Nav2GPT: Robot Navigation with LLM & ROS2

Let’s talk with Robots

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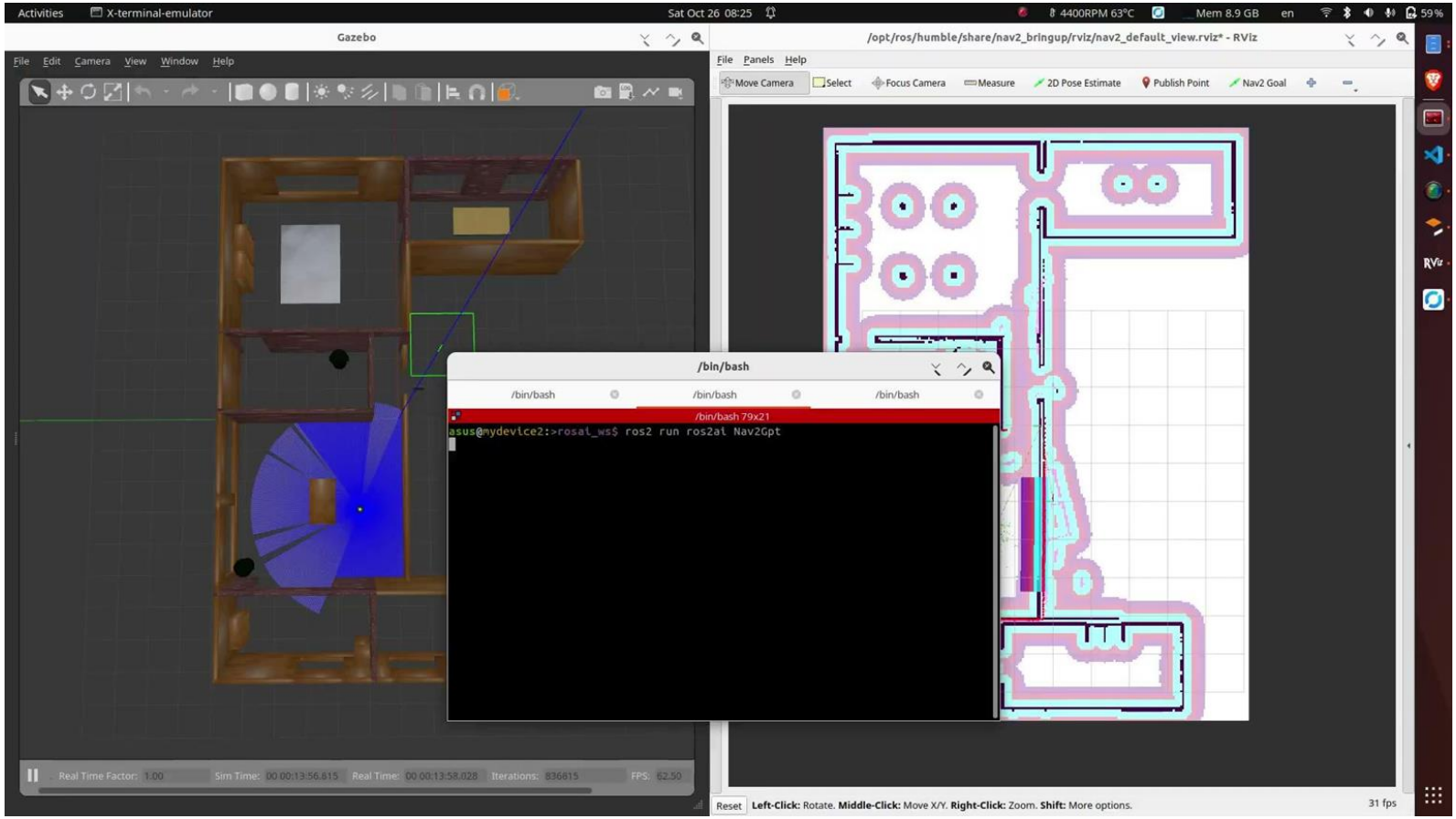
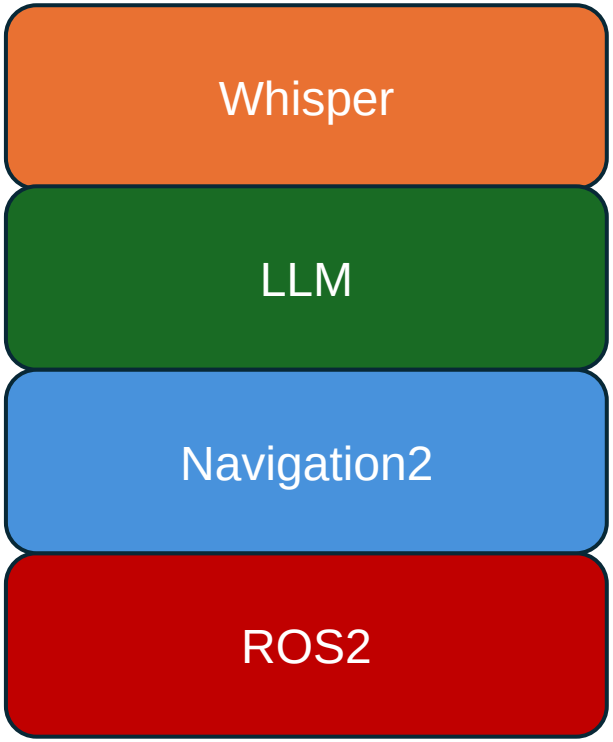
Demo


Activities
X-terminal-emulator
Sat Oct 26 08:25
4400RPM 63°C
Mem 8.9 GB
en
59%
Gazebo
File Edit Camera View Window Help
Real Time Factor: 1.00
Sim Time: 00 00:13:56.615
Real Time: 00 00:13:58.028
Iterations: 836615
FPS: 62.50
/opt/ros/humble/share/nav2_bringup/rviz/nav2_default_view.rviz* - RViz
File Panels Help
Move Camera
Select
Focus Camera
Measure
2D Pose Estimate
Publish Point
Nav2 Goal
Reset
Left-Click: Rotate. Middle-Click: Move X/Y. Right-Click: Zoom. Shift: More options.
31 fps
/bin/bash
/bin/bash
/bin/bash
/bin/bash
/bin/bash 79x21
asus@mydevice2:>rosai_ws$ ros2 run ros2ai Nav2Gpt

Technology Stack



Prompt

```
Use this JSON schema to achieve the user's goals:\n\
        {
"$schema": "http://json-schema.org/draft-04/schema#",
"type": "object",
"properties": {
    "service": {
        "type": "string",
        "default": "/goToPose"
    },
    "args": {
        "type": "object",
        "properties": {
            "x": {
                "type": "number",
                "min": 0,
                "max": 10
            },
            "y": {
                "type": "number",
                "min": 0,
                "max": 10
            },
            "theta": {
                "type": "number",
                "min": -3.14,
                "max": 3.14
            }
        },
        "required": [
            "x",
            "y",
            "theta"
        ]
    }
},
```

Fig. 1: Prompt (a)

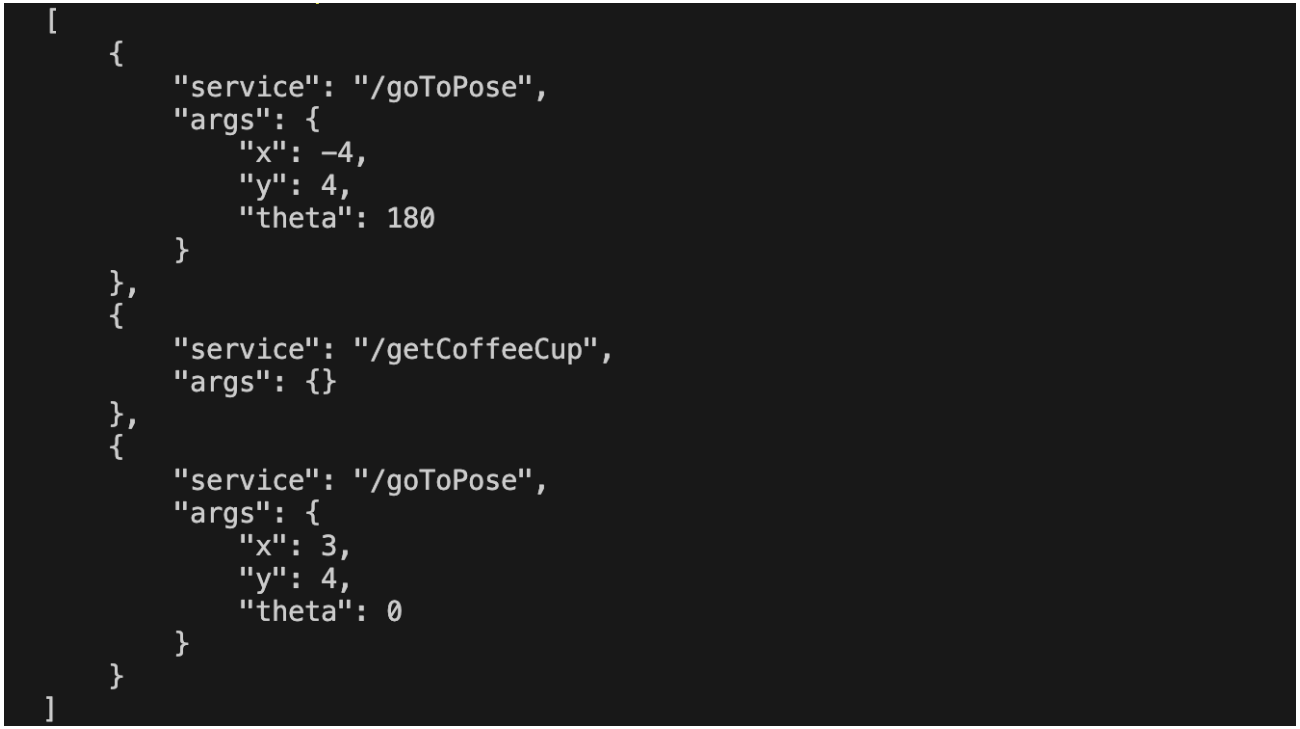
```
    Respond as a list of JSON objects.\
    Do not include explanations or conversation in the response


"role": "user",
        "content": f"\
        remember these the coordinates of the kitchen is x: -4, y: 4, theta: 180

        and the coordinates of the bedroom is x: 3, y: 4, theta: 0
```

Fig. 2: Prompt (b)

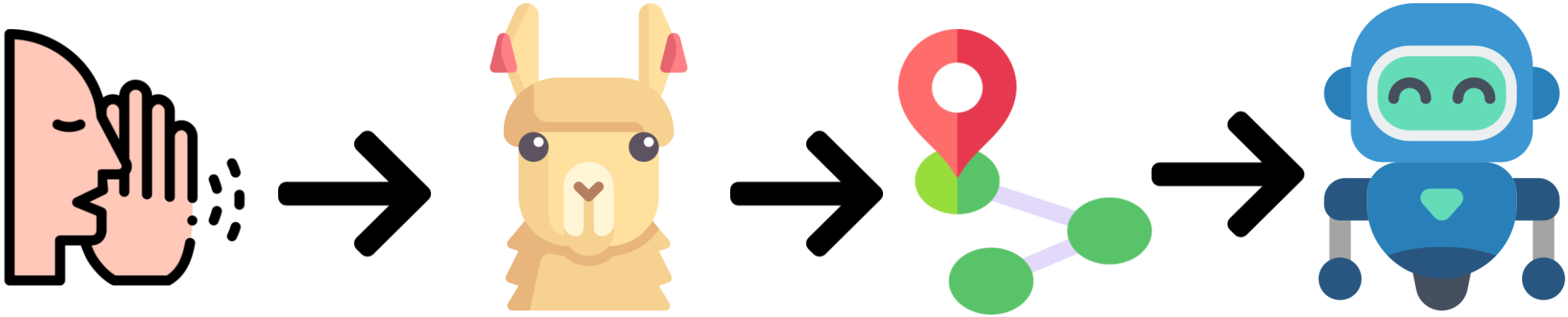
Response



```
[
    {
        "service": "/goToPose",
        "args": {
            "x": -4,
            "y": 4,
            "theta": 180
        }
    },
    {
        "service": "/getCoffeeCup",
        "args": {}
    },
    {
        "service": "/goToPose",
        "args": {
            "x": 3,
            "y": 4,
            "theta": 0
        }
    }
]
```

Fig. 2: Result from LLM

Pipeline



Whisper LLM Nav2 ROS2

Conclusion

- Talk with your robot
- Give simple instructions in human language
- Lack of Context Understanding
- Can make mistakes

Future work

- LLM will decide the agents based on the Context
- Navigation Agent
- Manipulation Agent
- Object Detection Agent (VLM)

Let’s Connect

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Github Repo:
https://github.com/sachinkum0009/nav2gpt