LLM to Action Robotics Platform

FALL/SPRING 2025

AI & ML @SJSU

Problem Description

Rigid, hand-coded routines

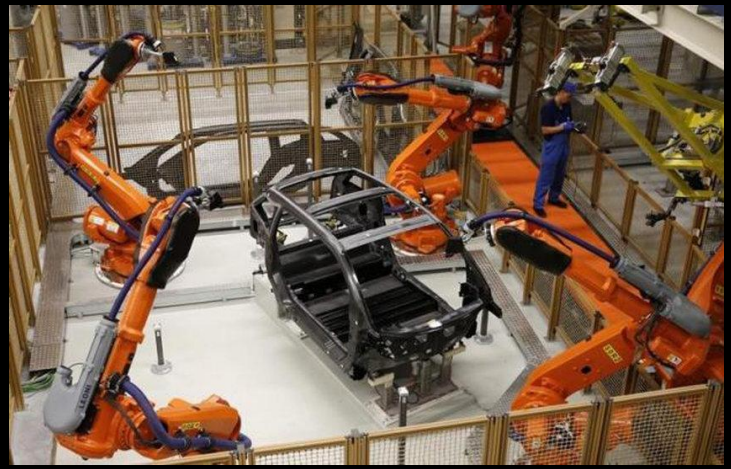
→ brittle interaction

Weak runtime assurance

→ Over-conservatism

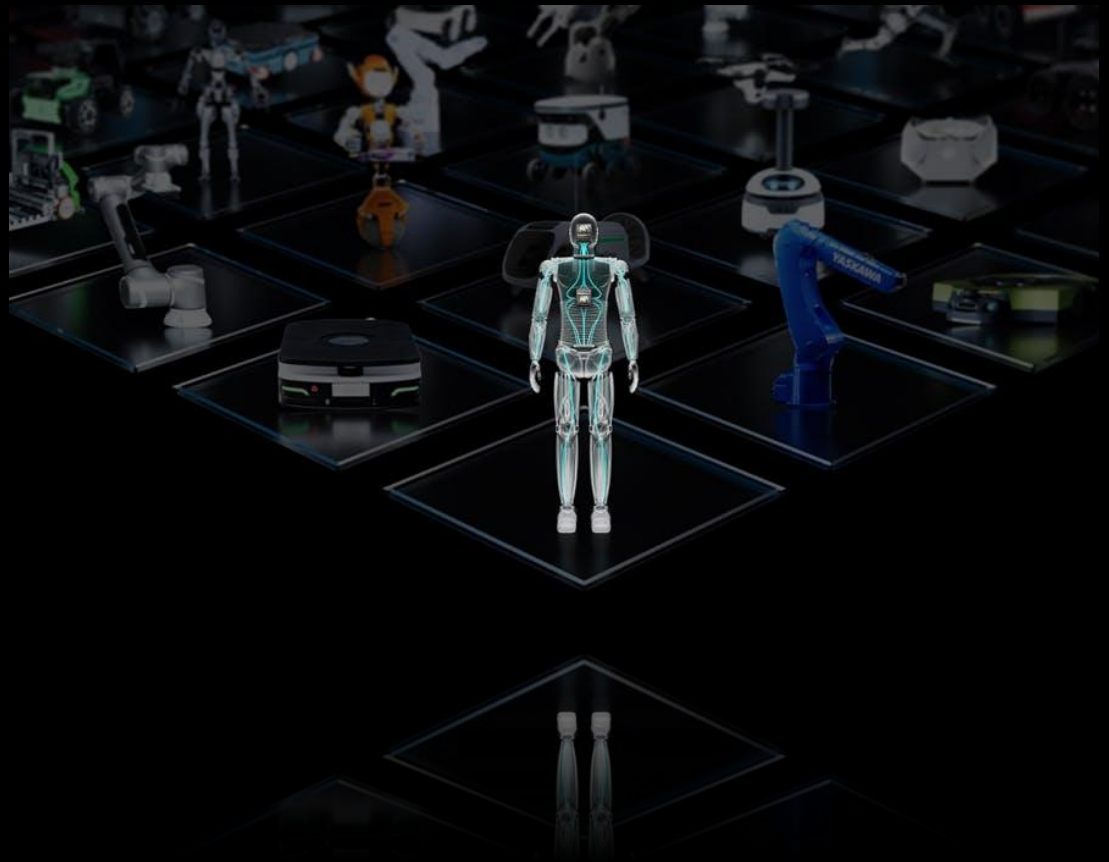
Poor measurability

→ hard to improve



NLX Robotics

Natural Language Execution

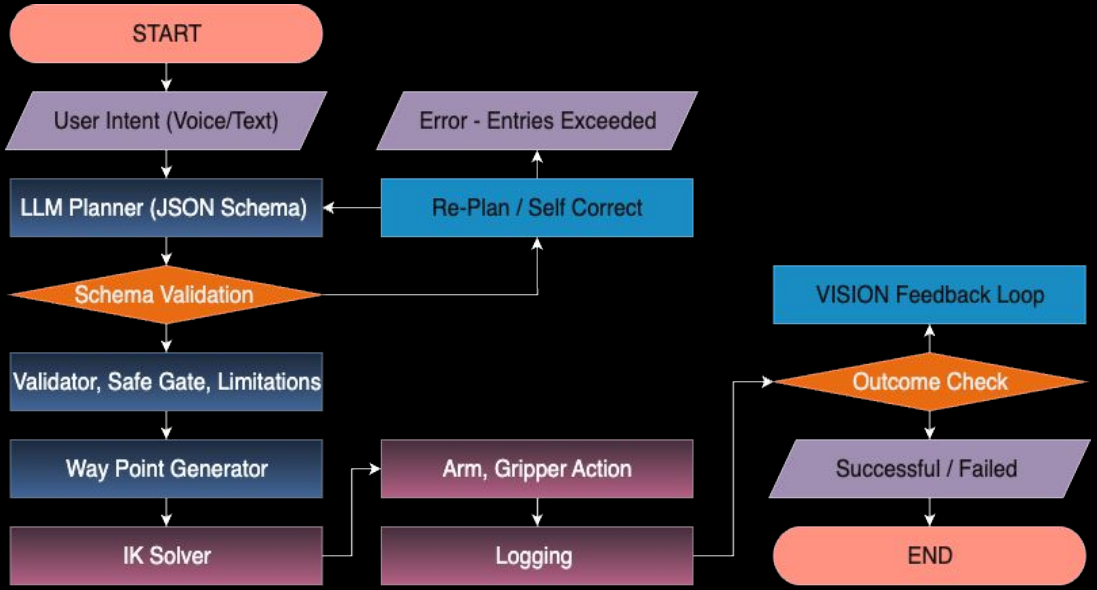


THE SOLUTION

NLX Robotics

Natural Language Processing to MCU readable commands. Building next level human - Machine interaction Platform.

Solution Architecture



VISION Feedback Loop

Camera checks object position with markers(Apriltag); if wrong, planner re-plans and re-executes

Research Map

A four-stage journey building skills in robotics, AI, embedded systems, and software practices.

Robotics Basics

Learn how a robotic arm moves safely through math and control.

- Kinematics (forward/inverse)
- PID control & motion profiles
- Safety limits & watchdogs

AI Planning

Translate natural language into safe, structured action plans.

- JSON skill schema
- Few-shot prompting & decoding
- Plan self-validation loops

Embedded Systems

Make validated plans run reliably on real hardware.

- MCU firmware (Arduino/ESP32)
- Serial communication protocols
- Real-time control loops

Software Practices

Build a robust, portfolio-ready system with engineering discipline.

- CI/CD testing
- Docs & repo conventions
- Telemetry & metrics logging

Evaluation Metrics

Project Performance

- **Plan Validity:** ≥95% JSON plans pass schema/limits on first try
- **Task Success:** ≥90% pick-and-place success over 20 trials
- **Safety:** 0 violations, watchdog active, e-stop functional
- **Latency:** ≤5s from command to motion start

Project Publication & Portfolio

- Public **GitHub repo** (code, tests, docs, CI)
- **Research logs & decision records** (ADRs, risk log)
- **Demo video (90–120s)** showing NL → Plan → Execute
- Resume-ready portfolio: metrics tables, README, instructor endorsement

TEAM ROLE & Requirements

Robotics & Control Engineer

Basic C/C++
Experience with Arduino or ESP32

Hardware

AI / LLM Planner

Basic Python + JSON handling
Prompt design & schema validation

Software

Documentation Engineer

Git/GitHub basics
Can write Markdown and set up a README
Comfortable with testing

Publication

You don’t need to be pro, just be passionate.

Connection & Past Work

linkedin.com/in/mannyhan

Discord: Ogee

LLm-to-action Robotics Platform — Production Plan

AI Driven Robotics Research Project Demo

Robotic Project - Land Aviation Robot Demo