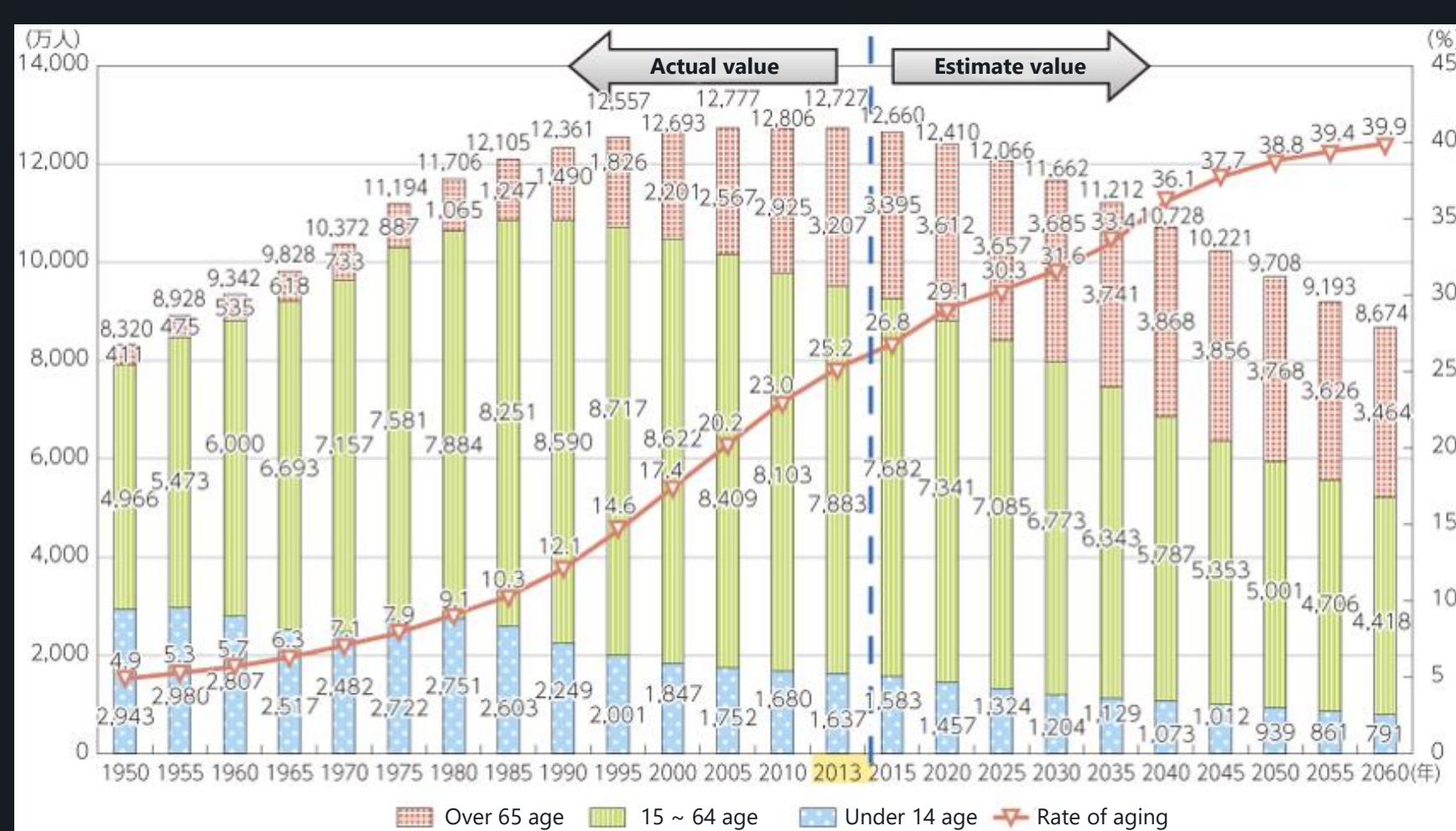


Development of Industrial Picking System

Ryodo TANAKA, Ryo KABUTAN, Shinji OOMORI, Masaru MORITA, Takeshi NISHIDA

Decrease of the population

The working population will decrease.



Estimate of the population on Kitakyushu City



Agriculture



Garbage disposal



Medical



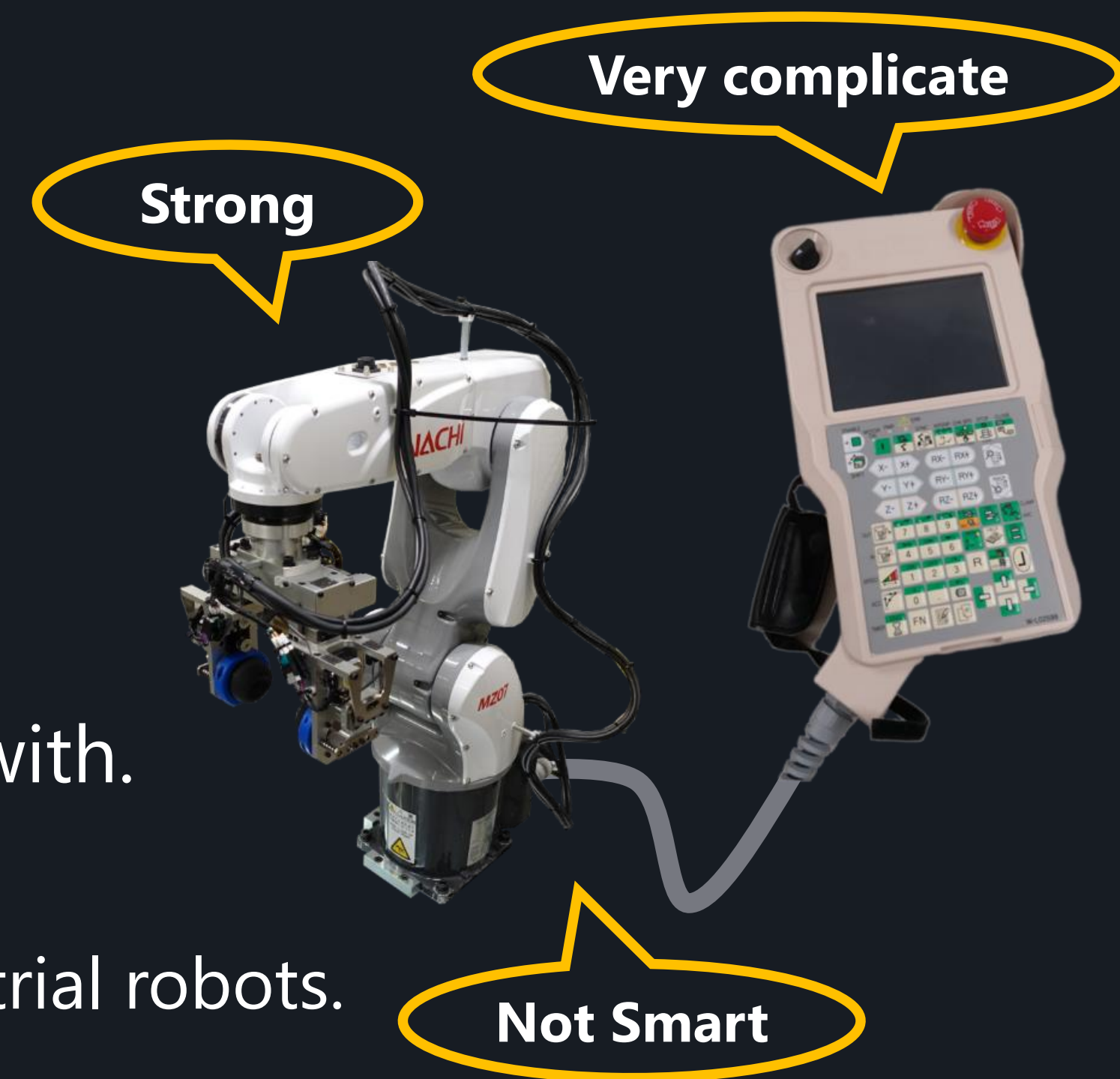
Food

Reality on Robots

- Exclusive controller
- Teaching is needed
- Almost everyone can not use
- Only professional engineers

can deal with.

It's **difficult to operate** industrial robots.



Industrial robots **should be smarter.**

We would like to **solve with Industrial Robots.**

1. Development of the UI

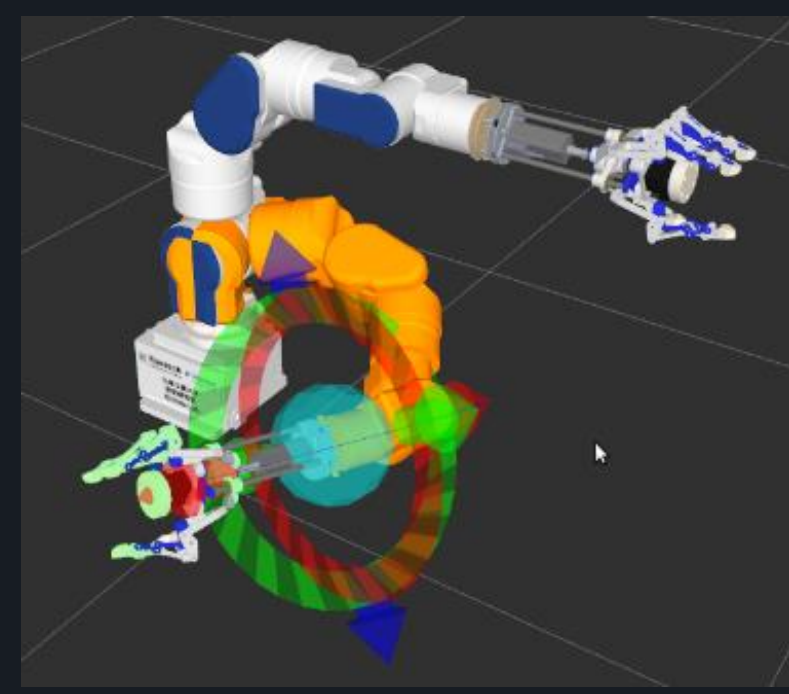
- Humanoid Robot
- Graphical UI

2. Robotic Intelligent Space

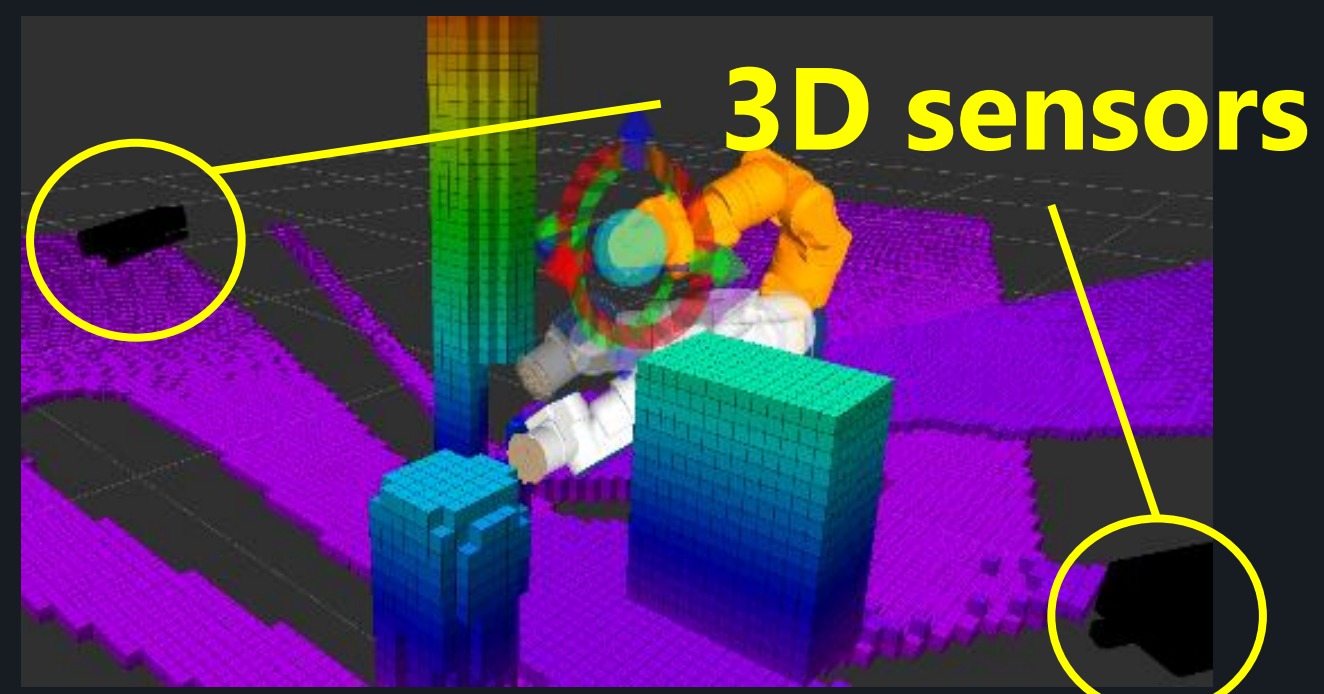
- Multiple 3D sensors measures surroundings
- No occlusion

3. Smart industrial robot

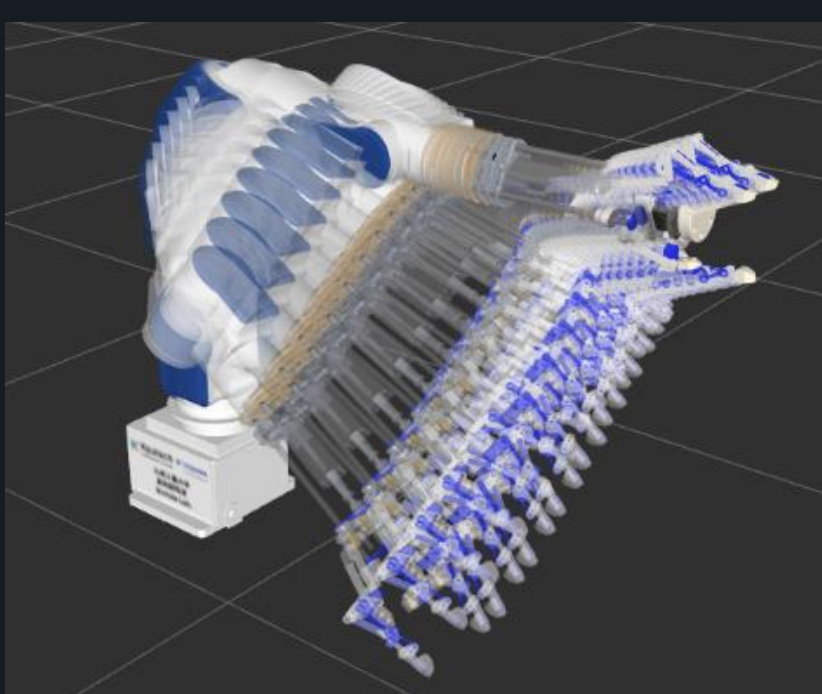
Autonomous calculation of the motion plan



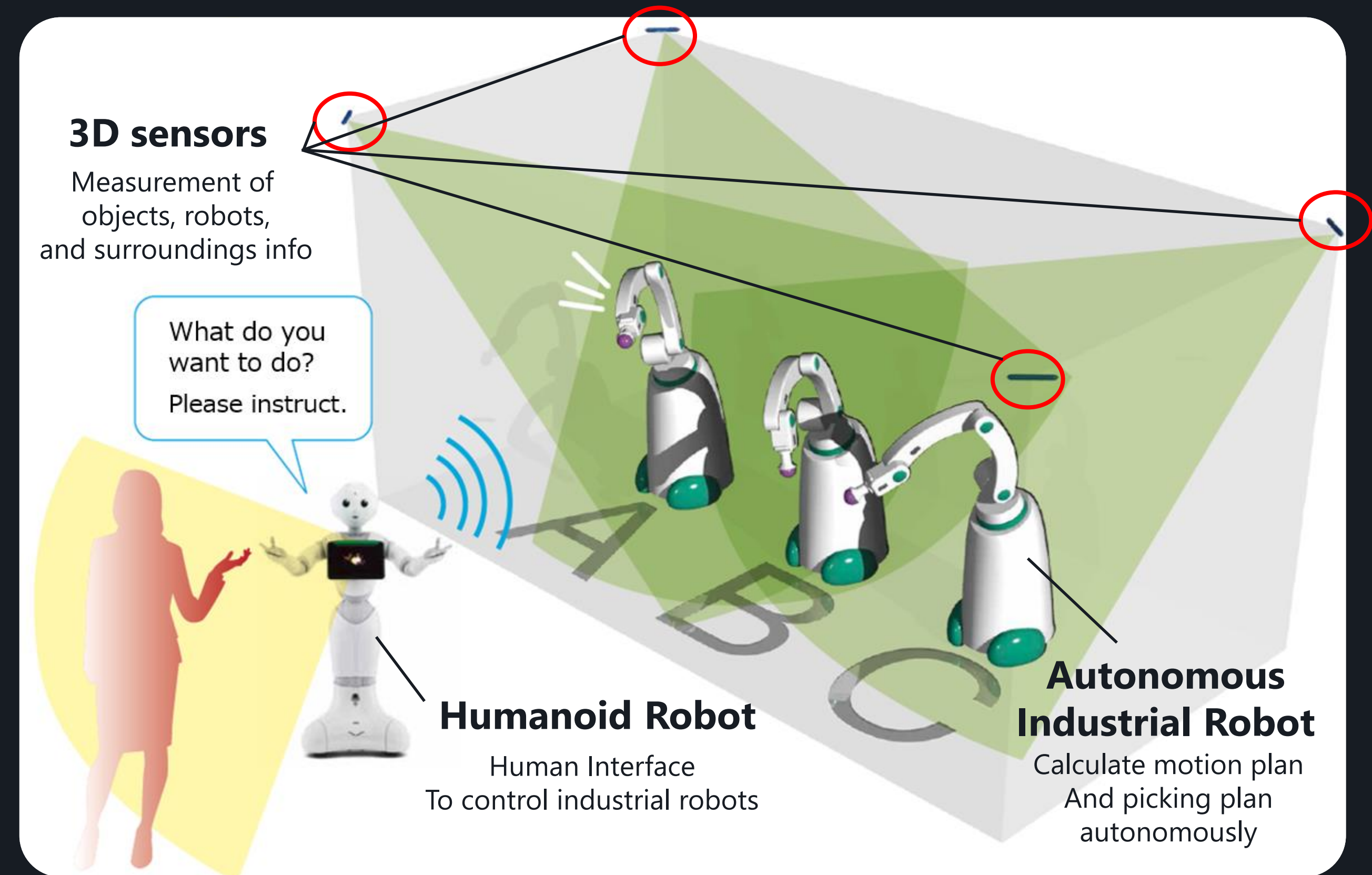
Graphical UI



Robotic Intelligent Space



Generated motion

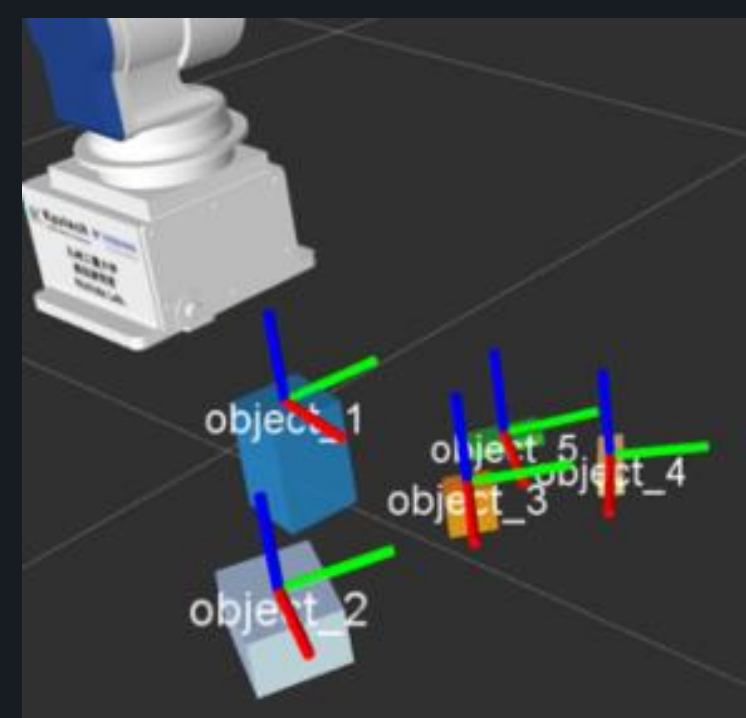


Easy operation of industrial robots.

Robotic Intelligent Space + Smart Industrial Robot

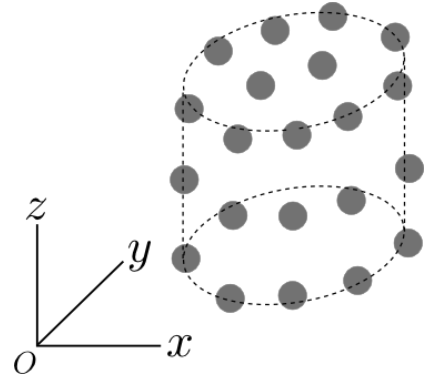


put objects

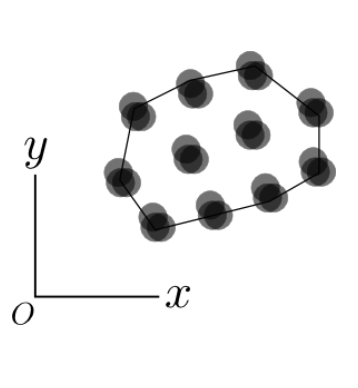


detected objects

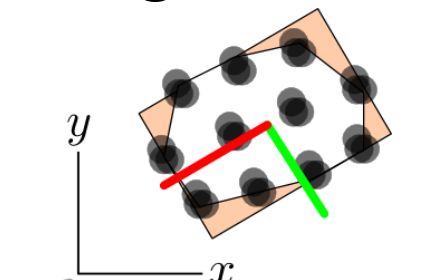
1 Measurement of the point cloud data



2 Projecting 3D points on 2D points

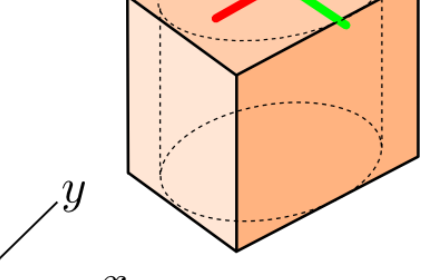


3 Finding a rectangle.



Searching minimum bounding rectangle

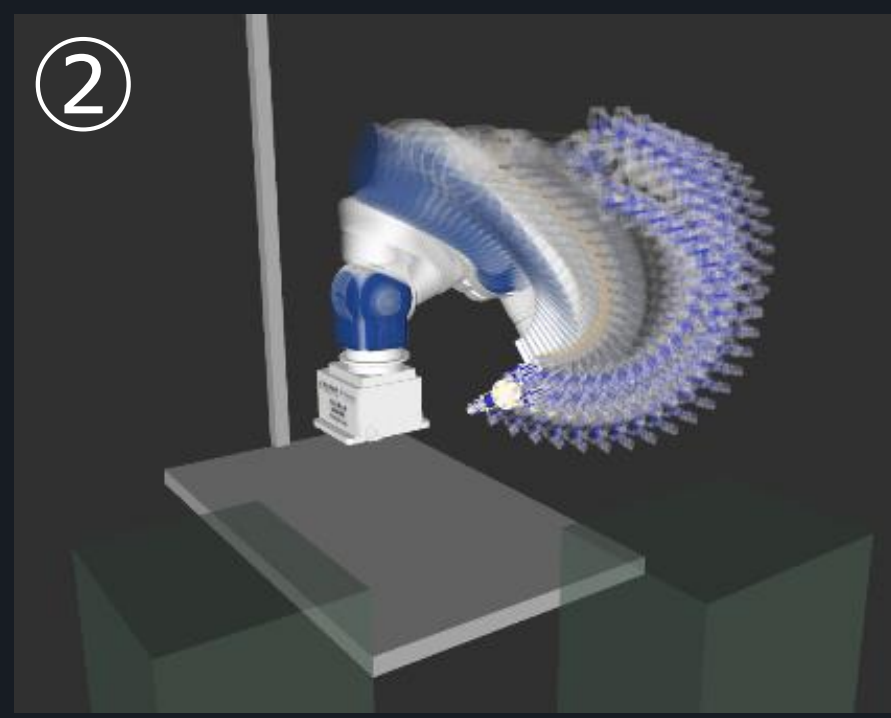
Output



Bounding box information is output.



1 Set the static environment



2 Calculate the motion

- We've used motion planning library.



- Motion planning algorithm is **RRT-Connect**.

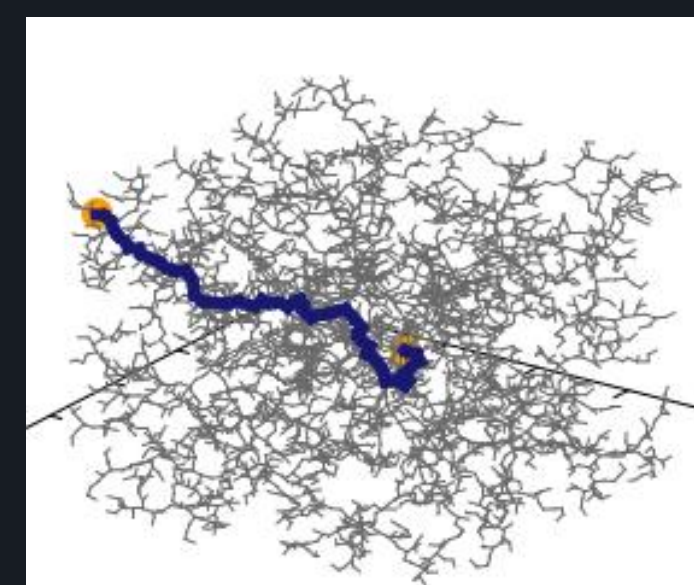
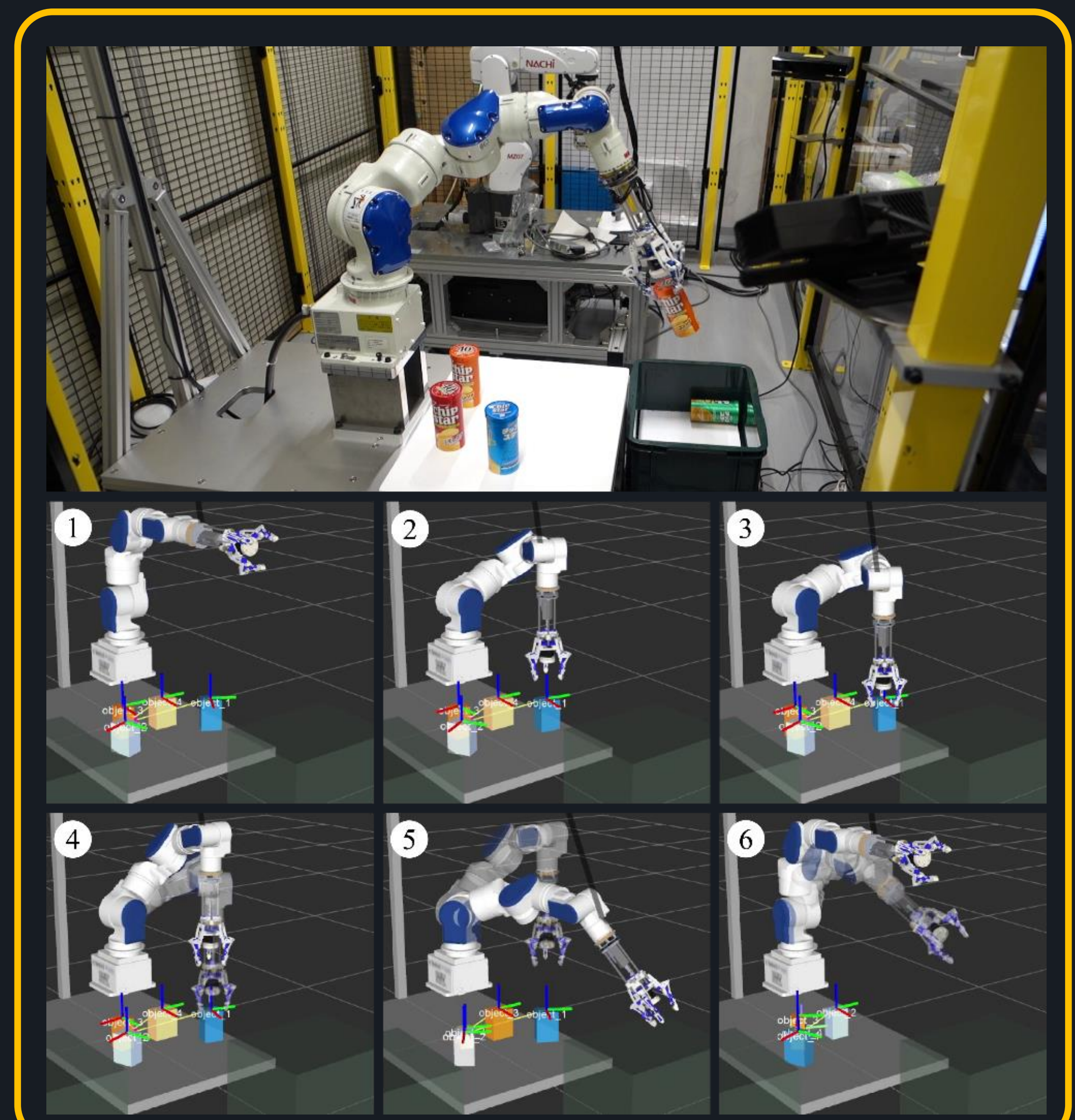


Image of RRT-Connect

Fast Calculation



Practical test & example

Repeating the experiment to execute pick and place tasks **120 times**.



Number of **failures** in each areas

Result	Count	Rate[%]
Success	100	83.3
Motion planning failure	13	10.8
D-Hand error	4	3.33
Gripping failure	2	1.67
Object detection error	1	0.833

The success rate of **motion planning** should be increased.

Proposed method + IBM Watson Recognition

IBM Bluemix Hackathon

We won the **2nd/80** price !!
= A lot of people **NEEDS** our system.

