Capstone Design 1
3rd Presentation

Group : **JYP**

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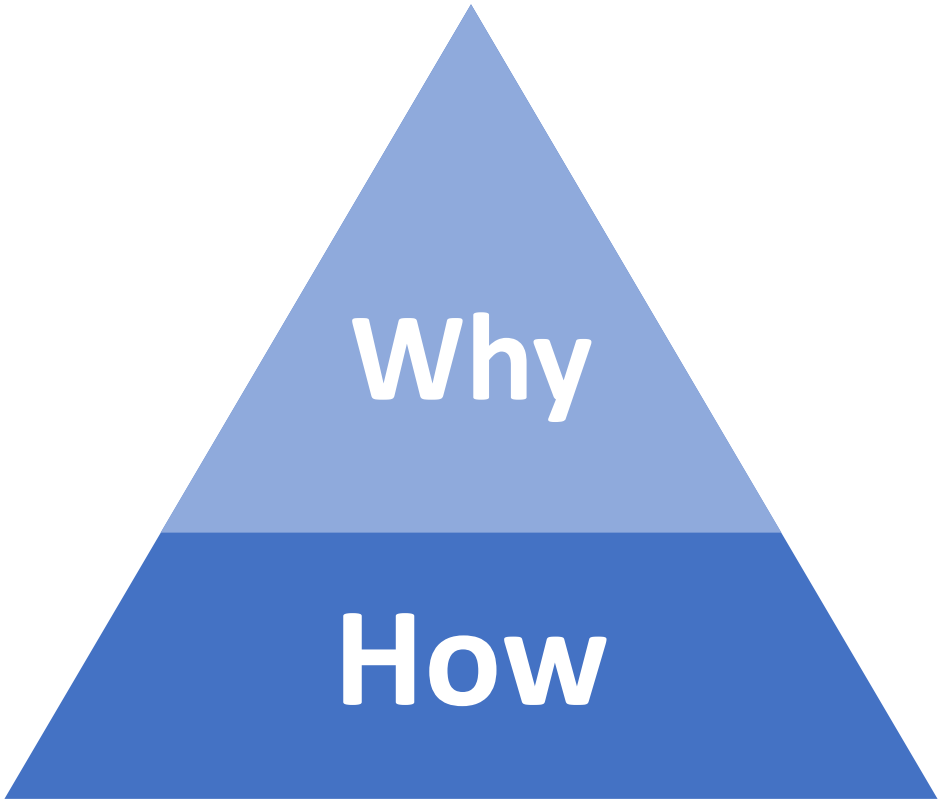
박연수 Wabi Demeke 조현근

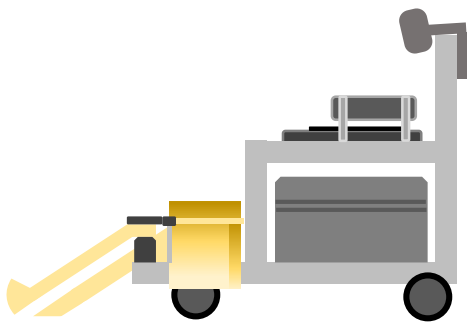
장신원 부준호 김경서 손기영


Why
How

Move

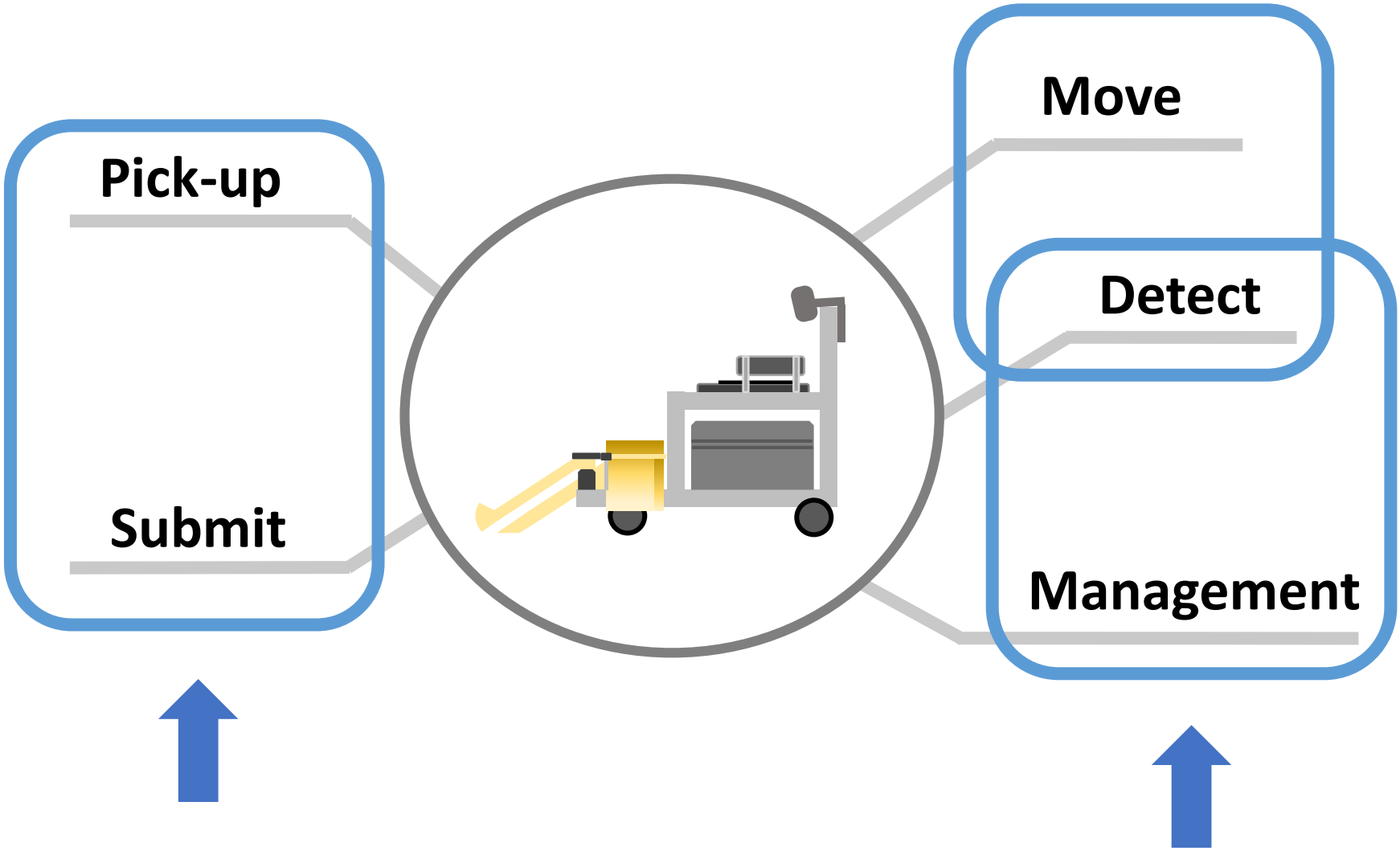
Pick-up

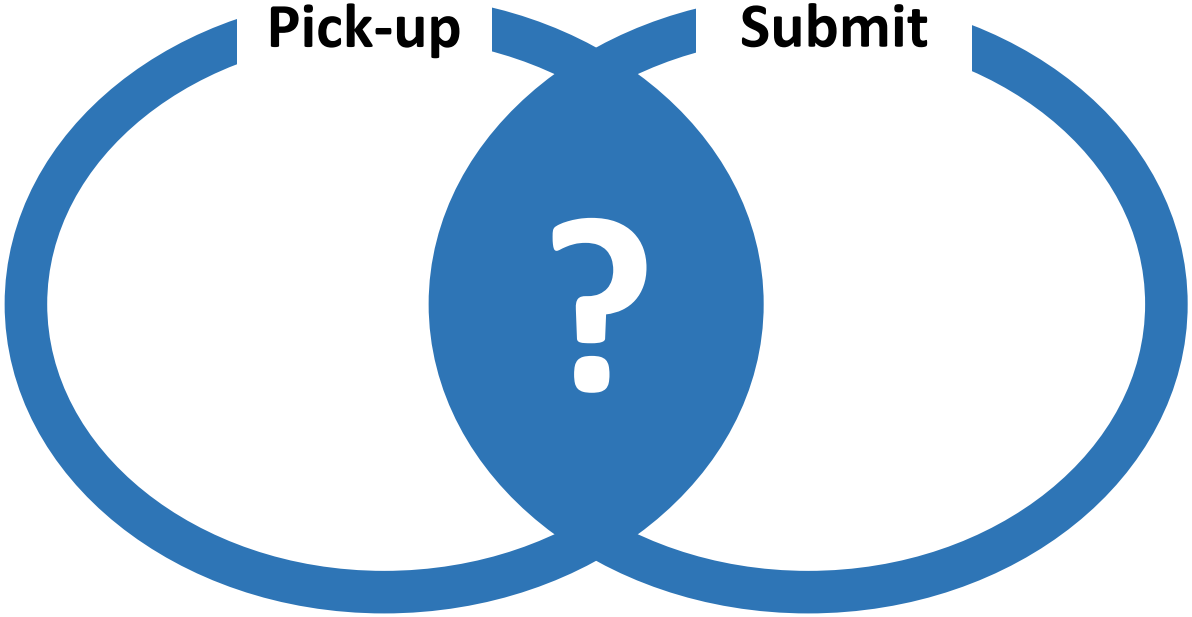
Detect



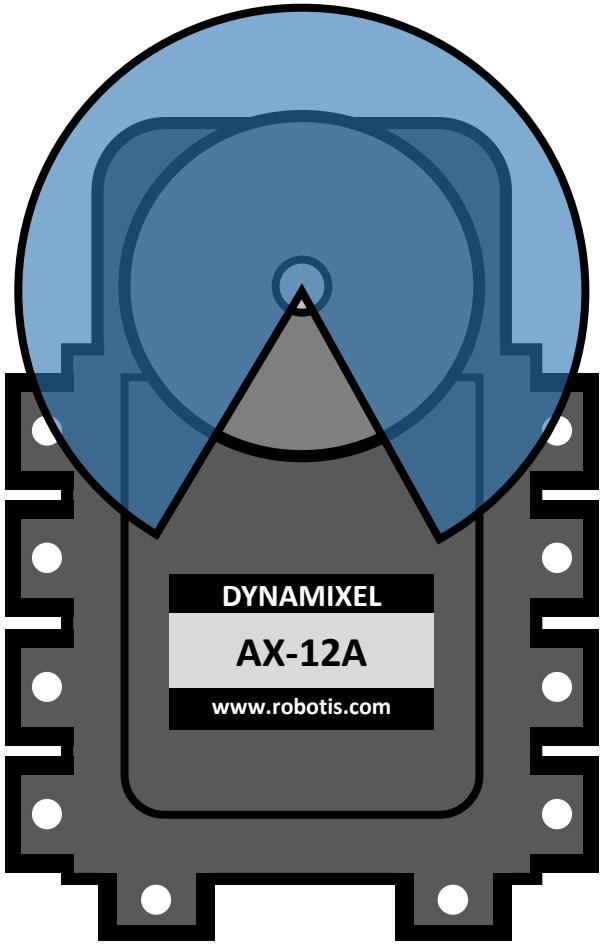
Submit

Management


Move
Pick-up
Detect
Submit
Management

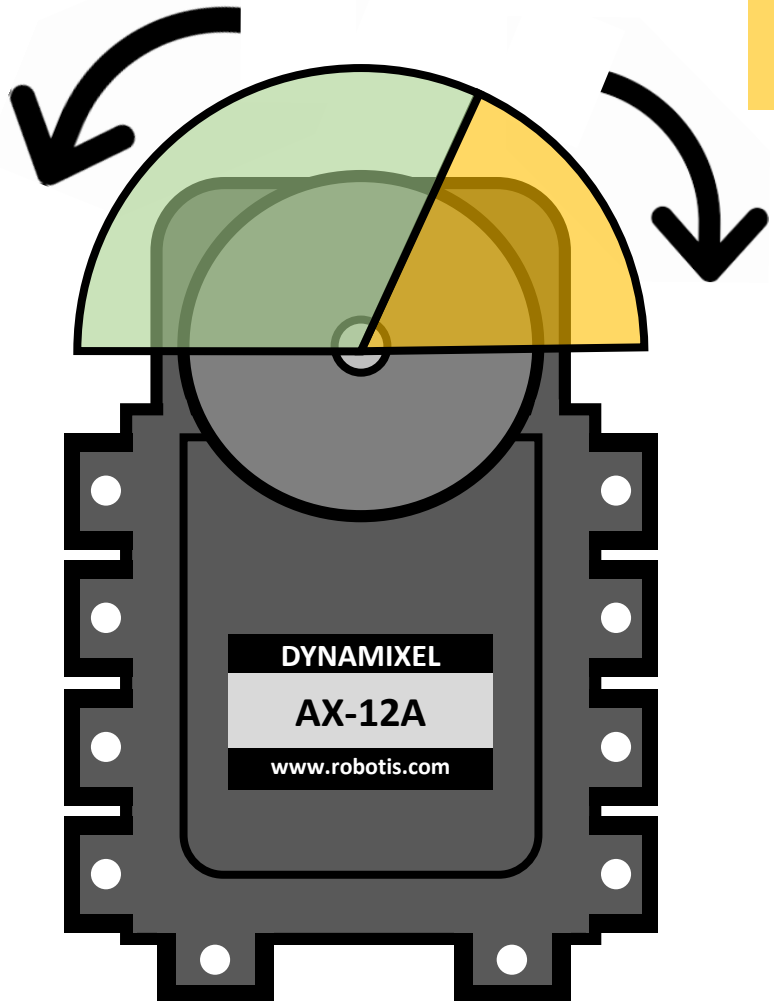

Pick-up
Submit
?

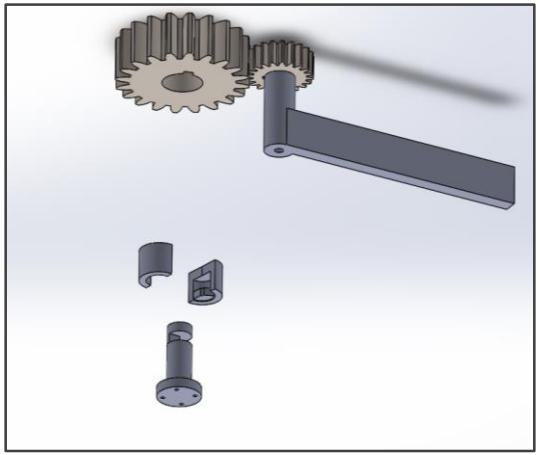
Joint Mode
0° ~ 300°

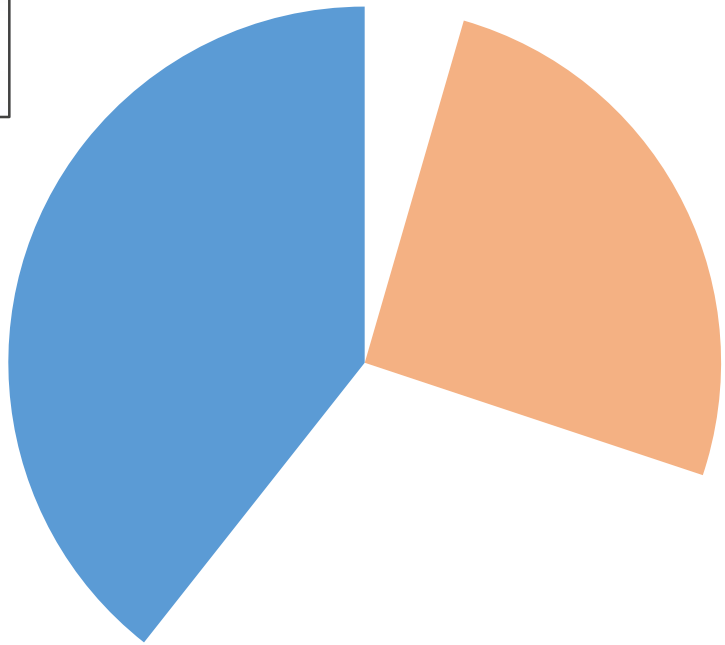


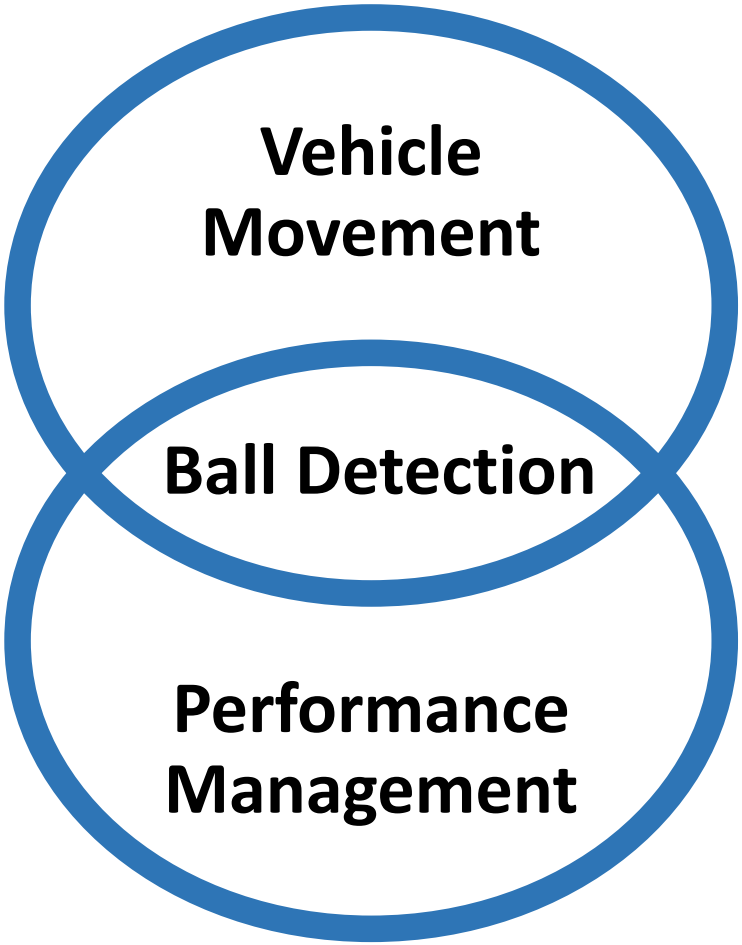
Pick-up

Open Storage



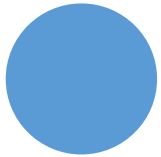




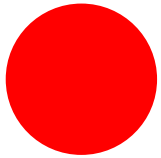

Vehicle Movement
Ball Detection
Performance Management

ACCURATE
ball detection

Ball Information → **Vehicle Movement**

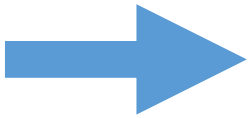


Pick-up



Avoid

Park

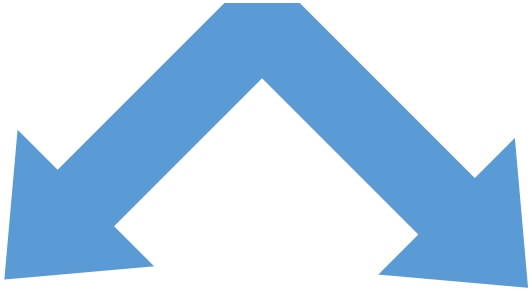


Vibration Control

ACCURATE ball detection

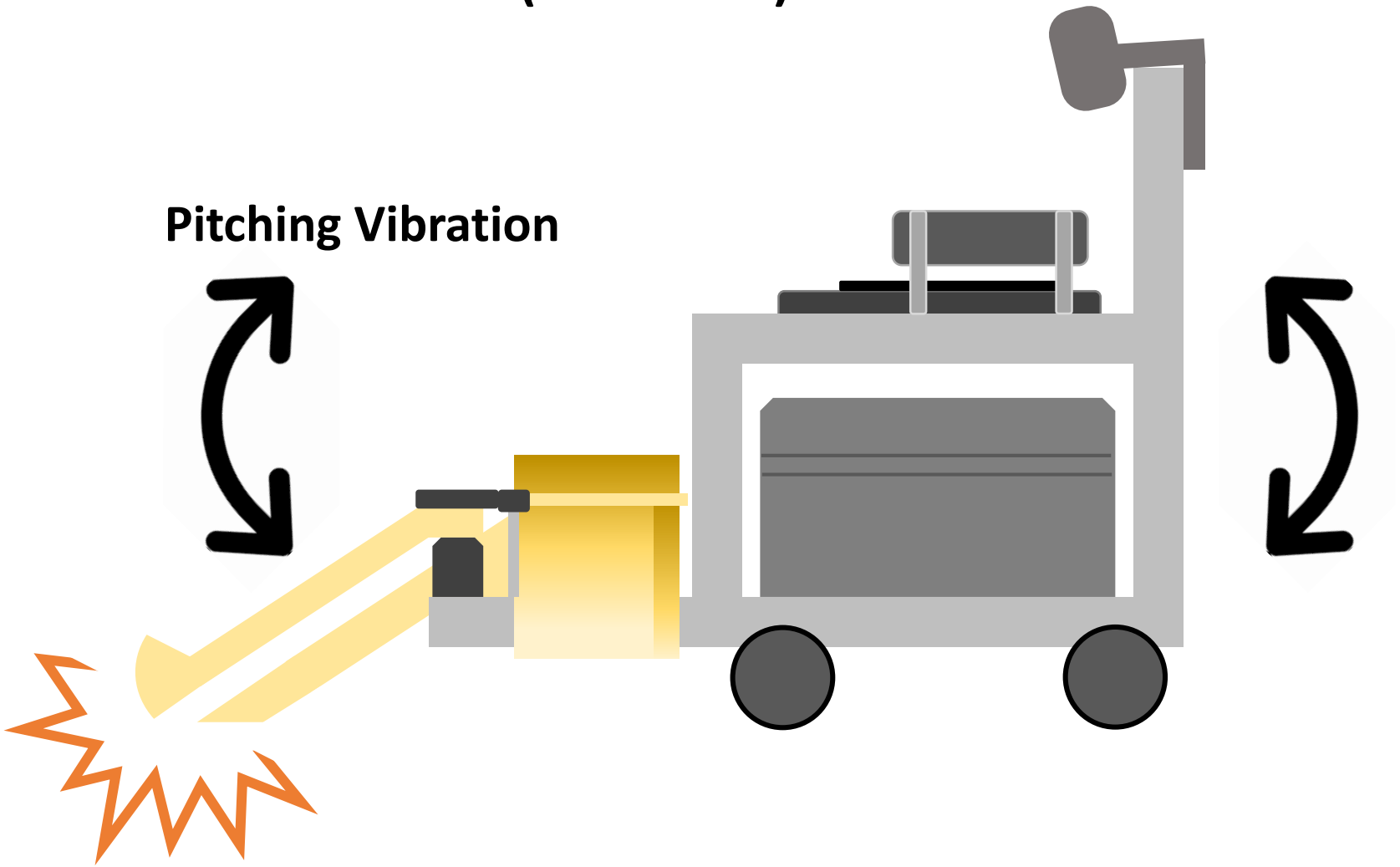
(performance management)

Vibration Control

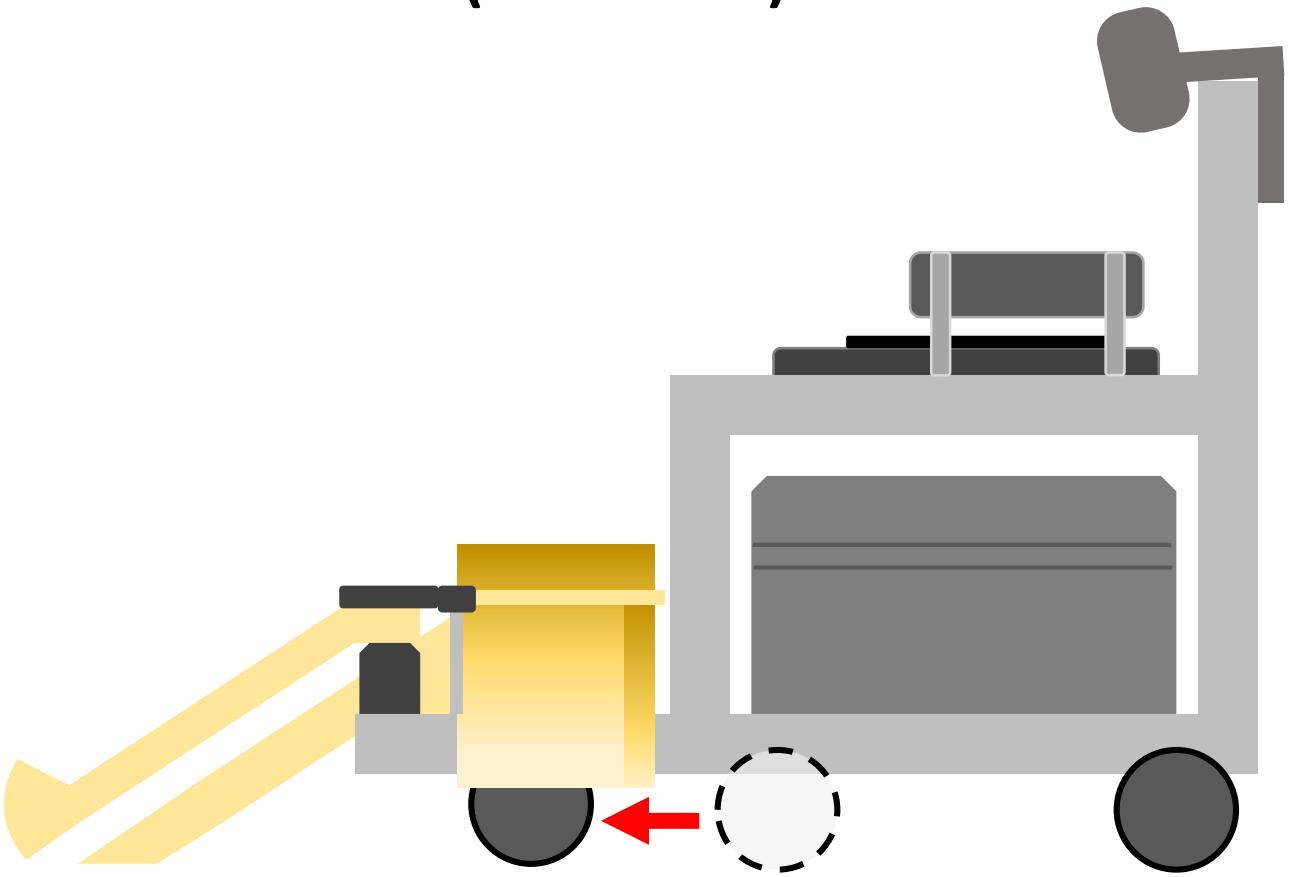


Hardware **Software**

Vibration Control (Hardware)

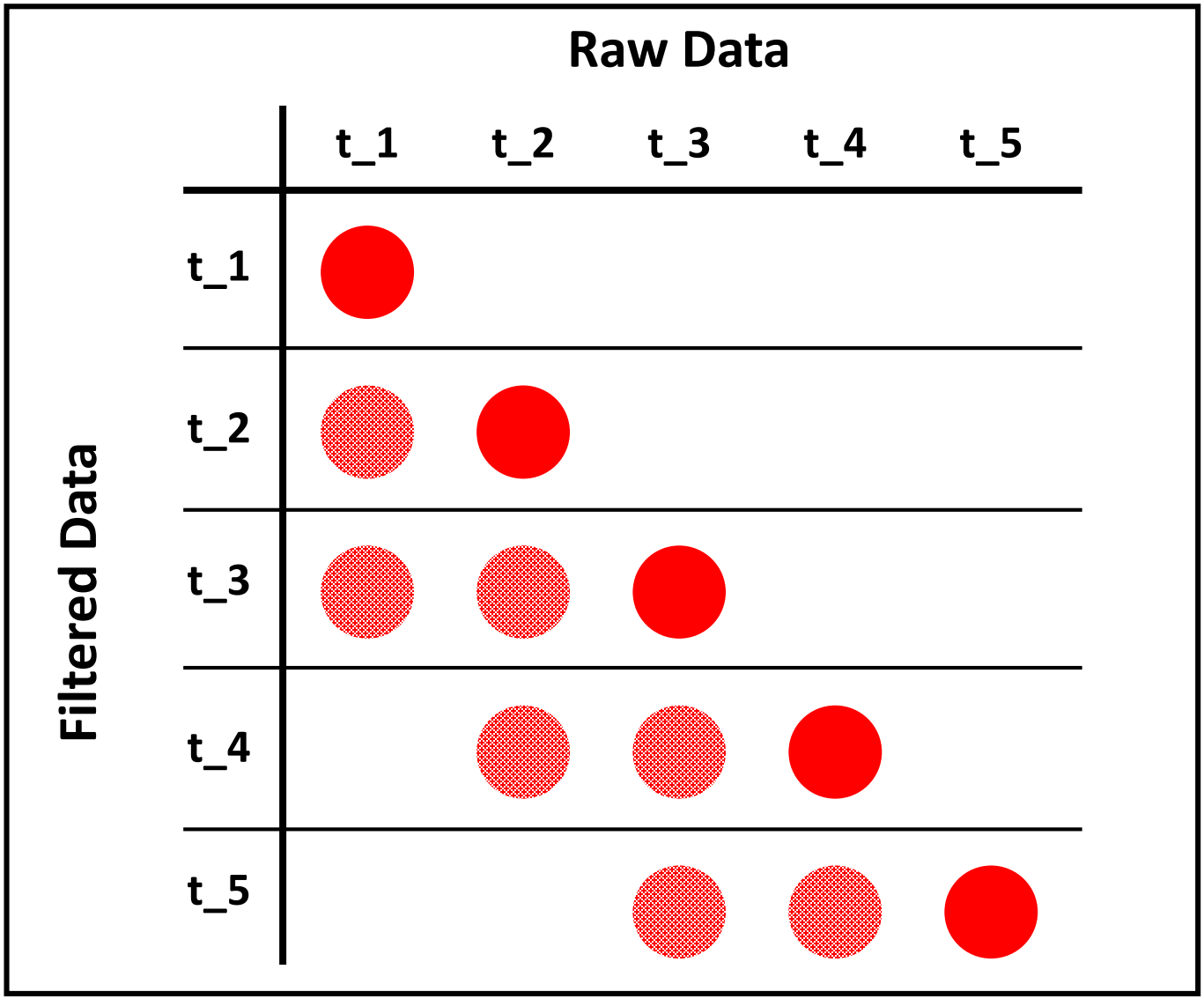


Vibration Control (Hardware)



Stabilize

Vibration Control (Software)



Ball Detect Mechanism

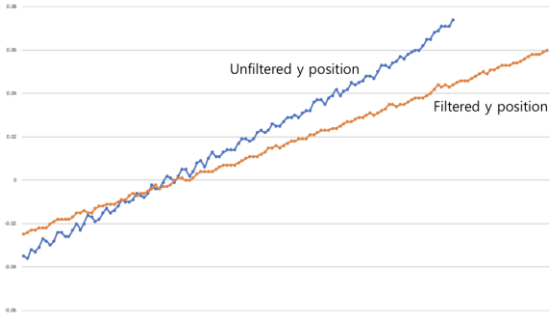
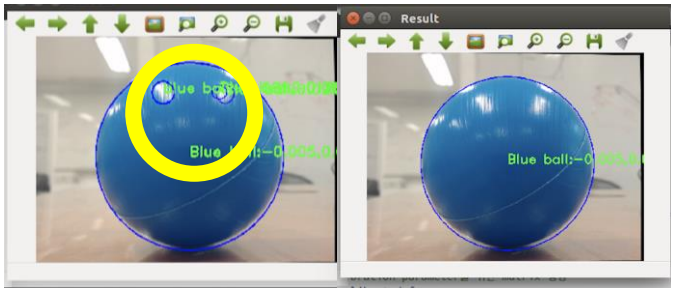
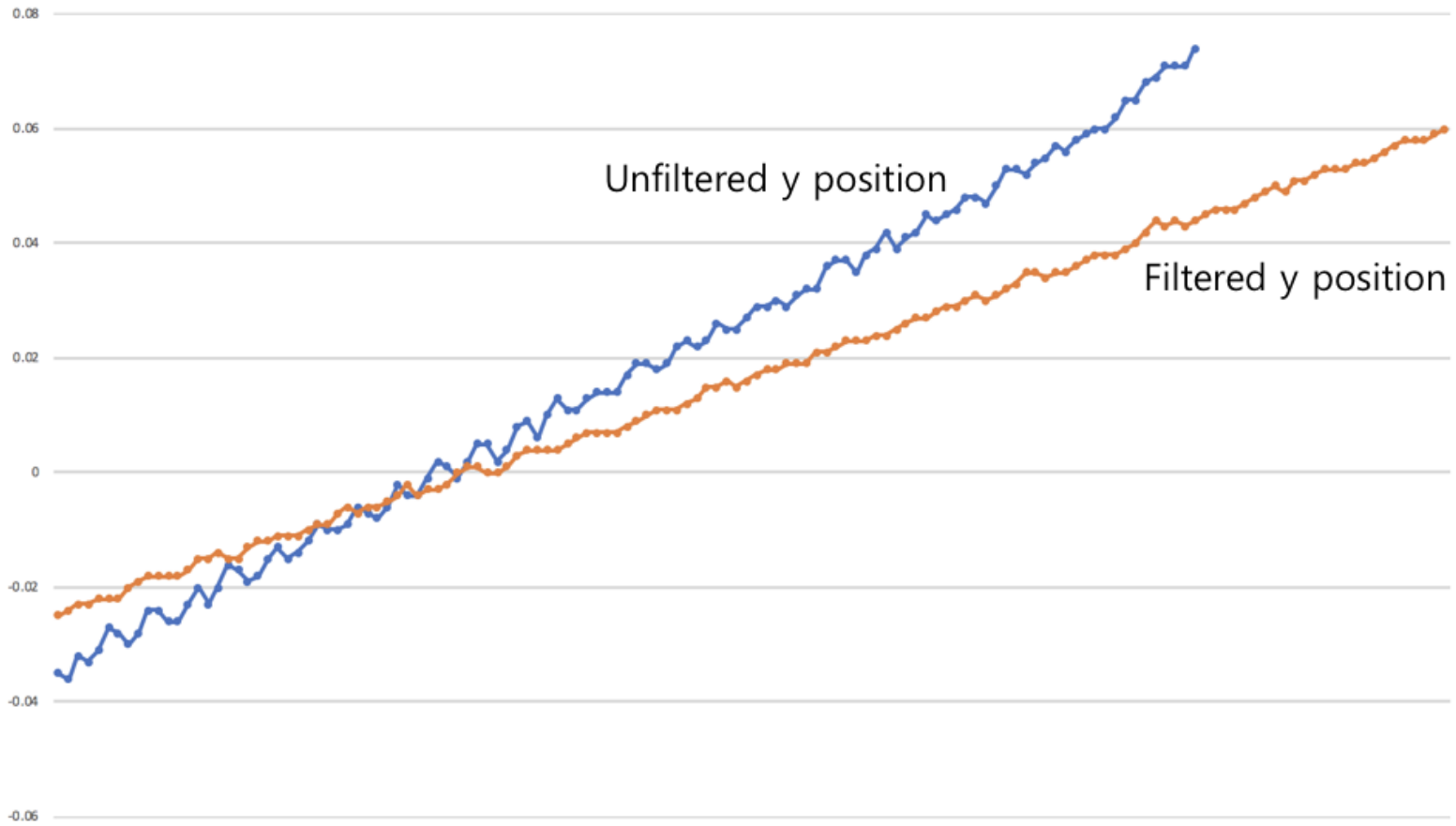


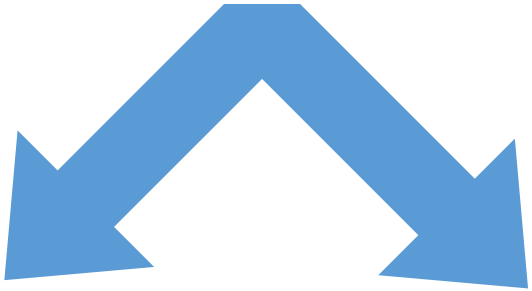
Image → Calibration
HSV, YCbCr
Blur filtering
Canny edge
Find contour
<Image processing> → Data extraction → Noise filtering



Vibration Control (Software)



Vibration Control

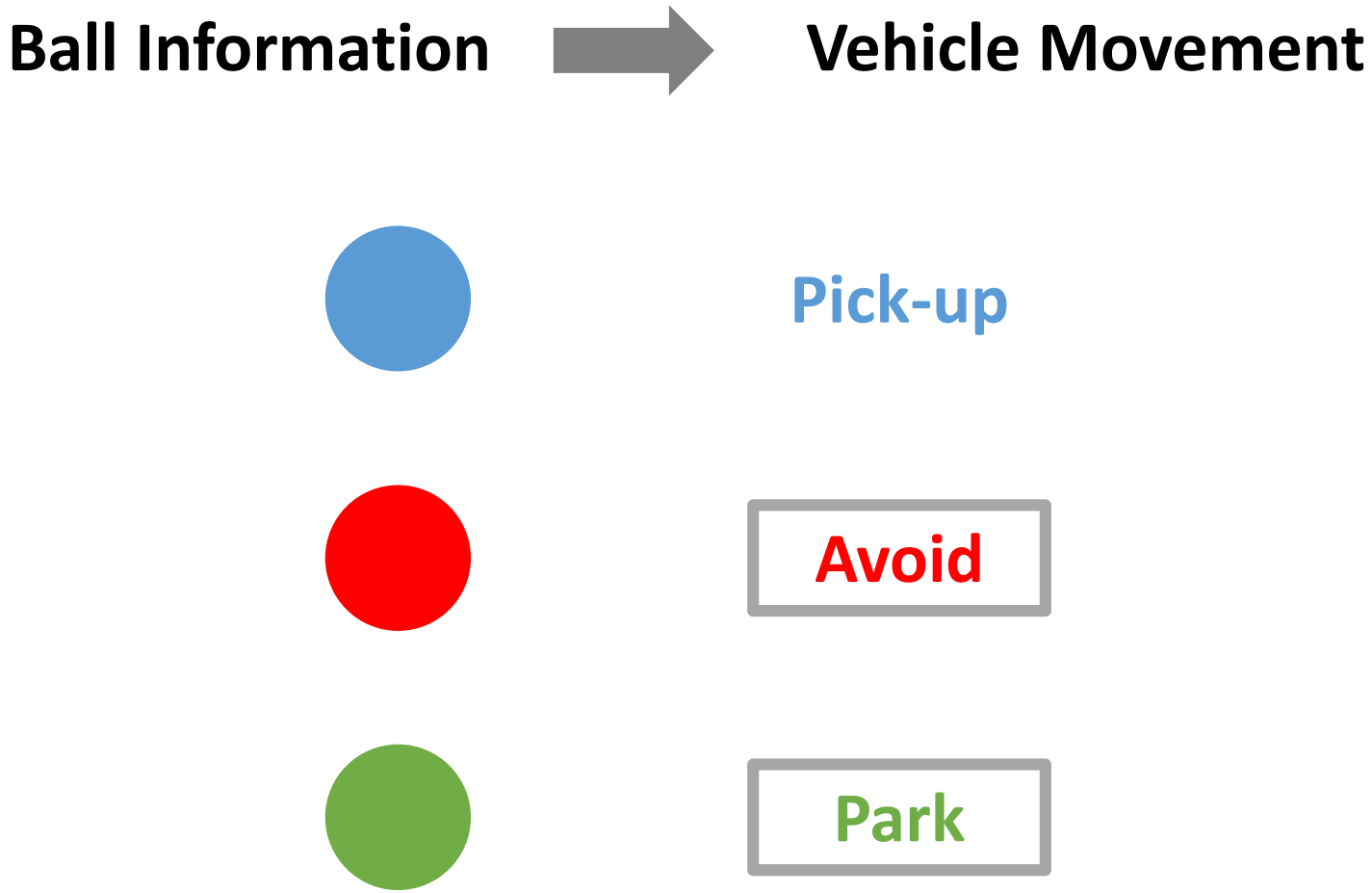


Hardware

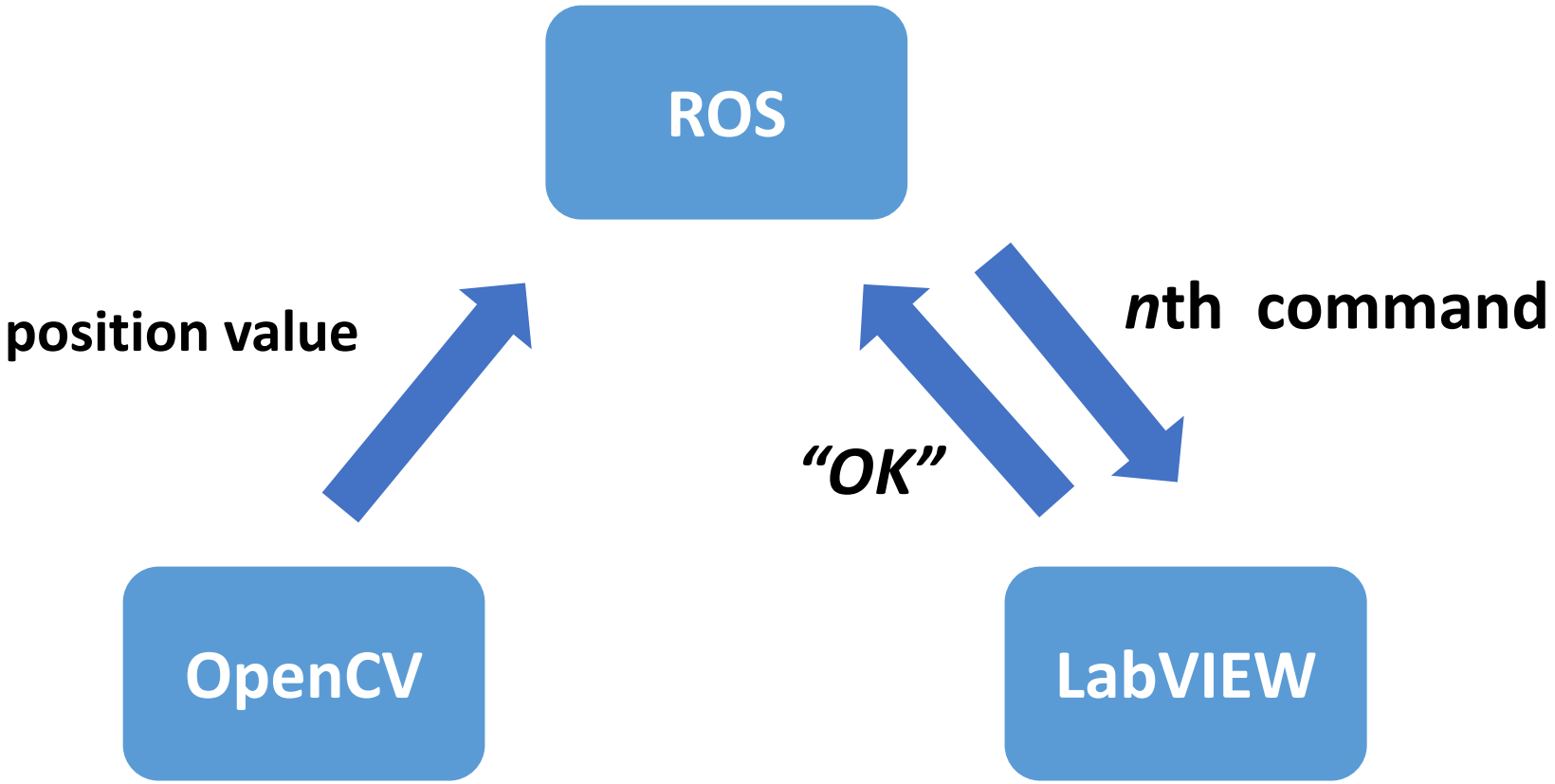
Wheel Position

Software

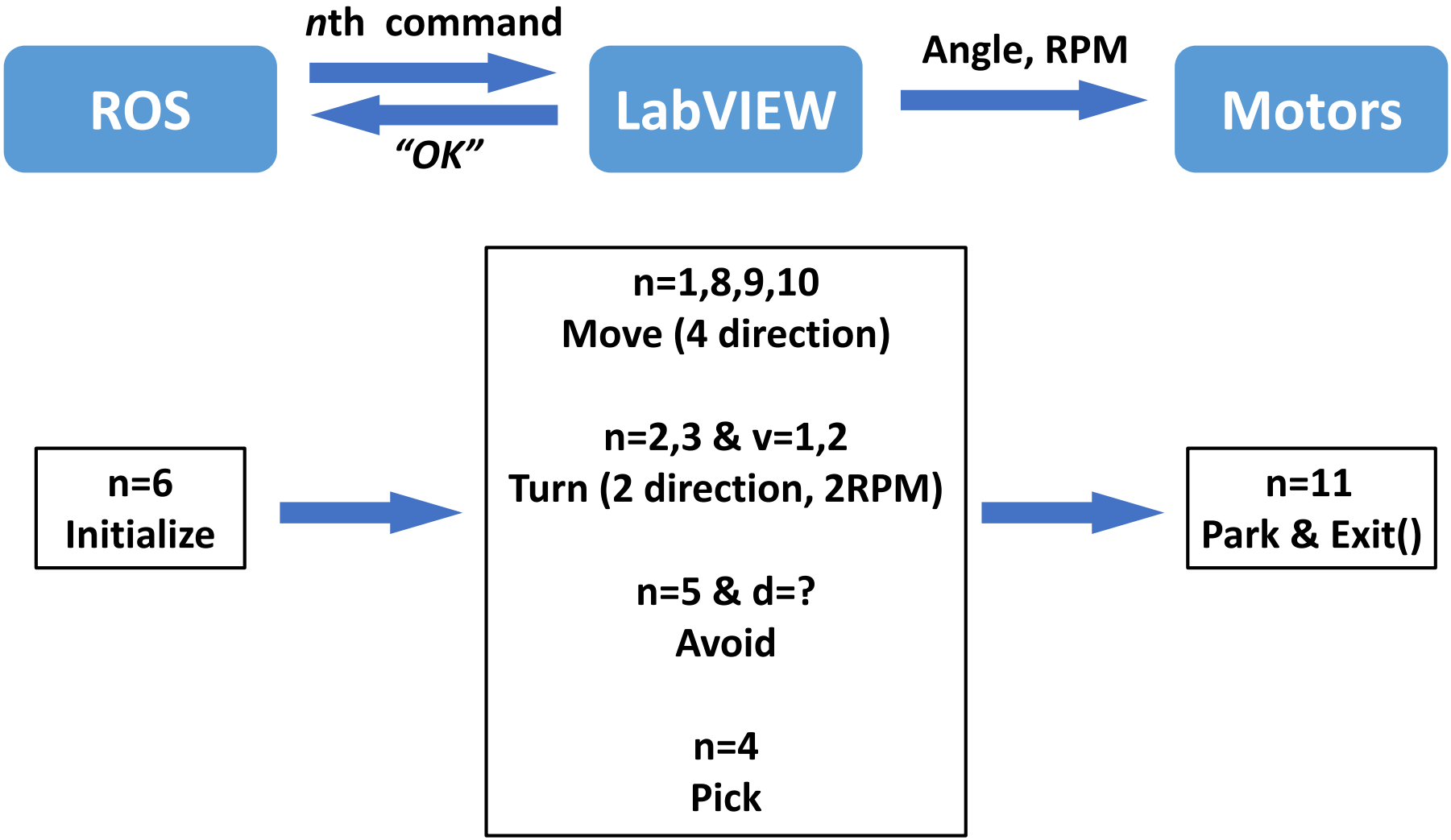
Data Refinement

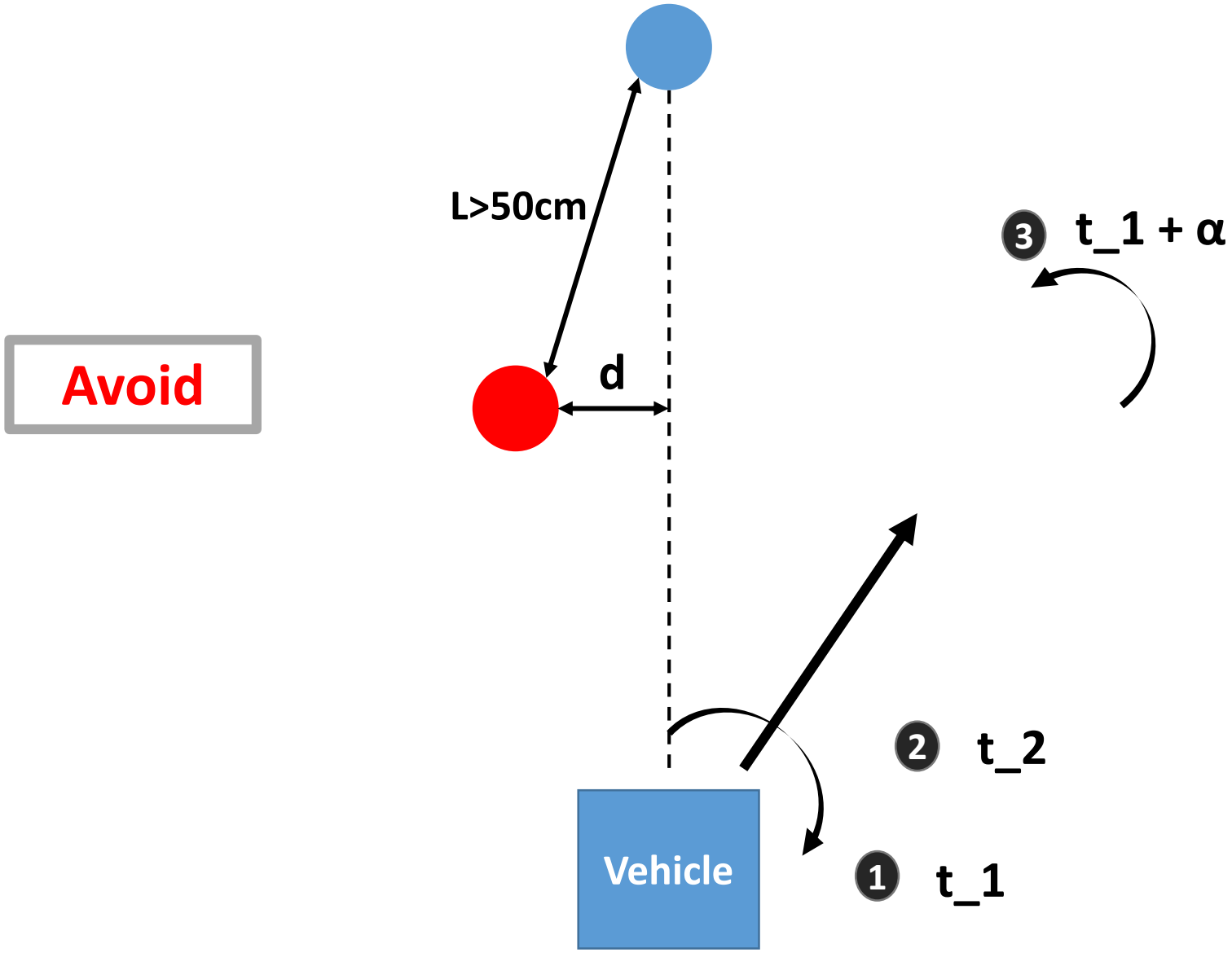

Ball Information
Vehicle Movement
Pick-up
Avoid
Park

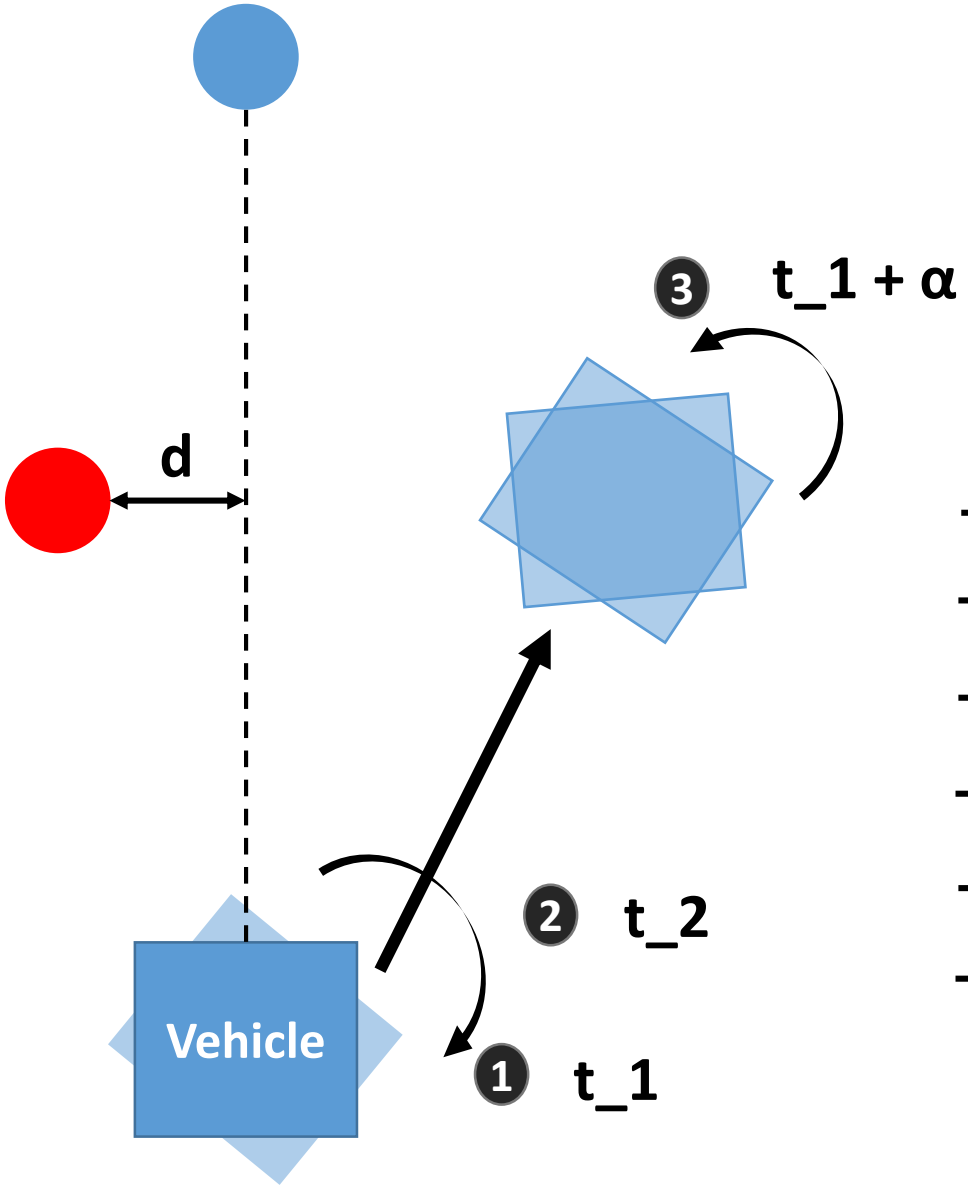
ROS integration



ROS integration




Avoid
L>50cm
d
3 t_1 + α
2 t_2
Vehicle
1 t_1

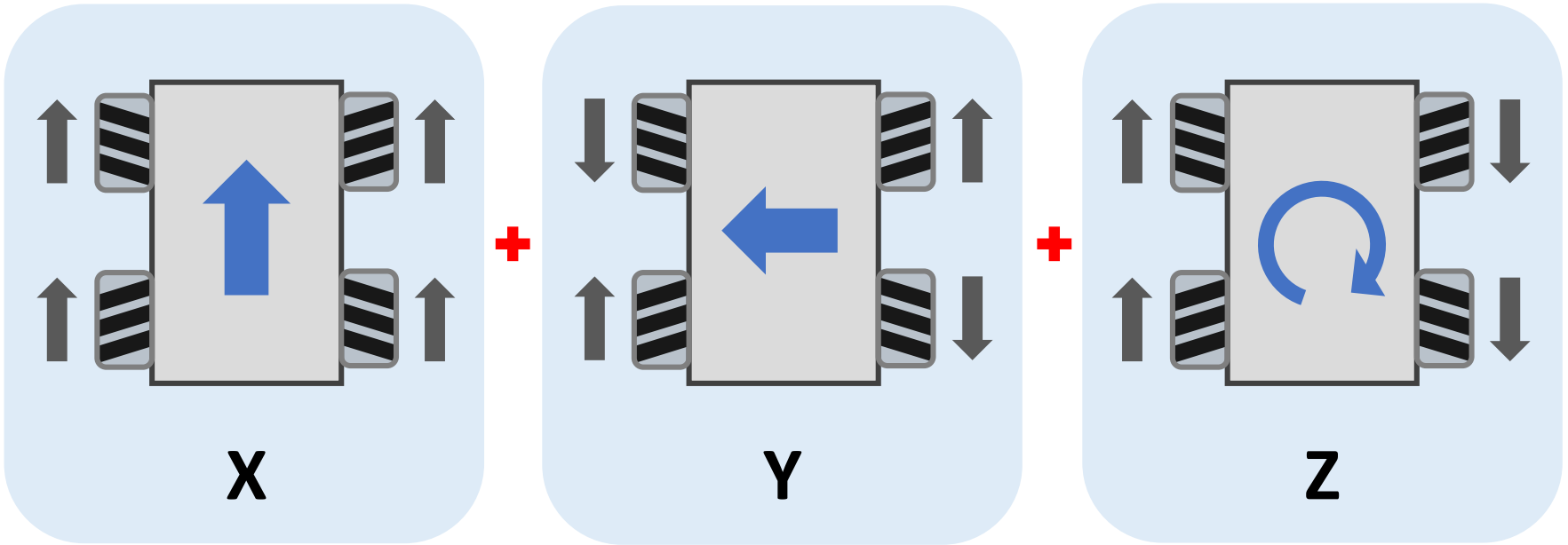


Avoid

	t_1	t_2
0cm< d <5cm	0.78s	4.18s
5cm< d <10cm	0.65s	3.95s
10cm< d <15cm	0.53s	3.55s
15cm< d <20cm	0.35s	3.15s
20cm< d	0.15s	2.59s

Park

$$aX + bY + cZ$$



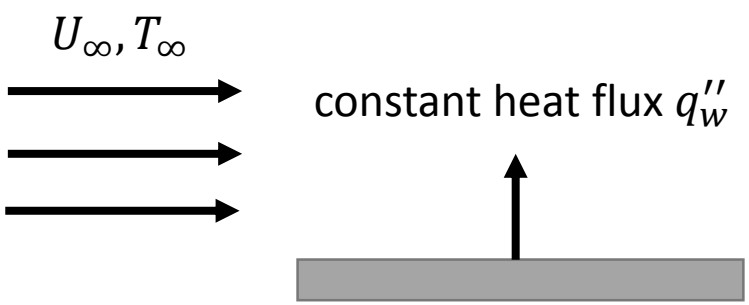
Park

- [x] Vision Recognition
- [x] Vibration Reduction
- [x] Pick-up
- [x] Motor Control
- [x] ROS integration
- [ ] Heat Management

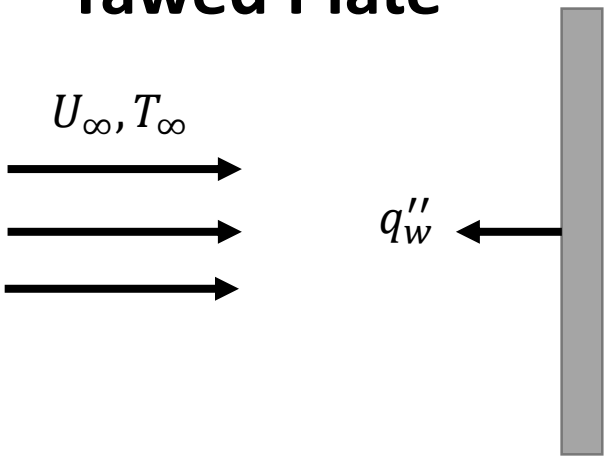
Forced Convection (Laminar Flow)

$$Nu = \frac{q_{conv}}{q_{cond}} = \frac{hL}{k} = C\ Re_L^{1/2}\ Pr^{1/3}$$

Flat Plate

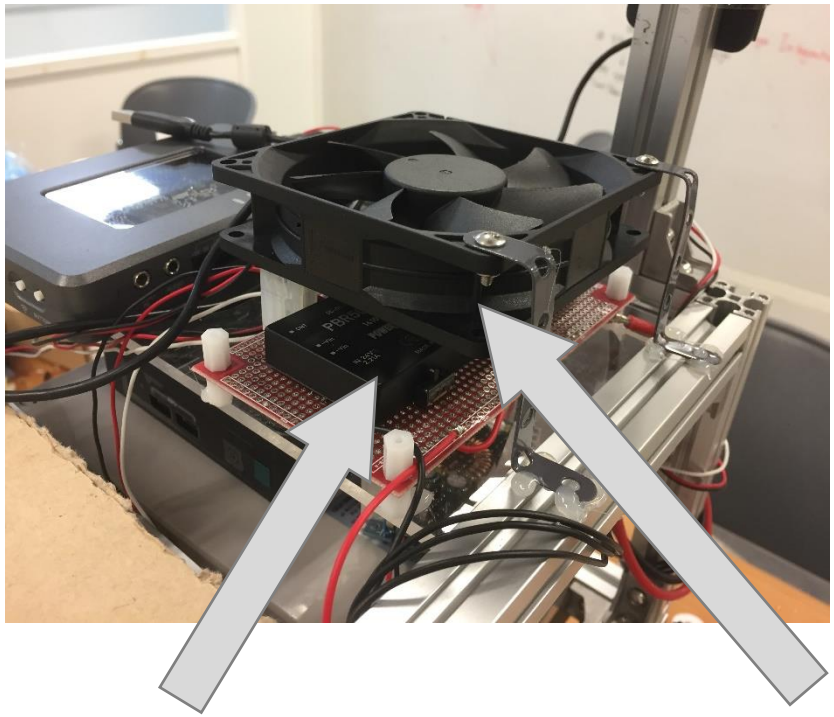


Yawed Plate



$C = 0.664$ $<$ $C = 0.931$

Heat Management

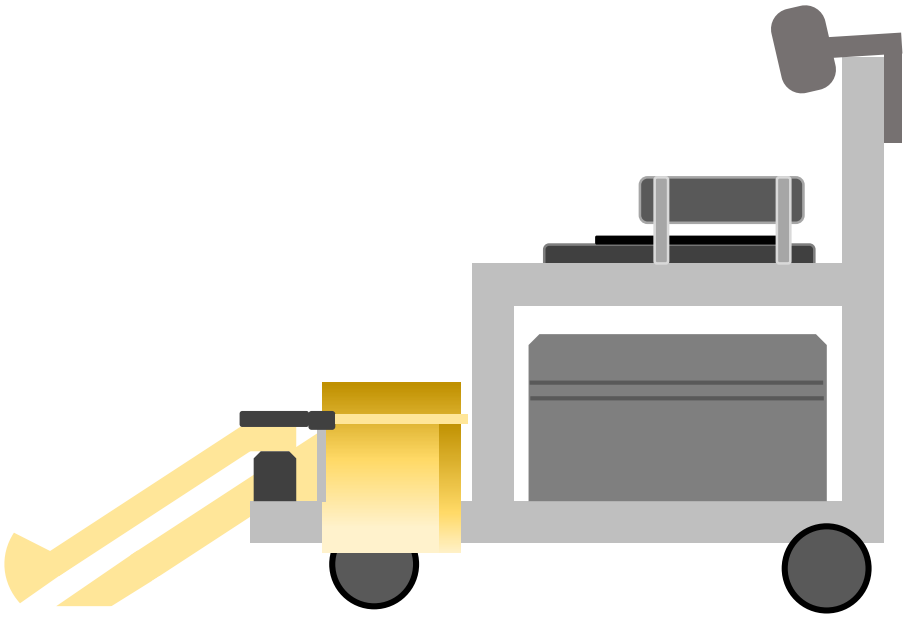


PMS

Fan

Heat Management

Maximum temperature < 40°C



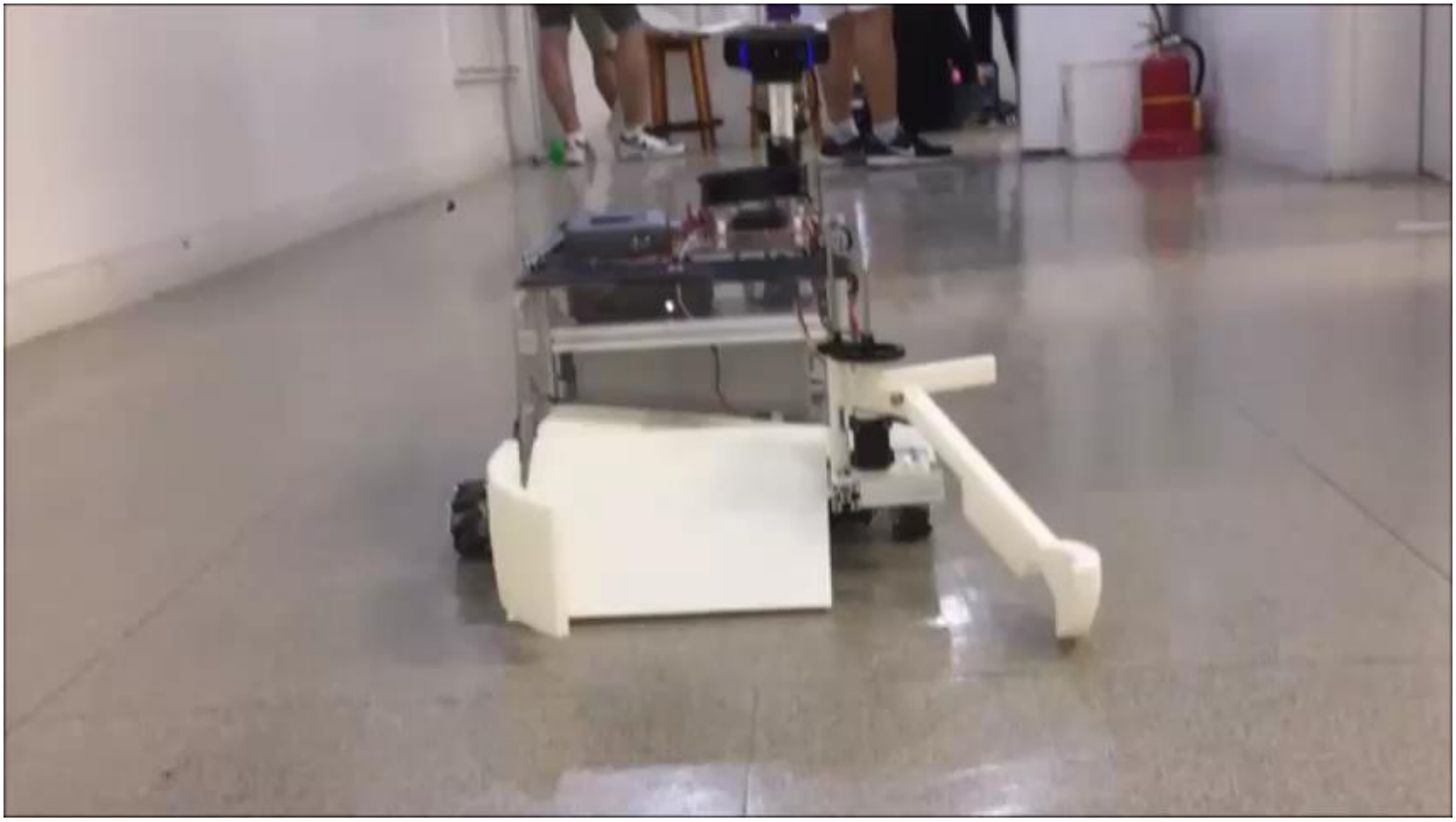
1) low expense

2) low power consumption

3) pick-up assurance

4) compact size

5) versatile pick-up system



Thank You