

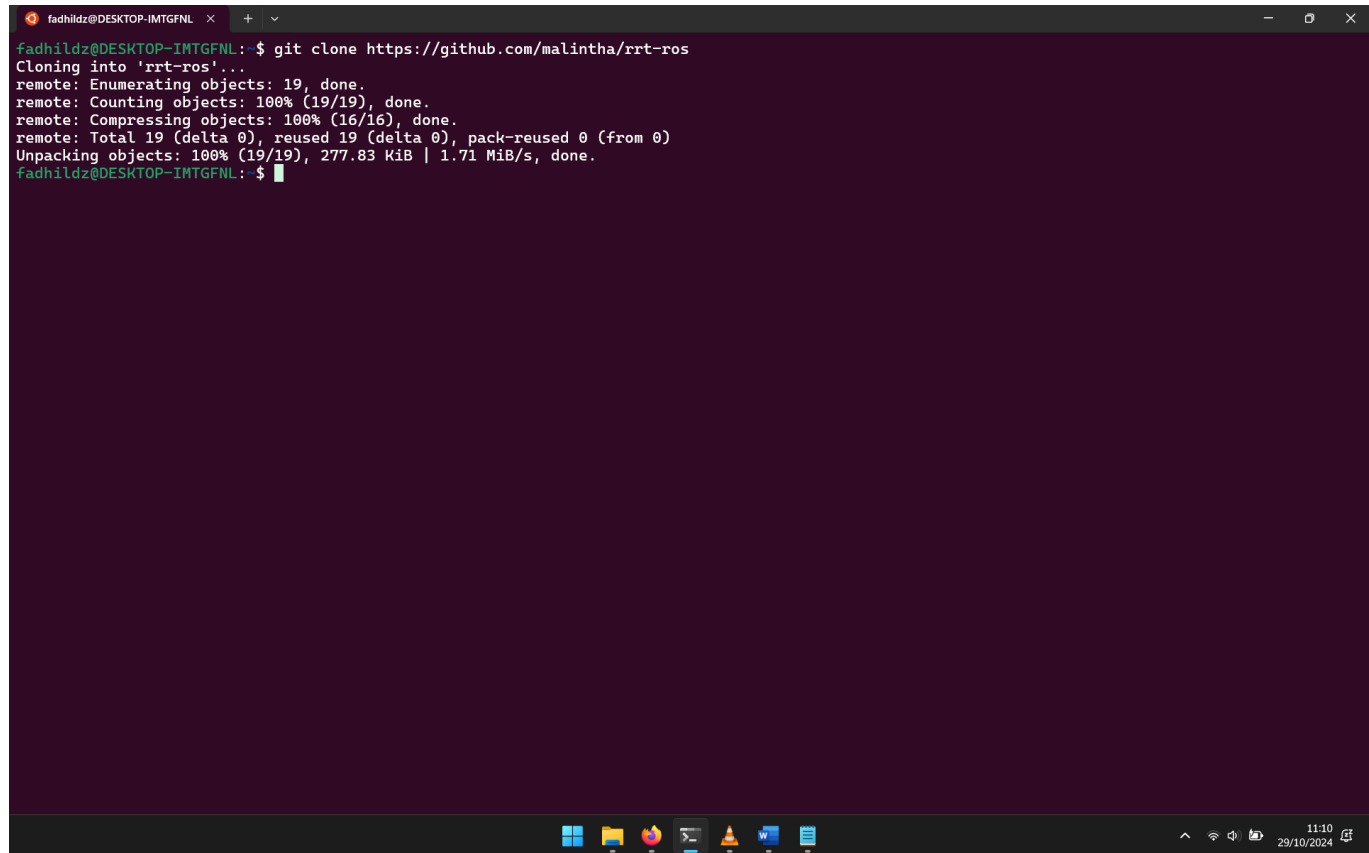
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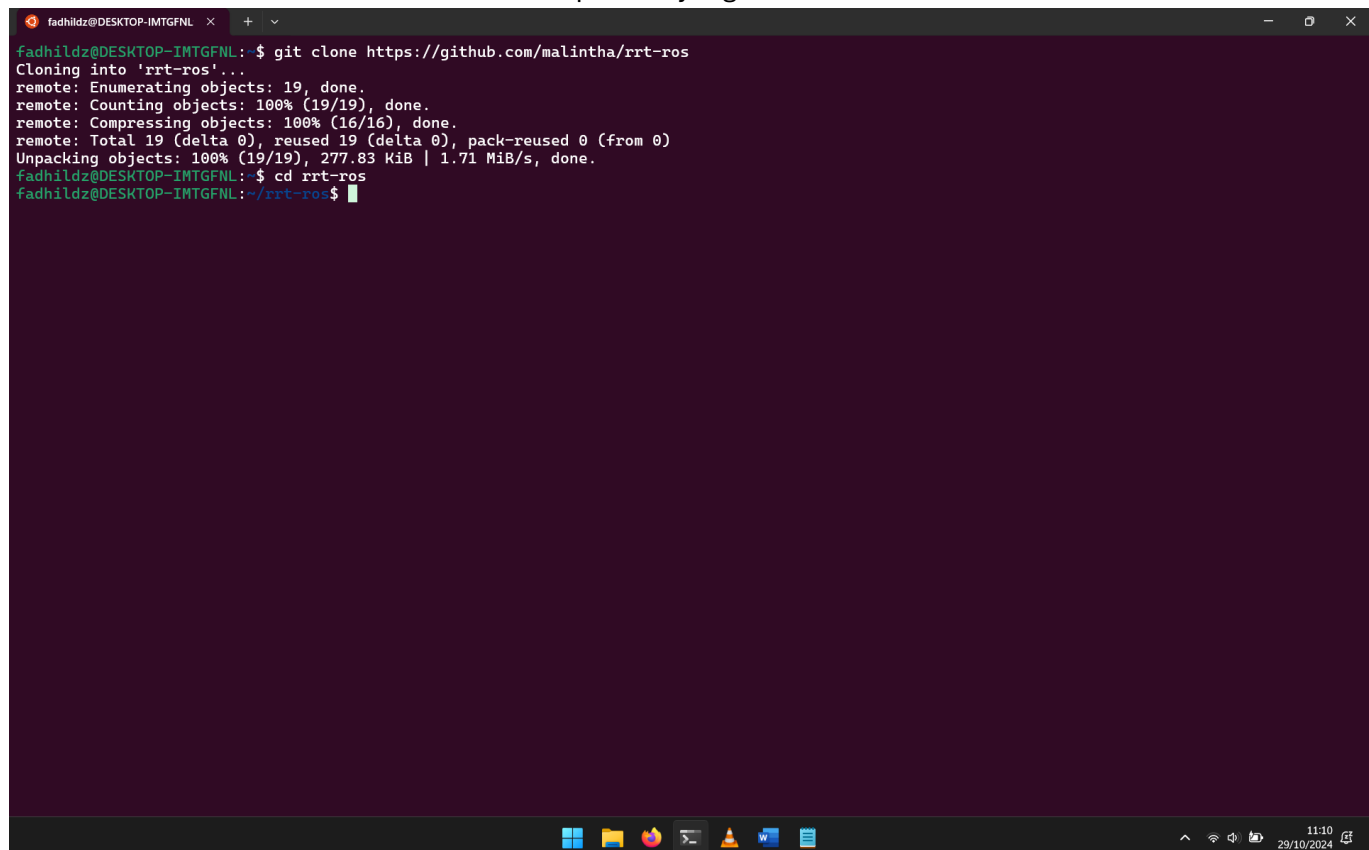
Implementasi Rapidly-Expanding Random Trees (RRT) di ROS dengan RViz

1. **git clone** <https://github.com/malinta/rrt-ros> untuk mengunduh repositori rrt-ros dari GitHub.



```
fadhildz@DESKTOP-IMTGFNL: ~$ git clone https://github.com/malinta/rrt-ros
Cloning into 'rrt-ros'...
remote: Enumerating objects: 19, done.
remote: Counting objects: 100% (19/19), done.
remote: Compressing objects: 100% (16/16), done.
remote: Total 19 (delta 0), reused 19 (delta 0), pack-reused 0 (from 0)
Unpacking objects: 100% (19/19), 277.83 KiB | 1.71 MiB/s, done.
fadhildz@DESKTOP-IMTGFNL: ~$
```

2. **cd rrt-ros** untuk masuk ke direktori repositori yang telah di-clone.



```
fadhildz@DESKTOP-IMTGFNL: ~$ git clone https://github.com/malinta/rrt-ros
Cloning into 'rrt-ros'...
remote: Enumerating objects: 19, done.
remote: Counting objects: 100% (19/19), done.
remote: Compressing objects: 100% (16/16), done.
remote: Total 19 (delta 0), reused 19 (delta 0), pack-reused 0 (from 0)
Unpacking objects: 100% (19/19), 277.83 KiB | 1.71 MiB/s, done.
fadhildz@DESKTOP-IMTGFNL: ~$ cd rrt-ros
fadhildz@DESKTOP-IMTGFNL: ~/rrt-ros$
```

3. catkin_make untuk membangun workspace dengan package RRT.

```
fadhildz@DESKTOP-INTGFLN: ~$ git clone https://github.com/malinha/rrt-ros
Cloning into 'rrt-ros'...
remote: Enumerating objects: 19, done.
remote: Counting objects: 100% (19/19), done.
remote: Compressing objects: 100% (16/16), done.
remote: Total 19 (delta 0), reused 19 (delta 0), pack-reused 0 (from 0)
Unpacking objects: 100% (19/19), 277.83 KiB | 1.71 MiB/s, done.
fadhildz@DESKTOP-INTGFLN: ~$ cd rrt-ros
fadhildz@DESKTOP-INTGFLN: ~/rrt-ros$ catkin_make
Base path: /home/fadhildz/rrt-ros
Source space: /home/fadhildz/rrt-ros/src
Build space: /home/fadhildz/rrt-ros/build
Devel space: /home/fadhildz/rrt-ros/devel
Install space: /home/fadhildz/rrt-ros/install
Removing symlink "/home/fadhildz/rrt-ros/src/CMakeLists.txt" which points to non-existing file
Creating symlink "/home/fadhildz/rrt-ros/src/CMakeLists.txt" pointing to "/opt/ros/noetic/share/catkin/cmake/toplevel.cmake"
####
### Running command: "cmake /home/fadhildz/rrt-ros/src -DCATKIN_DEVEL_PREFIX=/home/fadhildz/rrt-ros/devel -DCMAKE_INSTALL_PREFIX=/home/fadhildz/rrt-ros/install -G Unix Makefiles" in "/home/fadhildz/rrt-ros/build"
###
-- The C compiler identification is GNU 9.4.0
-- The CXX compiler identification is GNU 9.4.0
-- Check for working C compiler: /usr/bin/cc
-- Check for working C compiler: /usr/bin/cc -- works
-- Detecting C compiler ABI info
-- Detecting C compiler ABI info - done
-- Detecting C compile features
-- Detecting C compile features - done
-- Check for working CXX compiler: /usr/bin/c++
-- Check for working CXX compiler: /usr/bin/c++ -- works
-- Detecting CXX compiler ABI info
-- Detecting CXX compiler ABI info - done
-- Detecting CXX compile features
-- Detecting CXX compile features - done
-- Using CATKIN_DEVEL_PREFIX: /home/fadhildz/rrt-ros/devel
-- Using CMAKE_PREFIX_PATH: /home/fadhildz/ws_moveit/devel;/opt/ros/noetic
-- This workspace overlays: /home/fadhildz/ws_moveit/devel;/opt/ros/noetic
-- Found PythonInterp: /usr/bin/python3 (found suitable version "3.8.10", minimum required is "3")
-- Using PYTHON_EXECUTABLE: /usr/bin/python3
-- Using Debian Python package layout
-- Found PY_em: /usr/lib/python3/dist-packages/em.py
-- Using empy: /usr/lib/python3/dist-packages/em.py
-- Using CATKIN_ENABLE_TESTING: ON
-- Call enable_testing()
-- Using CATKIN_TEST_RESULTS_DIR: /home/fadhildz/rrt-ros/build/test_results
-- Forcing gtest/gmock from source, though one was otherwise available.
-- Found gtest sources under '/usr/src/gtest': gtests will be built
-- Found gmock sources under '/usr/src/gmock': gmock will be built
-- Found PythonInterp: /usr/bin/python3 (found version "3.8.10")
-- Found Threads: TRUE
-- Using Python nosetests: /usr/bin/nosetests3
-- catkin 0.8.10
-- BUILD_SHARED_LIBS is on
-- BUILD_SHARED_LIBS is on
-- traversing 1 packages in topological order:
--   - rrt-planning
-- +++ processing catkin package: 'rrt-planning'
-- ==> add_subdirectory(rrt-planning)
-- Configuring done
CMake Warning (dev) at rrt-planning/CMakeLists.txt:203 (add_dependencies):
Policy CMP0046 is not set: Error on non-existent dependency in
add_dependencies. Run "cmake --help-policy CMP0046" for policy details.
Use the cmake_policy command to set the policy and suppress this warning.

The dependency target "ros_rrt_generate_messages_cpp" of target "rrt" does
not exist.
This warning is for project developers. Use -Wno-dev to suppress it.

-- Generating done
-- Build files have been written to: /home/fadhildz/rrt-ros/build
####
### Running command: "make -j20 -l20" in "/home/fadhildz/rrt-ros/build"
###
Scanning dependencies of target rrt
[ 50%] Building CXX object rrt-planning/CMakeFiles/rrt.dir/src/rrt.cpp.o
[100%] Linking CXX executable /home/fadhildz/rrt-ros/devel/lib/rrt-planning/rrt
[100%] Built target rrt
fadhildz@DESKTOP-INTGFLN: ~/rrt-ros$ source devel/setup.bash
fadhildz@DESKTOP-INTGFLN: ~/rrt-ros$
```

4. source devel/setup.bash untuk mengaktifkan workspace yang telah dibangun.

```
fadhildz@DESKTOP-INTGFLN: ~$ source devel/setup.bash
-- Using PYTHON_EXECUTABLE: /usr/bin/python3
-- Using Debian Python package layout
-- Found PY_em: /usr/lib/python3/dist-packages/em.py
-- Using empy: /usr/lib/python3/dist-packages/em.py
-- Using CATKIN_ENABLE_TESTING: ON
-- Call enable_testing()
-- Using CATKIN_TEST_RESULTS_DIR: /home/fadhildz/rrt-ros/build/test_results
-- Forcing gtest/gmock from source, though one was otherwise available.
-- Found gtest sources under '/usr/src/gtest': gtests will be built
-- Found gmock sources under '/usr/src/gmock': gmock will be built
-- Found PythonInterp: /usr/bin/python3 (found version "3.8.10")
-- Found Threads: TRUE
-- Using Python nosetests: /usr/bin/nosetests3
-- catkin 0.8.10
-- BUILD_SHARED_LIBS is on
-- BUILD_SHARED_LIBS is on
-- traversing 1 packages in topological order:
--   - rrt-planning
-- +++ processing catkin package: 'rrt-planning'
-- ==> add_subdirectory(rrt-planning)
-- Configuring done
CMake Warning (dev) at rrt-planning/CMakeLists.txt:203 (add_dependencies):
Policy CMP0046 is not set: Error on non-existent dependency in
add_dependencies. Run "cmake --help-policy CMP0046" for policy details.
Use the cmake_policy command to set the policy and suppress this warning.

The dependency target "ros_rrt_generate_messages_cpp" of target "rrt" does
not exist.
This warning is for project developers. Use -Wno-dev to suppress it.

-- Generating done
-- Build files have been written to: /home/fadhildz/rrt-ros/build
####
### Running command: "make -j20 -l20" in "/home/fadhildz/rrt-ros/build"
###
Scanning dependencies of target rrt
[ 50%] Building CXX object rrt-planning/CMakeFiles/rrt.dir/src/rrt.cpp.o
[100%] Linking CXX executable /home/fadhildz/rrt-ros/devel/lib/rrt-planning/rrt
[100%] Built target rrt
fadhildz@DESKTOP-INTGFLN: ~/rrt-ros$ source devel/setup.bash
fadhildz@DESKTOP-INTGFLN: ~/rrt-ros$
```

5. Jalankan **roscore** di terminal lain untuk memulai master ROS.

```
fadhildz@DESKTOP-IMTGFNL: ~$ roscore
... logging to /home/fadhildz/.ros/log/56d82d98-95ac-11ef-8b47-51ac70082bef/roslaunch-DESKTOP-IMTGFNL-3880.log
Checking log directory for disk usage. This may take a while.
Press Ctrl-C to interrupt
Done checking log file disk usage. Usage is <1GB.

started roslaunch server http://DESKTOP-IMTGFNL:45031/
ros_comm version 1.17.0

SUMMARY
=====

PARAMETERS
* /rostdistro: noetic
* /rosversion: 1.17.0

NODES

auto-starting new master
process[master]: started with pid [3888]
ROS_MASTER_URI=http://DESKTOP-IMTGFNL:11311/

setting /run_id to 56d82d98-95ac-11ef-8b47-51ac70082bef
process[rosout-1]: started with pid [3898]
started core service [/rosout]
```

6. **roslaunch rrt-planning rrt** untuk menjalankan algoritma RRT.

```
fadhildz@DESKTOP-IMTGFNL: ~$ roslaunch rrt-planning rrt
-- traversing 1 packages in topological order:
--   - rrt-planning
-- +++ processing catkin package: 'rrt-planning'
-- ==> add_subdirectory(rrt-planning)
-- Configuring done
CMake Warning (dev) at rrt-planning/CMakeLists.txt:203 (add_dependencies):
  Policy CMP0046 is not set: Error on non-existent dependency in
  add_dependencies. Run "cmake --help-policy CMP0046" for policy details.
  Use the cmake_policy command to set the policy and suppress this warning.

  The dependency target "ros_rrt_generate_messages_cpp" of target "rrt" does
  not exist.
This warning is for project developers. Use -Wno-dev to suppress it.

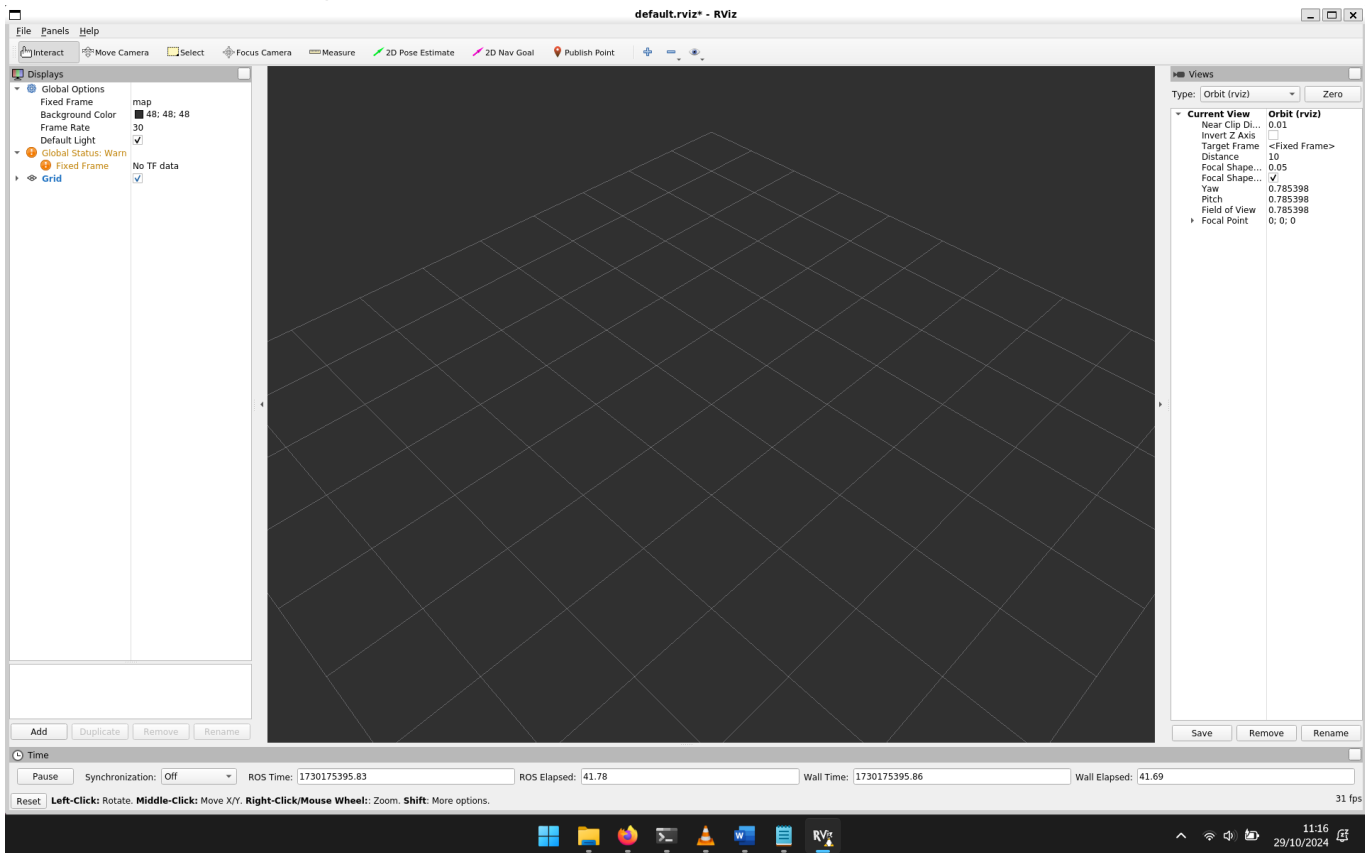
-- Generating done
-- Build files have been written to: /home/fadhildz/rrt-ros/build
####
#### Running command: "make -j20 -l20" in "/home/fadhildz/rrt-ros/build"
####
Scanning dependencies of target rrt
[ 50%] Building CXX object rrt-planning/CMakeFiles/rrt.dir/src/rrt.cpp.o
[100%] Linking CXX executable /home/fadhildz/rrt-ros/devel/lib/rrt-planning/rrt
[100%] Built target rrt
fadhildz@DESKTOP-IMTGFNL:~/rrt-ros$ source devel/setup.bash
fadhildz@DESKTOP-IMTGFNL:~/rrt-ros$ roslaunch rrt-planning rrt
[ INFO] [1730175299.991678413]: Frame: 0
Rand config:
x: 9
y: 10
z: 0
nearest_node:
x: 0
y: 0
z: 0
next_node:
x: 0.602068
y: 0.668965
z: 0

[ WARN] [1730175299.993913929]: Please run Rviz in another terminal.
```

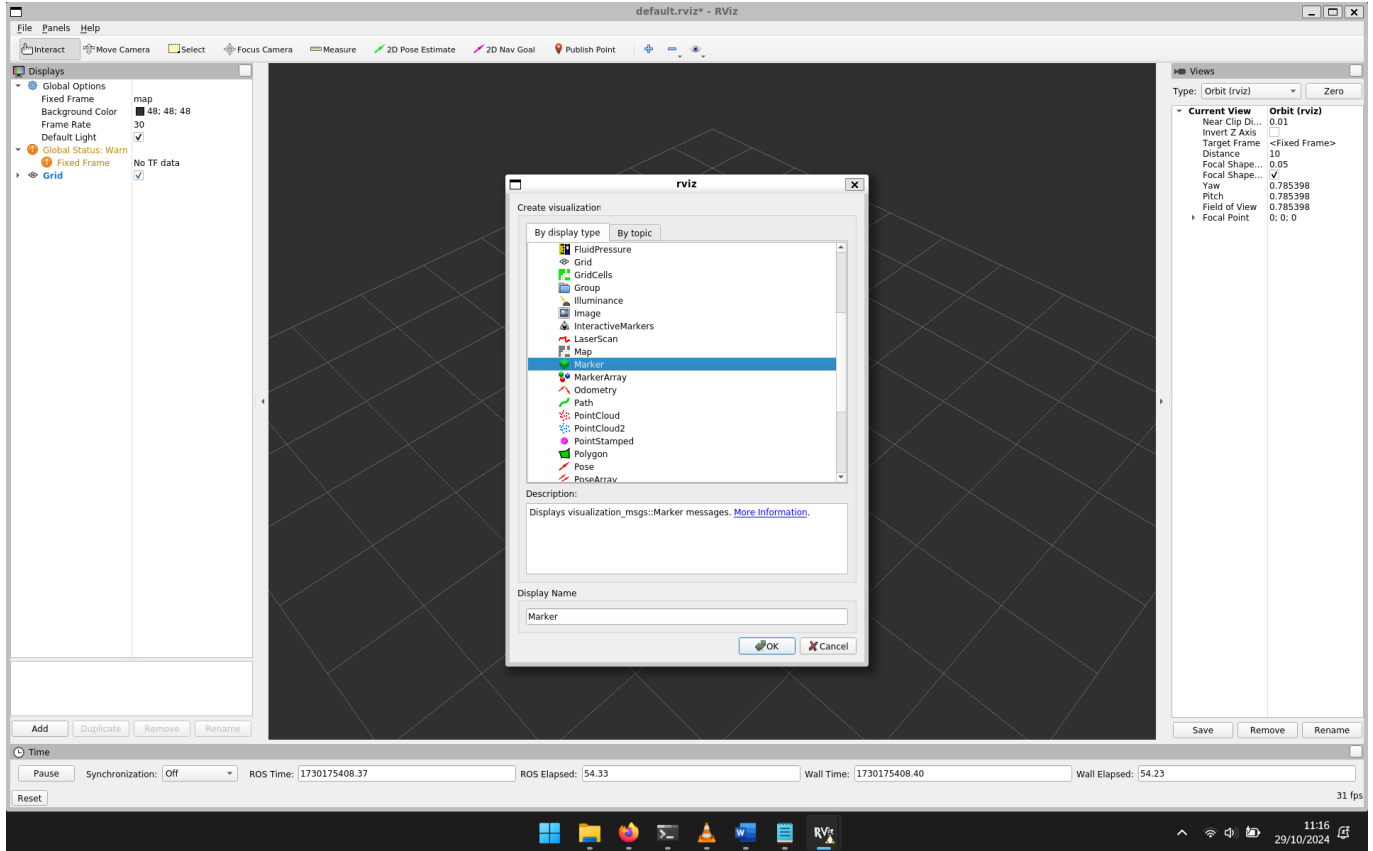
7. Di terminal lain, jalankan **roslaunch rviz rviz** untuk membuka RViz sebagai visualisasi.

```
fadhildz@DESKTOP-IMTGFNL: ~$ roslaunch rviz rviz
[ INFO] [1730175334.693129482]: rviz version 1.14.25
[ INFO] [1730175334.693241009]: compiled against Qt version 5.12.8
[ INFO] [1730175334.693262913]: compiled against OGRE version 1.9.0 (Ghadamon)
[ INFO] [1730175334.716801903]: Forcing OpenGL version 0.
WARNING: dzn is not a conformant Vulkan implementation, testing use only.
WARNING: dzn is not a conformant Vulkan implementation, testing use only.
WARNING: Some incorrect rendering might occur because the selected Vulkan device (Microsoft Direct3D12 (NVIDIA GeForce RTX 4050 Laptop GPU)) does not support base Zink requirements: feats.features.logicOp have_EXT_custom_border_color have_EXT_line_rasterization
WARNING: dzn is not a conformant Vulkan implementation, testing use only.
WARNING: dzn is not a conformant Vulkan implementation, testing use only.
WARNING: Some incorrect rendering might occur because the selected Vulkan device (Microsoft Direct3D12 (NVIDIA GeForce RTX 4050 Laptop GPU)) does not support base Zink requirements: feats.features.logicOp have_EXT_custom_border_color have_EXT_line_rasterization
[ INFO] [1730175353.552903812]: Stereo is NOT SUPPORTED
[ INFO] [1730175353.553041276]: OpenGL device: D3D12 (Intel(R) UHD Graphics)
[ INFO] [1730175353.553089724]: OpenGL version: 4.1 (GLSL 4.1) limited to GLSL 1.4 on Mesa system.
```

8. Akan muncul tampilan RViz.



9. Tambahkan Marker untuk menampilkan node dan edges yang dibuat oleh RRT.



10. Akan muncul visualisasi RRT di RViz, menampilkan pohon yang berkembang sesuai dengan algoritma RRT.

