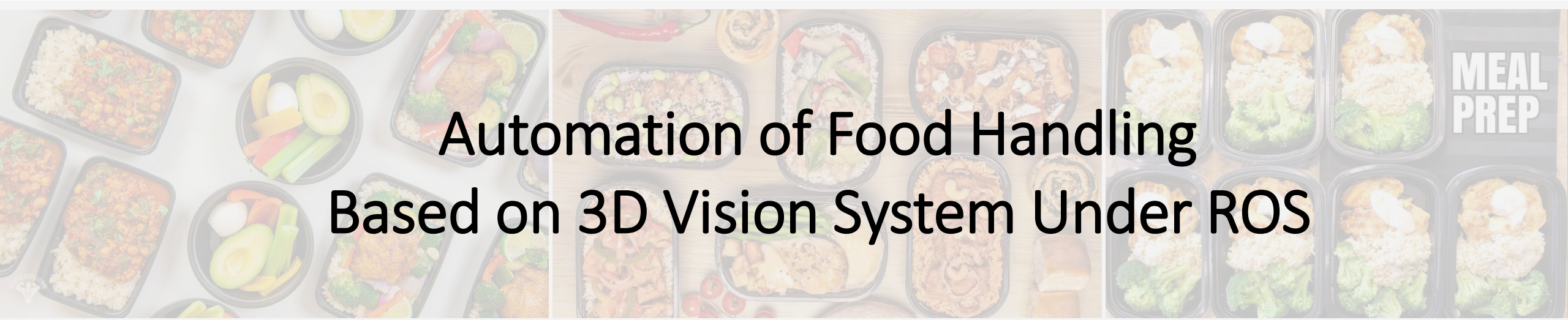
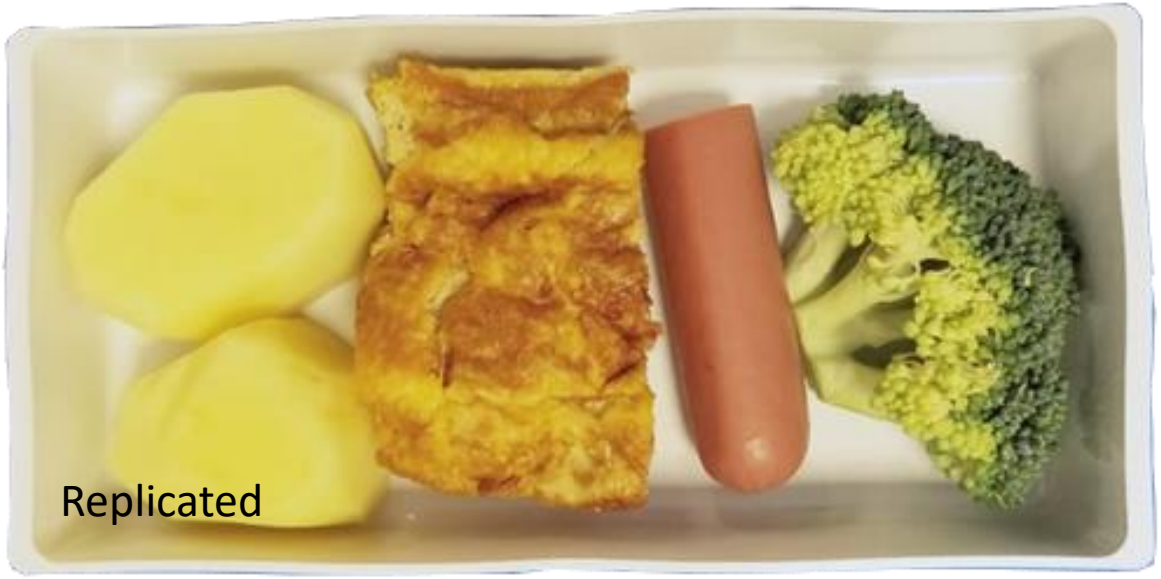


Automation of Food Handling Based on 3D Vision System Under ROS

Yadan Zeng
Research Associate
School of Mechanical and Aerospace Engineering
Nanyang Technological University, Singapore

Airline Meal Assembly (Western Menu)



Menu food items

- Lyonnaise Potatoes
- Omelette
- Sausage
- Broccoli
- Cherry Tomato (optional)

Automated meal assembly

RGBD camera (Output side)

RGBD camera (Input side)

Delta robot

Scara robot

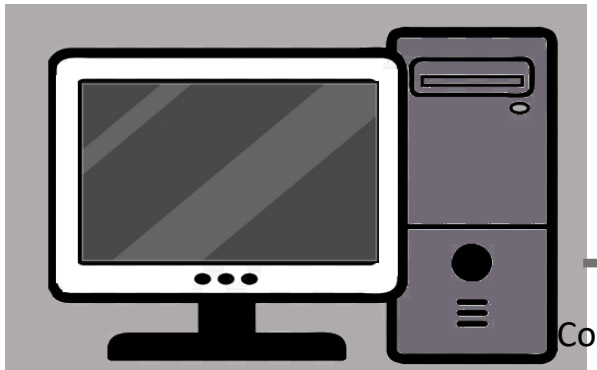
Trays of cooked food items at input

Meals being sorted as success and fail

Output conveyor belt

Input conveyor belt

Meals being assembled on casserole dishes at output



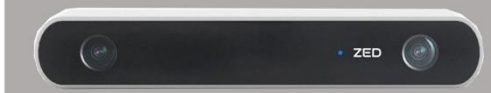
System Controller,
also running Vision Module
(Object Detection)

Coordinates
of target
items at
input side

RGBD data of item(s)
to be picked

RGBD Camera
(Input side)

RGB data of items at
output side



RGBD Camera
(Output side)

Robot Module

Delta Robot

Scara Robot

Robot Controller

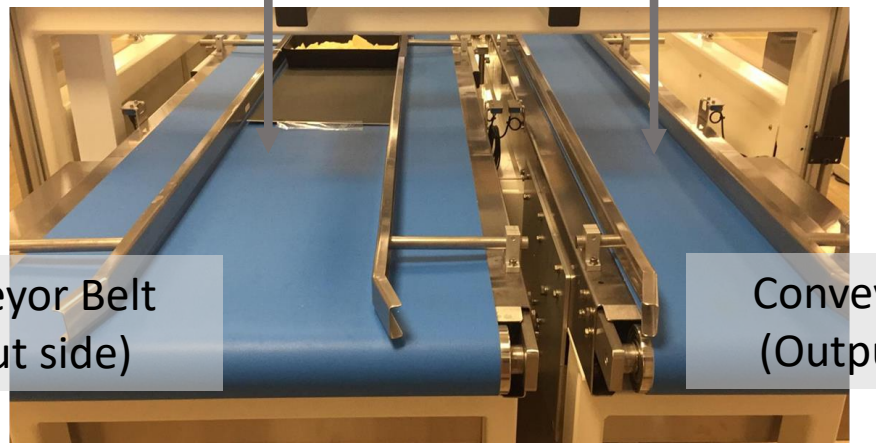
Robot Controller

Instructions to move input
and output conveyors

Instructions to sort
output meals

Instructions to open
or close gripper

Interchangeable
Gripper



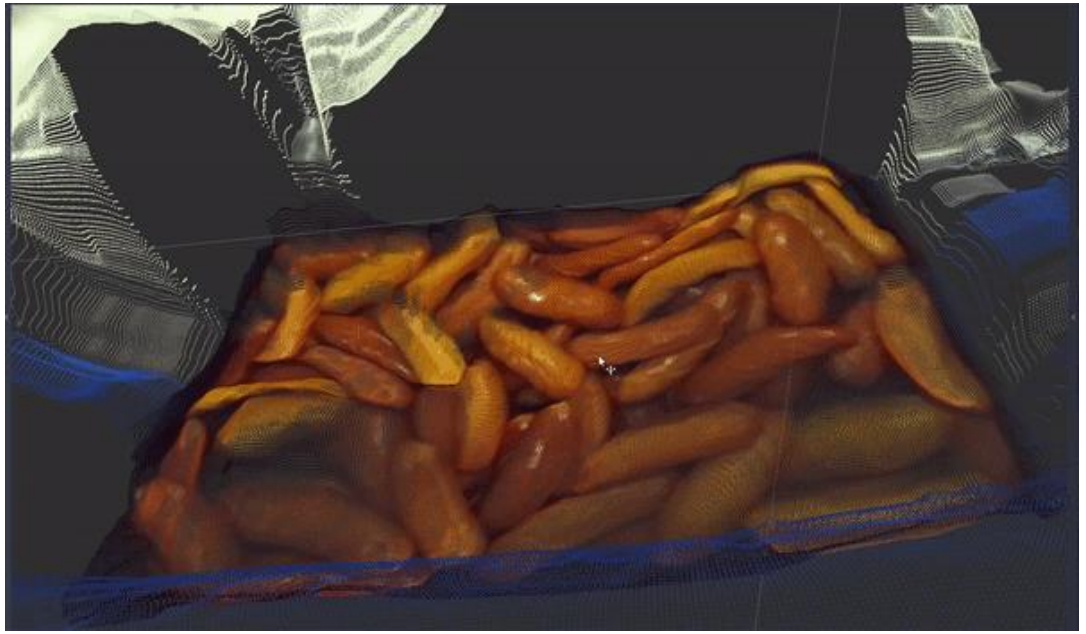
Conveyor Belt
(Input side)

Conveyor Belt
(Output side)

Performance of different cameras shown in RVIZ

ZIVID

ZED



System Integration based on ROS

RGBD data

Vision Module (Input side)

Zivid camera driver

Image data (RGB)

Object detector

Image data

Pose server

Point cloud data

Depth server

Depth data

RGBD data

Vision Module (Output side)

Zed camera driver

Image data (RGB)

Object detector

Item Arrangement Verifier

Check server

Scara Robot controller

Checking result

Triggering signal

3D pose & checking result

Comm. socket to robot controller

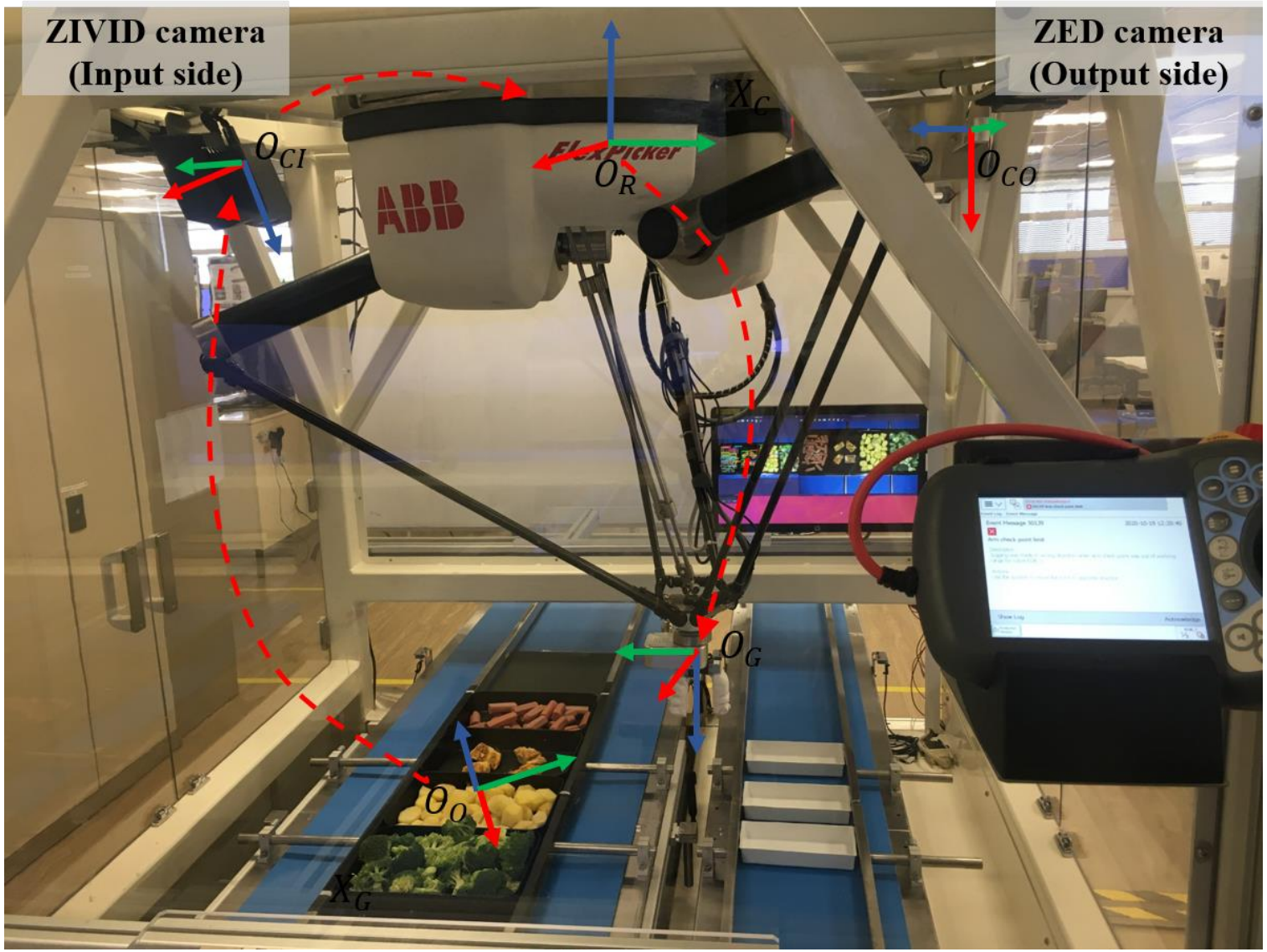
Triggering signal

3D pose & checking result

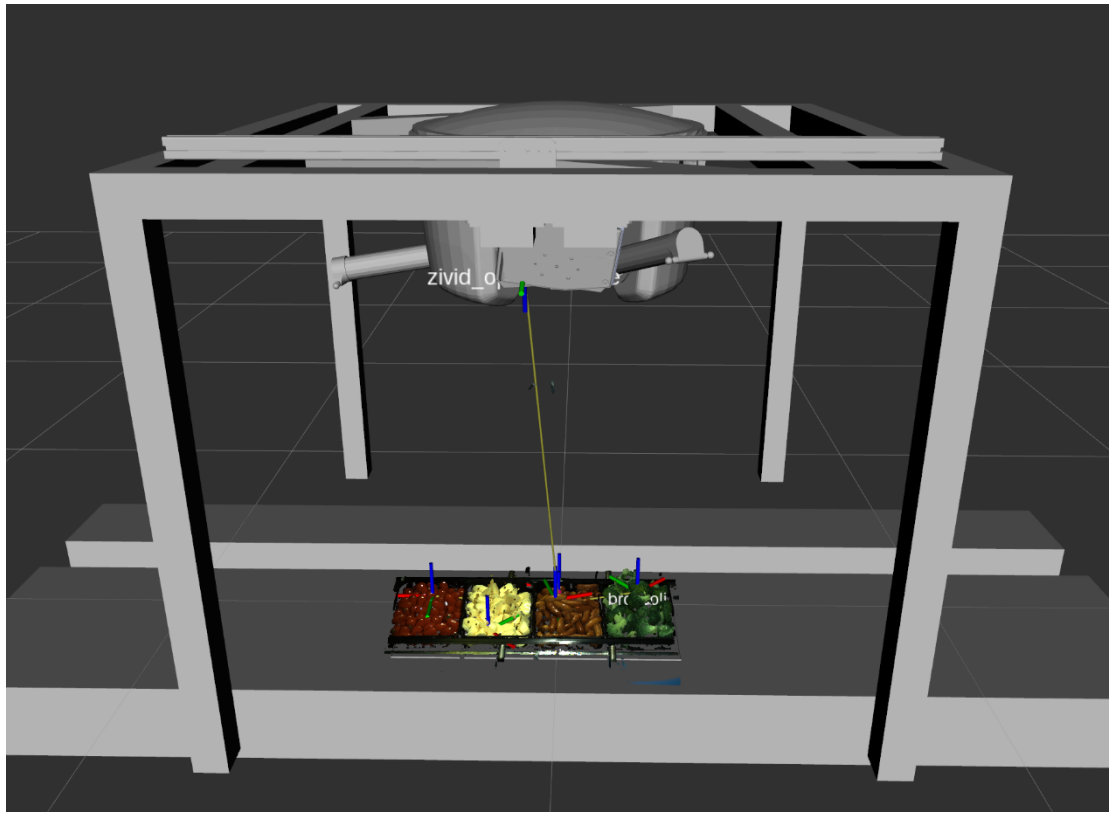
Triggering signal

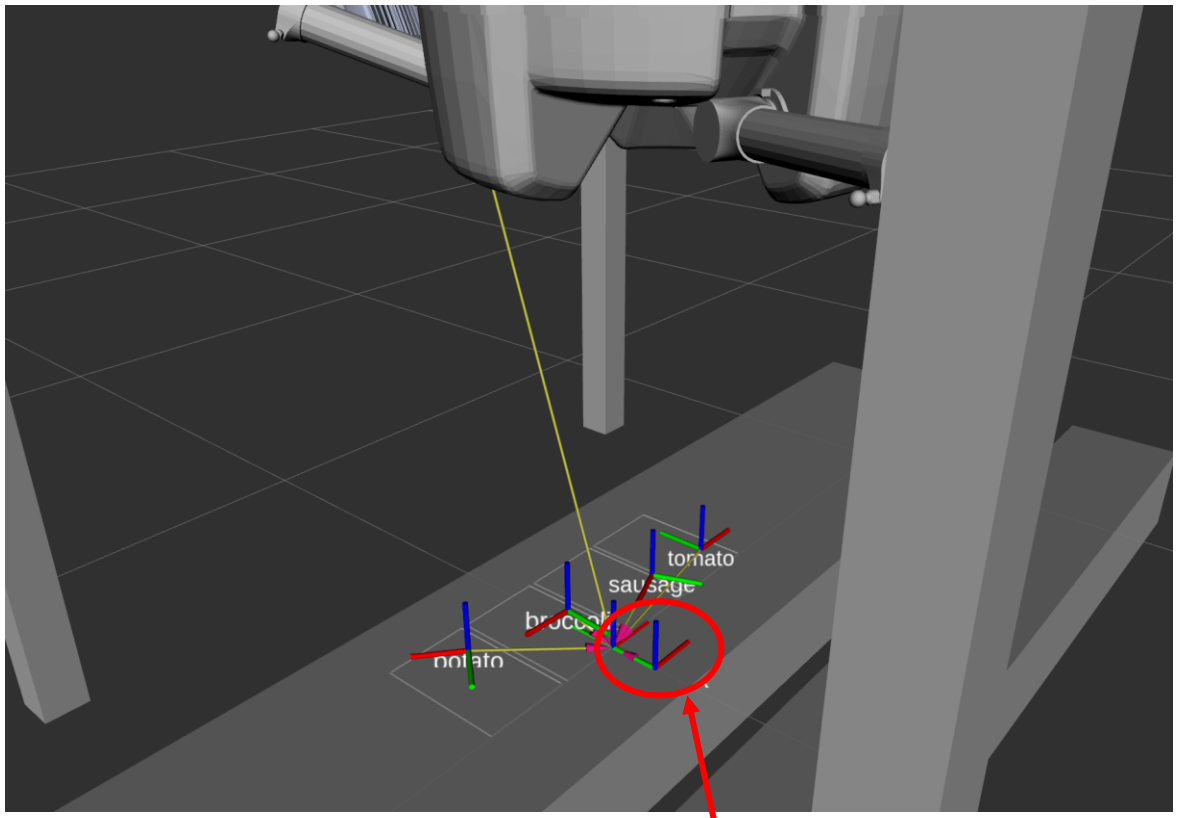
Delta Robot controller

Coordinate system relationship



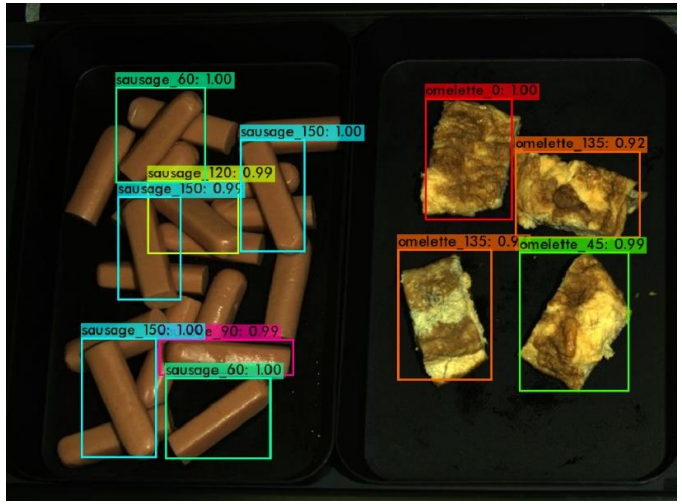
Coordinate frame relationship in RVIZ

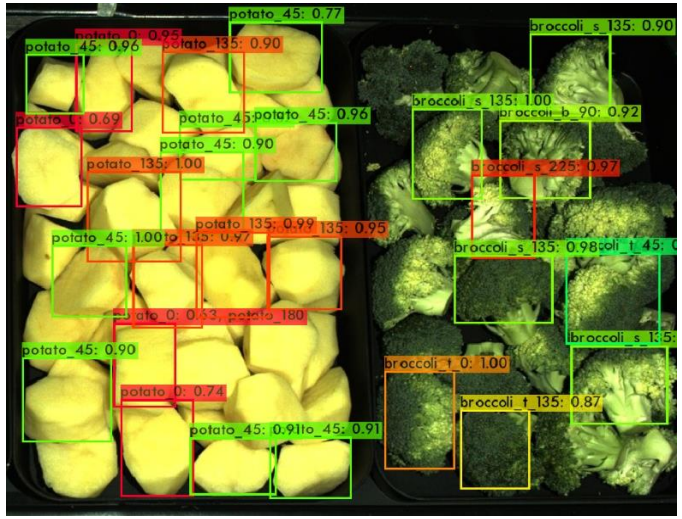




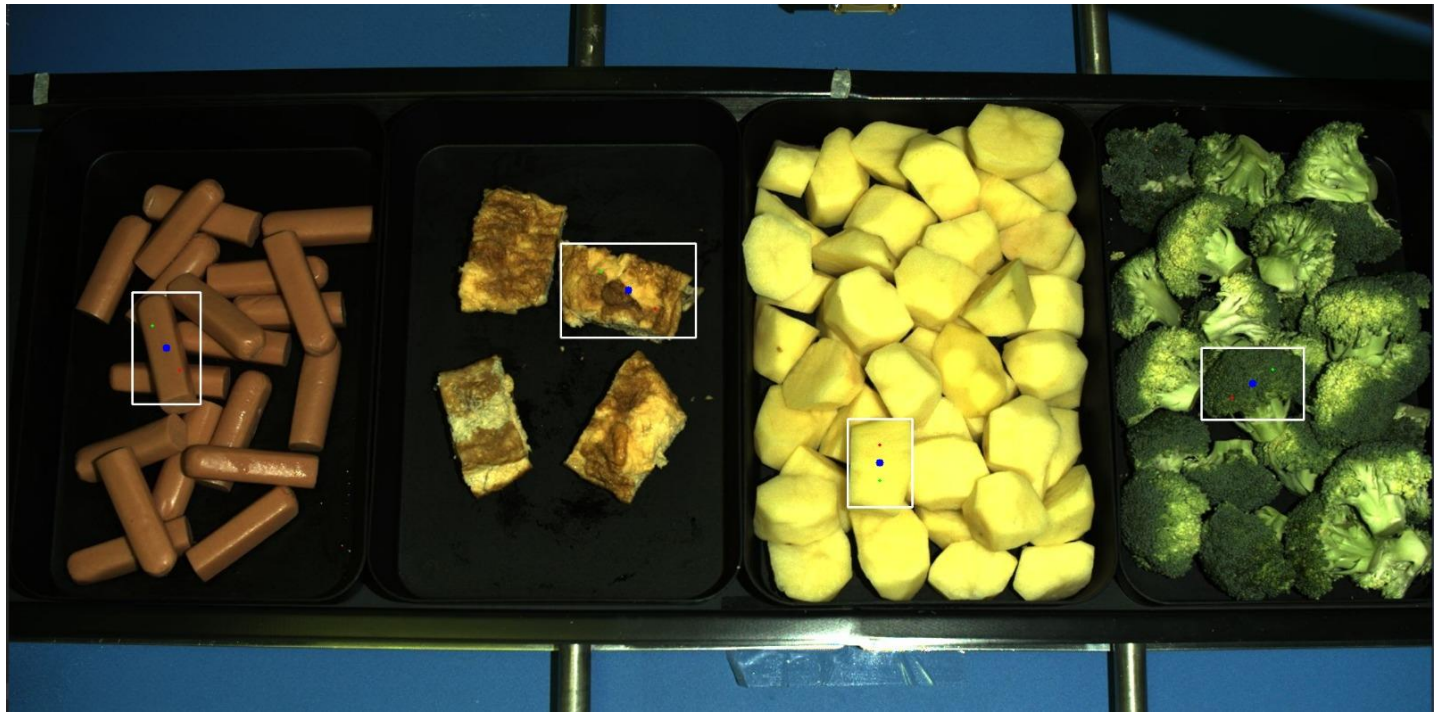
Recognizing real food items in trays

- Recognizing individual food items from trays





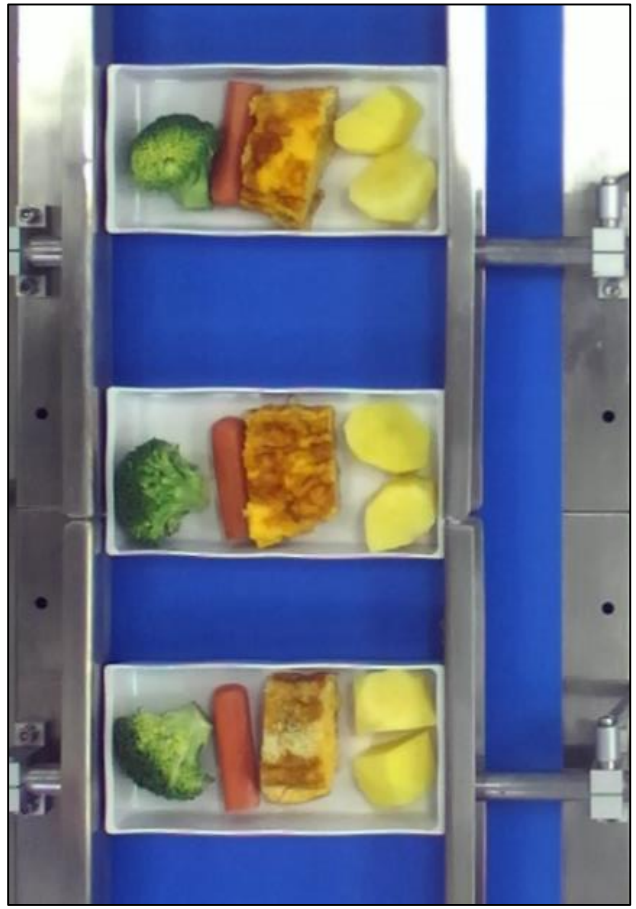
- Recommending target objects to pick based on 3D coordinates of candidate food items



Filling 3 casseroles (real foods)

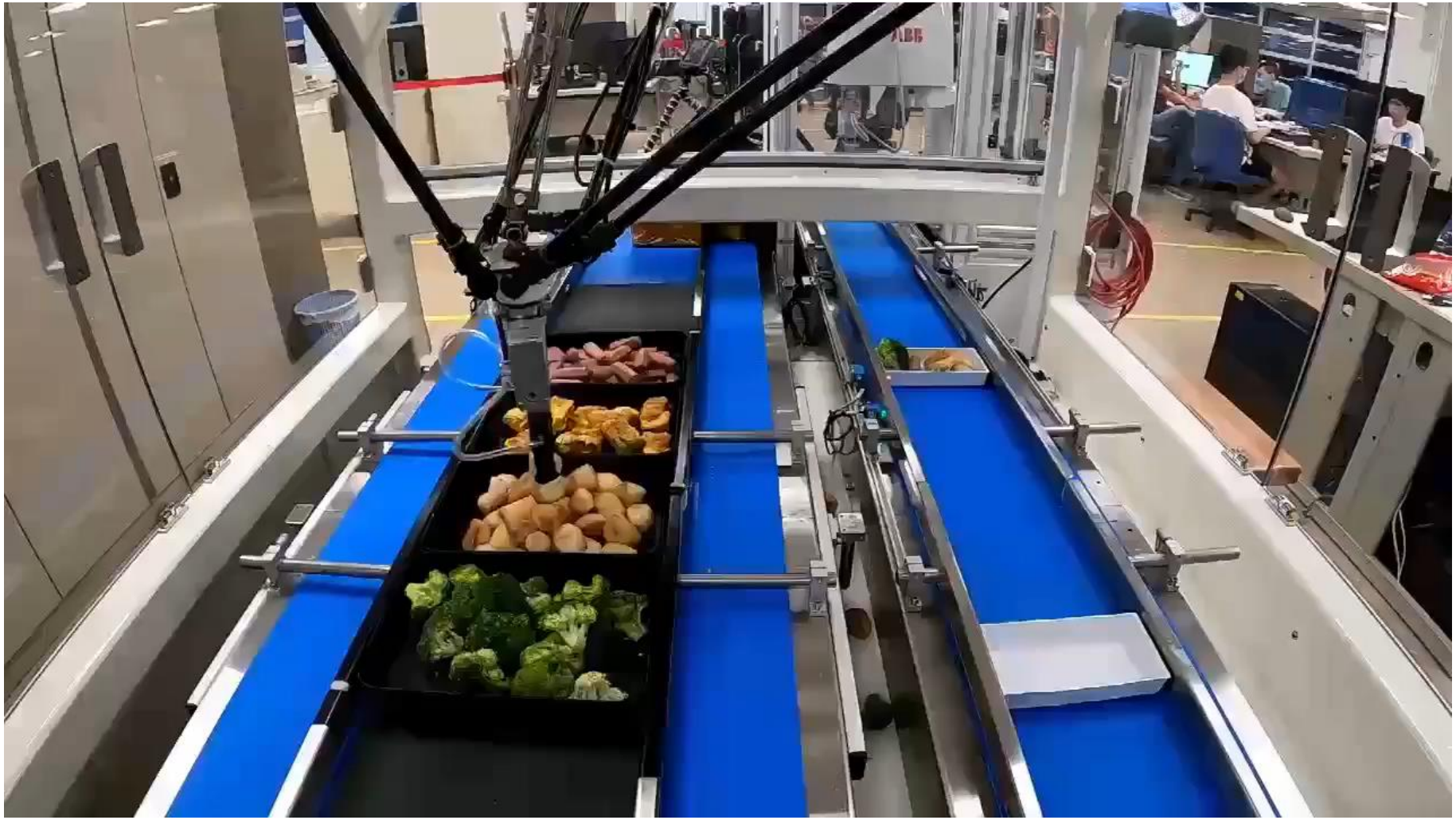
- A camera at the output conveyor checks for missing food items
- Motion-planning algorithm executes a routine for corrective action

Result after picking at output



Remedy action and post processing sorting

- Output meals are sorted into different collector based on the checking results



NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

ROS industrial consortium asia pacific

Thank you!

Yadan Zeng
Email : *Yadan001@e.ntu.edu.sg*