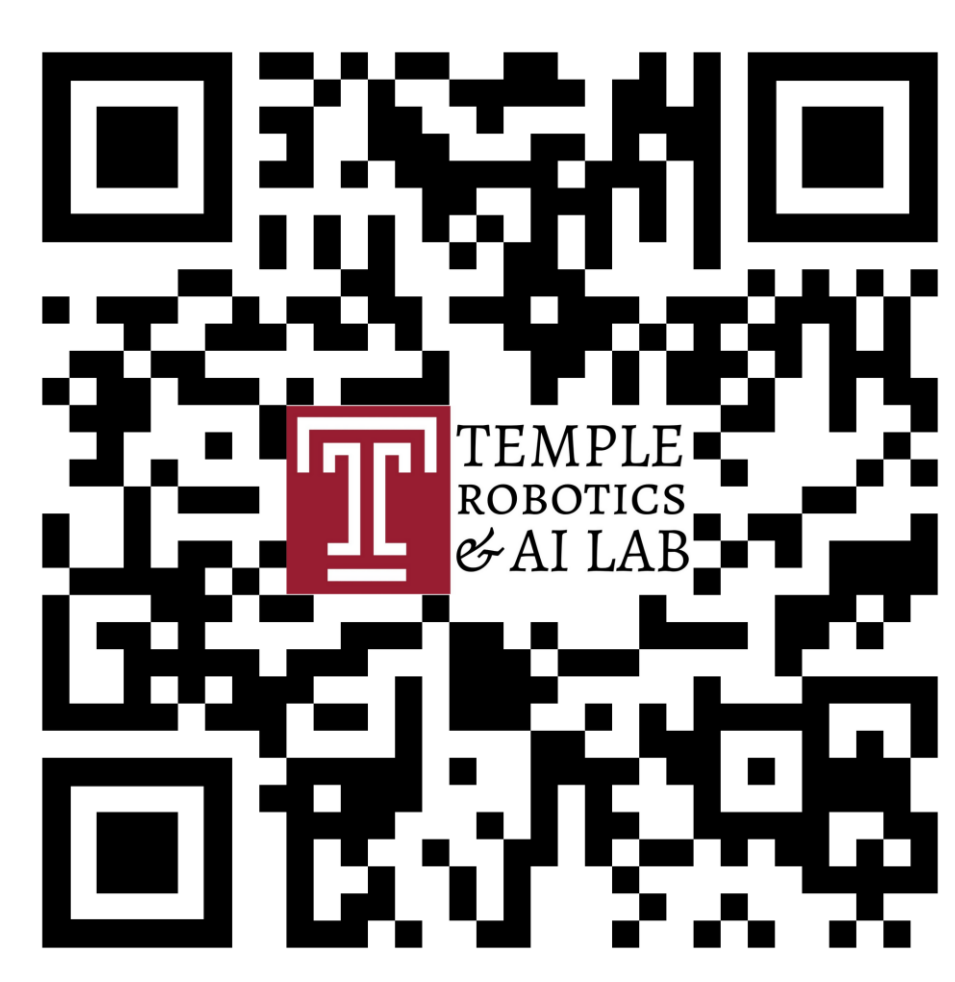




Speech-Guided Sequential Planning for Autonomous Navigation using Large Language Model Meta AI 3 (Llama3)

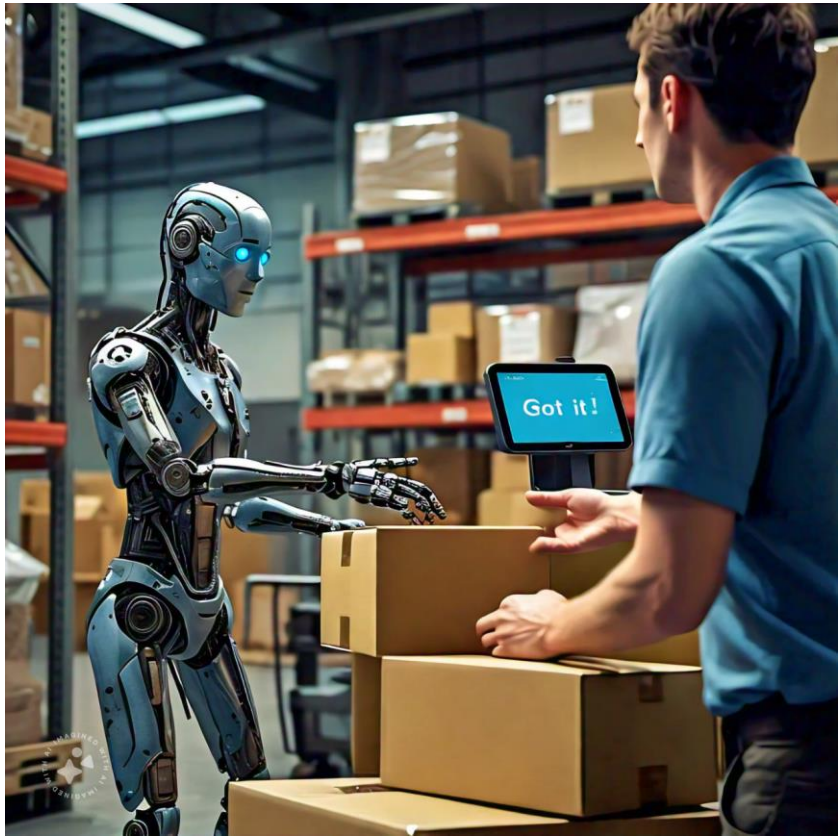
Alkesh K. Srivastava, Philip Dames

Department of Mechanical Engineering, Temple University, Philadelphia, USA



INTRODUCTION

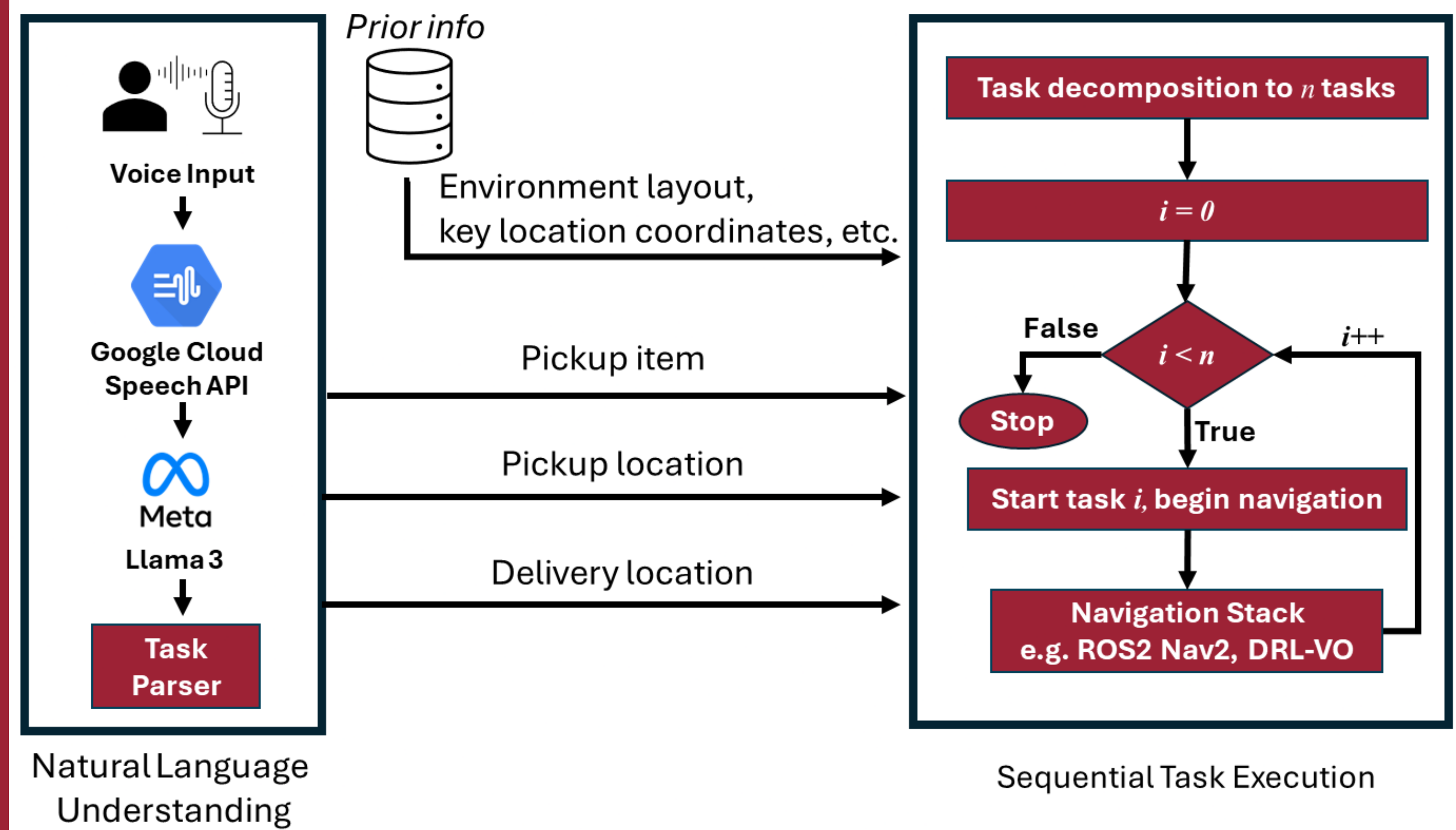
- Motivation:** Enable robots to **understand** natural language commands and **autonomously perform multi-step tasks** in dynamic human environments with **social compliance**



An illustration of human-robot interaction, depicting a human commanding a robot to autonomously execute package delivery (Generated by Meta AI)

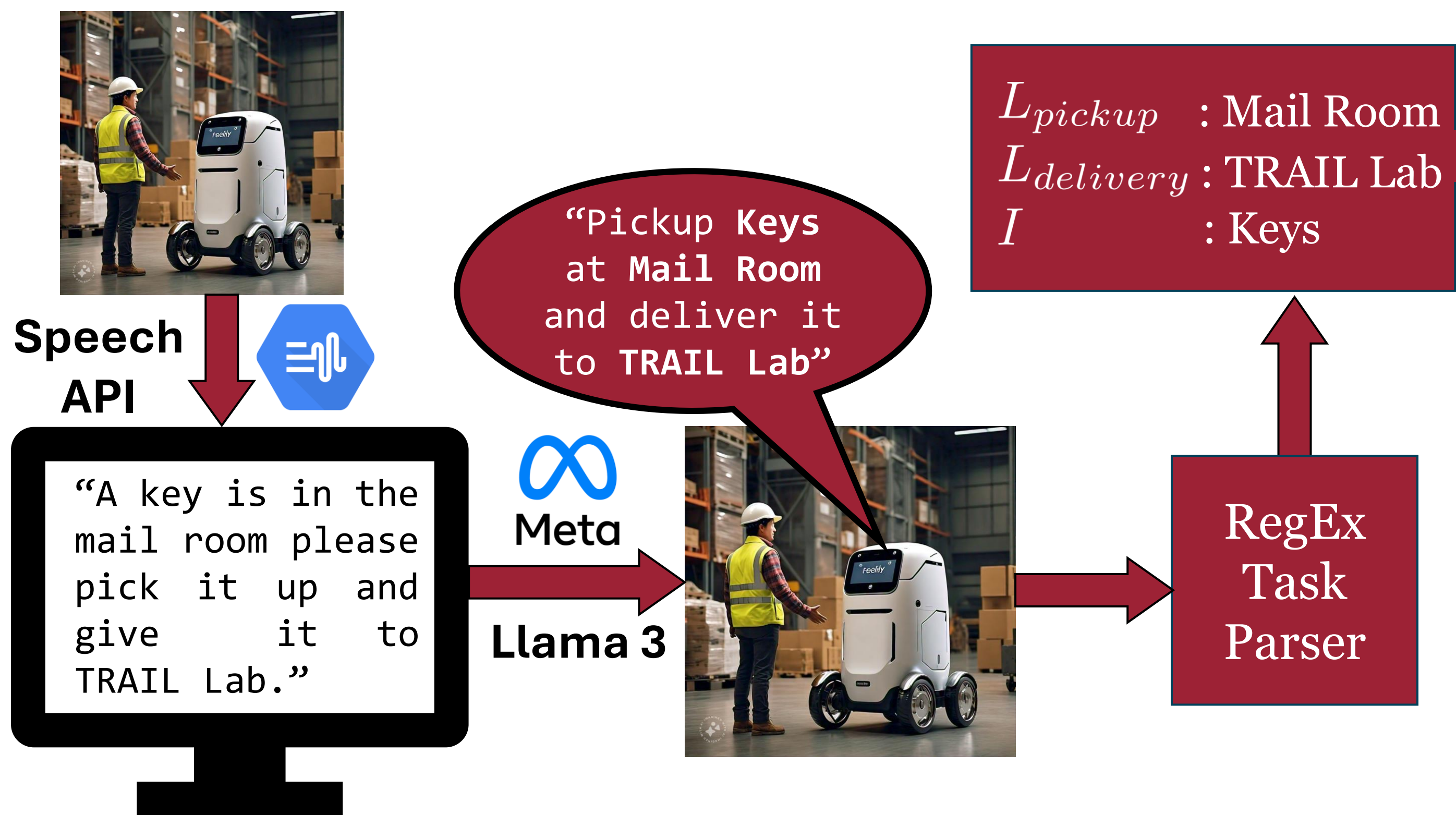
- Objective:** Develop a system integrating **LLM (Llama3)** for command interpretation and **DRL-VO** for autonomous navigation using **ROS**

SYSTEM OVERVIEW



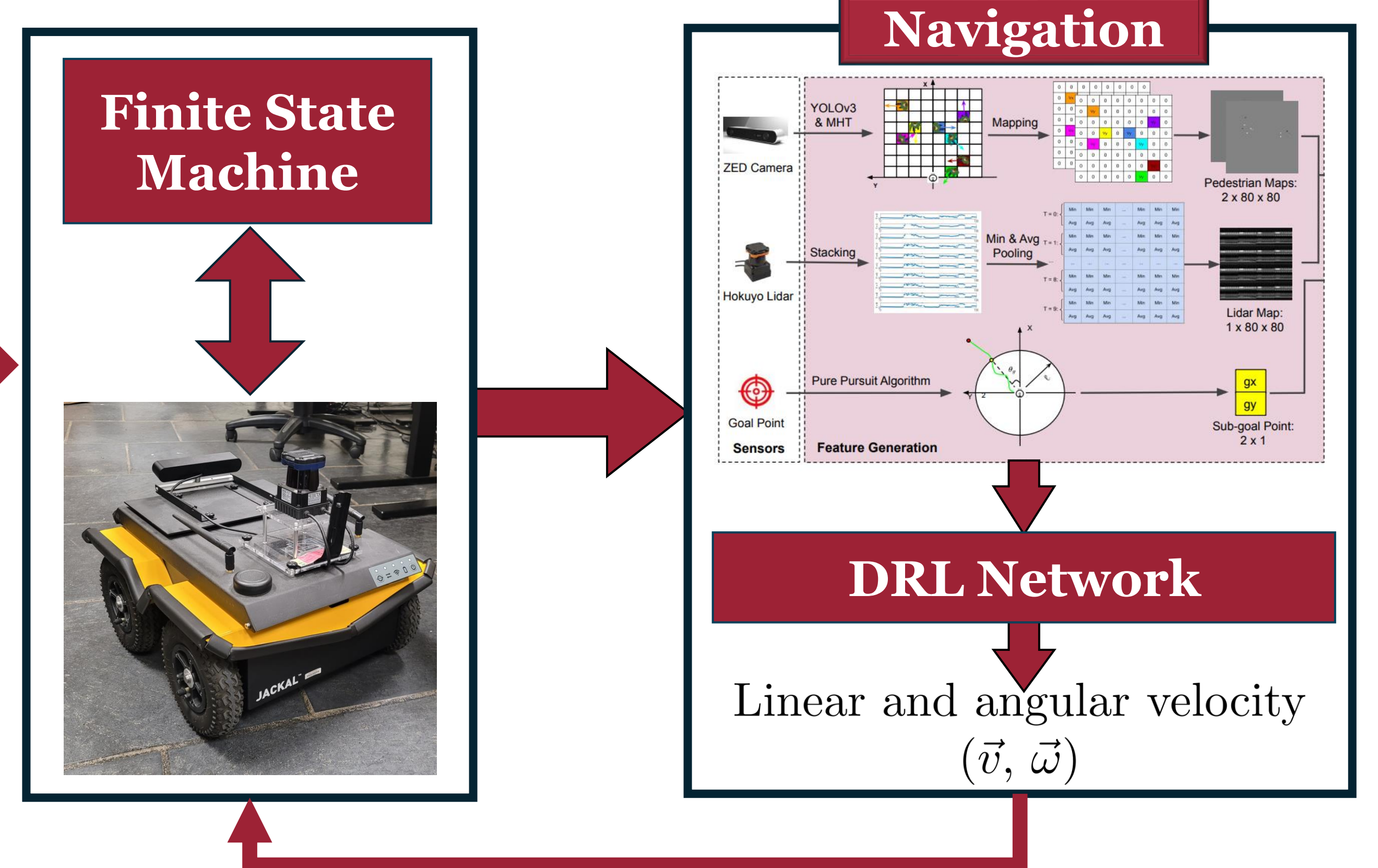
NATURAL LANGUAGE UNDERSTANDING

- Objective:** Extract pickup location L_{pickup} (e.g., Mail room), delivery location $L_{delivery}$ (e.g., TRAIL lab), and pickup item I (e.g., keys)



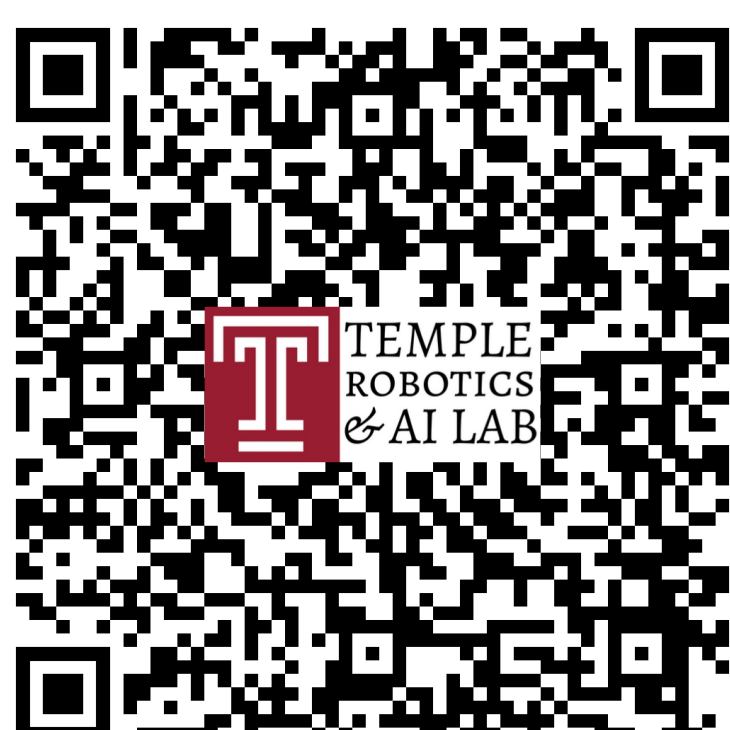
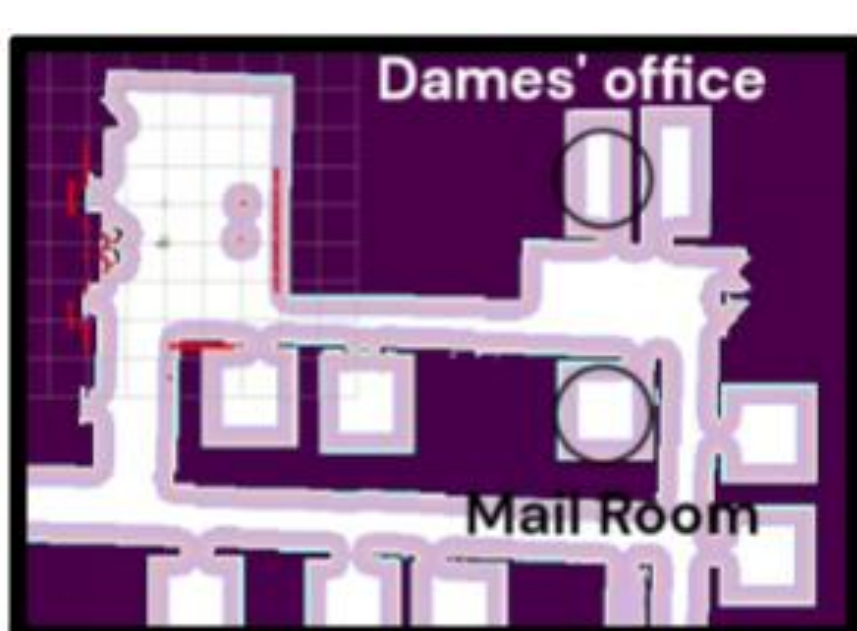
SEQUENTIAL TASK EXECUTION

- Objective:** Formulate & execute task sequence based on NLU in a **socially compliant manner** using **DRL-VO**



EXPERIMENTS & RESULTS

- Task Classification:** Accuracy of **84.37%** is achieved
- Simulation Trials:** Conducted on Turtlebot2 (ROS1) and Turtlebot3 (ROS2)
- Hardware Trials:** Performed using Clearpath Jackal UGV



CONCLUSION

- We successfully integrate **natural language understanding** using **Llama3** for sequential planning while ensuring **social compliance**
- We demonstrate the robustness of our system in **ROS1**, **ROS2**, and on a **Clearpath Jackal UGV**

ACKNOWLEDGMENT

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