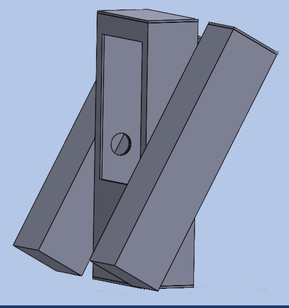
D.A.M.E.

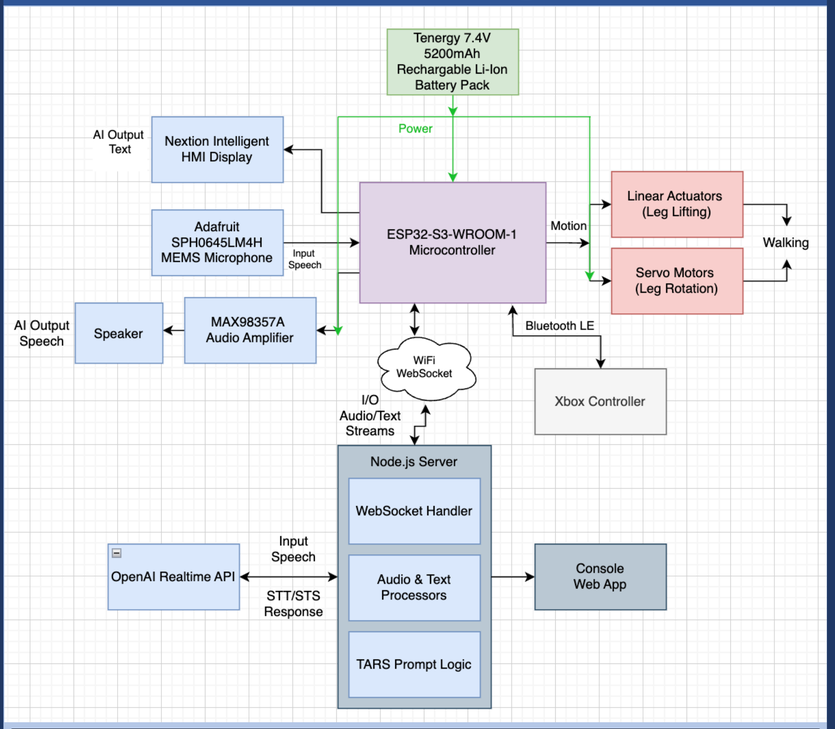
Dynamic Artificial Mechanical Entity



Overview

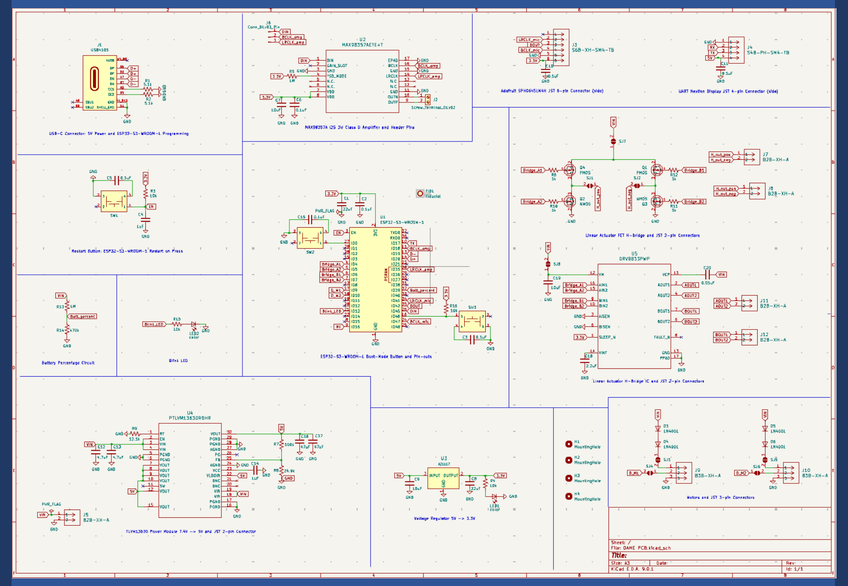
Interstellar captured the minds of young engineers in 2014, but what happens when those kids grow up? They build the robot from the movie 11 years later. Our **Dynamic Artificial Mechanical Entity**, DAME, walks and talks with a snappy persona akin to that of the movie's robot. With a fully embedded AI interface, DAME is capable of full conversations!

Block Diagram



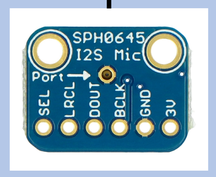
DAME Team: Jack Corrao, Jack McGarrity, Matthew Sims, Xander Steele, and Garrett Young

Board Schematic

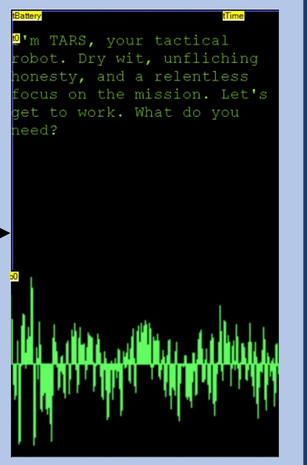


User Interface

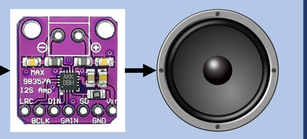
Xbox Controller



SPH0645LM4H Microphone



Nextion Screen



MAX98357A Amplifier **Speaker**

Key Features

Mobility:

- **DC House 1.2" Linear Actuator** for linear arm motion
- **DS04-NFC** for arm rotation motion
- PMOS/NMOS **H-Bridge** for reversing linear polarity

Frame:

- **10" x 12"** DAME frame 3D-printed from the EIH
- **Six unique parts**: lower body, upper body, 2x body cap, 2x lower arm, 2x upper arm, 2x arm cap
- Each upper and lower portion of the frame is **mounted** with screws and glue, **flush** with the conjoined piece

Artificial Intelligence:

- Real-time voice interaction through **OpenAI GPT- 4o**
- **WebSocket server** handles bidirectional audio/text streams
- Uses **LangChain** tools to execute commands
- Natural, **dry-witted TARS personality** driven by custom GPT prompt
- **Audio chunking + buffering** to support ESP32 constraints
- **Prioritized audio/text queuing** ensures smooth voice playback without interruption
- Entire server stack built with **TypeScript + Hono framework**

User-Interface:

- **ESP32-S3-WROOM-1** manages local interaction and peripherals
- **I2S microphone and speaker** for real-time voice capture/playback
- **Xbox Series X controller** triggers voice recording and movement
- **Nextion 7" touchscreen** shows live transcription from GPT
- Modular C++ firmware using **PlatformIO + Arduino Framework**