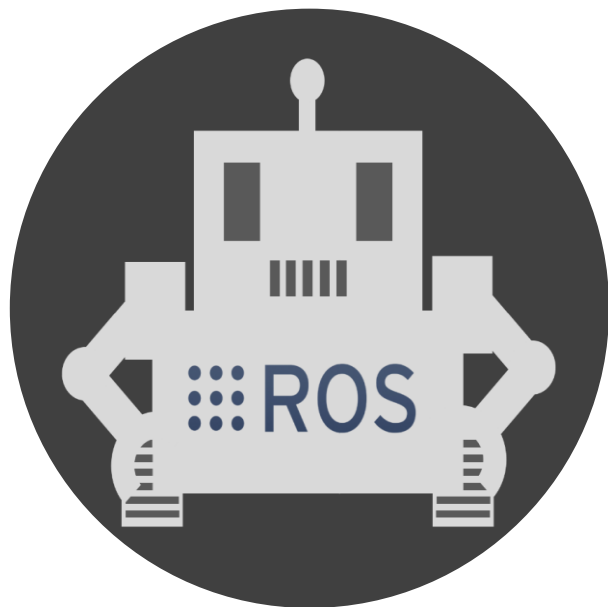



강사 소개



구선생 로보틱스 박형묵



구선생 로보틱스






@PigeonSenseiRobotics 구독자 2.65천명 동영상 117개

로봇공학 채널 구선생 로보틱스입니다. >

github.com/PigeonSensei

홈 동영상 재생목록 커뮤니티 채널 정보 >

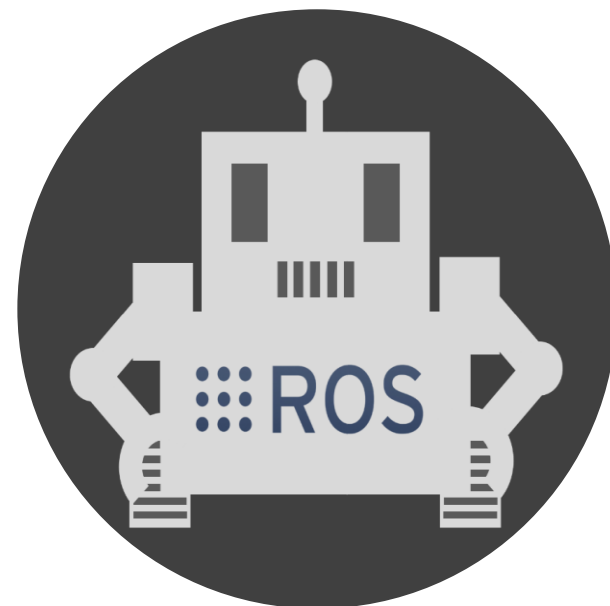
동영상 ▶ 모두 재생

ROS 기초 강의	ROS 기초 강의	ROS 기초 강의	ROS 기초 강의	ROS 기초 강의
ROS TF 생성	ROS TF 기초	ROS 동적 파라미터 생성	ROS 정적 파라미터 생성	ROS Parameter 기초
 3:53	 2:40	 6:38	 6:51	 2:15
[ROS 기초 강의] Chapter9-1. ROS TF 생성 조회수 79회 • 4일 전	[ROS 기초 강의] Chapter9. ROS TF 기초 조회수 162회 • 6일 전	[ROS 기초 강의] Chapter8-2. ROS 동적 파라미터 생성 조회수 96회 • 2주 전	[ROS 기초 강의] Chapter8-1. ROS 정적 파라미터 생성 조회수 102회 • 3주 전	[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

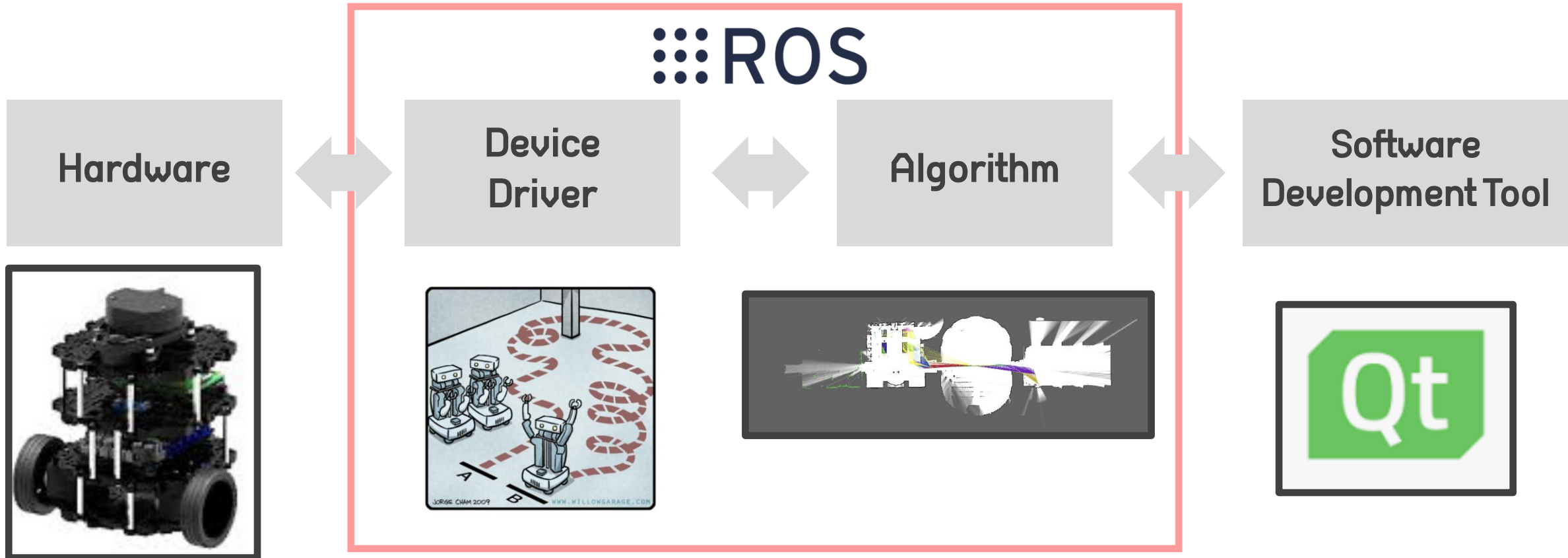
<https://github.com/DoveSensei/TurtlebotNote>

ROS란 무엇인가?

ROS란 무엇인가?

개요

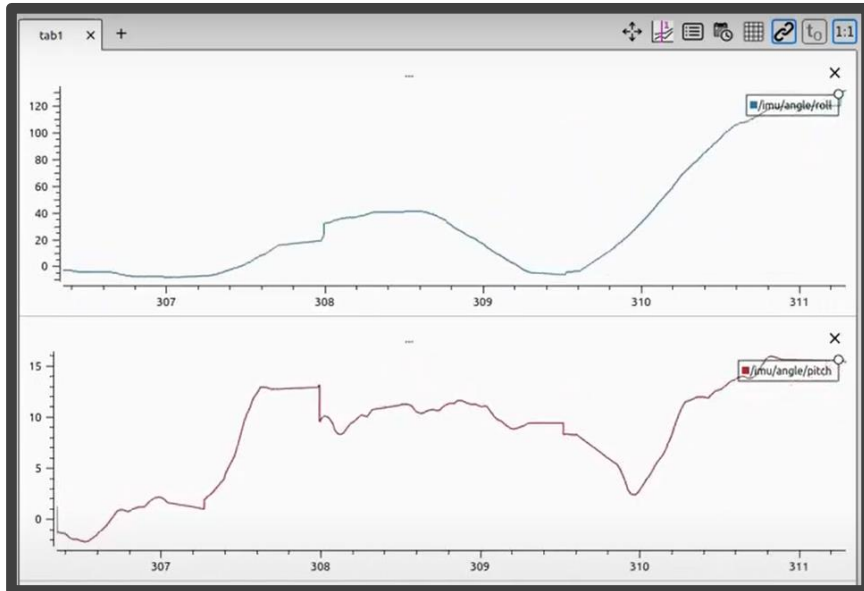
- Robot Operating System의 약자
- 로봇 소프트웨어를 구축하는데 도움이 되는 라이브러리



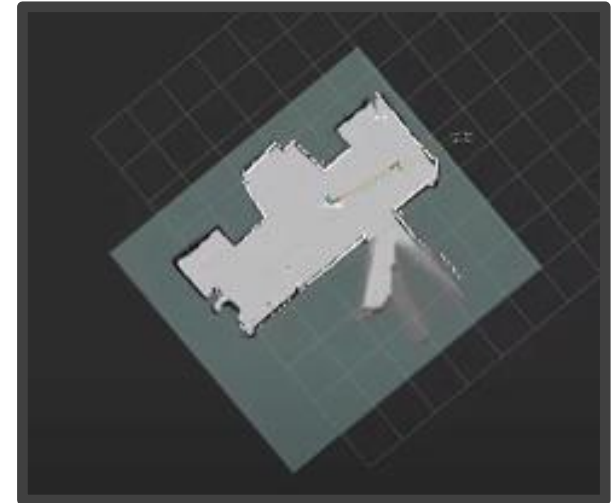
ROS란 무엇인가?

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
1	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
2	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
3	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
4	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
5	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
6	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
7	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
8	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
9	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
10	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
11	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
12	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
13	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
14	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
15	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
16	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
17	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
18	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
19	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
20	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
21	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
22	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
23	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
24	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
25	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
26	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
27	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
28	10	0	0	0	0	10	0.0	0.0	0.0	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	10.3	0	0	0	0	10.3	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
30	10.6	0	0	0	0	10.6	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
31	10.9	0	0	0	0	10.9	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
32	11.2	0	0	0	0	11.2	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
33	11.5	0	0	0	0	11.5	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
34	11.8	0	0	0	0	11.8	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
35	12.1	0	0	0	0	12.1	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
36	12.4	0	0	0	0	12.4	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
37	12.7	0	0	0	0	12.7	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
38	13	0	0	0	0	13	0.0	0.0	0.0	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	13.3	0	0	0	0	13.3	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
40	13.6	0	0	0	0	13.6	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
41	13.9	0	0	0	0	13.9	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
42	14.2	0	0	0	0	14.2	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

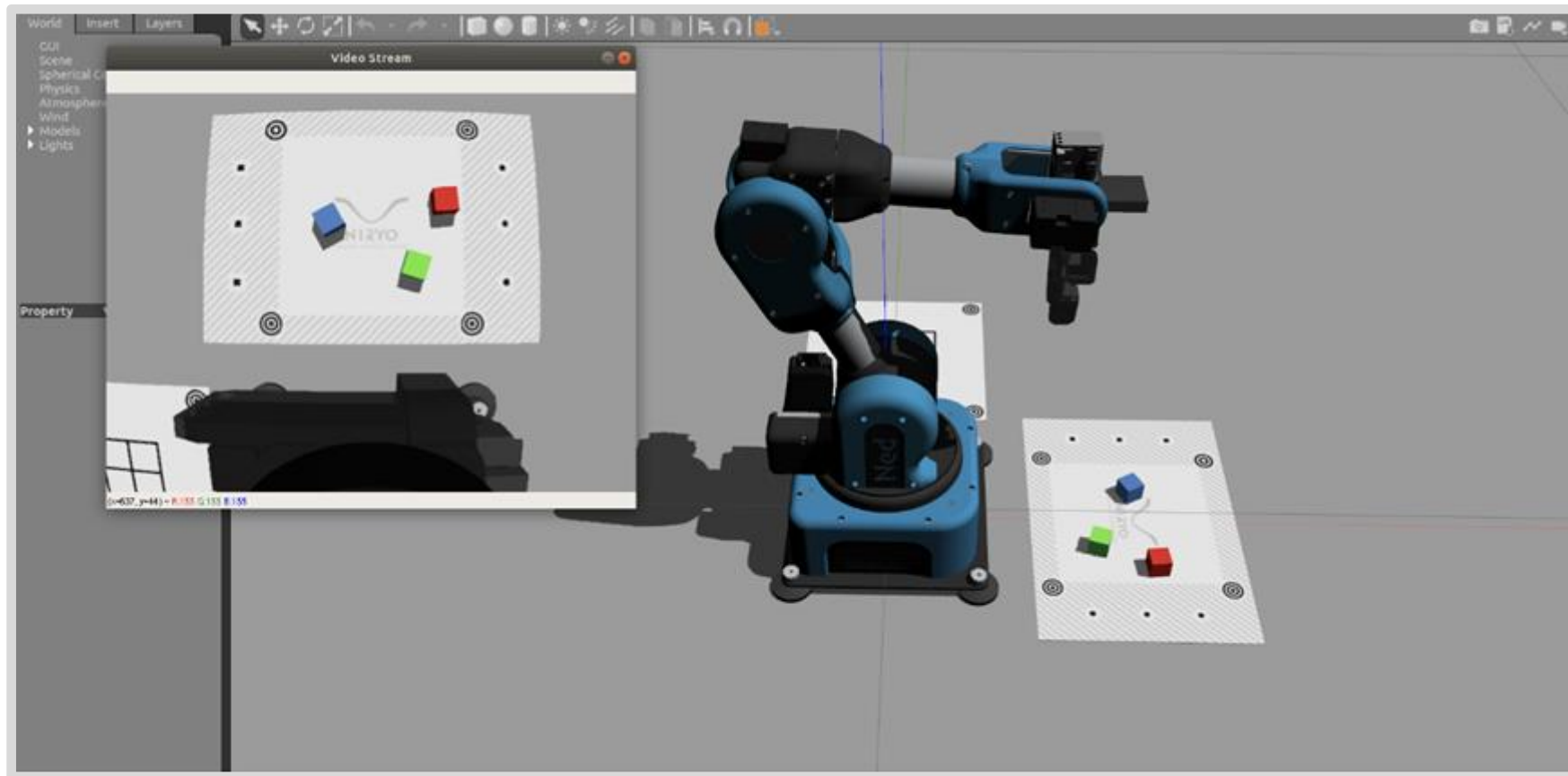
ROS 시뮬레이션

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

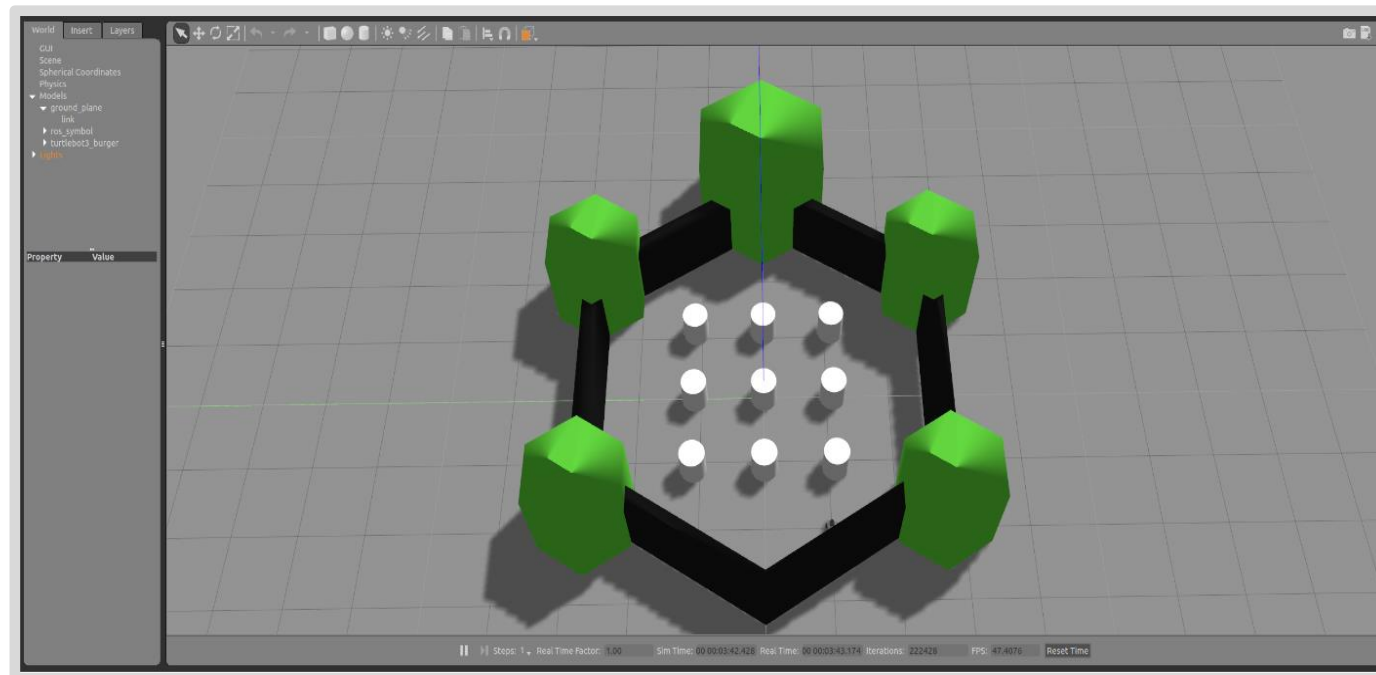
```
$ git clone https://github.com/ROBOTIS-GIT/turtlebot3.git  
$ git clone https://github.com/ROBOTIS-GIT/turtlebot3_msgs.git  
$ git clone https://github.com/ROBOTIS-GIT/turtlebot3_simulations.git
```

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

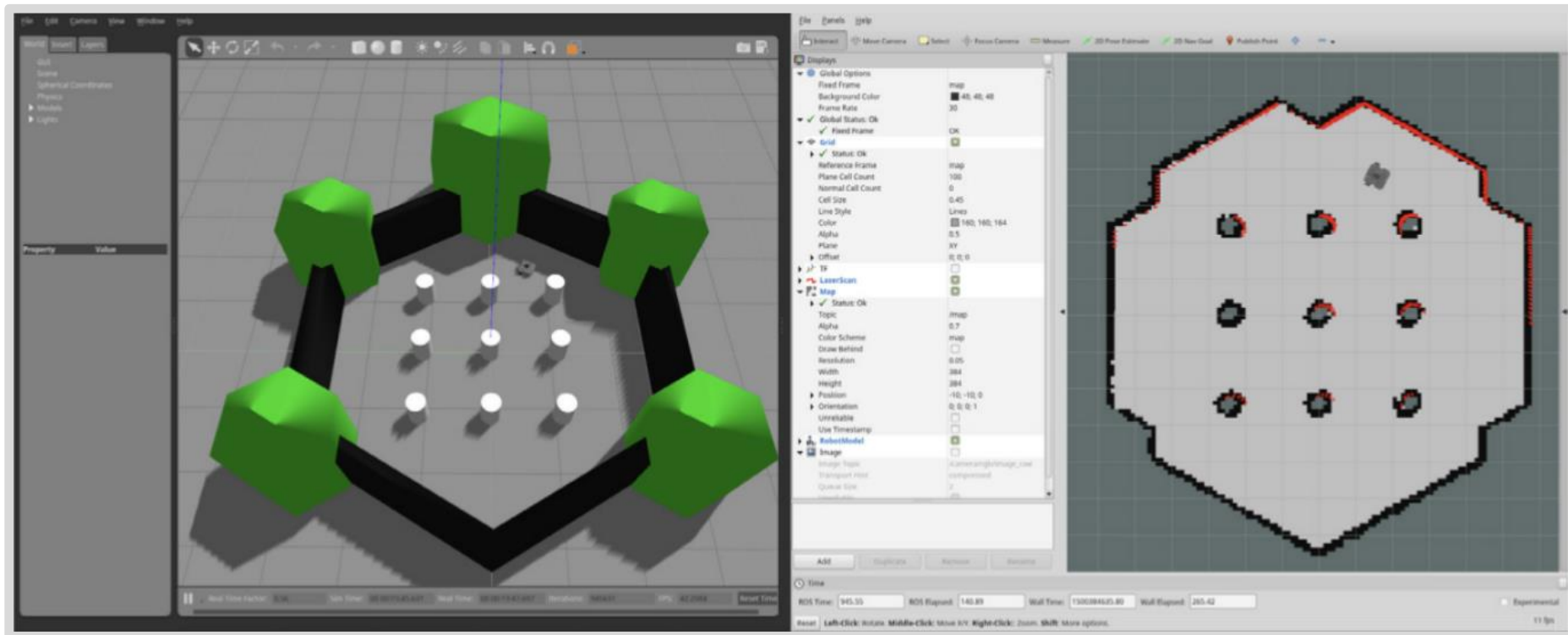
```
$ export TURTLEBOT3_MODEL=burger  
$ roslaunch turtlebot3_teleop turtlebot3_teleop_key.launch
```

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
```


감사합니다

구선생 로보틱스

