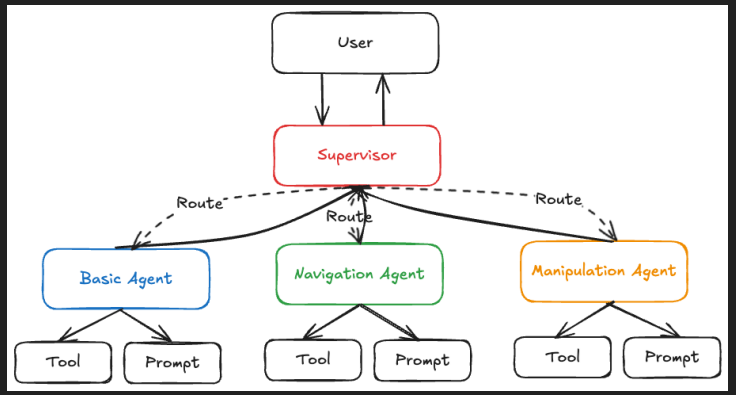
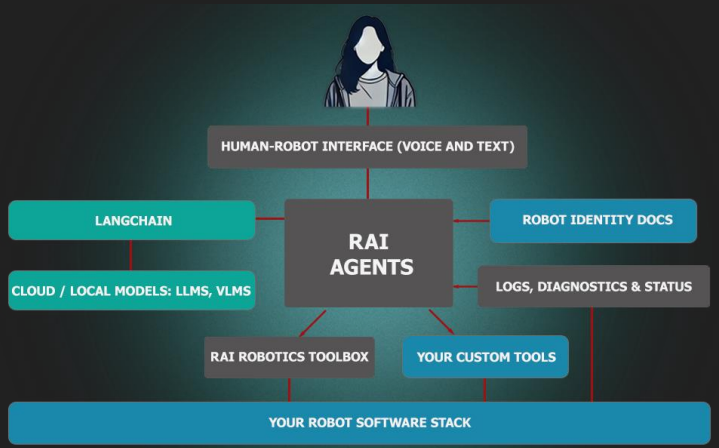
Agents Everywhere

Multi Agent Collaboration with RAI





Presenter: Sachin Kumar

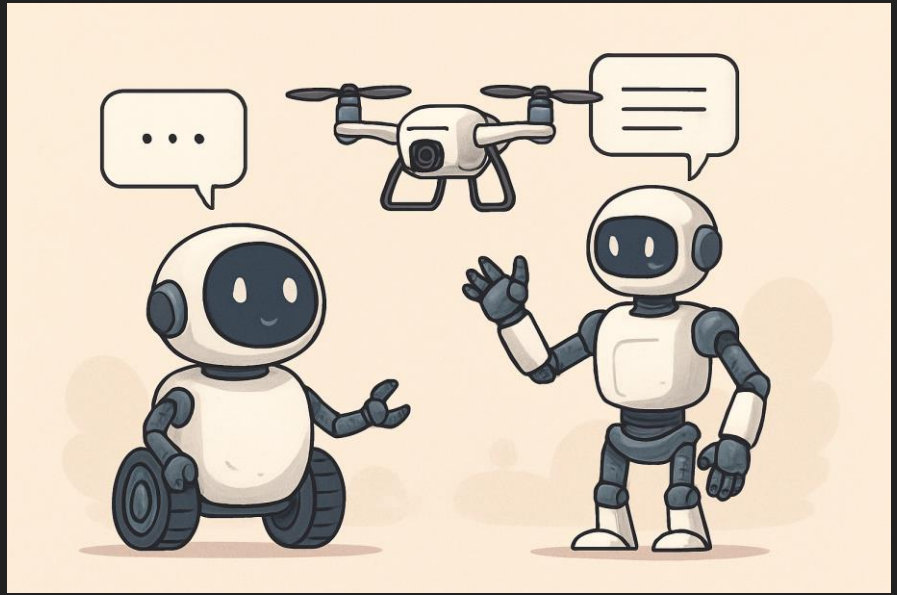
Who Am I

Sachin Kumar

Robotics AI Simulation Engineer

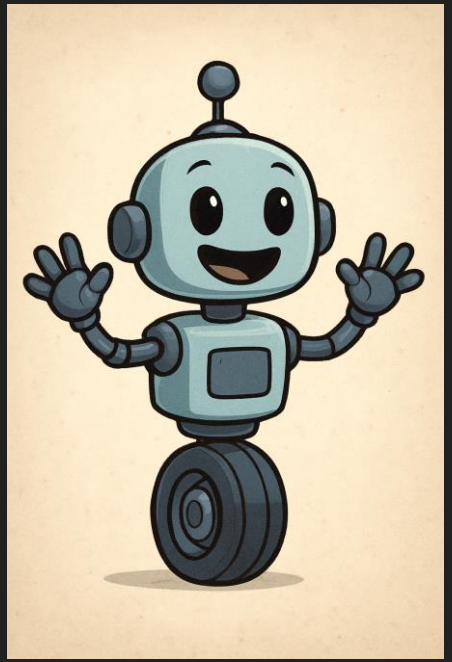
Motivation

- Interface like ChatGPT to interact with Robots.
- Use AI agents to control navigation and robot arm movements.
- Performing complex, multi-step tasks.
- Facilitating multi agent collaboration.
- A Supervisor coordinates sub-agents, handling plans, requests, and status.



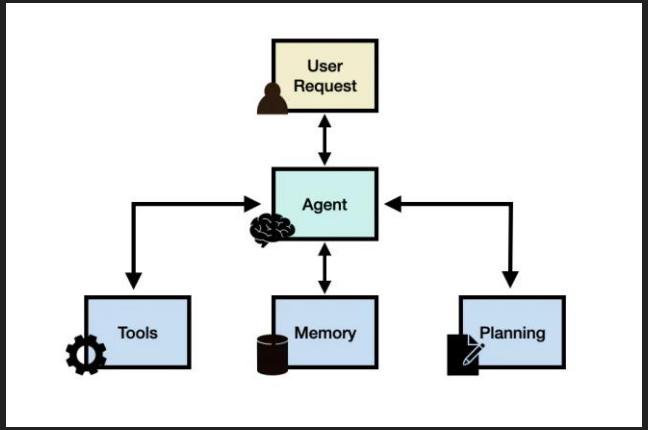
Introduction

- Making Robots Smarter with RAI
- Providing various tools to interact with Environment and control robot
- Enables robots to perform complex, multi-step tasks
- Supports **specialized agents**: navigation, manipulation, perception
- RAI provides Vendor-agnostic, scalable, and flexible platform
- Focus on **collaboration, adaptability, and natural interaction**



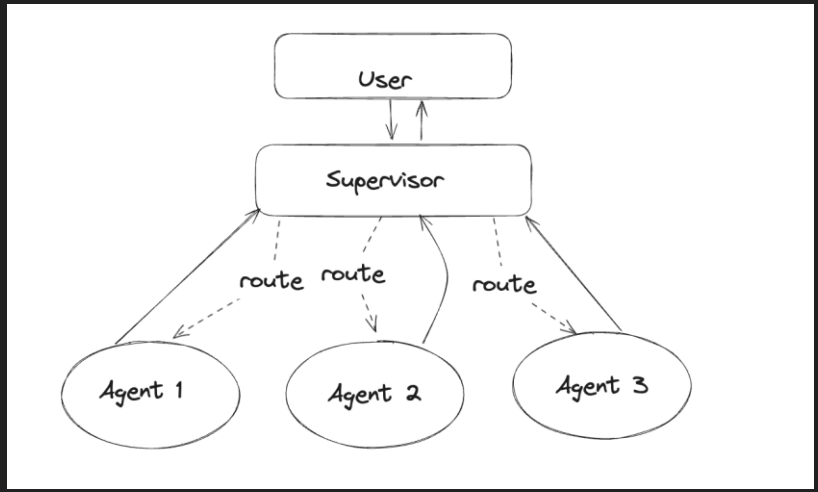
Agent

- An AI agent is a system that uses an LLM to decide the control flow of an application.
- It can call tools to use functions which can perform actions to interact with the environment
- For example, **get_current_temp** tool can be used to get the current temperature



Multi Agents

- **Supervisor Agent**: manages workflow and decides which agent to activate
- **Sub-Agents**: specialized for specific tasks:
    - Basic: robot hardware, sensors, ros2 topics, services, actions
    - Navigation: path planning and obstacle avoidance
    - Manipulation: object handling and pick-and-place tasks
- Sub-Agents report results back to Supervisor
- Supervisor coordinates multi-agent collaboration for user-defined tasks
- Benefits: modularity, scalability, collaboration, and flexible task execution



Embodied Agents: Complete Toolkit Overview

Basic Agent

ROS2 Toolkit
Core ROS functionalities

GetCurrentTemp
Retrieve ambient temperature

TellMeAJoke
Conversational engagement

Navigation Agent

NavigateToPose
Move to target pose

GetNavFeedback
Real-time status updates

GetNavResult
Final outcome metrics

CancelNavigation
Halt movement immediately

Manipulation Agent

MoveToPoint
End-effector positioning

MoveObjectFromTo
Object relocation task

GetObjectPosition
3D coordinate retrieval

Embodiment JSON Capabilities

Basic Agent

- System control parameters
- Sensor integration specs
- Tool registration schema
- Constraint definitions

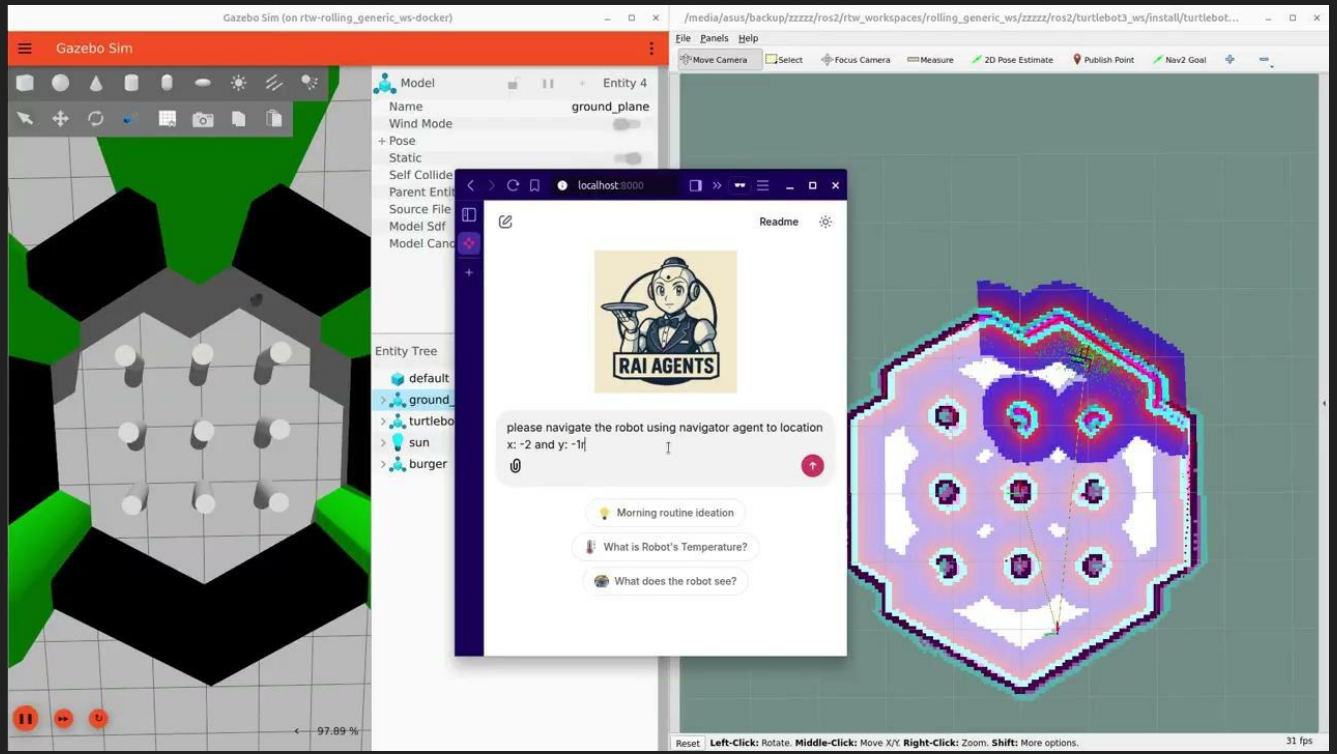
Navigation Agent

- Velocity/acceleration limits
- Sensor fusion parameters
- Path planning configs
- Collision avoidance thresholds

Manipulation Agent

- End-effector kinematics
- Grip force limits
- Object detection specs
- Safety constraints

Demo


Gazebo Sim (on rtw-rolling_generic_ws-docker)
Gazebo Sim
Model
Entity 4
Name
ground_plane
Wind Mode
Pose
Static
Self Collide
Parent Entity
Source File
Model Sdf
Model Canc
Entity Tree
default
ground_
turtlebo
sun
burger
97.89 %
/media/asus/backup/zzzzz/ros2/rtw_workspaces/rolling_generic_ws/zzzzz/ros2/turtlebot3_ws/install/turtlebot...
File Panels Help
Move Camera
Select
Focus Camera
Measure
2D Pose Estimate
Publish Point
Nav2 Goal
localhost:8000
Readme
RAI AGENTS
please navigate the robot using navigator agent to location x: -2 and y: -1
Morning routine ideation
What is Robot's Temperature?
What does the robot see?
Reset
Left-Click: Rotate. Middle-Click: Move X/Y. Right-Click: Zoom. Shift: More options.
31 fps

Resources

- https://github.com/sachinkum0009/bandu
- https://robotecai.github.io/rai/
- https://github.com/Chainlit/chainlit
- https://github.com/ollama/ollama

GitHub Repo