Field painting robot based on ROS and map recognition

팀 명 : Gear (Good efficiency and result)

팀 구성 : 김정윤 (2018100670), 방지호 (2018100694)

Human-Robot Interaction Laboratory

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Electronic Engineering
Kyung Hee University

Contents

01. 주제 선정 이유

Field painting robot based on ROS and map recognition

NISSAN의 피치-R 로봇

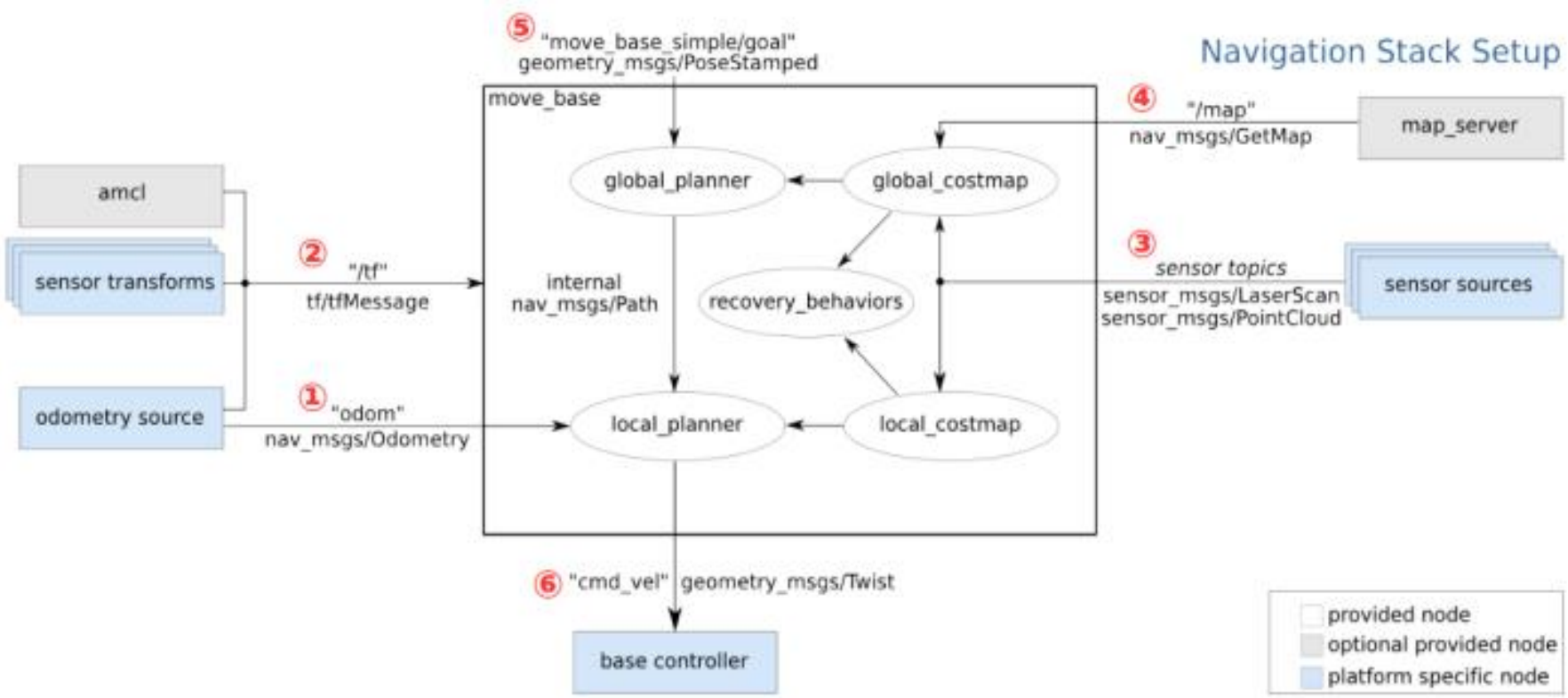
도로서 도색 작업하던 50대, 후진하던 작업 차량에 치여 숨져

차선 도색 작업기 폭발 사고...30대 남성 화상

02. Navigation 이론

기본 동작 → 센싱 → 위치 추정 → 모션 계획 → 이동 & 장애물 회피

[내비게이션에 필요한 정보]



① 오도메트리

② 상대 위치 변환

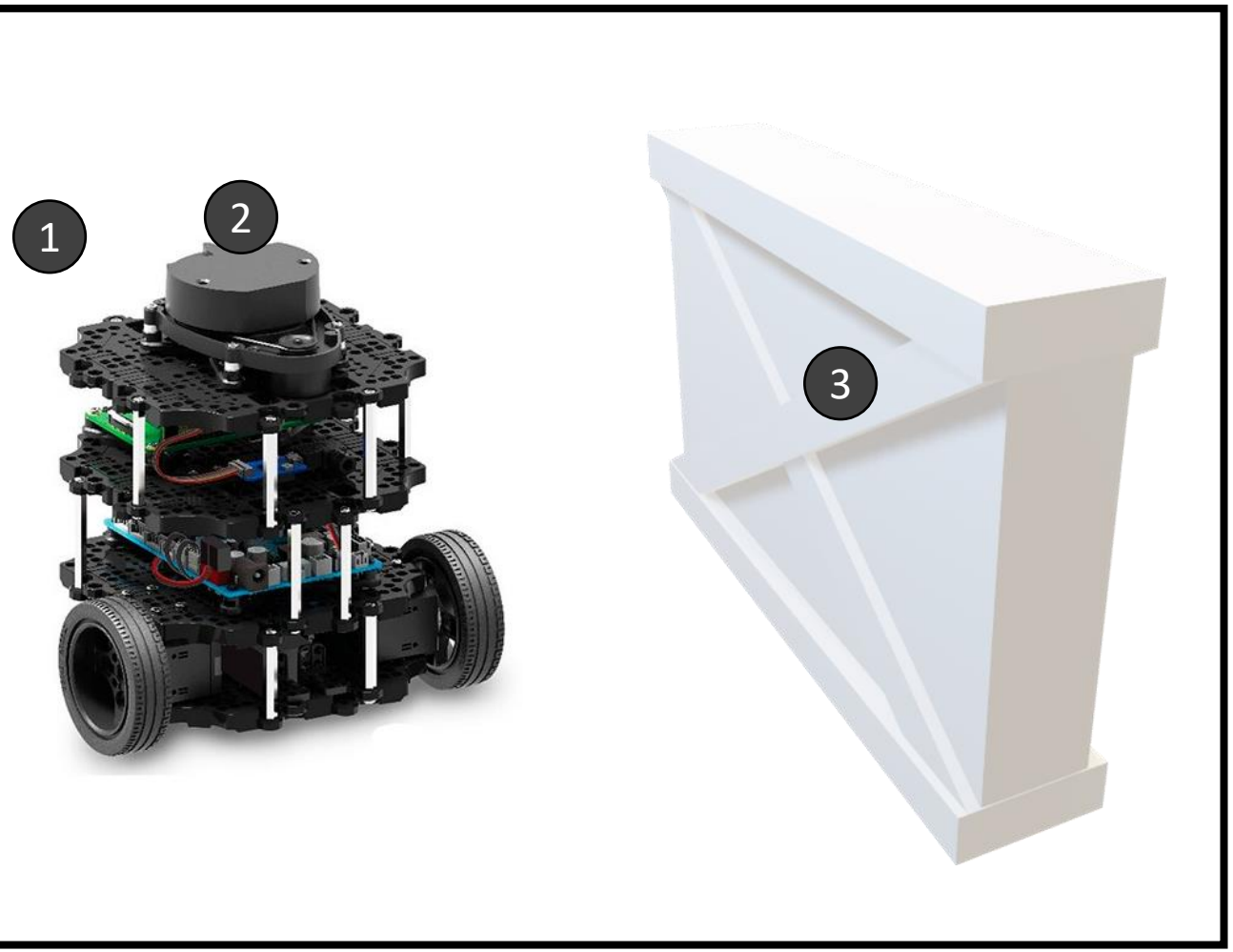
③ 거리 센서

④ 지도(map)

⑤ 목표 좌표

⑥ 속도 명령

02. Navigation 이론



01. 로봇 위치

02. 센서 위치

03. 장애물 위치 정보

04. 고정 지도(static map)

→ Costmap

02. Navigation 이론

로봇 위치 추정을 위한 AMCL (Adaptive Monte Carlo Localization)

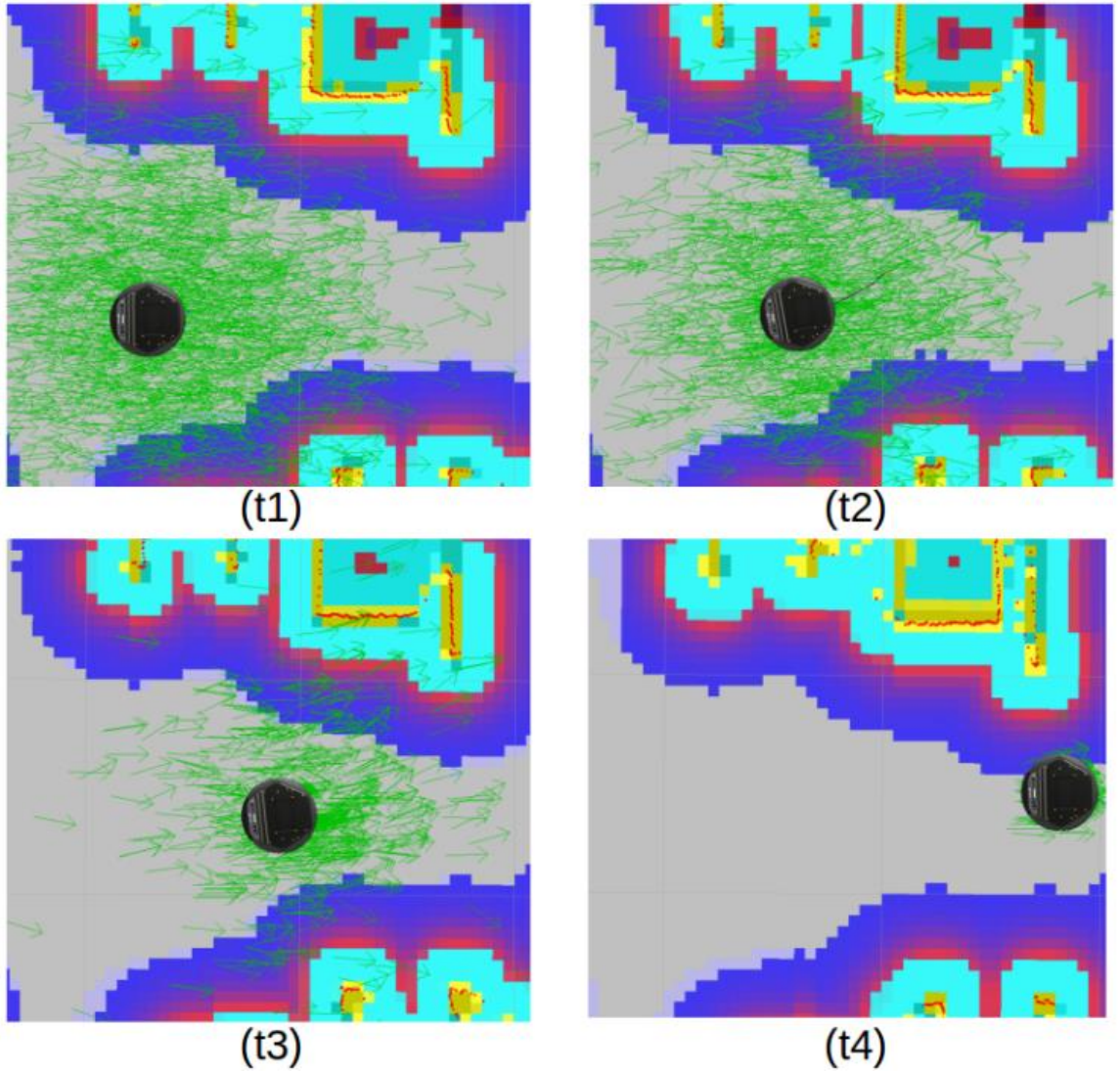
$$bel(x_t) = p(x_t | z_{0..t}, u_{0..t})$$

$$\acute{bel}(x_t) = \int P(x_t | x_{t-1}, u_{t-1}) \, bel(x_{t-1}) \, dx_{t-1}$$

$$bel(x_t) = \eta_t \, p(z_t | x_t) \, \acute{bel}(x_t)$$

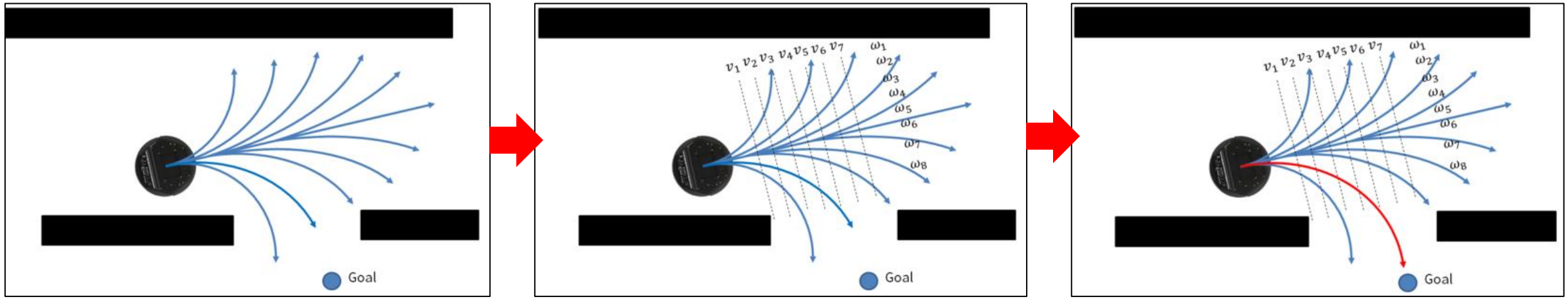
$$\omega_t^{(i)} = \eta \, p(z_t | x_t^{'(i)})$$

$$X_t = \{ x_t^{(j)} | j = 1 \cdots N \} \sim \{ x_t^{'(i)}, \omega_t^{(i)} \}$$



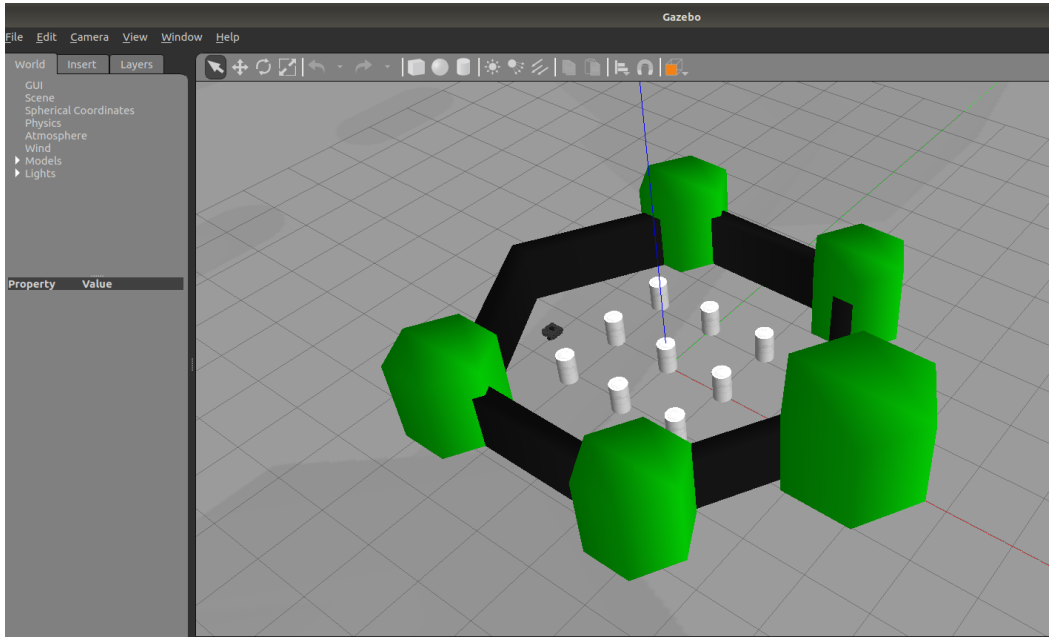
02. Navigation 이론

지역 계획, Dynamic Window Approach (DWA)

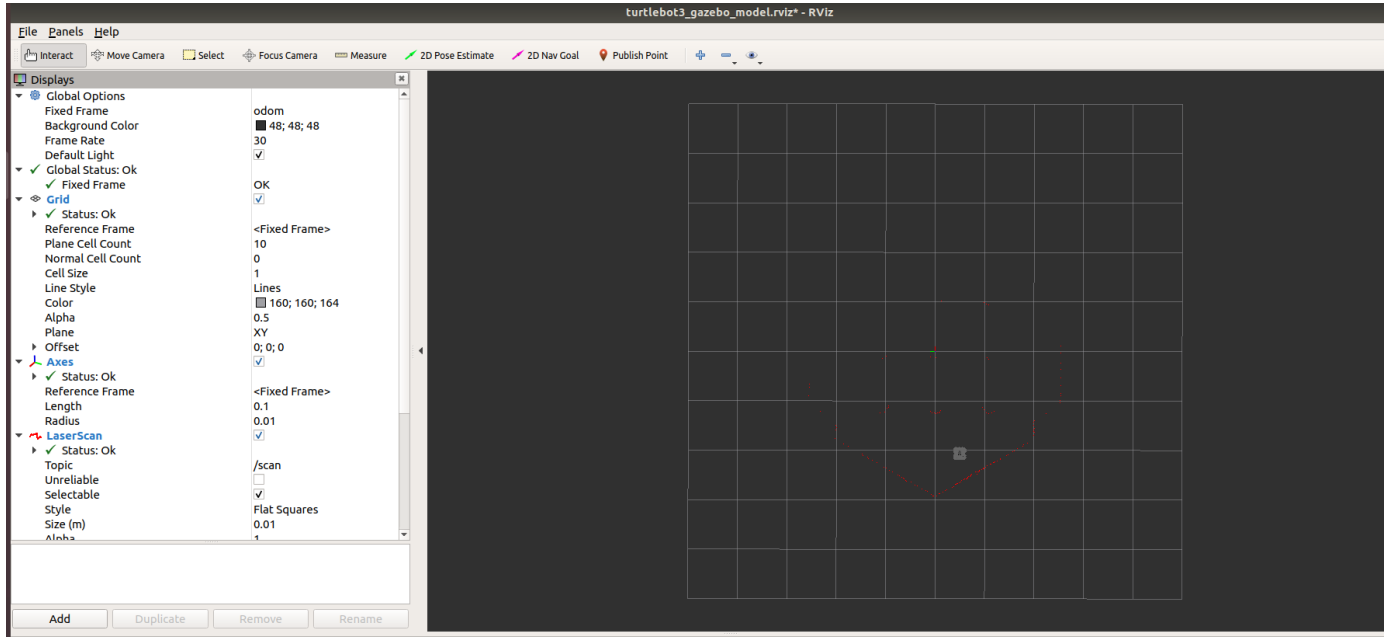


로봇의 방향 속도, 충돌을 고려하여, 목적함수가 최대가 되는 속도 v, ω를 구함

03. ROS Navigation & SLAM

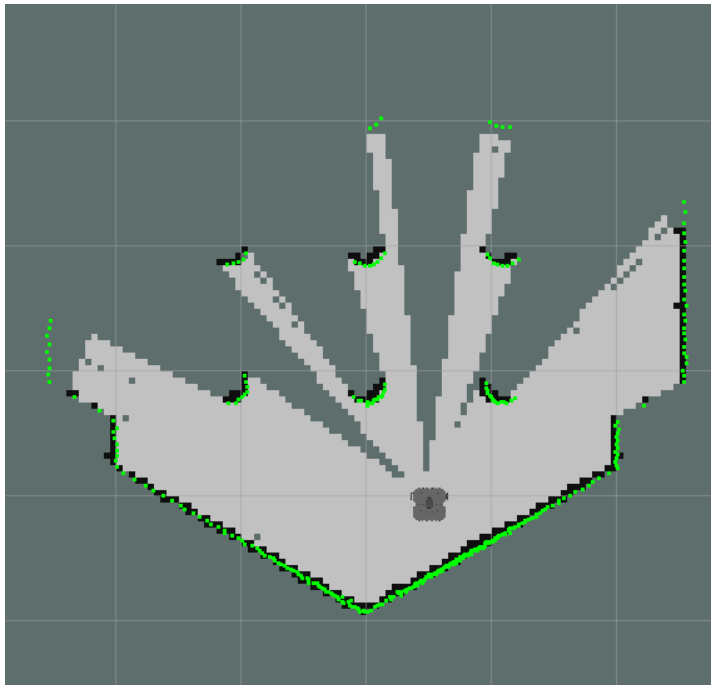


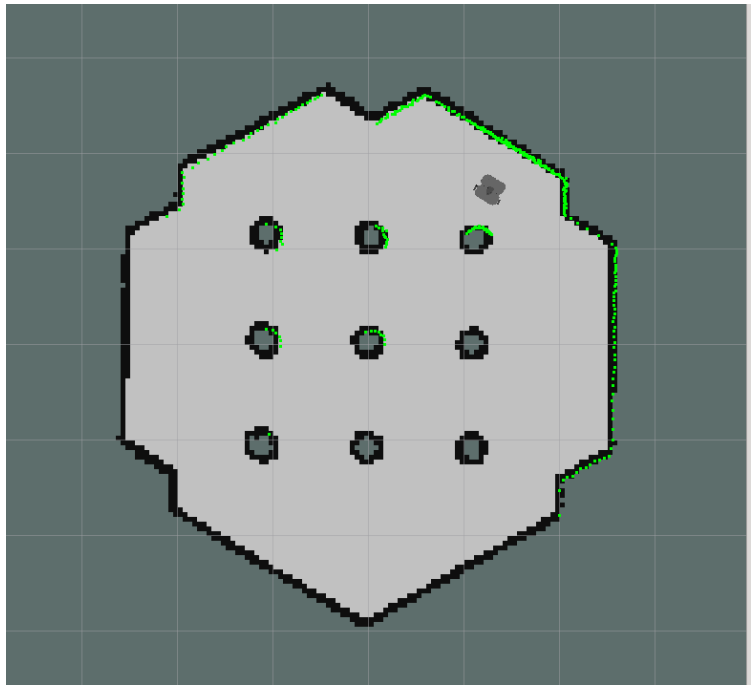
ROS Gazebo

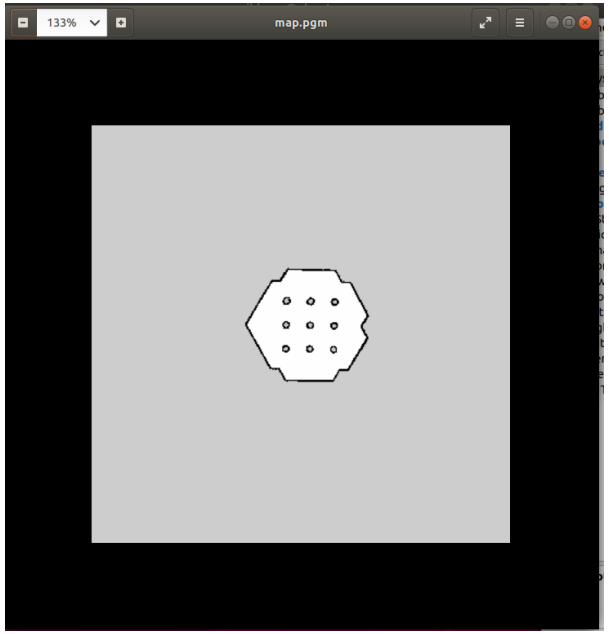


ROS Rviz

03. ROS Navigation & SLAM



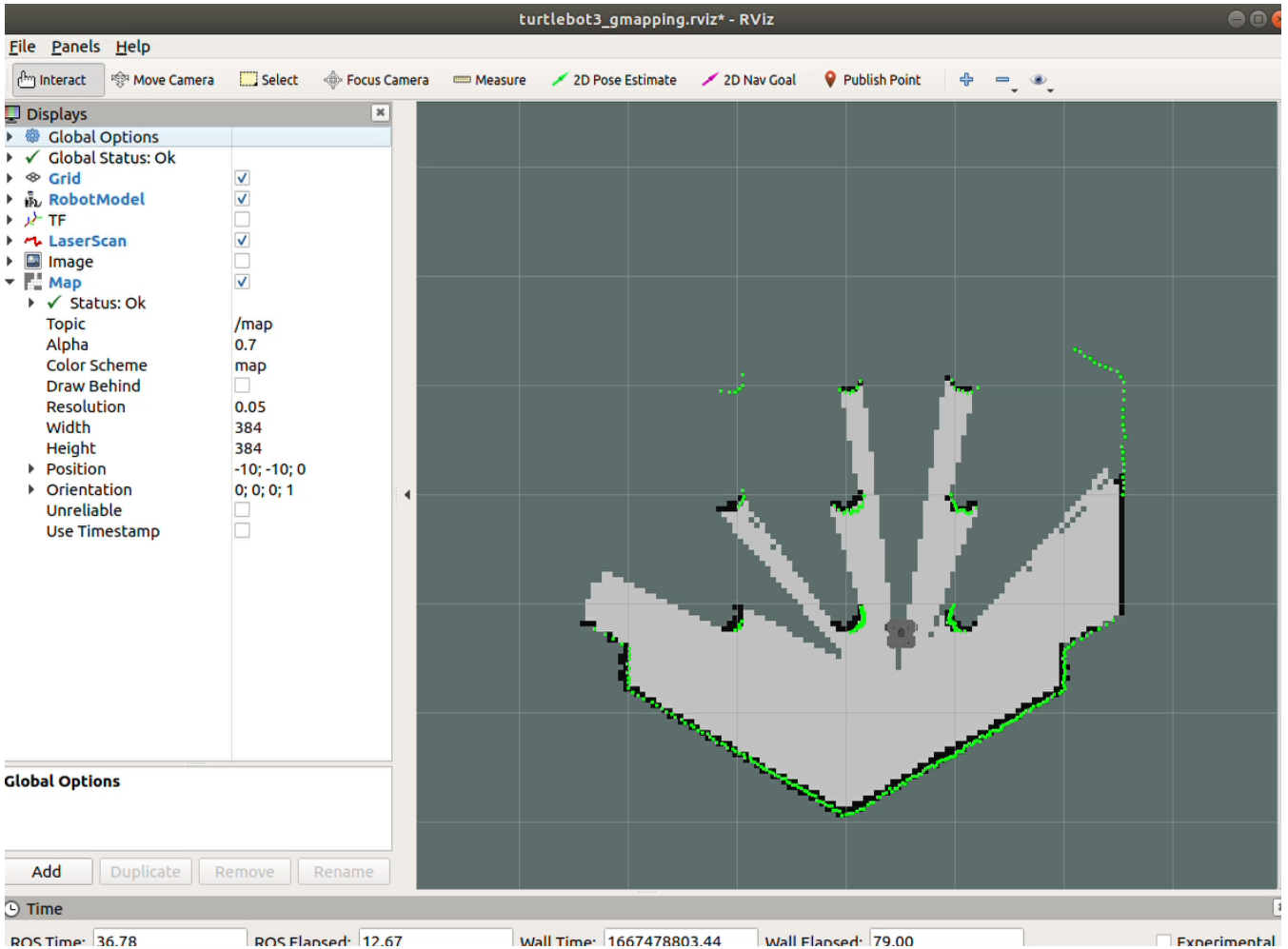




SLAM Mapping

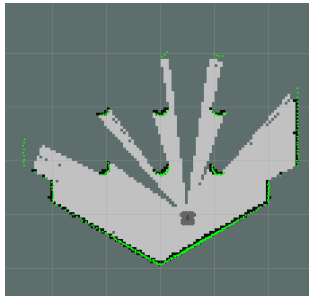
Map Complete

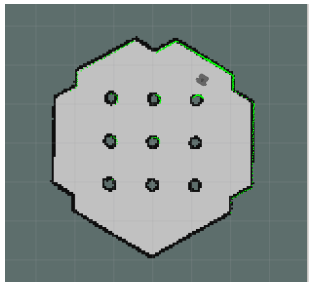
03. ROS Navigation & SLAM

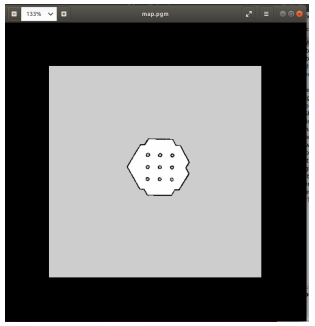


ROS Mapping

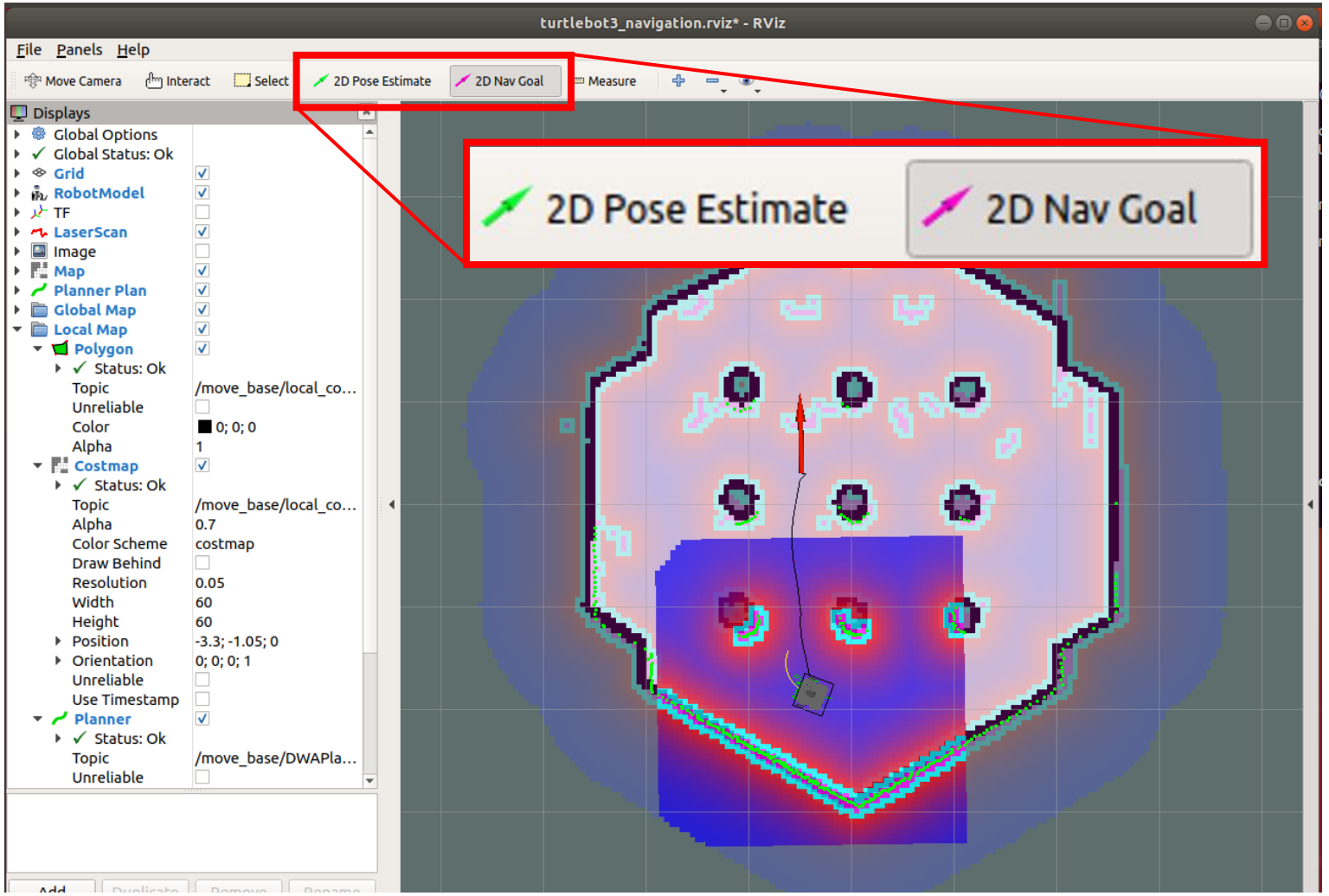
03. ROS Navigation & SLAM





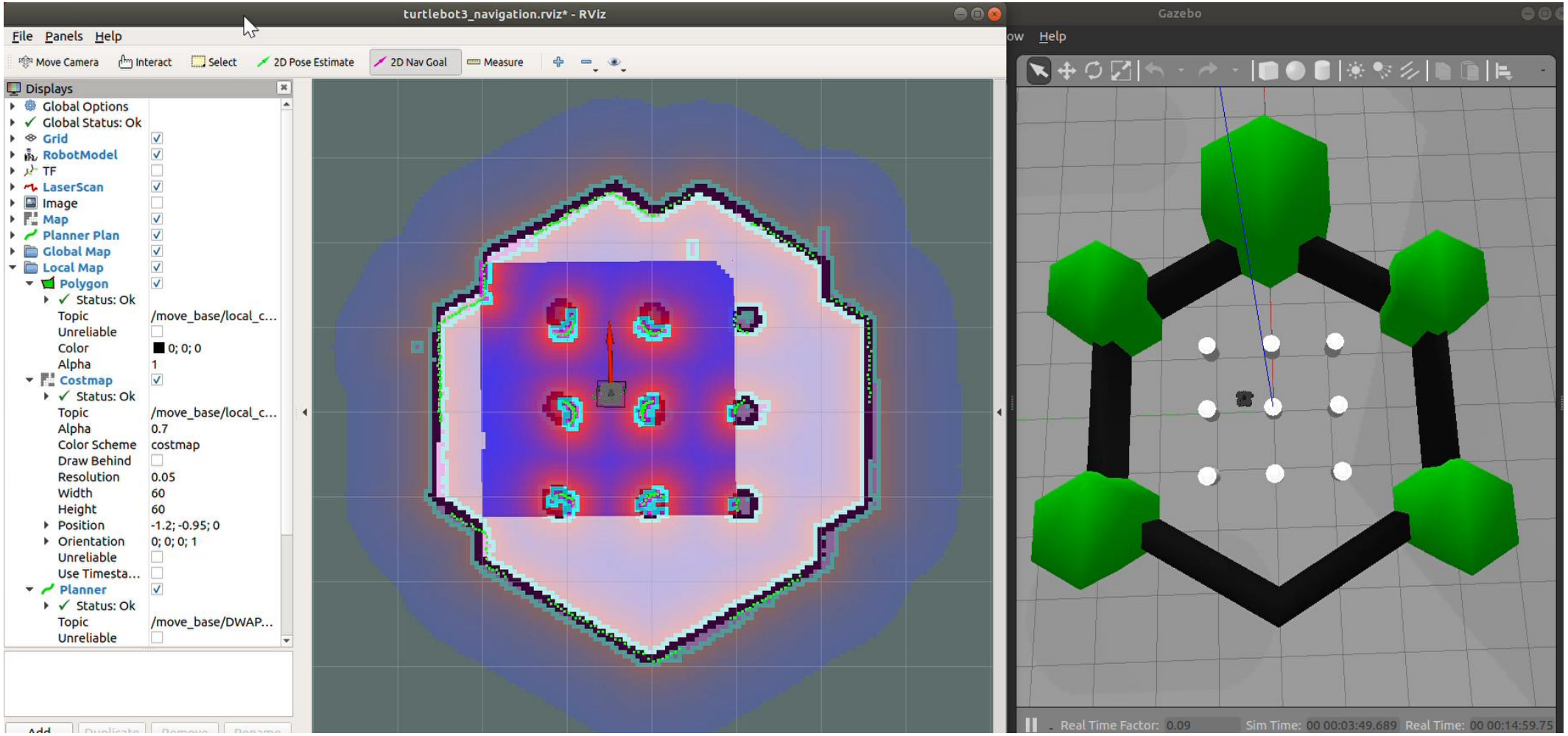


Map



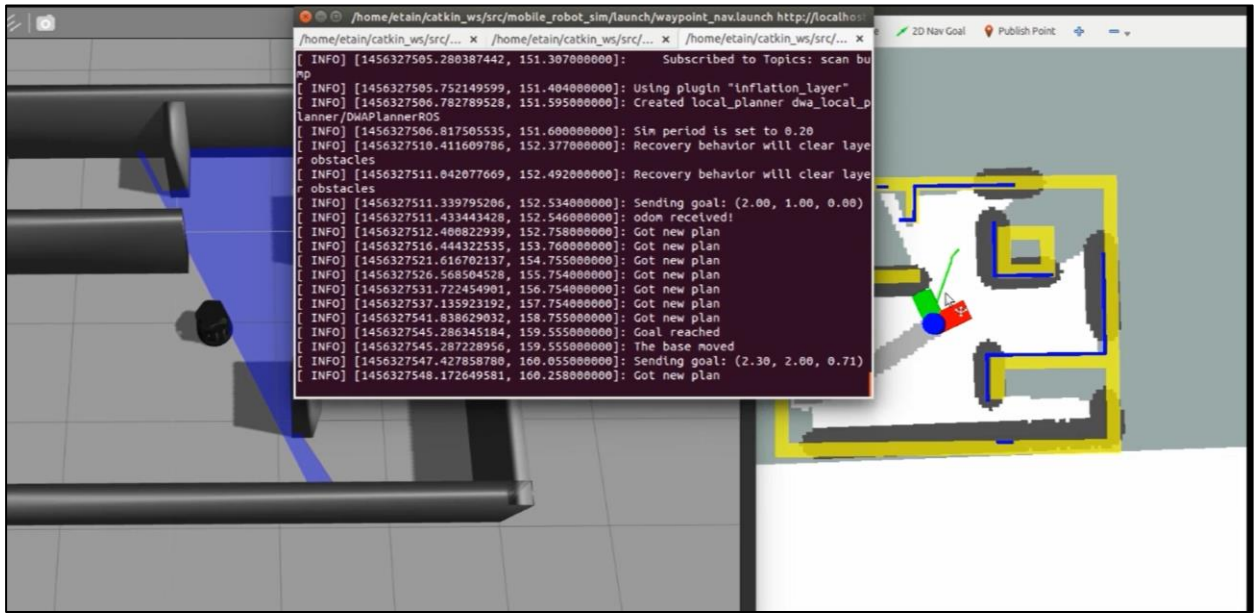
ROS Navigation

03. ROS Navigation & SLAM

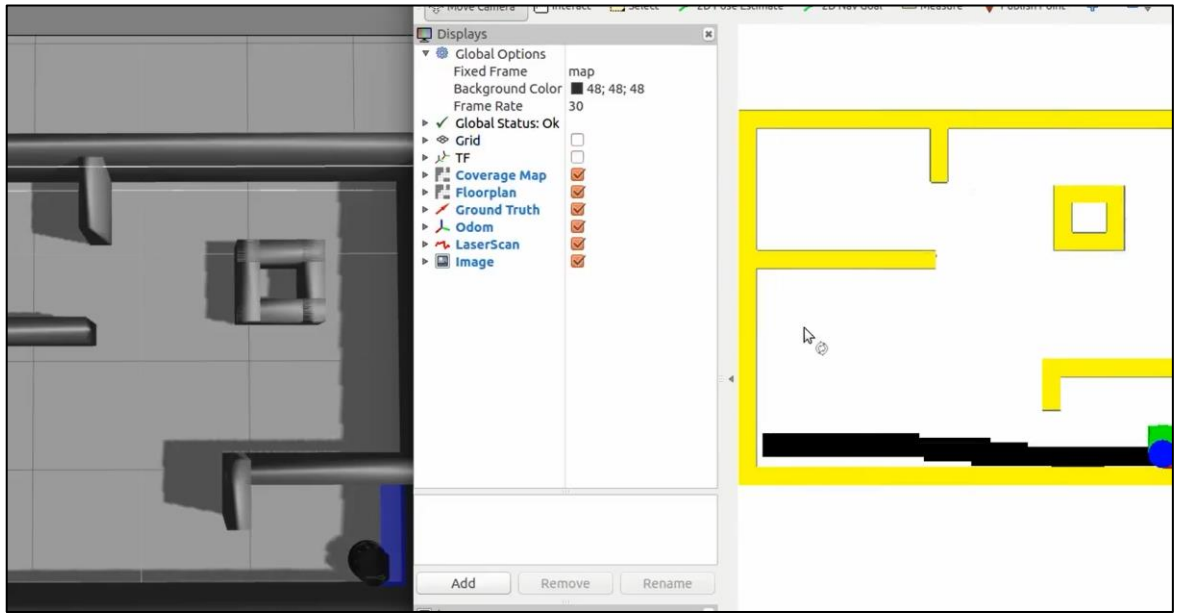


ROS Navigation

04. ROS Gazebo에서 Field painting robot 구현



ROS Waypoint Navigation



Create travel path trajectory

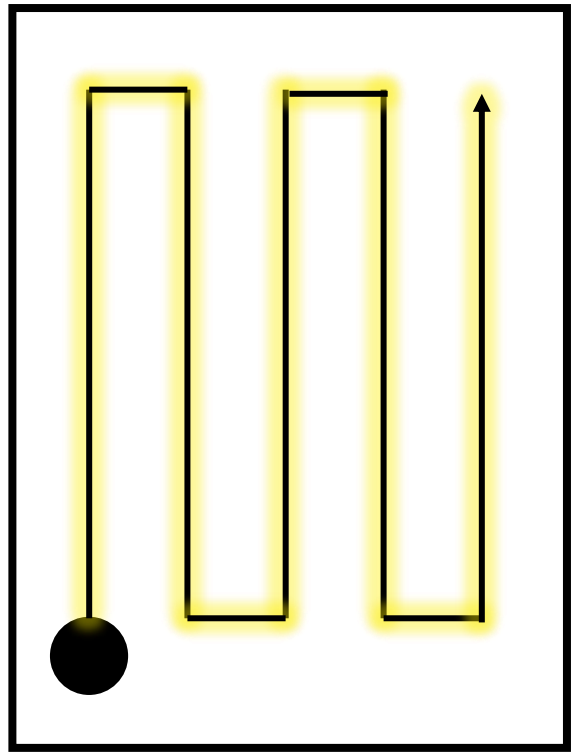
05. 향후 계획

ROS

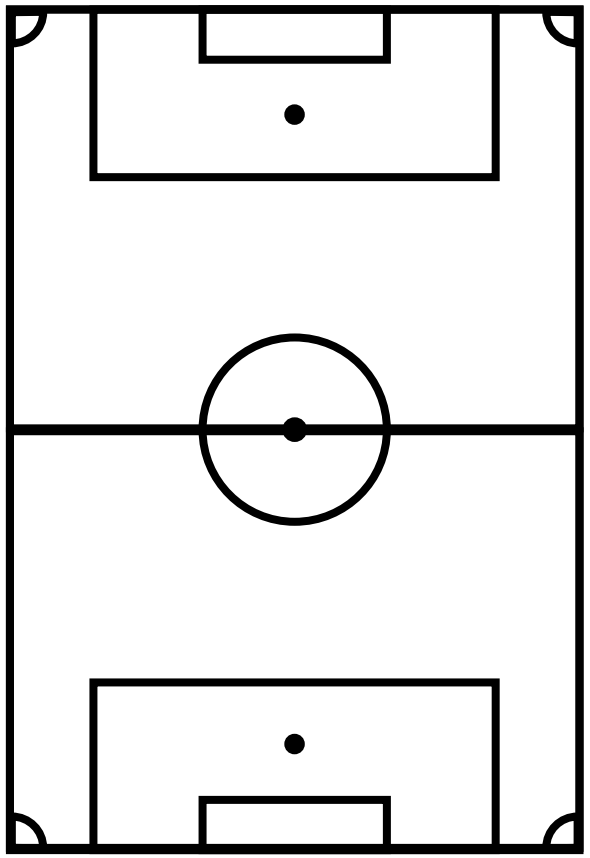
+

ARDUINO

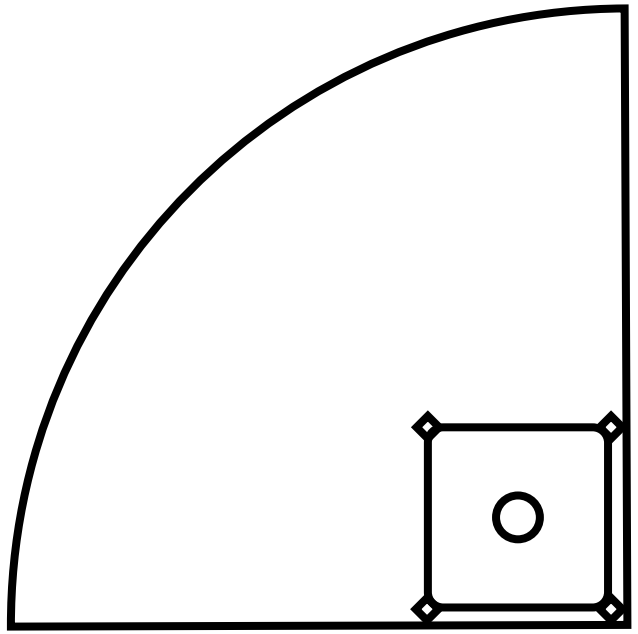
=



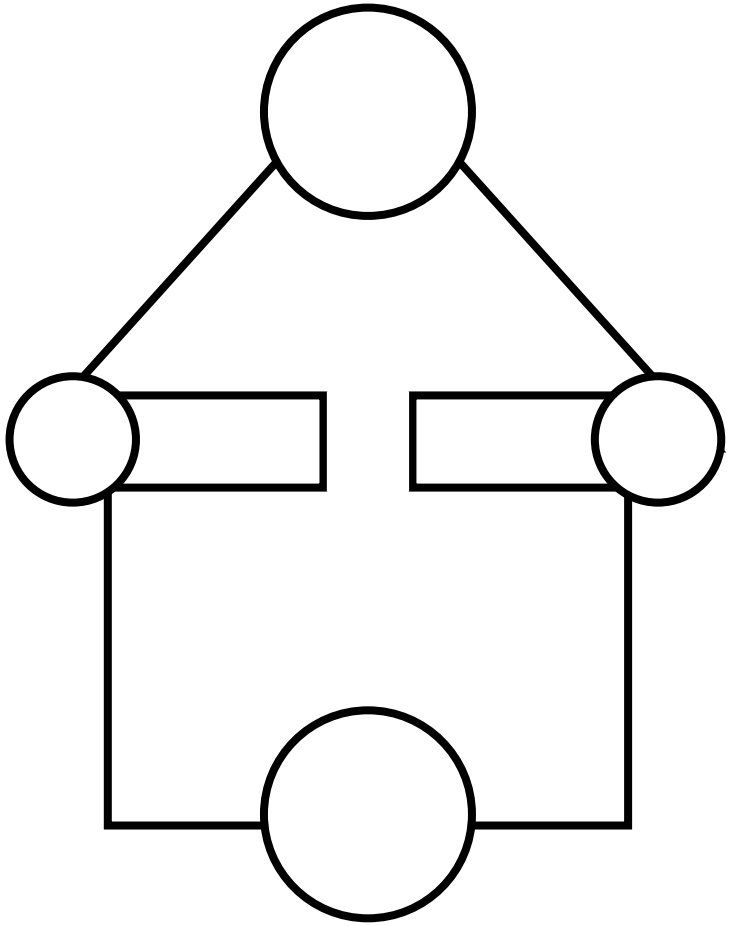
05. 향후 계획



축구 경기장



야구 경기장



오징어 게임 경기장

Thank You For Your Kind Attention