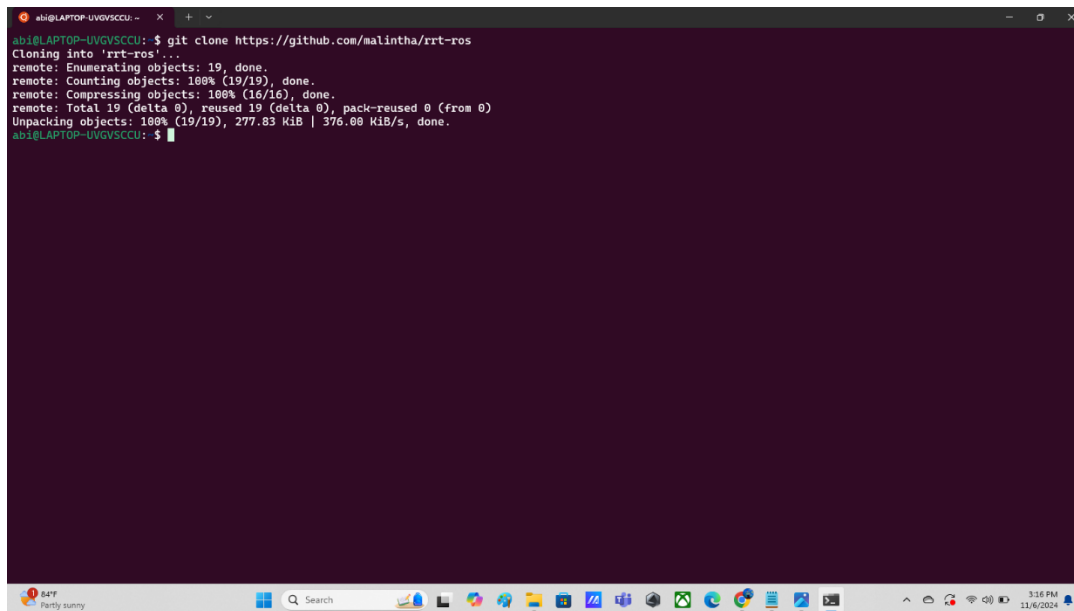


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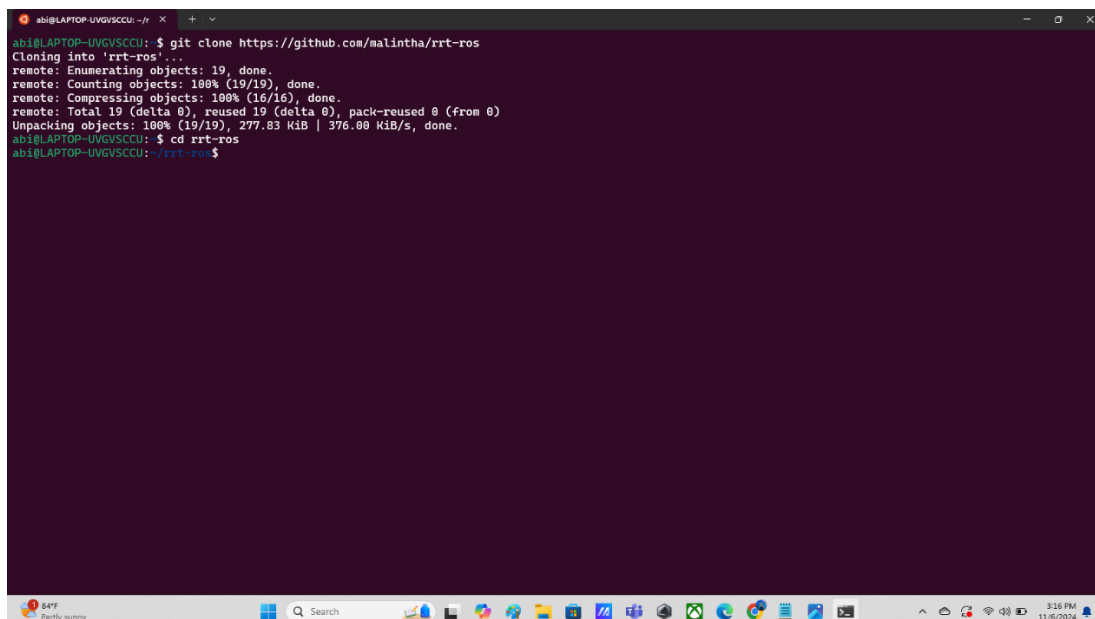
## Implementasi Rapidly-Expanding Random Trees (RRT) di ROS dengan Rviz

1. Jalankan syntax **git clone https://github.com/malinha/rrt-ros** untuk mengunduh repositori rrt-ros dari GitHub.



```
abi@LAPTOP-UVGVSCCU: ~$ 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 | 376.00 KiB/s, done.
abi@LAPTOP-UVGVSCCU: ~$
```

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



```
abi@LAPTOP-UVGVSCCU: ~$ 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 | 376.00 KiB/s, done.
abi@LAPTOP-UVGVSCCU: ~$ cd rrt-ros
abi@LAPTOP-UVGVSCCU: ~/rrt-ros$
```

3. Jalankan syntax **catkin\_make** untuk membangun workspace dengan package RRT.

```
abi@LAPTOP-UVGVSCCU: ~ % cd rrt-ros
abi@LAPTOP-UVGVSCCU: ~/rrt-ros % catkin_make
Base path: /home/abi/rrt-ros
Source space: /home/abi/rrt-ros/src
Build space: /home/abi/rrt-ros/build
Devel space: /home/abi/rrt-ros/devel
Install space: /home/abi/rrt-ros/install
Removing symlink "/home/abi/rrt-ros/src/CMakeLists.txt" which points to non-existing file
Creating symlink "/home/abi/rrt-ros/src/CMakeLists.txt" pointing to "/opt/ros/noetic/share/catkin/cmake/toplevel.cmake"
####
#### Running command: "cmake /home/abi/rrt-ros/src -DCATKIN_DEVEL_PREFIX=/home/abi/rrt-ros/devel -DCMAKE_INSTALL_PREFIX=/home/abi/rrt-ros/install -G Unix Makefiles" in "/home/abi/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/abi/rrt-ros/devel
-- Using CMAKE_PREFIX_PATH: /home/abi/ws_moveit/devel;/opt/ros/noetic
-- This workspace overlays: /home/abi/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/abi/rrt-ros/build/test_results
-- Forcing gtest/gmock from source, though one was otherwise available.
-- Found gtest sources under '/usr/src/googletest': gtests will be built
```

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

```

abi@LAPTOP-UVGVSCCU: ~/r
-- Using empy: /usr/lib/python3/dist-packages/em.py
-- Using CATKIN_ENABLE_TESTING: ON
-- Call enable_testing()
-- Using CATKIN_TEST_RESULTS_DIR: /home/abi/rrt-ros/build/test_results
-- Forcing gtest/gmock from source, though one was otherwise available.
-- Found gtest sources under '/usr/src/gtestest': gtests will be built
-- Found gmock sources under '/usr/src/gtestest': 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/abi/rrt-ros/build
####
#### Running command: "make -j12 -l12" in "/home/abi/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/abi/rrt-ros/devel/lib/rrt-planning/rrt
[100%] Built target rrt
abi@LAPTOP-UVGVSCCU:~/rrt-ros$ source devel/setup.bash
abi@LAPTOP-UVGVSCCU:~/rrt-ros$

```

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

```
abi@LAPTOP-UVGVSCCU: ~/rr X roscore http://LAPTOP-UVGVSCCU:11311/ X + v
abi@LAPTOP-UVGVSCCU: $ roscore
... logging to /home/abi/.ros/log/9b458f86-9c17-11ef-baf3-734c75d50608/roslaunch-LAPTOP-UVGVSCCU-1507.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://LAPTOP-UVGVSCCU:39721/
ros_comm version 1.17.0

SUMMARY
=====

PARAMETERS
* /roscpp: noetic
* /rosversion: 1.17.0

NODES

auto-starting new master
process[master]: started with pid [1517]
ROS_MASTER_URI=http://LAPTOP-UVGVSCCU:11311/

setting /run_id to 9b458f86-9c17-11ef-baf3-734c75d50608
process[rosout-1]: started with pid [1527]
started core service [/rosout]
█
```

## 6. Jalankan syntax **roslaunch rrt-planning rrt** untuk menjalankan algoritma RRT

```
abi@LAPTOP-UVGVSCCU: ~/rr X roscore http://LAPTOP-UVGVSCCU:11311/ X + v
-- ++ 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.

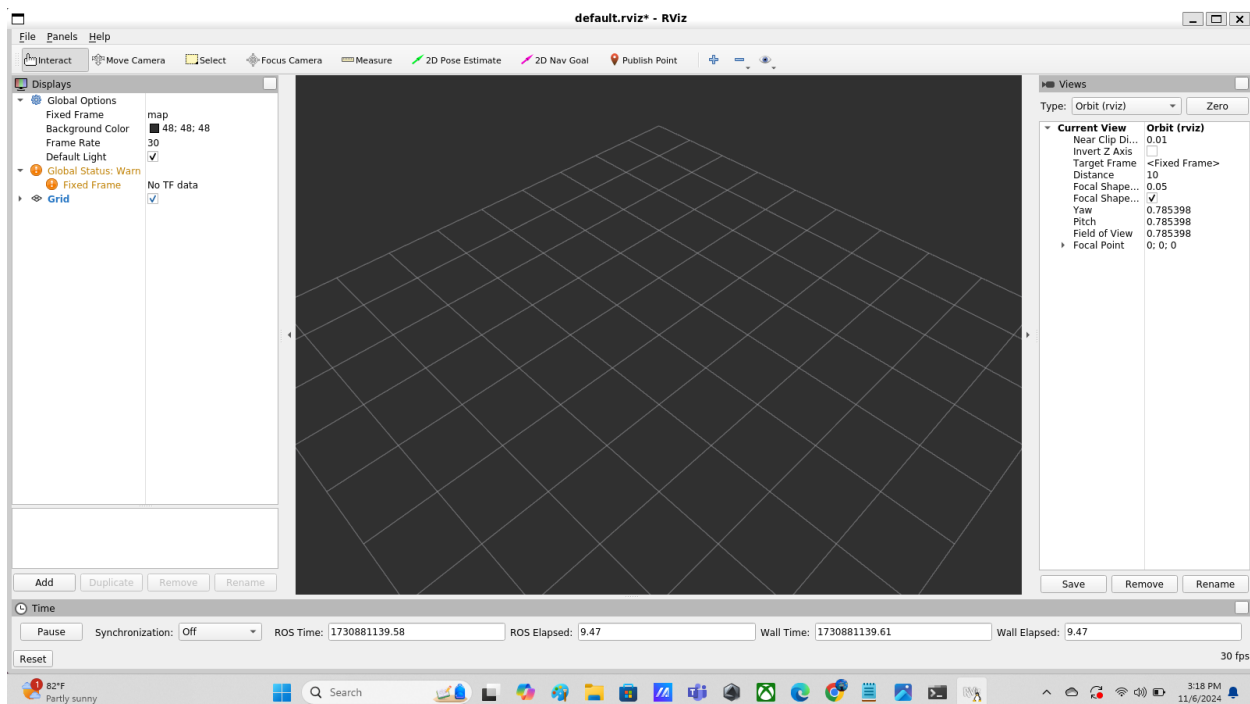
-- Generating done
-- Build files have been written to: /home/abi/rrt-ros/build
####
#### Running command: "make -j12 -l12" in "/home/abi/rrt-ros/build"
####
Scanning dependencies of target rrt
[ 50%] Building CXX object rrt-planning/CMakeFiles/rrt.dir/src/rrt.cpp.o
[100%] Linking CXX executable /home/abi/rrt-ros/devel/lib/rrt-planning/rrt
[100%] Built target rrt
abi@LAPTOP-UVGVSCCU: ~/rrt-ros $ source devel/setup.bash
abi@LAPTOP-UVGVSCCU: ~/rrt-ros $ roslaunch rrt-planning rrt
[ INFO] [1730881086.362675087]: Frame: 0
Rand config:
x: 10
y: 2
z: 0
nearest_node:
x: 0
y: 0
z: 0
next_node:
x: 0.882523
y: 0.176505
z: 0

[ WARN] [1730881086.365586760]: Please run Rviz in another terminal.
█
```

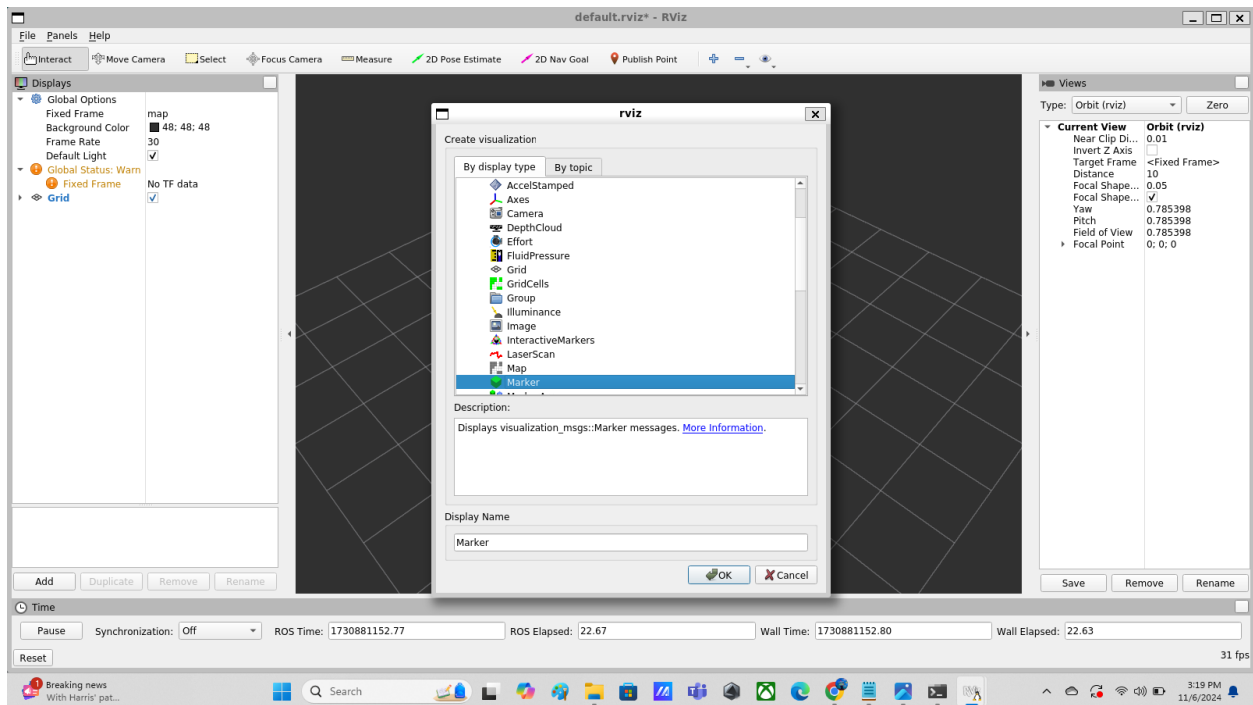
7. Jalankan syntax **roslaunch rviz rviz** di terminal lain untuk membuka RViz sebagai visualisasi.

```
abi@LAPTOP-UVGVSCCU: ~/r X  roscore http://LAPTOP-UVGVSCCU: ~ X  abi@LAPTOP-UVGVSCCU: ~ X  + v X
abi@LAPTOP-UVGVSCCU: $ roslaunch rviz rviz
[ INFO ] [1730881114.690268776]: rviz version 1.14.25
[ INFO ] [1730881114.690352452]: compiled against Qt version 5.12.8
[ INFO ] [1730881114.690362369]: compiled against OGRE version 1.9.0 (Ghadamon)
[ INFO ] [1730881114.709508357]: Forcing OpenGL version 0.
[ INFO ] [1730881129.531439041]: Stereo is NOT SUPPORTED
[ INFO ] [1730881129.531858885]: OpenGL device: D3D12 (NVIDIA GeForce RTX 3050 Laptop GPU)
[ INFO ] [1730881129.532137248]: OpenGL version: 3.1 (GLSL 1.4).
```

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.

