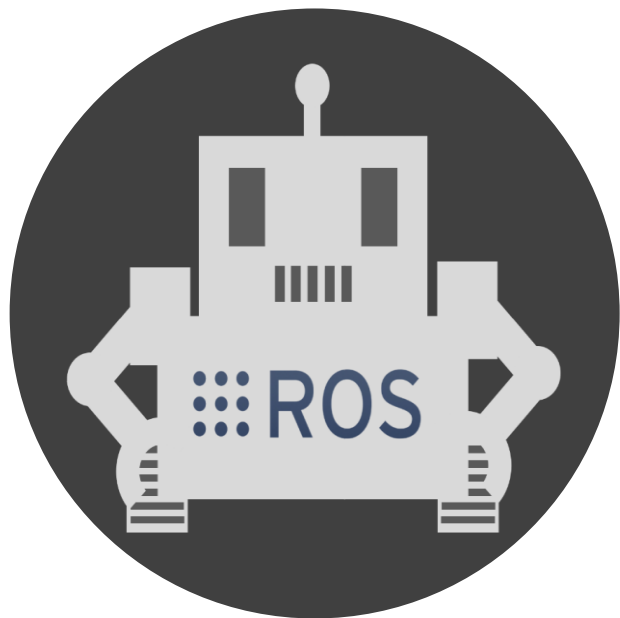



강사 소개



구선생 로보틱스 박형묵



구선생 로보틱스
@PigeonSenseiRobotics 구독자 2.65천명 동영상 117개
로봇공학 채널 구선생 로보틱스입니다. >
github.com/PigeonSensei

홈 동영상 재생목록 커뮤니티 채널 정보 >

동영상 ▶ 모두 재생

ROS 기초 강의
ROS TF 생성
3:53

[ROS 기초 강의] Chapter9-1. ROS TF 생성
조회수 79회 • 4일 전

ROS 기초 강의
ROS TF 기초
2:40

[ROS 기초 강의] Chapter9. ROS TF 기초
조회수 162회 • 6일 전

ROS 기초 강의
ROS 동적 파라미터 생성
6:38

[ROS 기초 강의] Chapter8-2. ROS 동적 파라미터 생성
조회수 96회 • 2주 전

ROS 기초 강의
ROS 정적 파라미터 생성
6:51

[ROS 기초 강의] Chapter8-1. ROS 정적 파라미터 생성
조회수 102회 • 3주 전

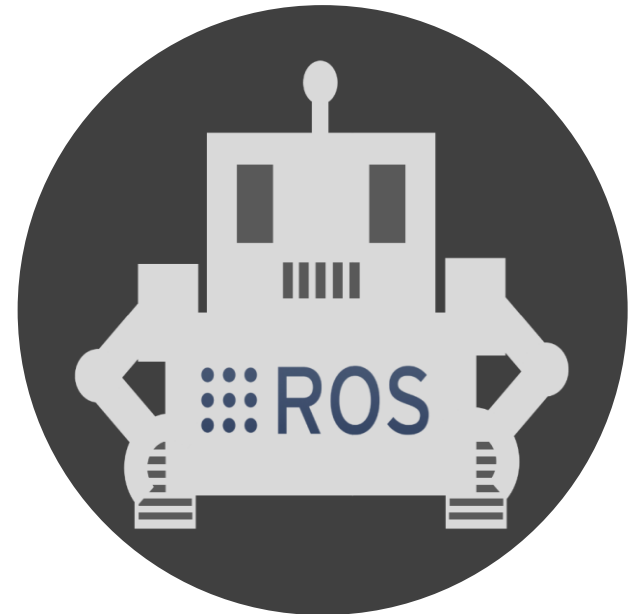
ROS 기초 강의
ROS Parameter 기초
2:15

[ROS 기초 강의] Chapter8. ROS Parameter 기초
조회수 90회 • 4주 전

터틀봇 자율주행

Chapter 1. 시뮬레이션 환경에서 자율주행

구선생 로보틱스



강의 자료 다운로드



터틀봇 자율주행 강의 노트

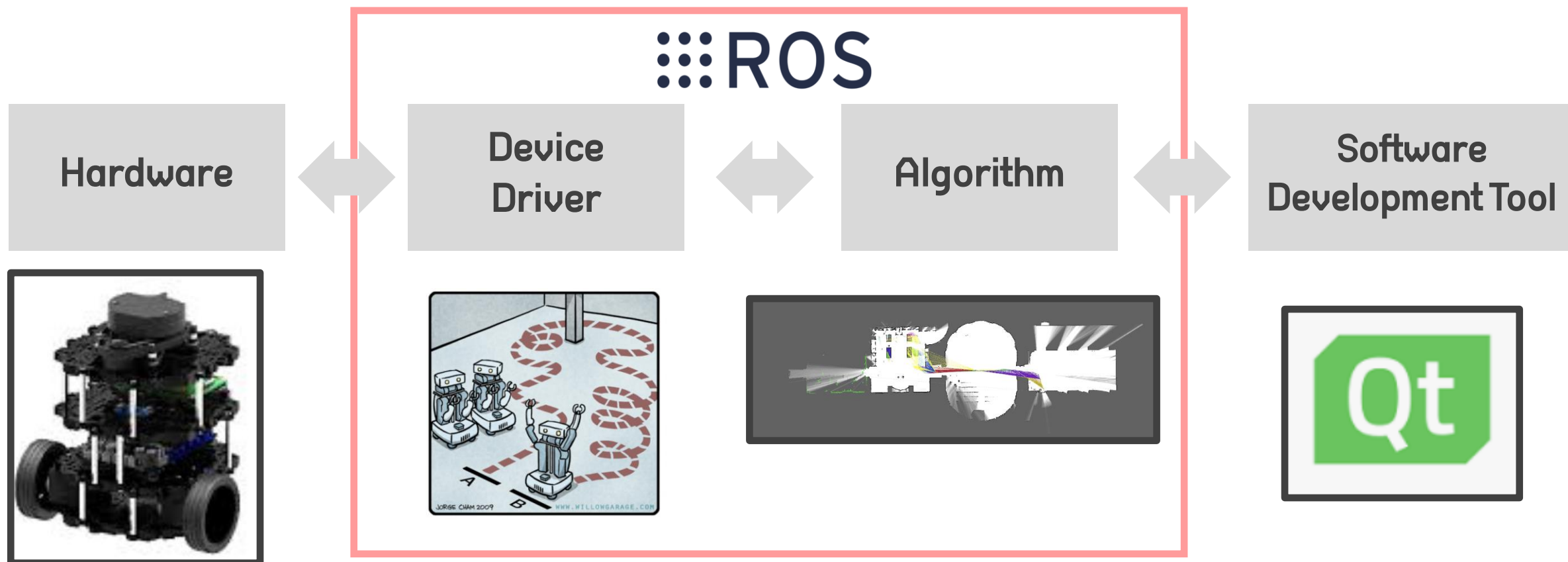
<https://github.com/DoveSensei/TurtlebotNote>

ROS란 무엇인가?

ROS란 무엇인가?

개요

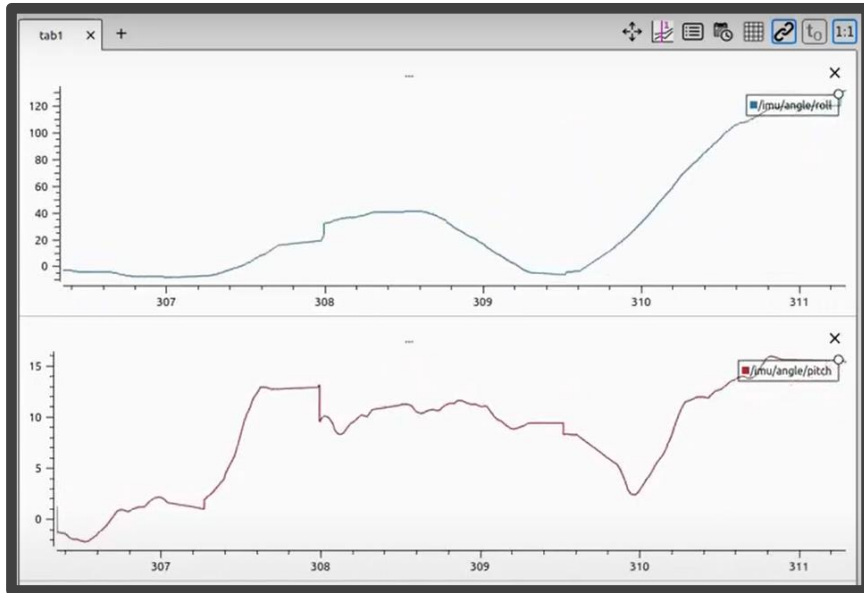
- Robot Operating System의 약자
- 로봇 소프트웨어를 구축하는데 도움이 되는 라이브러리



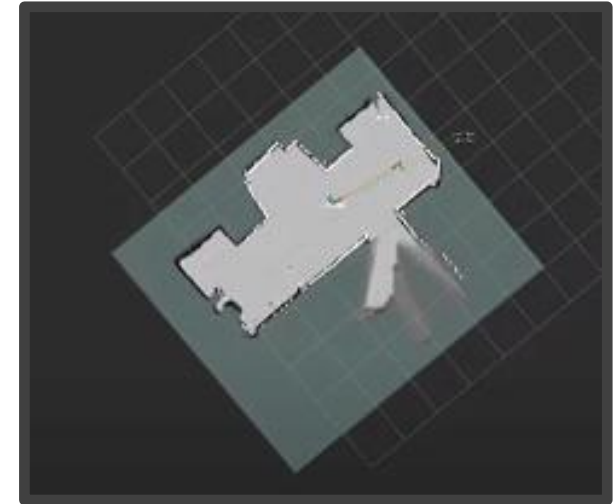
ROS란 무엇인가?

왜 ROS를 사용해야 하는가?

- 모듈화의 이점
- 개발 및 유지보수 시간 단축
- SLAM 및 Navigation 등 다양한 오픈소스 제공



	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI
3	2.1	0	0	0	0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	2.4	0	0	0	0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	2.7	0	0	0	0	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	3	0	0	0	0	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	3.3	0	0	0	0	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	3.6	0	0	0	0	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	3.9	0	0	0	0	3.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	4.2	0	0	0	0	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	4.5	0	0	0	0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	4.8	0	0	0	0	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	5.1	0	0	0	0	5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	5.4	0	0	0	0	5.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	5.7	0	0	0	0	5.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	6	0	0	0	0	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	6.3	0	0	0	0	6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	6.6	0	0	0	0	6.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	6.9	0	0	0	0	6.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	7.2	0	0	0	0	7.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	7.5	0	0	0	0	7.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	7.8	0	0	0	0	7.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	8.1	0	0	0	0	8.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	8.4	0	0	0	0	8.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	8.7	0	0	0	0	8.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	9	0	0	0	0	9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	9.3	0	0	0	0	9.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	9.6	0	0	0	0	9.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	9.9	0	0	0	0	9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	0	0	0	0	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	0.3	0	0	0	0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	0.6	0	0	0	0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	0.9	0	0	0	0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	1.2	0	0	0	0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	1.5	0	0	0	0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36	1.8	0	0	0	0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37	2.1	0	0	0	0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38	2.4	0	0	0	0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39	2.7	0	0	0	0	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
40	3	0	0	0	0	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41	3.3	0	0	0	0	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
42	3.6	0	0	0	0	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
43	3.9	0	0	0	0	3.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
44	4.2	0	0	0	0	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0



위의 기능을 모듈형태로 오픈소스로 제공하고 있어 쉽게 적용 가능

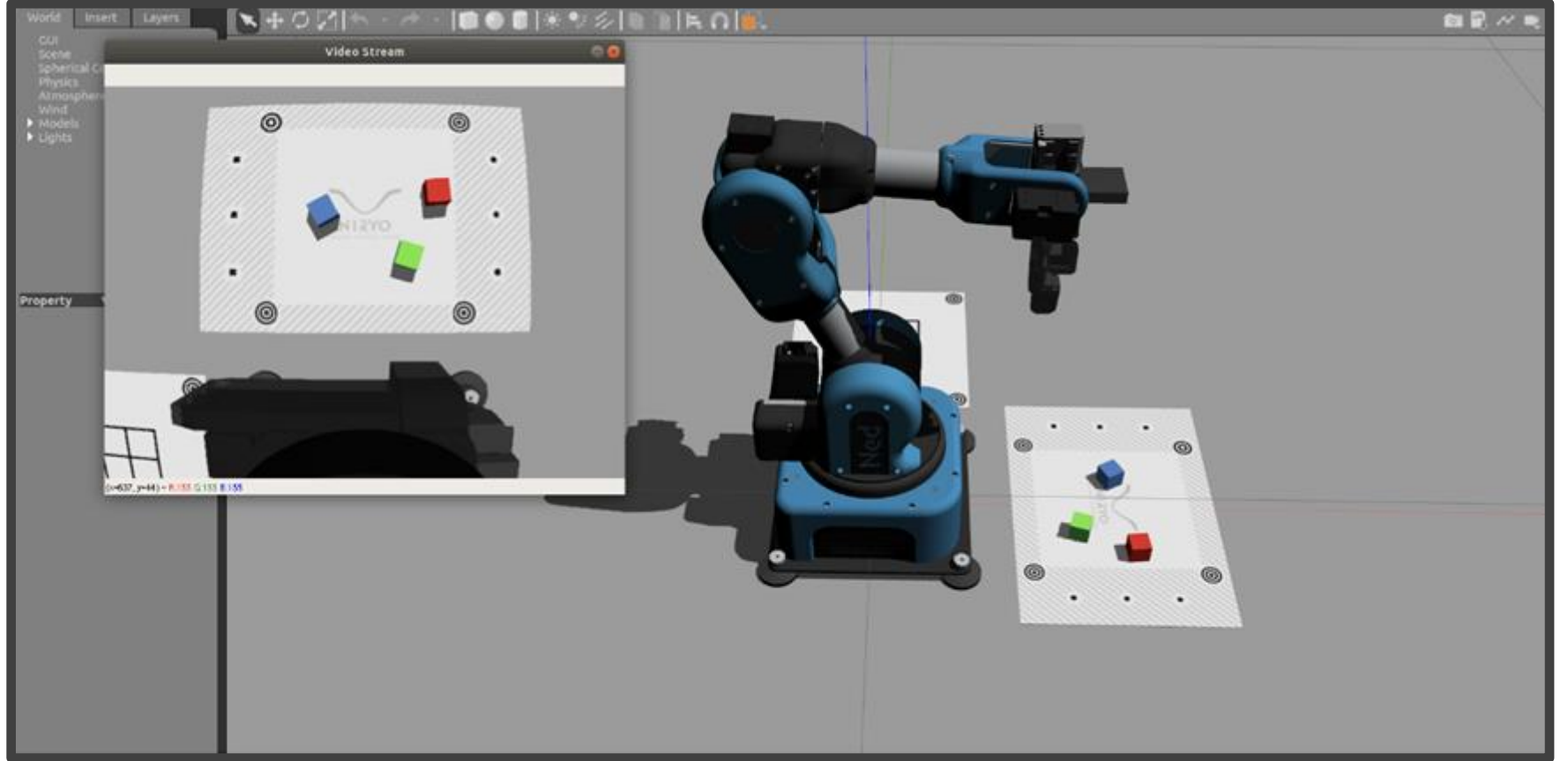
ROS 시뮬레이션

ROS 시뮬레이션

Gazebo란?



Gazebo



Robot 시뮬레이션을 위한 툴, ROS를 지원한다

상세 내용은 아래 위키 참고

https://classic.gazebosim.org/tutorials?tut=ros_overview

ROS 시뮬레이션

터틀봇 시뮬레이션 설치

1) 레포지토리 업데이트

```
$ sudo apt-get update
```

2) 종속성 패키지 설치

```
$ sudo apt-get install ros-noetic-joy  
$ sudo apt-get install ros-noetic-teleop-twist-joy  
$ sudo apt-get install ros-noetic-teleop-twist-keyboard  
$ sudo apt-get install ros-noetic-laser-proc  
$ sudo apt-get install ros-noetic-rgbd-launch  
$ sudo apt-get install ros-noetic-rosserial-arduino  
$ sudo apt-get install ros-noetic-rosserial-python  
$ sudo apt-get install ros-noetic-rosserial-client
```

ROS 시뮬레이션

터틀봇 시뮬레이션 설치

```
$ sudo apt-get install ros-noetic-rosserial-msgs
$ sudo apt-get install ros-noetic-amcl
$ sudo apt-get install ros-noetic-map-server
$ sudo apt-get install ros-noetic-move-base
$ sudo apt-get install ros-noetic-urdf
$ sudo apt-get install ros-noetic-xacro
$ sudo apt-get install ros-noetic-compressed-image-transport
$ sudo apt-get install ros-noetic-rqt*
$ sudo apt-get install ros-noetic-rviz
$ sudo apt-get install ros-noetic-gmapping
$ sudo apt-get install ros-noetic-navigation
$ sudo apt-get install ros-noetic-interactive-markers
```

ROS 시뮬레이션

터틀봇 시뮬레이션 설치

3) 터틀봇 시뮬레이션 패키지 설치

```
$ git clone https://github.com/ROBOTIS-GIT/turtlebot3.git  
$ git clone https://github.com/ROBOTIS-GIT/turtlebot3_msgs.git  
$ git clone https://github.com/ROBOTIS-GIT/turtlebot3_simulations.git
```

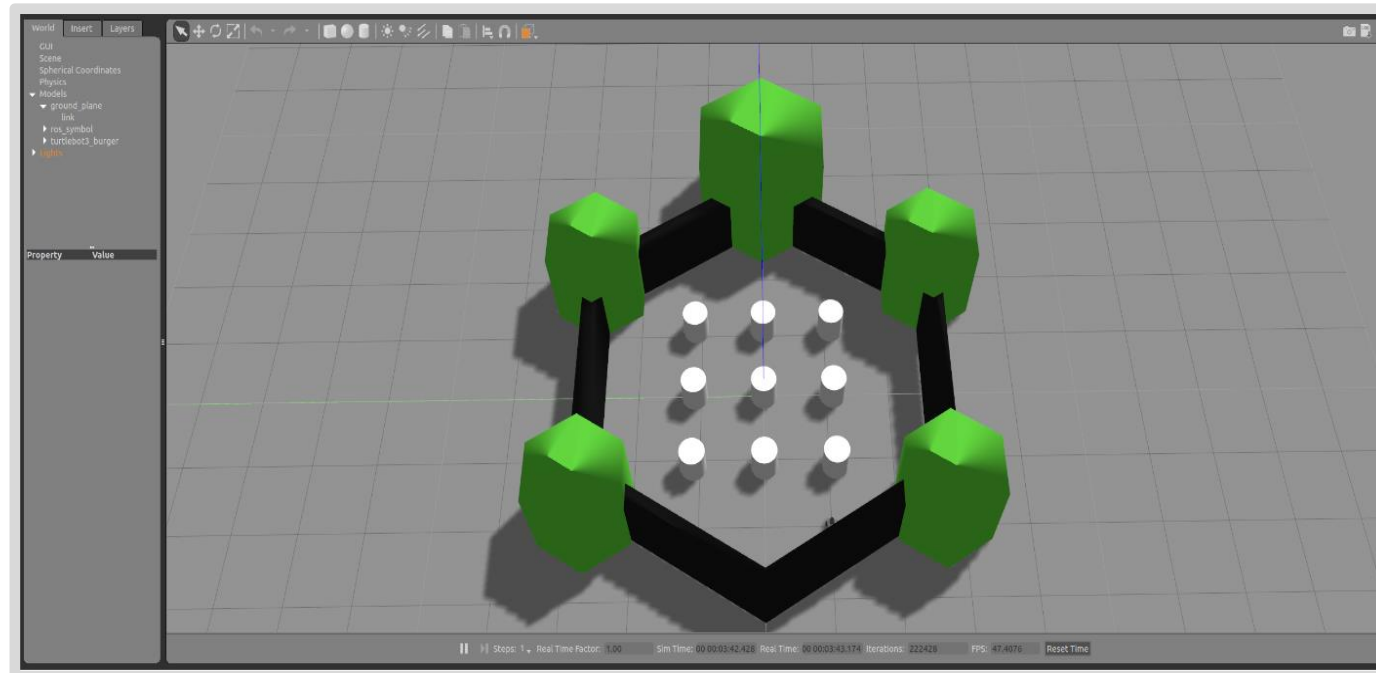
ROS 시뮬레이션

터틀봇 시뮬레이션 실행

터틀봇 시뮬레이션 실행 명령어

```
$ export TURTLEBOT3_MODEL=burger
```

```
$ roslaunch turtlebot3_gazebo turtlebot3_world.launch
```



SLAM 및 Navigaion

SLAM 및 Navigation

터틀봇 시뮬레이션을 이용하여 SLAM

1) Turtlebot Gazebo 실행

```
$ export TURTLEBOT3_MODEL=burger  
$ roslaunch turtlebot3_gazebo turtlebot3_world.launch
```

2) Turtlebot SLAM 실행

```
$ export TURTLEBOT3_MODEL=burger  
$ roslaunch turtlebot3_slam turtlebot3_slam.launch slam_methods:=gmapping
```

3) Turtlebot 조종

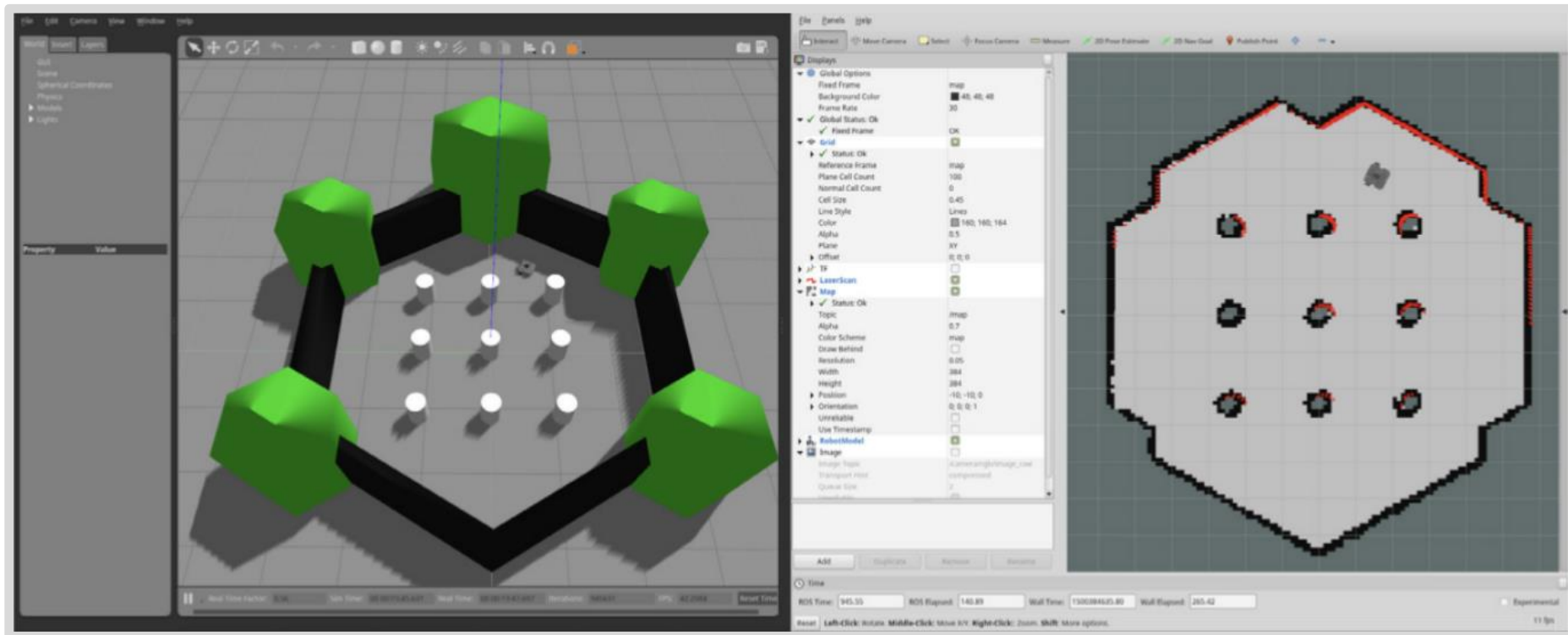
```
$ export TURTLEBOT3_MODEL=burger  
$ roslaunch turtlebot3_teleop turtlebot3_teleop_key.launch
```

SLAM 및 Navigation

터틀봇 시뮬레이션을 이용하여 SLAM

4) Map 저장

```
$ rosrun map_server map_saver -f ~/map
```



SLAM 및 Navigation

터틀봇 시뮬레이션을 이용하여 Navigation

1) Turtlebot Gazebo 실행

```
$ export TURTLEBOT3_MODEL=burger  
$ roslaunch turtlebot3_gazebo turtlebot3_world.launch
```

2) Turtlebot Navigation 실행

```
$ export TURTLEBOT3_MODEL=burger  
$ roslaunch turtlebot3_navigation turtlebot3_navigation.launch map_file:=$HOME/map.yaml
```