SIS2021 Final

組別: 第二組

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Contribution

- Task1 Detection: 劉紫晏
- Task2 Pose Estimation and Grasping: 劉紫晏，黃柏叡
- Task3 Navigation: 黃柏叡
- Task4 Pick and Place: 童瑞棋
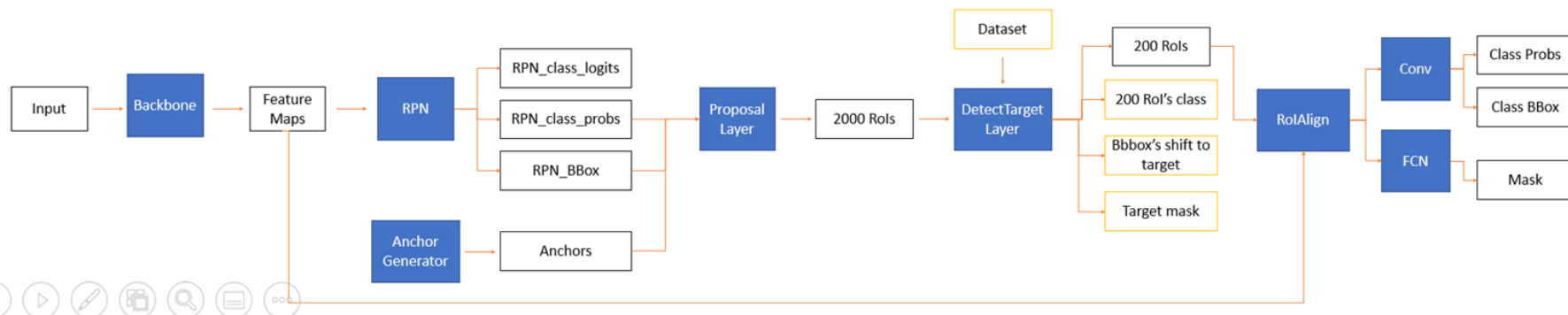- 影片剪輯：童瑞棋
- PPT: 黃柏叡，劉紫晏，童瑞棋

Task1 MaskRCNN

MaskRCNN:

- An algorithm that do well in instance segmentation field
- FasterRCNN + mask branch

MaskRCNN input: real-time RGB image got from locobot's camera

MaskRCNN output: the object's class, bounding box, and segmentation

MaskRCNN full network architecture:

Task1 results

Input

RGB Image

Output

Classification + Bounding Box

Segmentation

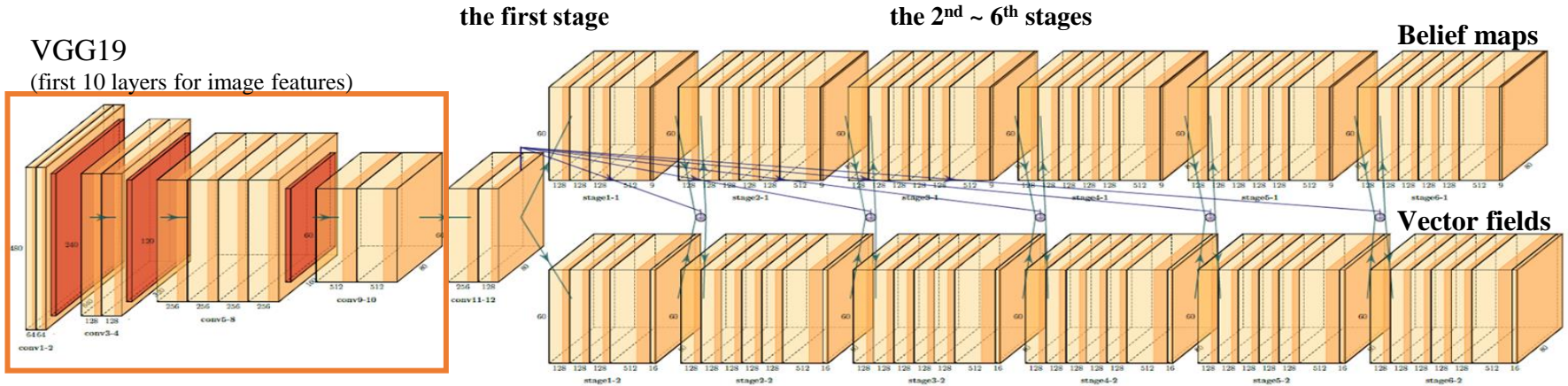# Task2 DOPE + grasping

DOPE:

- An algorithm to get 6-DoF pose estimation of known objects from a single RGB image.

DOPE input: an RGB image of size w×h×3 (640×480×3)

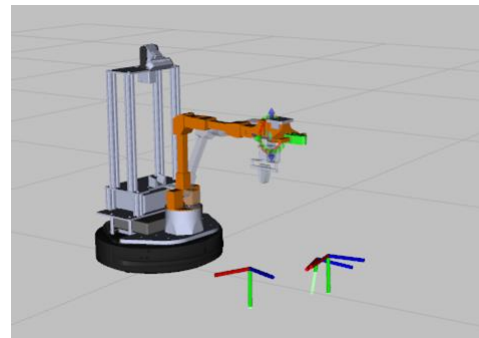DOPE output: (1)belief maps and (2)vector fields.

Task2 results

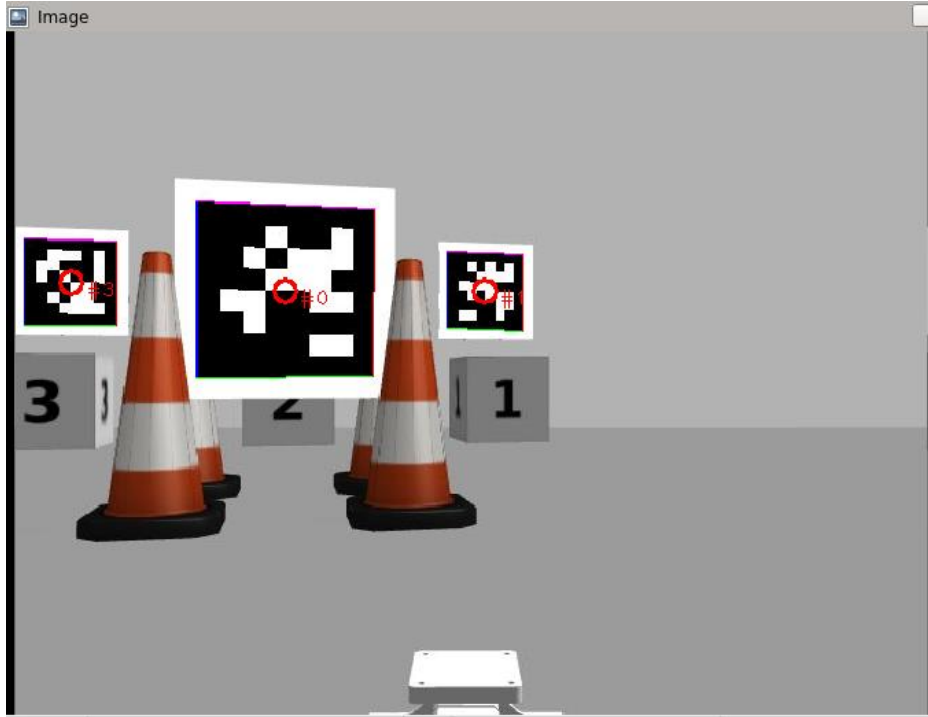**Input**

Output

RGB Image

belief maps
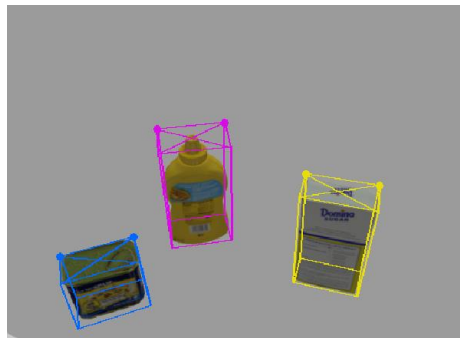
vector fields

Task3 AprilTag2

- Apriltag detection
  - localization
    - transform camera optical frame to map frame
      - obtain goal point
  - Input: camera image and info
  - Output: PoseArray
- process
  - rotate locobot until three apriltag is detected
  - start navigation toward designated goal point

Task3 A* Navigation

- A* input: Occupanacy Grid map(generate by D435 pointcloud)
- A* output: path to target goal
- pure pursuit: generate local goal on the path and use PID control to navigate torward local goal
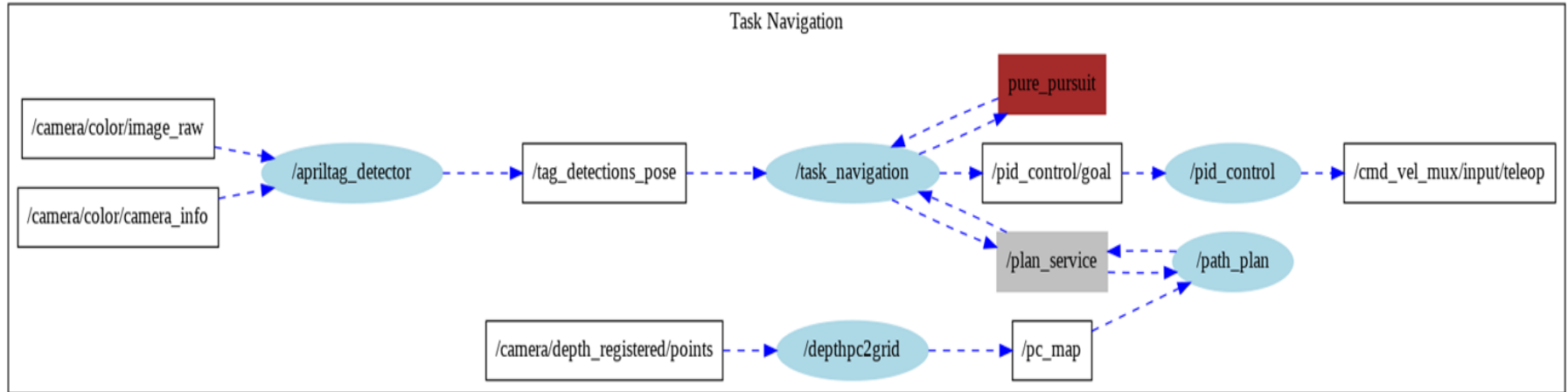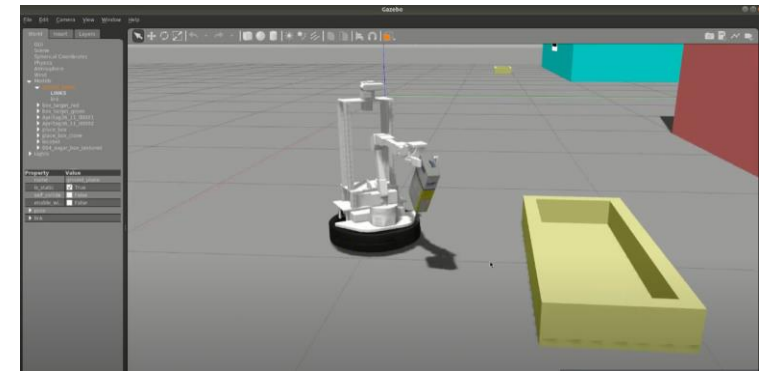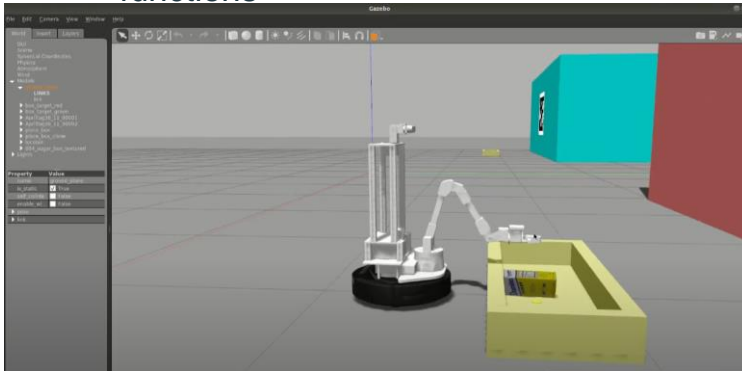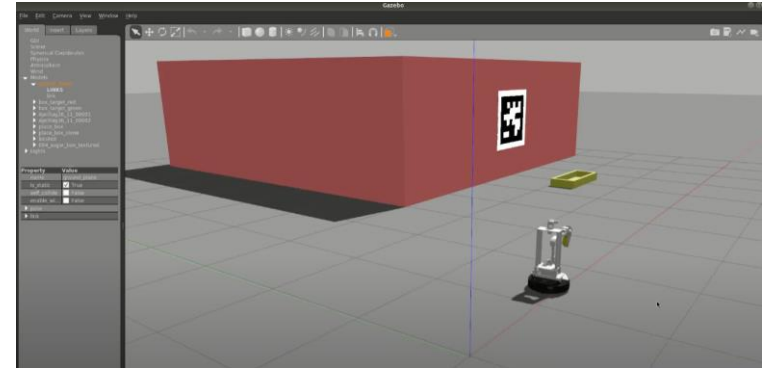
Task3 A* Results
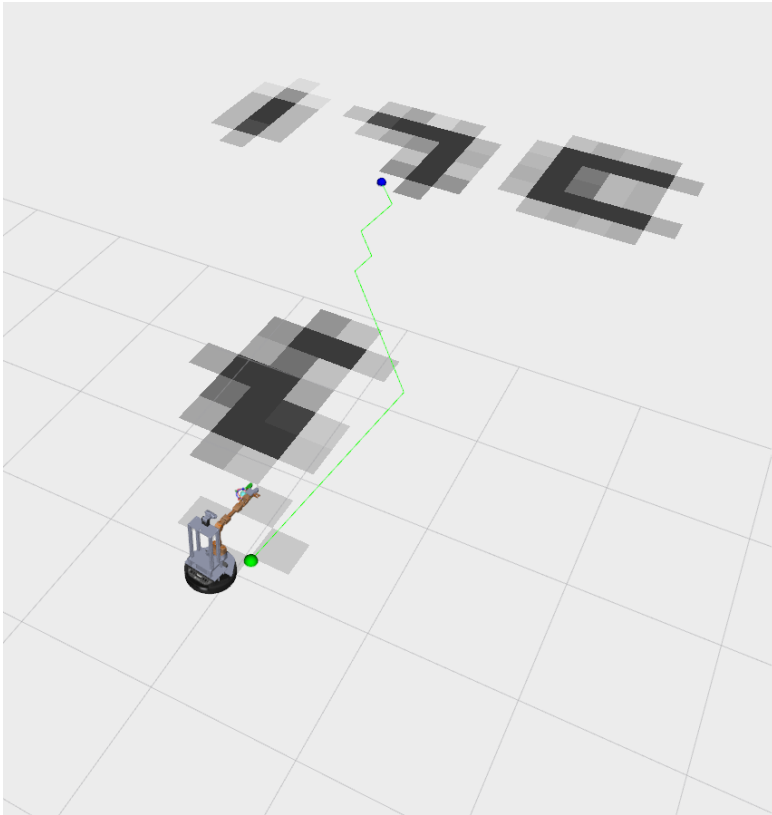
- Green line: astar path
- blue point: target goal
- green point: PID goal (local goal)
- map: pc map

Task4 Placing

- Based on Task3 to go placing
- Assign Locobot to arrive destination(in front of AprilTag for 1.7m far)
- Modify parameters to optimize placing accuracy based on baselines and Locobot's official functions

Reference

- [1]: [AprilTag 2:Efficient and robust fiducail detection](#)
- [2]: [Mask R-CNN](#)
- [3]: [Dope](#)
- [4]: [Locobot Manipulation](#)
- Github Repo: https://github.com/ray0727/sis2021_final