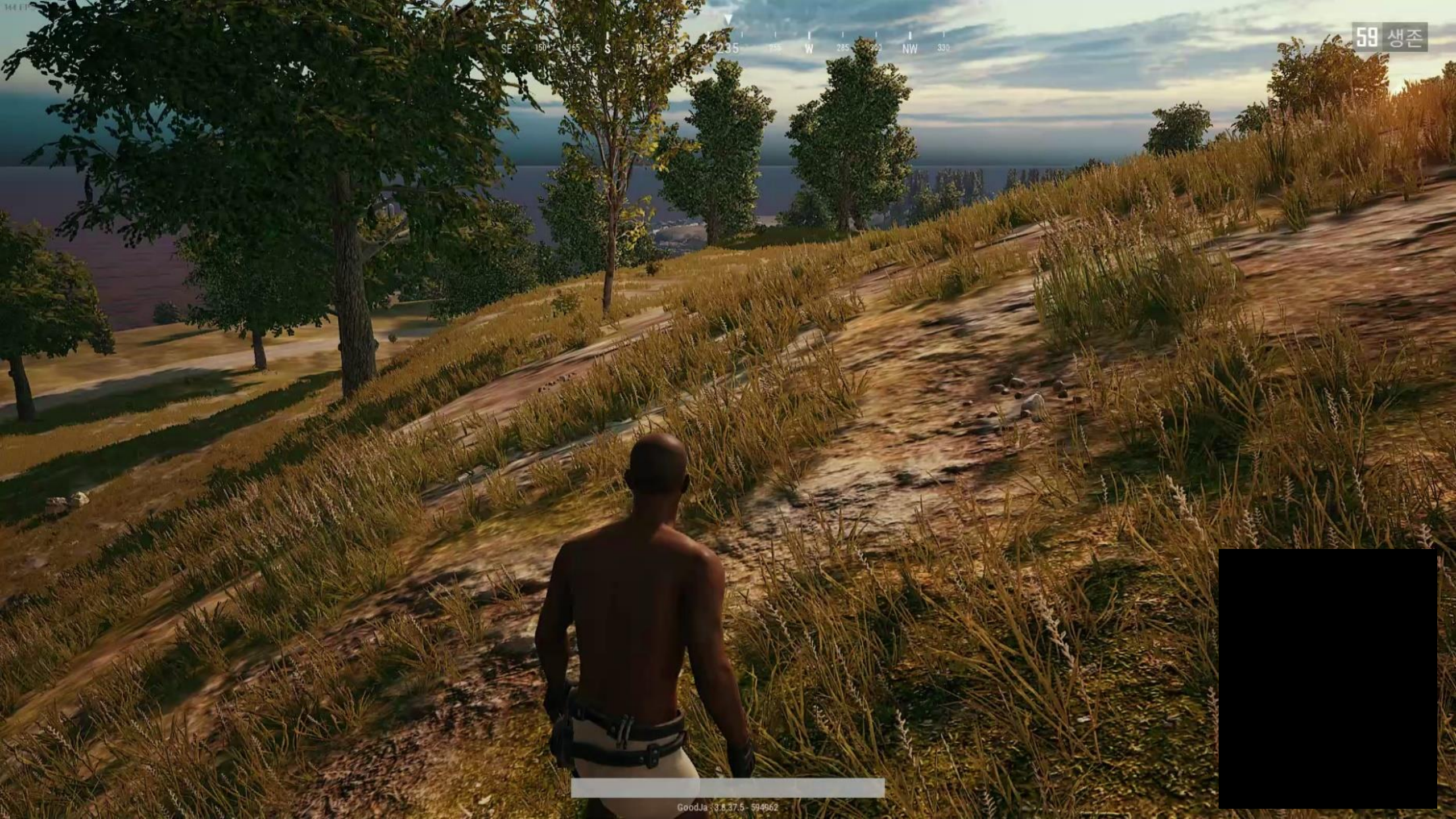
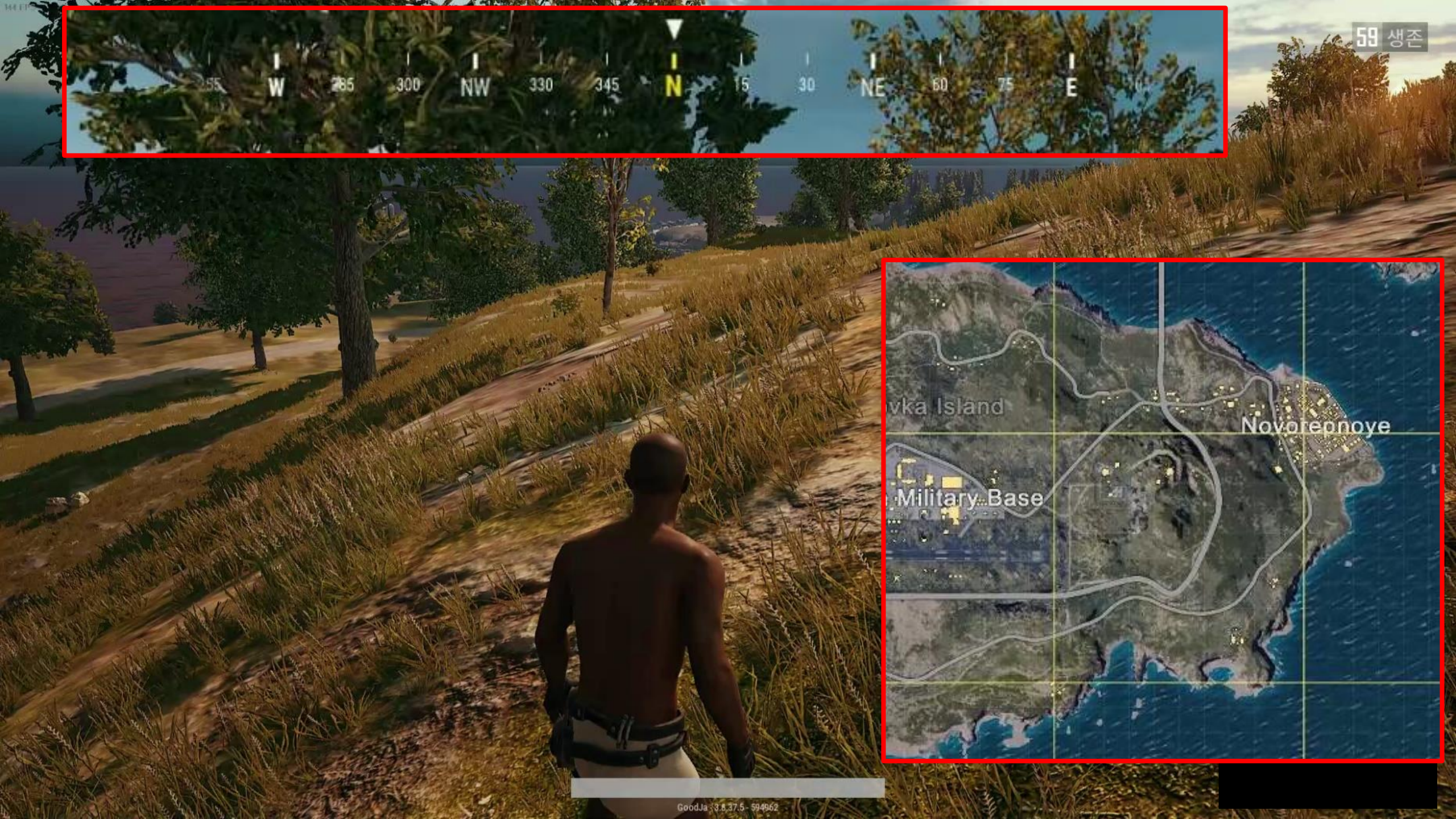
3rd Design Review

Capstone7 / 배달의민족




SE
S
W
NW
235
59 생존
GoodJa : 3.8.37.5 - 594962

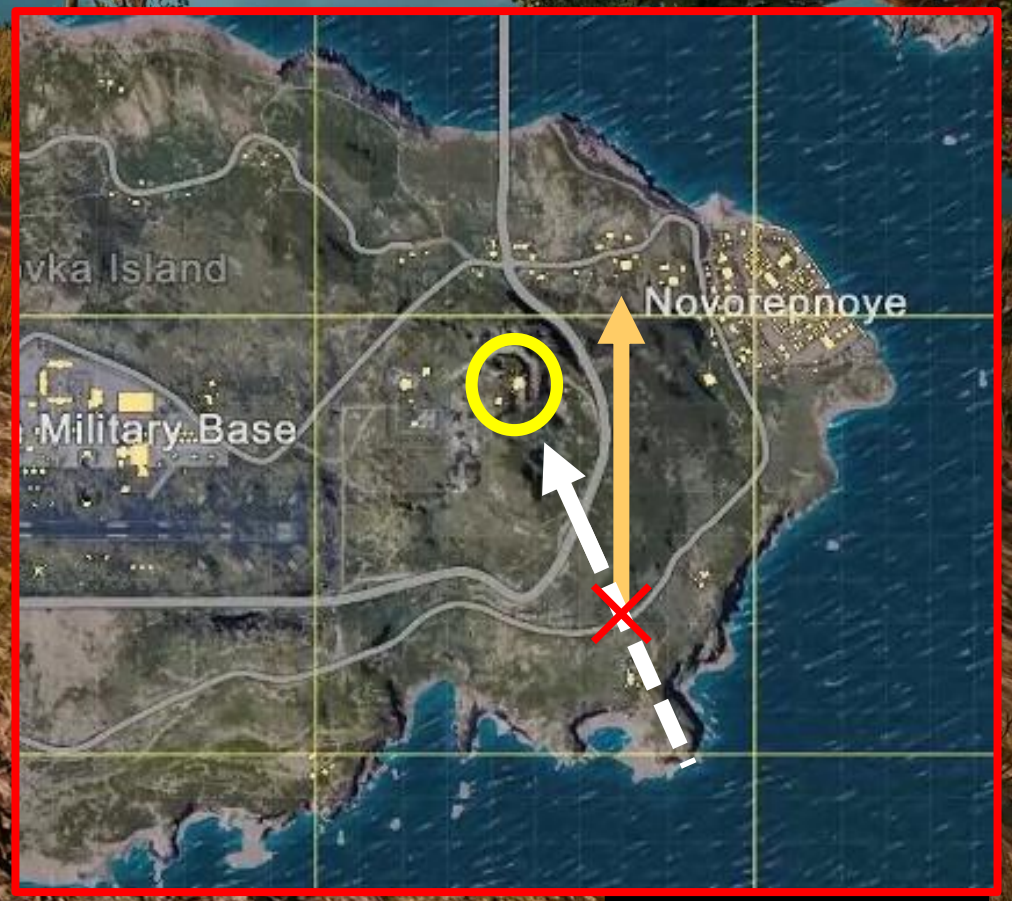

255
W
285
300
NW
330
345
N
15
30
NE
60
75
E
59 생존
vka Island
Novorepnoye
Military Base
GoodJa : 3.8.37.5 - 594962


144 FPS
NW
335
NE
59 생존
Novorepnoye
Military Base
GoodJa - 3.8.37.5 - 594962

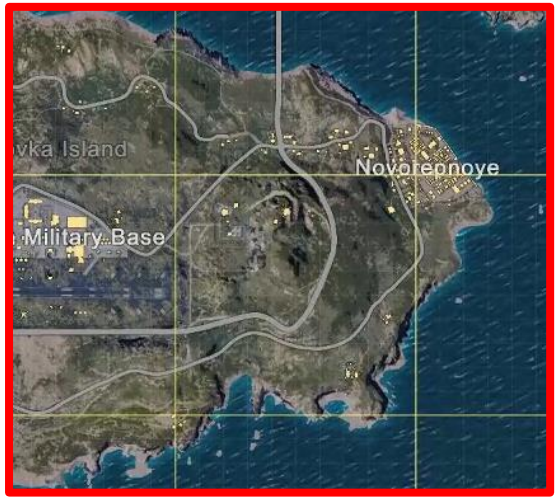

W
285
300
NW
330
345
N
15
30
NE
60
75
E
Military Base
Novorepnoye

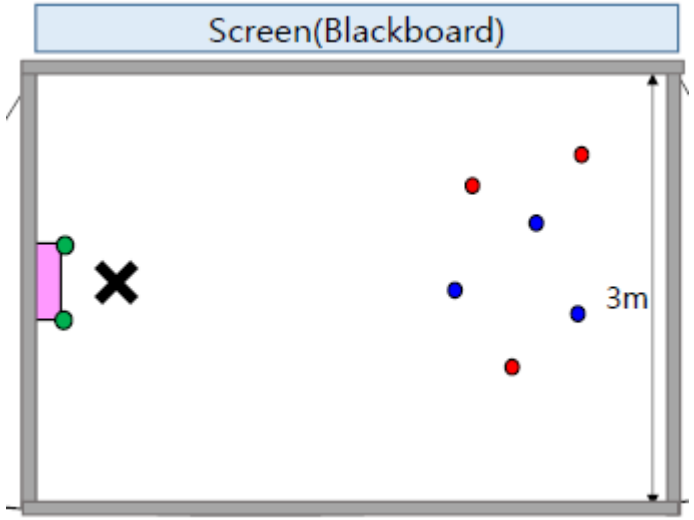

W
285
300
NW
330
345
N
15
30
NE
60
75
E


Novor

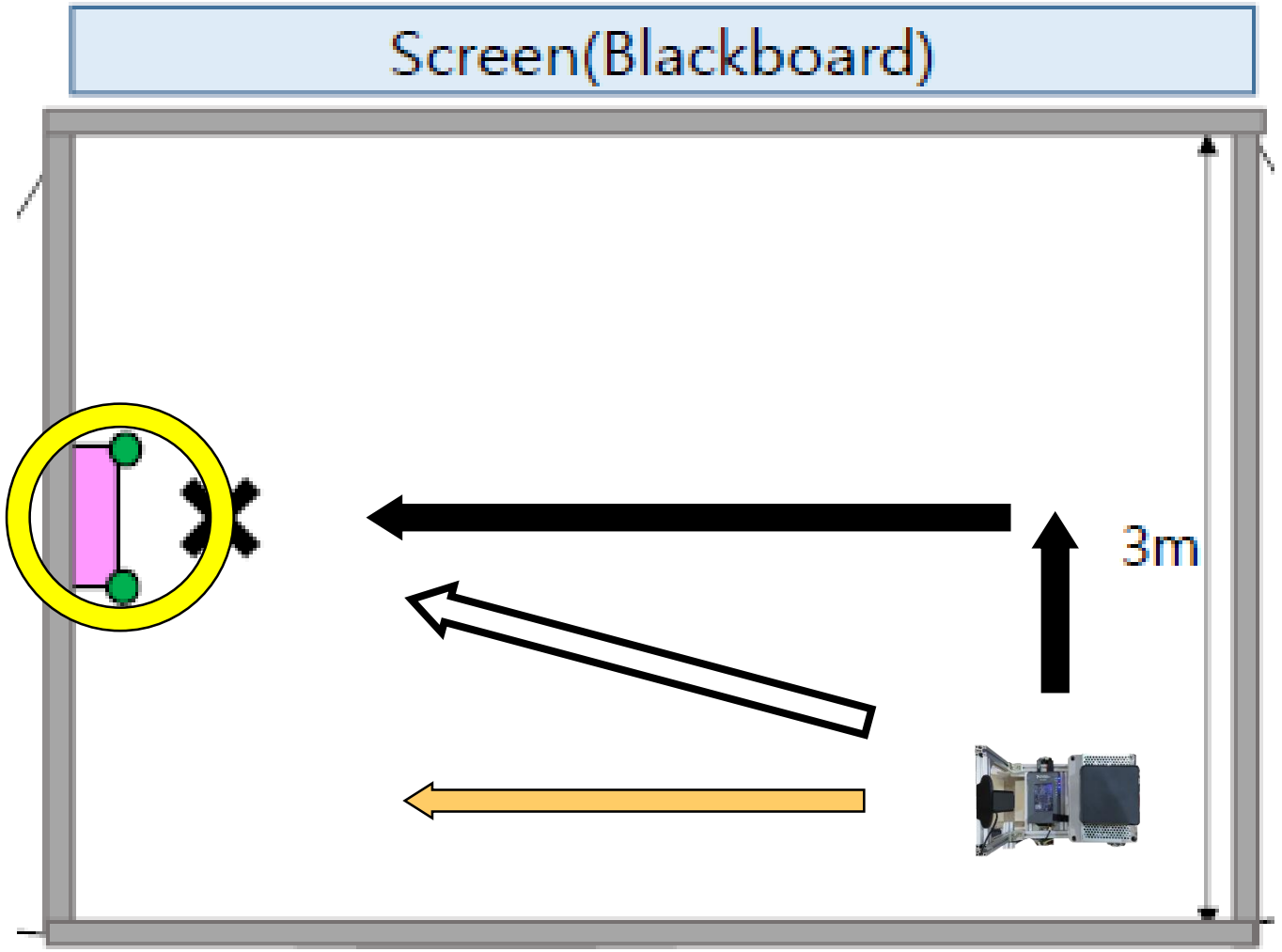

Novorepnoye
Military Base

Our Key Strategy





Our Key Strategy

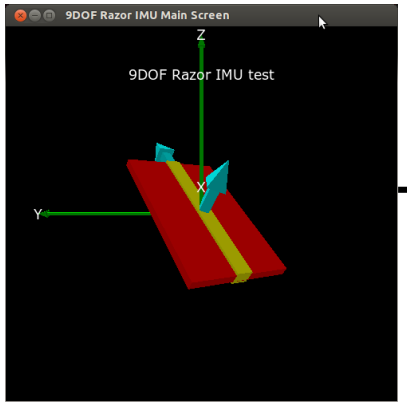


ROS – IMU implementation

/ttyACM0

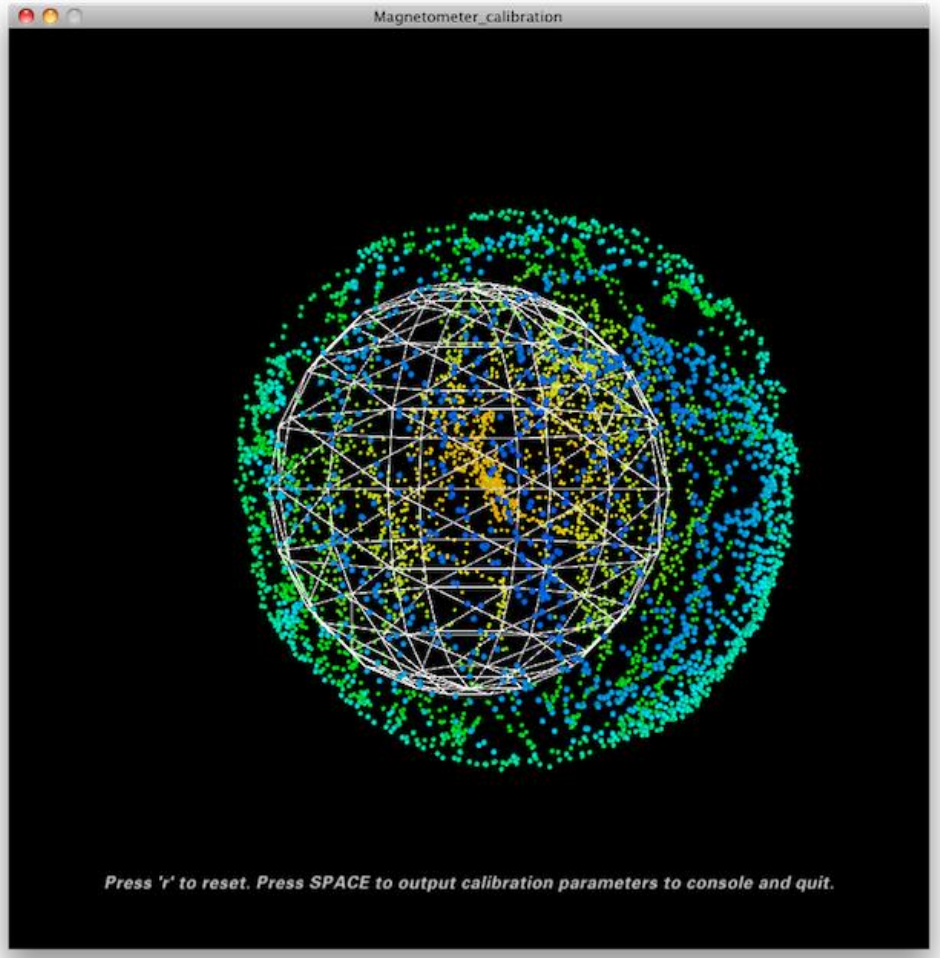
115200 Baud rate

ROS-serial-package



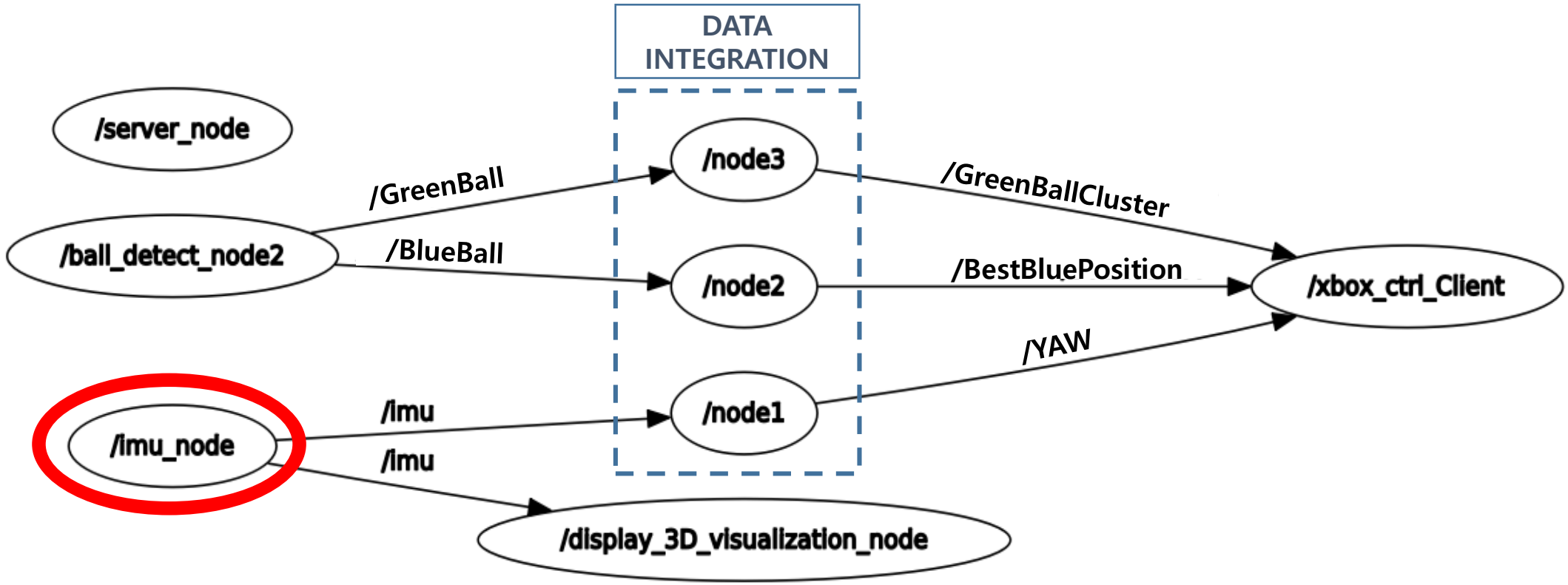
Quaternion

Elliptic calibration



/Imu_node

ROS – Integration



OpenCV Progress

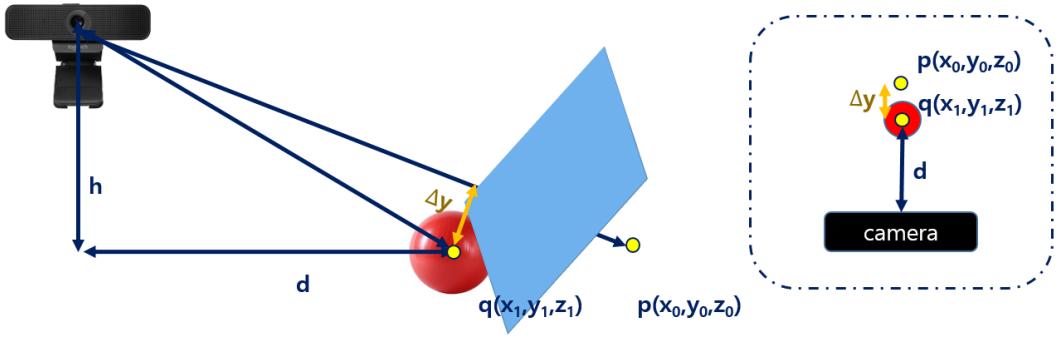
Green Ball

-ball tracking for green ball in order to return blue balls to the basket

Radius to Δy

-Use center of ball, rather than radius of ball to calculate distance

-Because center information is more stable



OpenCV Progress

Data Selection

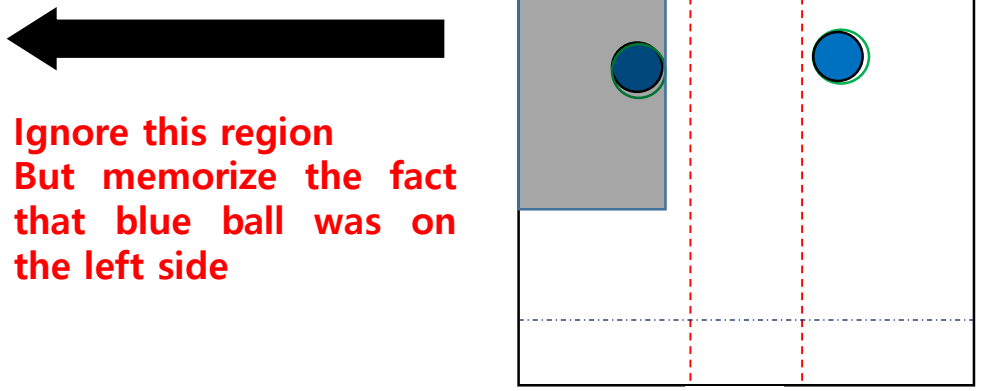
-If the balls is at similar distance the vehicle sometimes hesitate

-We forced it to select right most one.

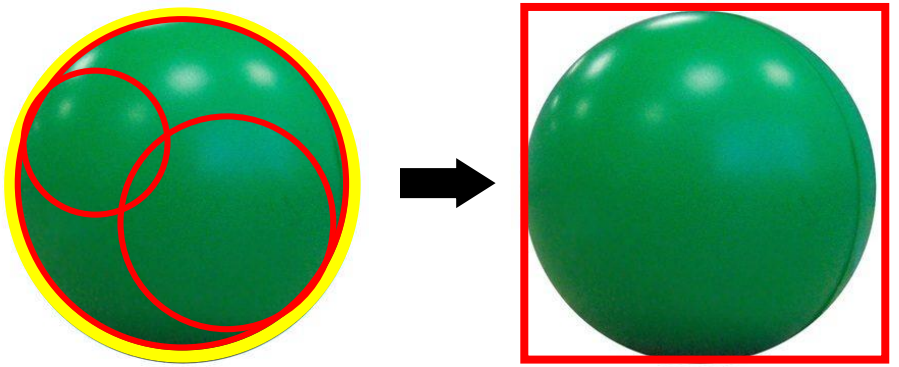
Data Integration

- Confine the noisy detection
- Extract essential information (x, y, r, existence …)

Webcam view



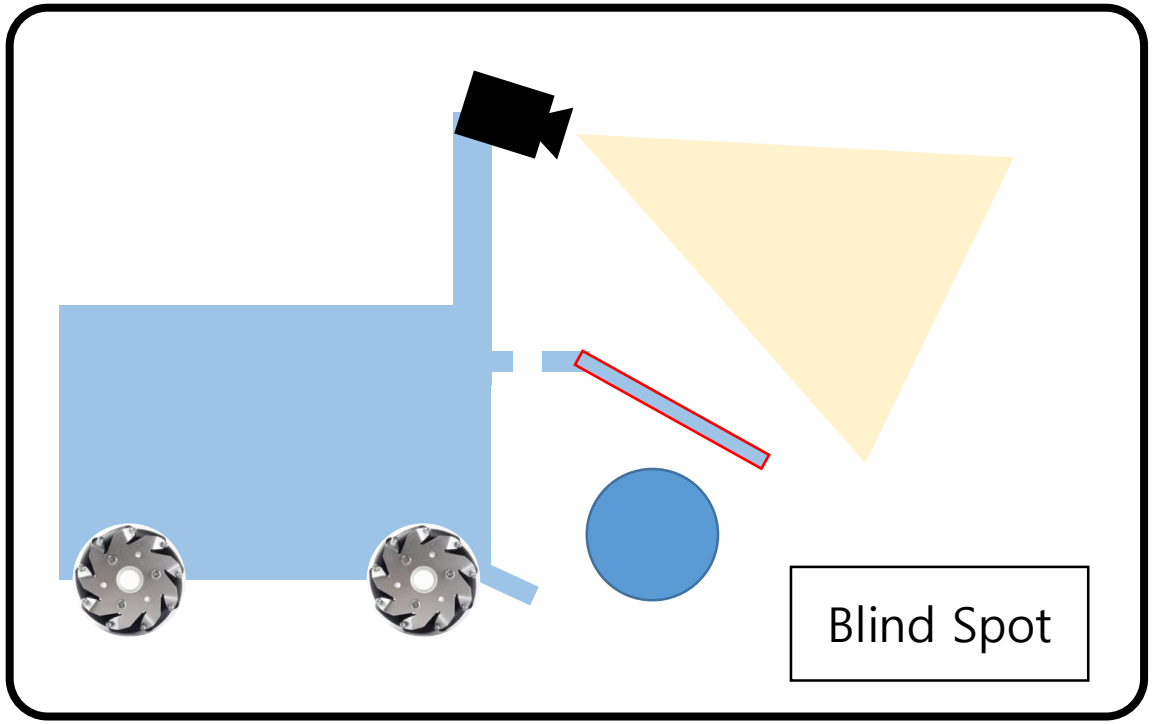
Ignore this region
But memorize the fact that blue ball was on the left side

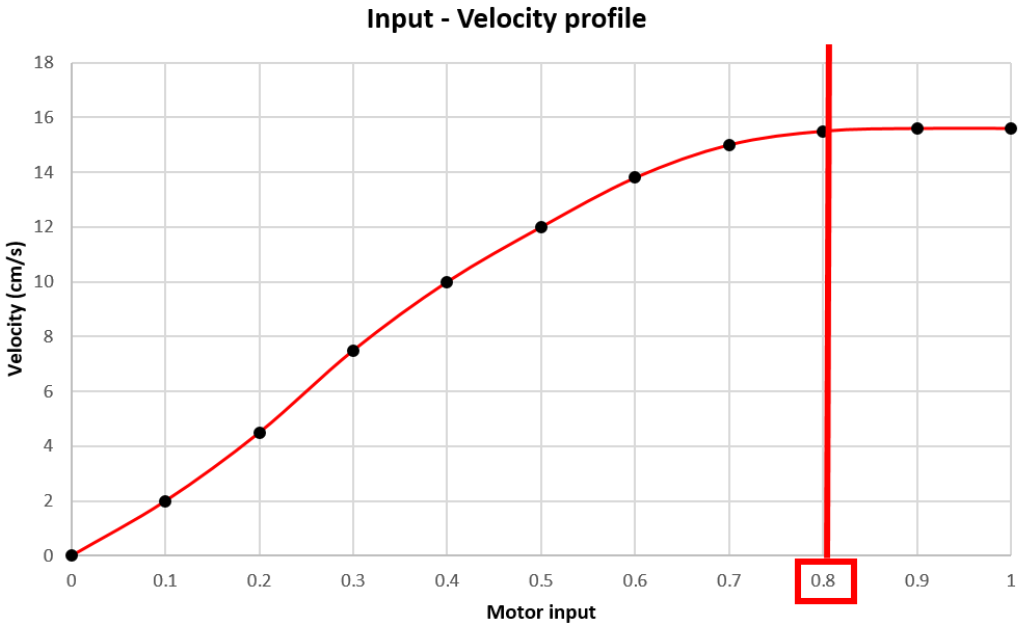


LabView Progress

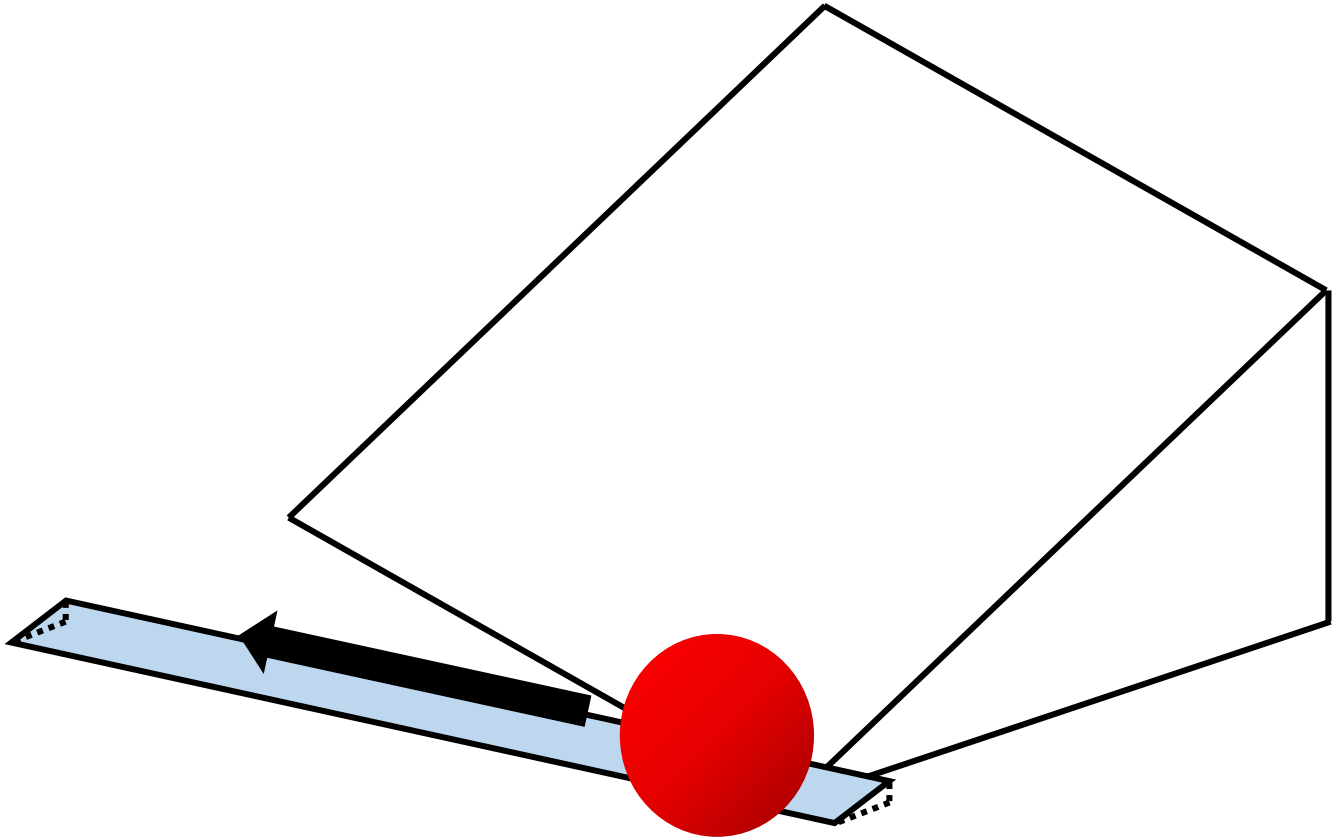
Input and motor integration

- Sweeping the ball at blind spot, the motor would be integrated with appropriate input.



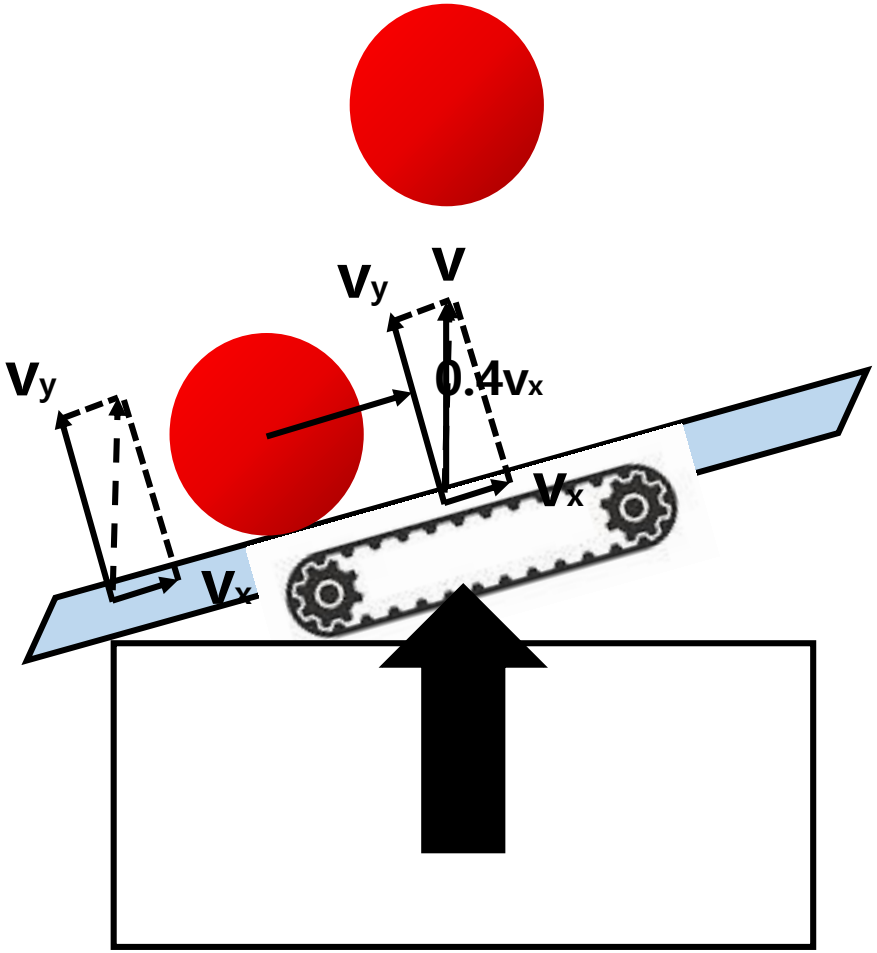


Ramp Design – Push Out The Red

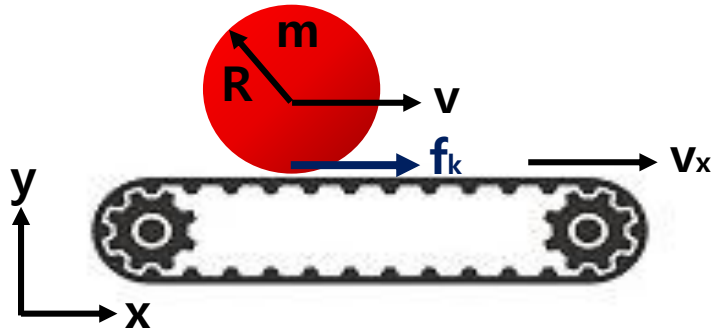


Ramp Design – Push Out The Red

<System Modelling>



Physical Analysis



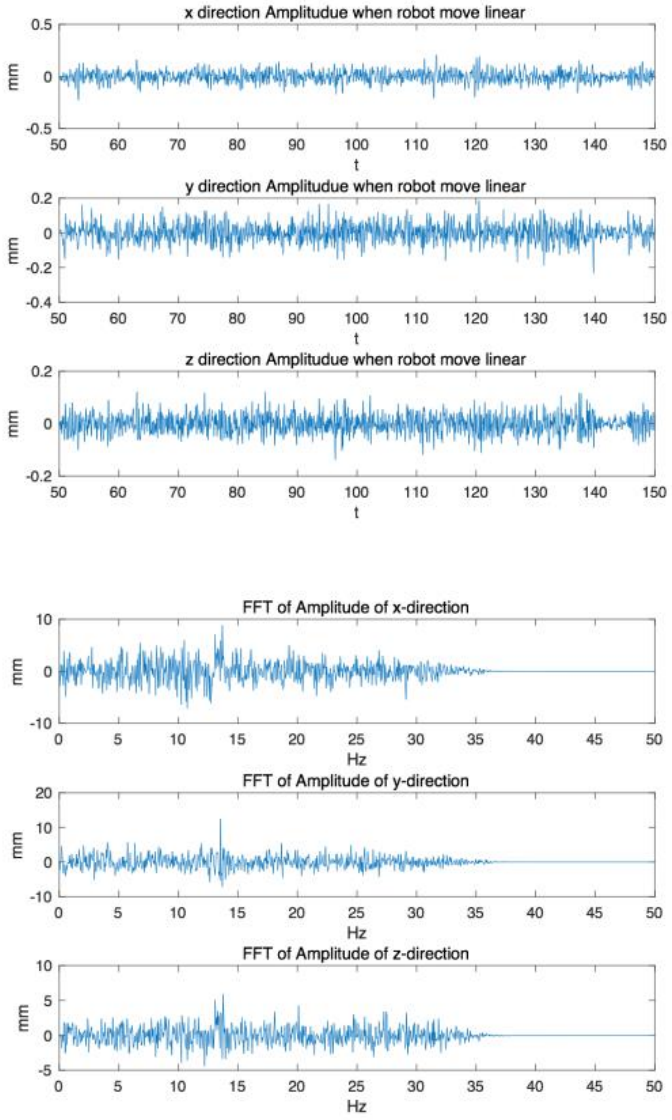
$$t_{no-slip} = \frac{v_x}{\left(\frac{1}{m} + \frac{1}{I/R^2}\right) f_k}$$

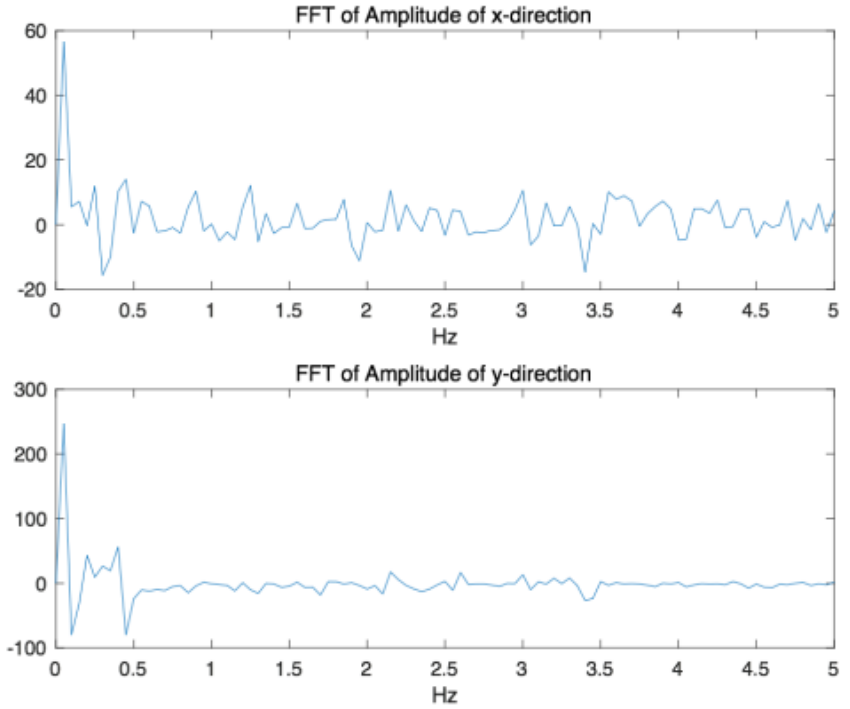
$$v = \frac{f_k}{m} t = \frac{v_x}{1 + \frac{1}{I/mR^2}}$$

$$\therefore v = 0.4v_x$$

Ramp Design – Field Test

Vibration





No Big Vibration unless there are abrupt movement

For the case, filter by software / gives some spare

Temperature Control

Battery (20.9V)

Efficiency x %

Converter

Heat

Mechanical Energy (Main motor) 60W

Electrical Energy 50W

Intel Nuc : 25W

NI myRIO : 14W

RPLidar, DFR0315 : 4W

Logitech HD pro webcam :3W

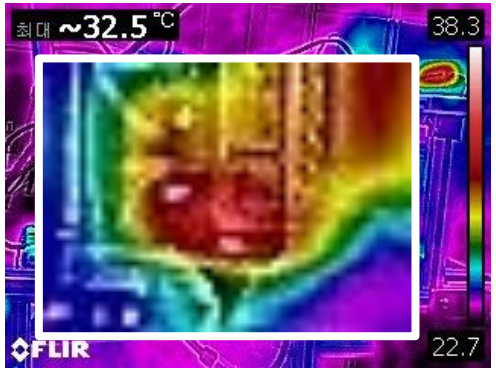
Heat

1. Heat Concentration
2. Safety
3. Durability

Temperature Control

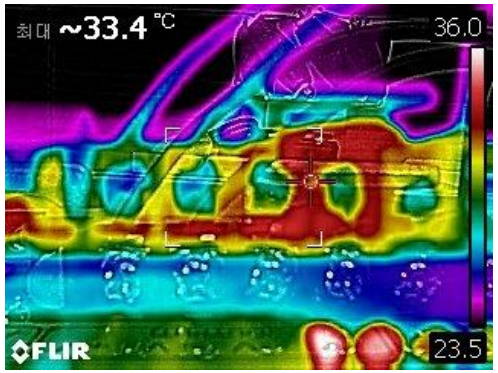
Without fins

Front view



Put Fins on Major Heat source

With fins



No Major Difference

Other solutions

Temperature Control

#Fans might increase heat convection coefficient but not suitable to our system.

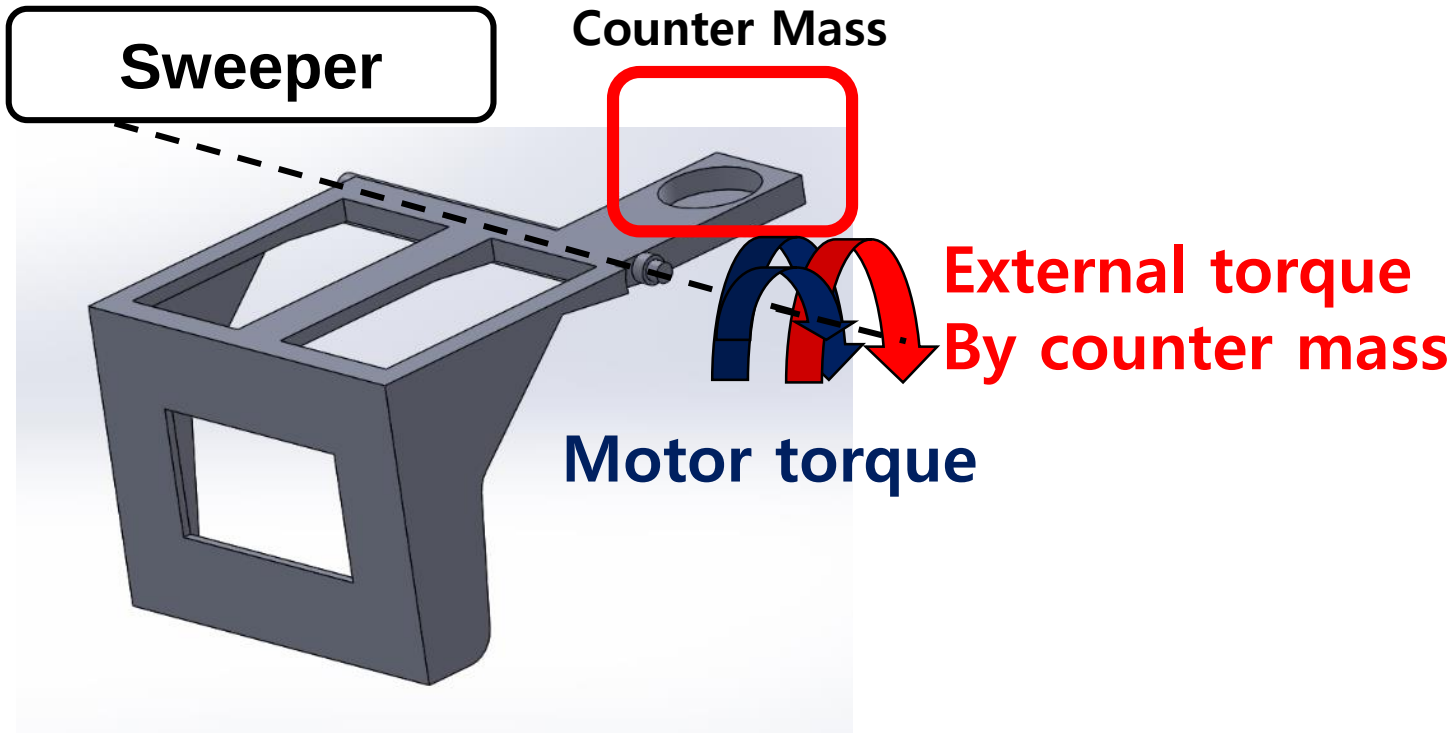
Drawbacks of Fan

- Required additional converter.
- Energy consumption.
- Higher cost.
- The temperature is not high so the heat transfer might not much effect the system performance.

Focusing on other solution on energy management such as Energy Save / Reducing the Runtime.

Temperature Control

Cut Out Energy Consumption



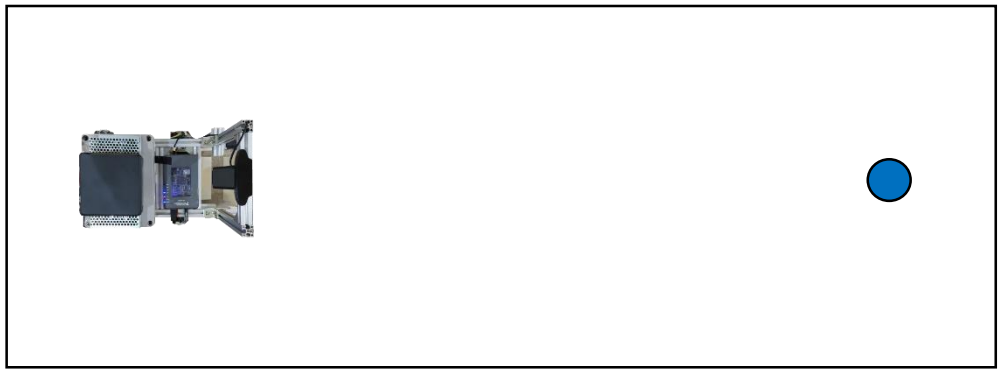
Motor load reduction => Heat dissipation reduction

Temperature Control

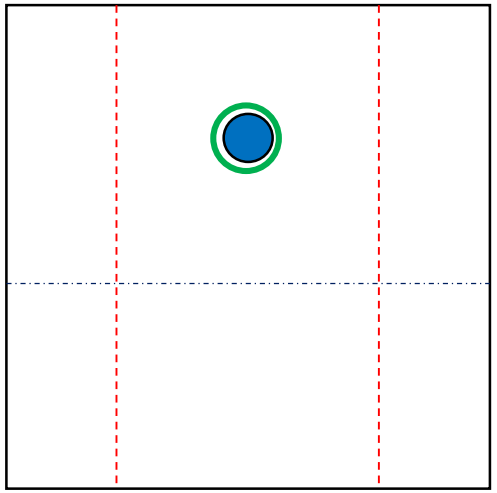
Cut Out Running Time

1. Push Out The Red Balls	No need to waste extra time / energy on avoiding balls
2. Memorize ball position	Reduce unnecessary movements
3. Map Reading Method	Reduce unnecessary movements

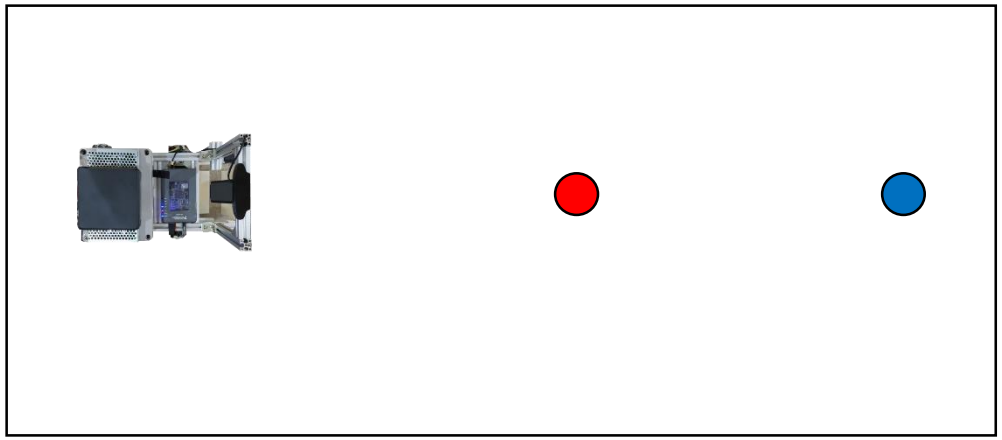
1. Push Out The Red Balls

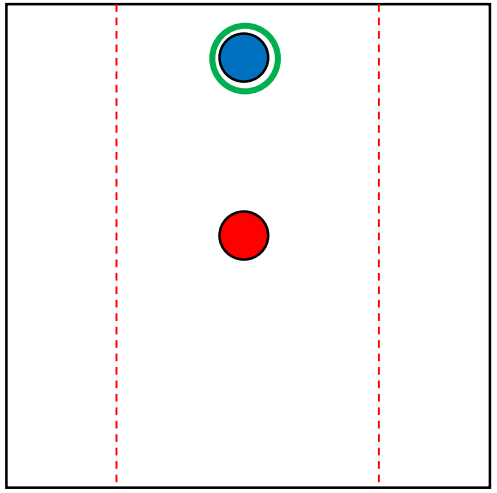


Webcam view

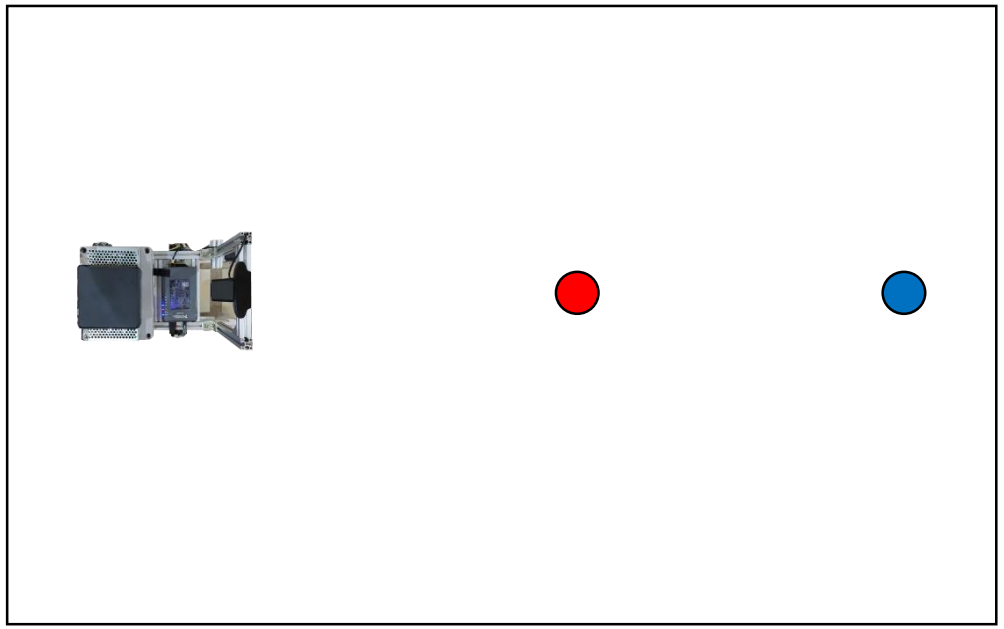


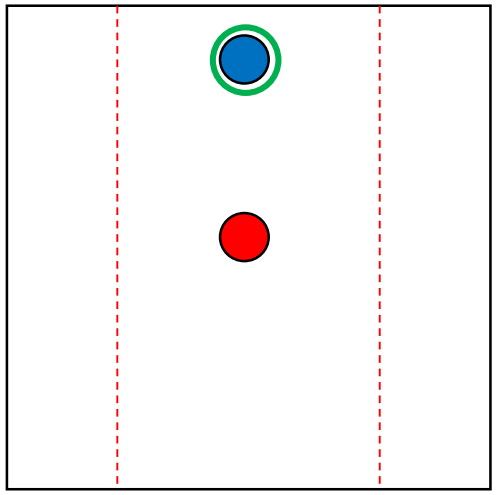
1. Blue ball detect
2. Move to ball
3. Blue ball disappear
4. Move 10cm
5. Sweep the ball



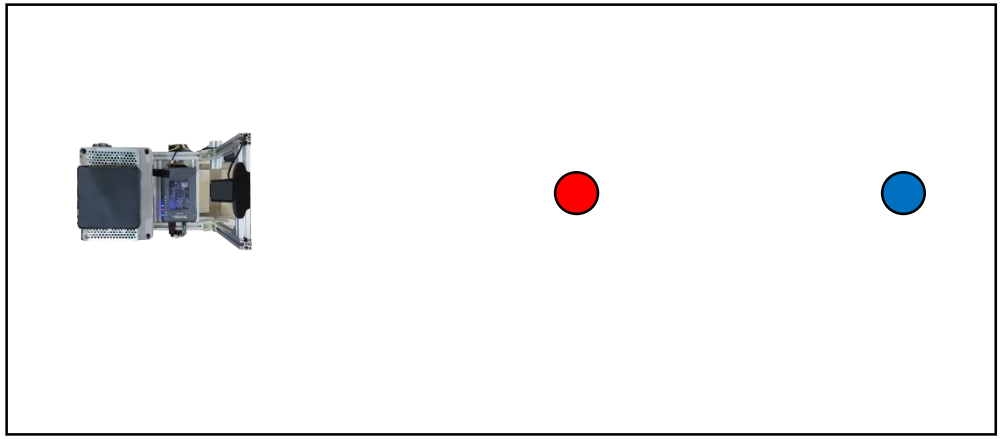


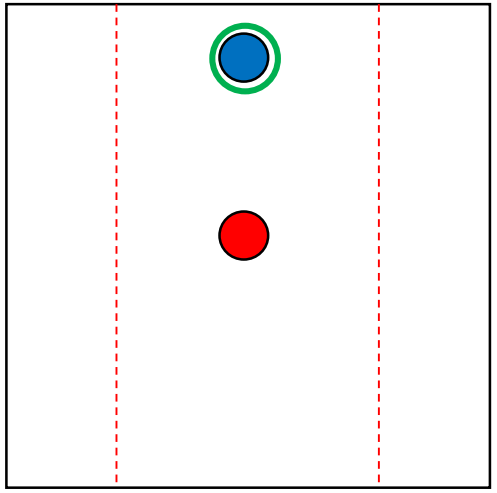
1. Blue ball detect but red ball exist in the path
2. Move to blue ball & Ignore red ball (Push it away)
3. Blue ball Disappear
4. Move 10cm
5. Sweep the ball





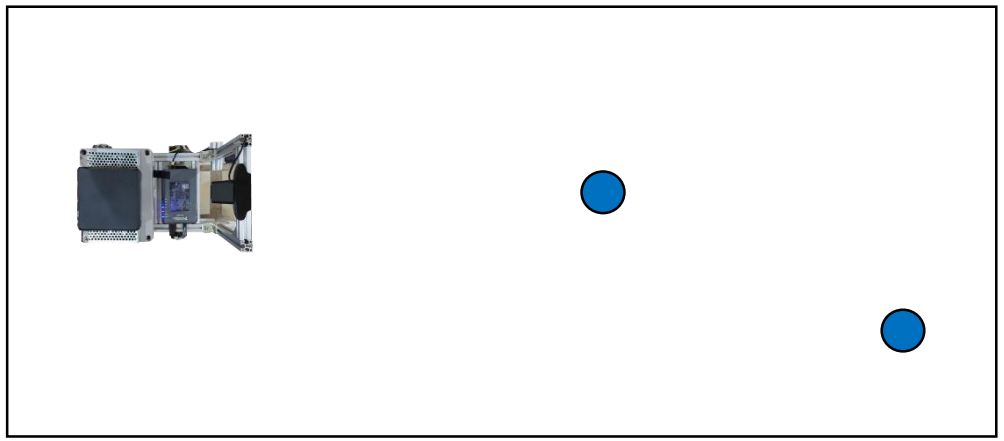
1. Blue ball detect but red ball exist in the path
2. Move to blue ball & Ignore red ball (Push it away)
3. Blue ball Disappear
4. Move 10cm
5. Sweep the ball



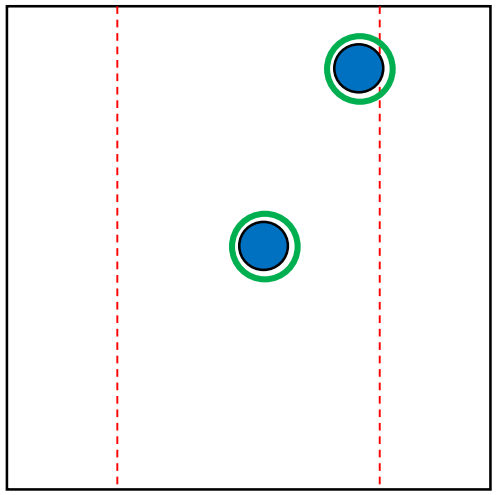


1. Blue ball detect but red ball exist in the path
2. Move to blue ball & Ignore red ball (Push it away)
3. Blue ball Disappear
4. Move 10cm
5. Sweep the ball

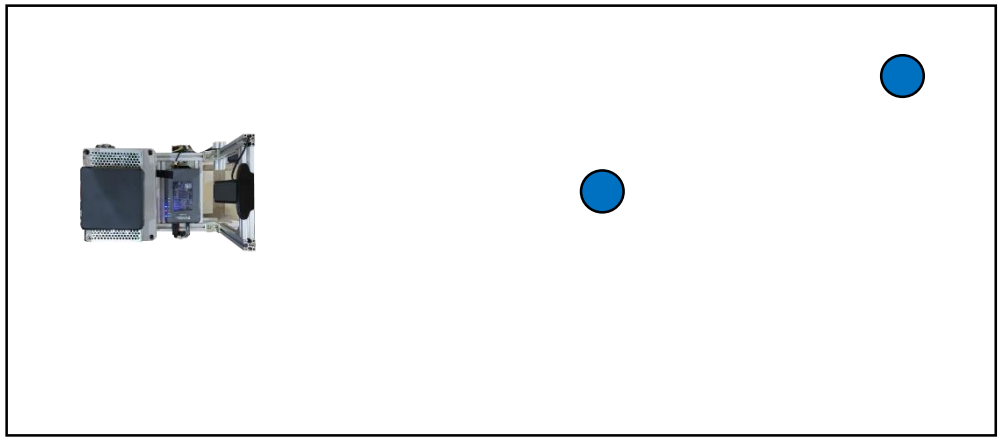
2. Memorize ball position

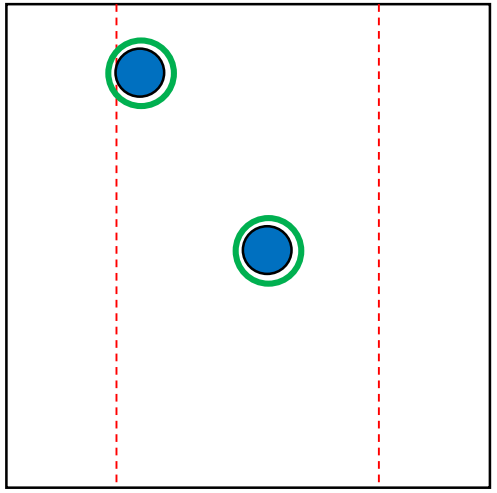


Webcam view



1. Blue ball detect but red ball exist in the path
2. Move to blue ball & Ignore red ball (Push it away)
3. Blue ball Disappear
4. Move 10cm
5. Sweep the ball





1. Blue ball detect but red ball exist in the path
2. Move to blue ball & Ignore red ball (Push it away)
3. Blue ball Disappear
4. Move 10cm
5. Sweep the ball