Yuan Ze University

Dual camera mechanism to remove dynamic obstacles for improving ORB - SLAM 2 Algorithm

Taiwan Experience Education Program - Internship

Introduction

- ORB SLAM 2 algorithm helps in **estimating the position** of a robot in a given environment by identifying **feature points** in RGB and depth data.
- The feature points taken on the **dynamic obstacles** in the environment causes **deviation** in the estimated **path** of the robot.
- Several algorithms have been proposed to avoid those deviation, but those algorithms have both pros and cons.

Scope of the project

- The **dual camera** mechanism is devised to identify dynamic obstacles and **In - paint** them in RGB and Depth image.
- Our In - painting enhances the algorithm by considering **actual feature** points behind the dynamic obstacles.
- The dynamic obstacles that are **stacked together** are also removed in our approach.

Methodology

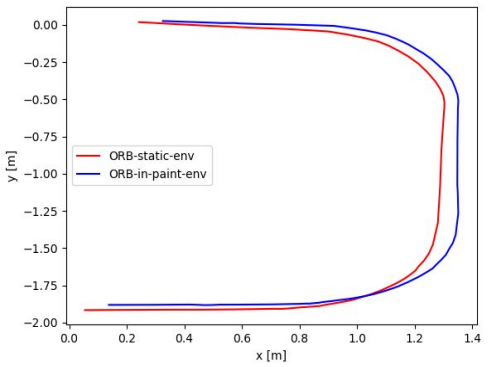
- Recording the dataset of the environment using two intel realsense **D435i** camera mounted on top of **turtlebot 4** as shown.

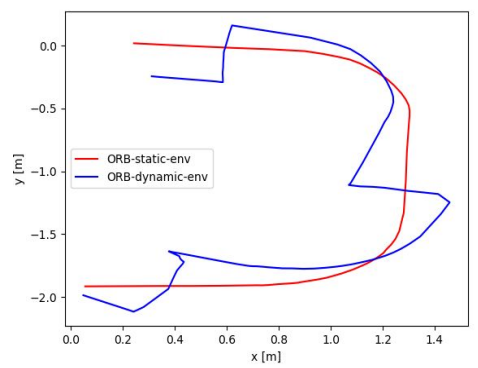
- The Mask R-CNN algorithm trained with MS COCO dataset is used to **identify the objects** from images of **two** cameras that are **correlated** at same plane at different time.
- The images undergoes **feature matching** to identify the **movement** in obstacle by generating key points descriptors and finding the best matches between them.
- With the help of object detecting and feature matching the change in **size and shift** of the object in left or right is identified.
- The change in size indicates movement of object in **forward or backward** and shift indicates movement in **left or right.**
- The dynamic obstacles are In - painted and given to ORB SLAM 2 to estimate path and create **sparse 3D map.**

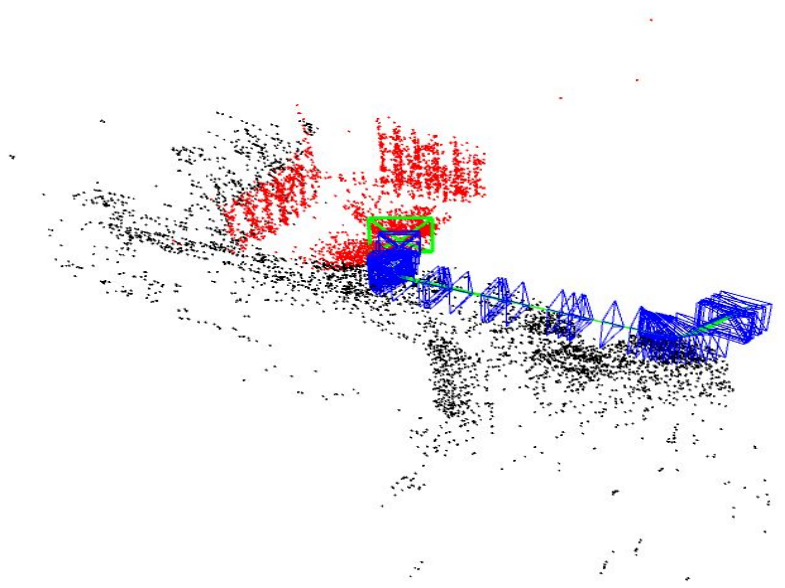
Result and Discussion

- The dynamic obstacle in **camera 2** is In - painted in **white first** and depending on the **movement** of obstacle, **camera 1's** RGB image will be **In - painted** in place of white.

- The ORB SLAM 2 algorithm with **no dynamic** obstacle was **compared** with 2 cases, one with **dynamic obstacle** and other with result from **our In - painting** algorithm in the **same environment**. (**Trajectory and sparse 3D map** is given below)







Conclusion and Discussion

- The estimated path of generated using our In - painting algorithm is similar to ORB SLAM 2 case with no dynamic obstacle.
- There is an improvement of 90.60 % in RMSE value of translational error of ATE for the above shown case.

Presenter Details

Nikil K 1080442
Rammesh Adhav SR 1080443

Guide : Dr. Po-Chiang Lin