- **How to using slam by ROS – Gmapping :**

- **Click here**
  https://emanual.robotis.com/docs/en/platform/turtlebot3/quick-start/
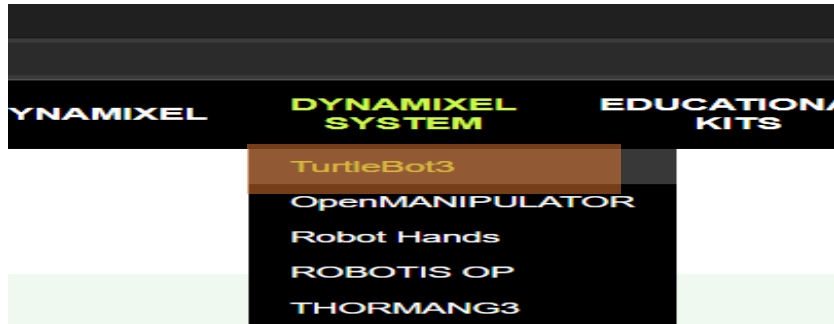
- select the version :
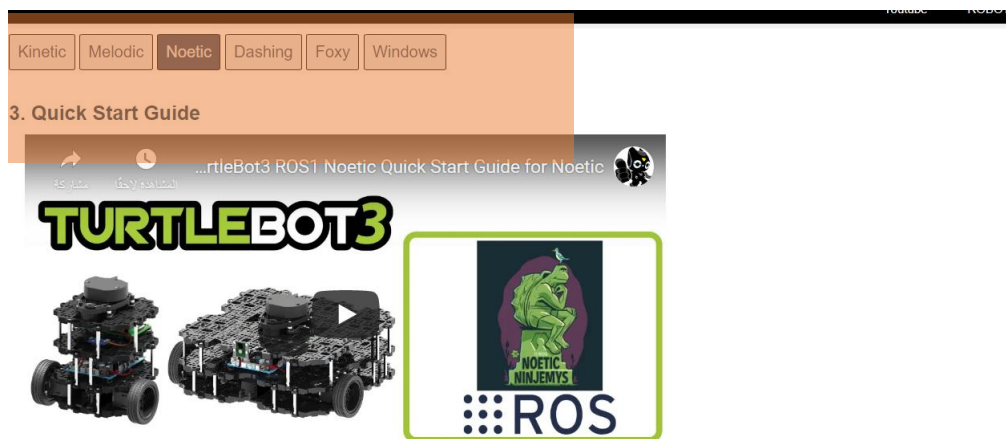
- open terminal window :
  write :

```
$ sudo apt update
$ sudo apt upgrade
$ wget https://raw.githubusercontent.com/ROBOTIS-
GIT/robotis_tools/master/install_ros_noetic.sh
$ chmod 755 ./install_ros_noetic.sh
$ bash ./install_ros_noetic.sh
```

```
$ sudo apt-get install ros-noetic-joy ros-noetic-teleop-
twist-joy \
   ros-noetic-teleop-twist-keyboard ros-noetic-laser-proc
\
   ros-noetic-rgbd-launch ros-noetic-rosserial-arduino \
   ros-noetic-rosserial-python ros-noetic-rosserial-client
\
   ros-noetic-rosserial-msgs ros-noetic-amcl ros-noetic-
map-server \
   ros-noetic-move-base ros-noetic-urdf ros-noetic-xacro \
   ros-noetic-compressed-image-transport ros-noetic-rqt*
ros-noetic-rviz \
   ros-noetic-gmapping ros-noetic-navigation ros-noetic-
interactive-markers
```



```
rafa@rafa-VirtualBox:~$ sudo apt-get install ros-noetic-joy ros-noetic-teleop-t
wist-joy \
>    ros-noetic-teleop-twist-keyboard ros-noetic-laser-proc \
>    ros-noetic-rgbd-launch ros-noetic-rosserial-arduino \
>    ros-noetic-rosserial-python ros-noetic-rosserial-client \
>    ros-noetic-rosserial-msgs ros-noetic-amcl ros-noetic-map-server \
>    ros-noetic-move-base ros-noetic-urdf ros-noetic-xacro \
>    ros-noetic-compressed-image-transport ros-noetic-rqt* ros-noetic-rviz \
>    ros-noetic-gmapping ros-noetic-navigation ros-noetic-interactive-markers
[sudo] password for rafa:
قراءة قوائم الحزم... تمَّ0%
```

Install TurtleBot3 Packages:

```
$ sudo apt install ros-noetic-dynamixel-sdk
$ sudo apt install ros-noetic-turtlebot3-msgs
$ sudo apt install ros-noetic-turtlebot3
```



```
سيتم ترقيتها، 0 مثبتة حديثا،  0 لإزالتها و 0 لم يتم ترقيتها 0
rafa@rafa-VirtualBox:~$ sudo apt install ros-noetic-dynamixel-sdk
قراءة قوائم الحزم... تمَّ0%
Building dependency tree
Reading state information... تمَّ
ros-noetic-dynamixel-sdk is already the newest version (3.7.51-4focal.20220106.
235702).
The following packages were automatically installed and are no longer required:
  libfwupdplugin1 linux-headers-5.13.0-52-generic
  linux-hwe-5.13-headers-5.13.0-52 linux-image-5.13.0-52-generic
  linux-modules-5.13.0-52-generic linux-modules-extra-5.13.0-52-generic
Use 'sudo apt autoremove' to remove them.
سيتم ترقيتها، 0 مثبتة حديثا،  0 لإزالتها و 0 لم يتم ترقيتها 0
rafa@rafa-VirtualBox:~$ sudo apt install ros-noetic-turtlebot3-msgs
قراءة قوائم الحزم... تمَّ0%
Building dependency tree
Reading state information... تمَّ
ros-noetic-turtlebot3-msgs is already the newest version (1.0.1-1focal.20210423
.224157).
The following packages were automatically installed and are no longer required:
  libfwupdplugin1 linux-headers-5.13.0-52-generic
  linux-hwe-5.13-headers-5.13.0-52 linux-image-5.13.0-52-generic
  linux-modules-5.13.0-52-generic linux-modules-extra-5.13.0-52-generic
Use 'sudo apt autoremove' to remove them.
سيتم ترقيتها، 0 مثبتة حديثا،  0 لإزالتها و 0 لم يتم ترقيتهم 0
rafa@rafa-VirtualBox:~$ sudo apt install ros-noetic-turtlebot3
قراءة قوائم الحزم... تمَّ0%
Building dependency tree
Reading state information... تمَّ
```

- Second step :

5. Navigation

6. Simulation

6. 1. Gazebo Simulation

Install Simulation Package :

```
$ cd ~/catkin_ws/src/
$ git clone -b noetic-devel https://github.com/ROBOTIS-
GIT/turtlebot3_simulations.git
$ cd ~/catkin_ws && catkin_make
```

You have three options:

```
burger
waffle
waffle_pi
```
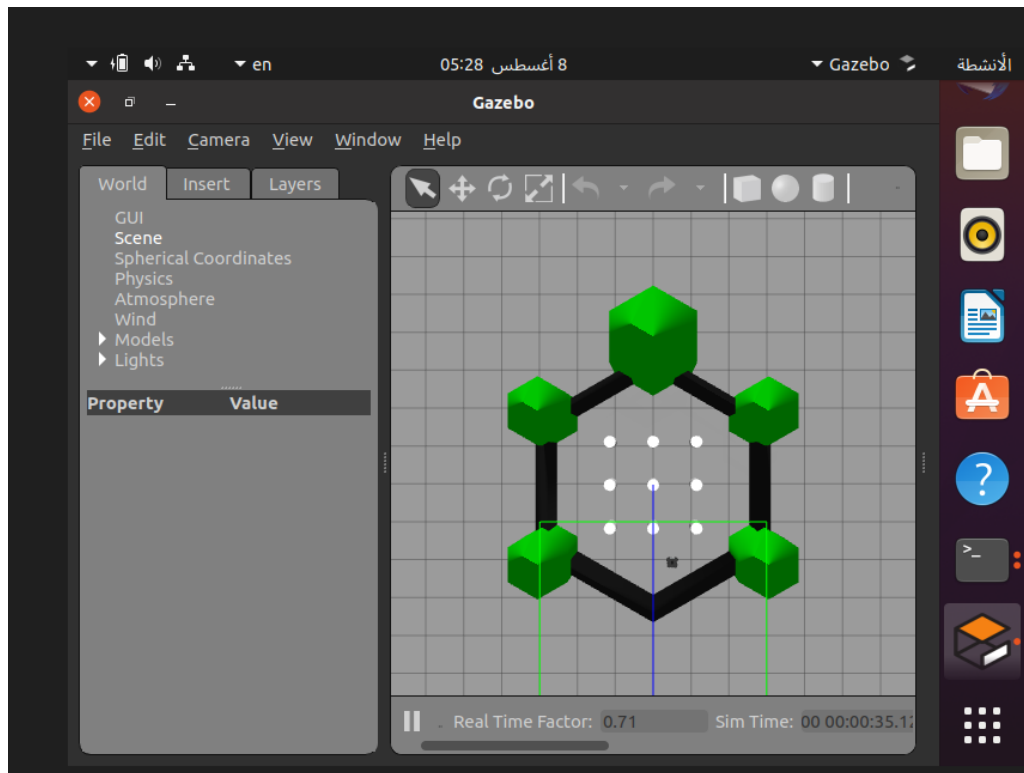
select one of them :

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

In order to teleoperate the TurtleBot3 with the keyboard, launch the teleoperation node with below command in **a new terminal window**.

```
$ export TURTLEBOT3_MODEL=waffle
```

```
$ roslaunch turtlebot3_teleop
turtlebot3_teleop_key.launch
```
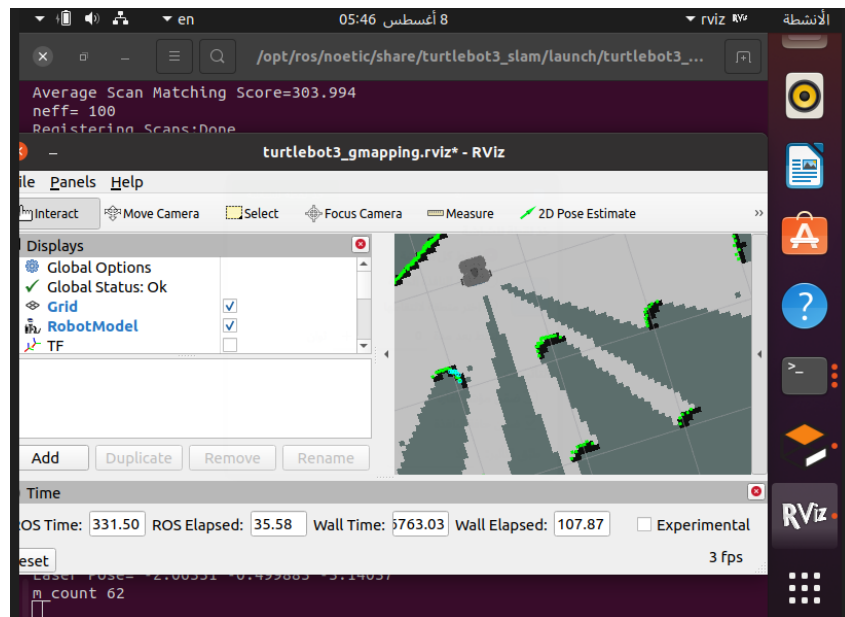
Then open Gazebo page :

Launch Simulation World :

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

```
$ roslaunch turtlebot3_slam turtlebot3_slam.launch
slam_methods:=gmapping
```


End step :