Ever-evolving Conscious Humanoid (EDEN)

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Intro & Problem Definition

Existing humanoid robots can perform tasks but lack the cognitive depth to understand context, retain memory, or express consistent personality. EDEN is a humanoid robot project that merges the humanoid software stack with a novel cognitive layer that enables adaptive reasoning, emotional context, and long-term memory integration, allowing robots to think and respond more like humans.

System Design

EDEN integrates modular software and hardware systems designed for adaptive humanoid cognition.

The system operates across six layers distributed between a Jetson Nano (onboard perception) and a Host PC (cognitive, planning and action layers).

Data flows between layers through WebSocket and ROS2 messasing, allowing real-time context sharing, memory recall, and closed-loop decision-making.

This distributed system setup allows real-time decision-making, contextual awareness, and long-term learning.

Current Capabilities

EDEN's perception, cognition, and planning pipelines are now integrated with each other.

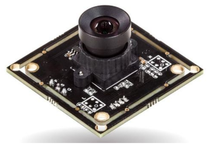
The system can detect and interpret human actions in real time, reason about prior experiences through Supermemory, and generate context-aware responses.

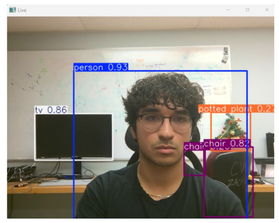
ROS-MCP has been successfully validated in simulation, confirming end-to-end communication from perception to motion control.

This concludes EDEN's first semester by reaching cross-layer functionality.

Software Layers

Input Layer






```
Frame 141 | Detected: person, tv, chair, potted plant
Based on the recent frames and context, an individual appears to be walking towar
ds a table with a laptop, likely moving from another location to pick it up or ca
rry it near the table.

Frame 154 | Detected: person, tv, chair, potted plant
Based on the recent frame, an object (a person) appears to be walking towards a t
able with a laptop, likely picking it up or carrying it from another location.

Frame 167 | Detected: person, tv, chair, potted plant
Based on the recent frames and context, an individual appears to be walking towar
ds a table with a laptop, likely picking it up or carrying it from another locati
on.
```

Context Gathering Layer

Llama 3.2

JSON with scene description, intent recognition, and task framing to put into memory.

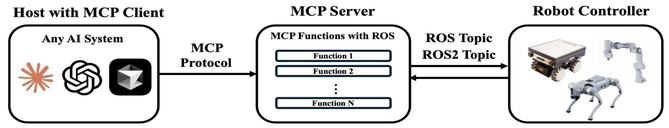
Cognitive Layer

Makes decisions based on memories on users, rules and conversation. Then factors in personality to further chance decisions.

Planning Layer

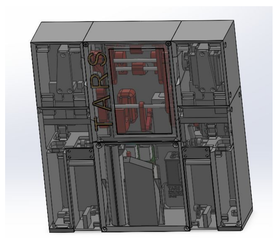
Breaks down entire decisions into small steps that the ROS MCP layer will be able to achieve.

Action Layer



Credit: ROSMCP Github

Hardware



Research Significance

EDEN introduces a framework for emotionally adaptive decision-making in humanoid robots.

Rather than responding deterministically to commands, EDEN evaluates each input against prior experiences, user interactions, and contextual memory stored in Supermemory.

This means its responses evolve over time. For example, a user who was dismissive or broke rules may receive a polite refusal, while positive interactions increase cooperation.

By blending affective state modeling with long-term memory and reasoning, EDEN moves toward robots that make socially informed, human-aligned decisions.

Future Goals

- Migrate AI stack to Jetson Orin Nano
- Add speech and emotion display modules
- Begin TARS-inspired bipedal prototype
- Extend Supermemory for multi-user recall
- Conduct real-world adaptive behavior tests

Documentation

EDEN is going to be released as a open source project soon with a prospective developer community built around it. For that reason, we have a Github organization for EDEN with it's own detailed documentation for developer set up.

Eden