SIGMA PHI DELTA

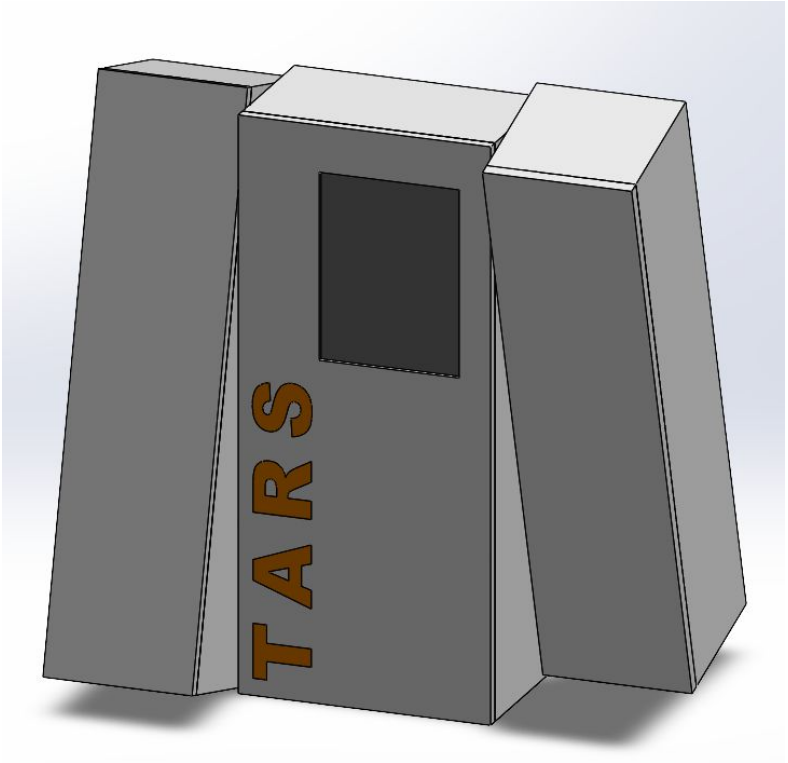
THE PREMIER INTERNATIONAL FRATERNITY OF ENGINEERS

TARS

Proposed by: Charles Bradley and Cash Weaver

Outline

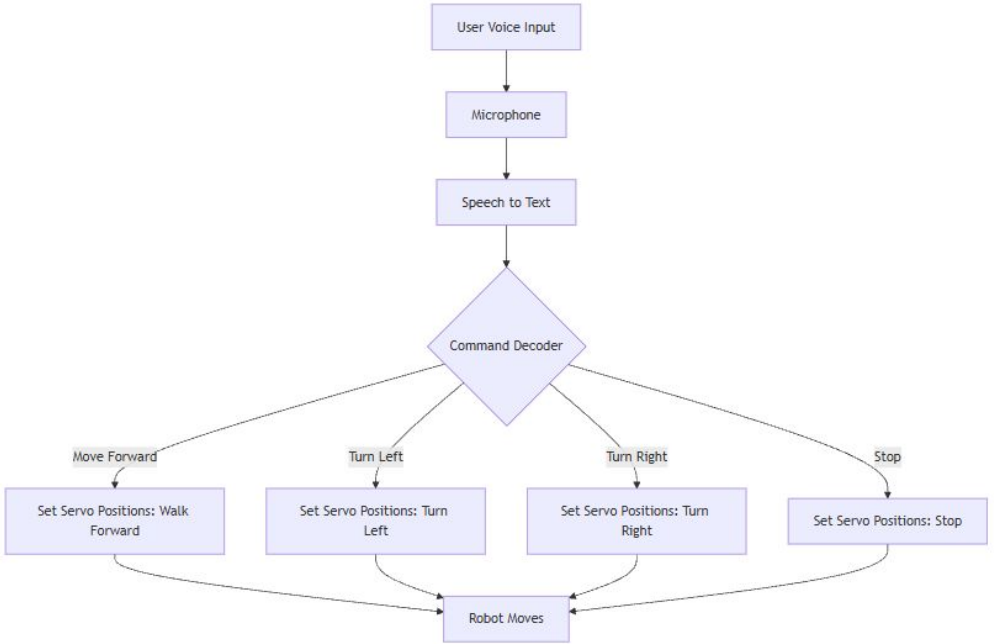
We will build a walking robot modeled after TARS that is capable of walking autonomously through voice commands. This project will test of our engineering knowledge by combining mechanical design, electrical systems, and software integration. This project will serve as a base for future mechatronics projects with the long term goal to add a vision based automation, asynchronous control, and artificial intelligence.



Design Goals

Our design goal is to build a proof of concept robot capable of autonomous movement. This will be achieved using 4 simple voice commands that will be decoded into various servo positions

1. “Move forward”
2. “Turn right”
3. “Turn left”
4. “Stop”



Mechanical Design

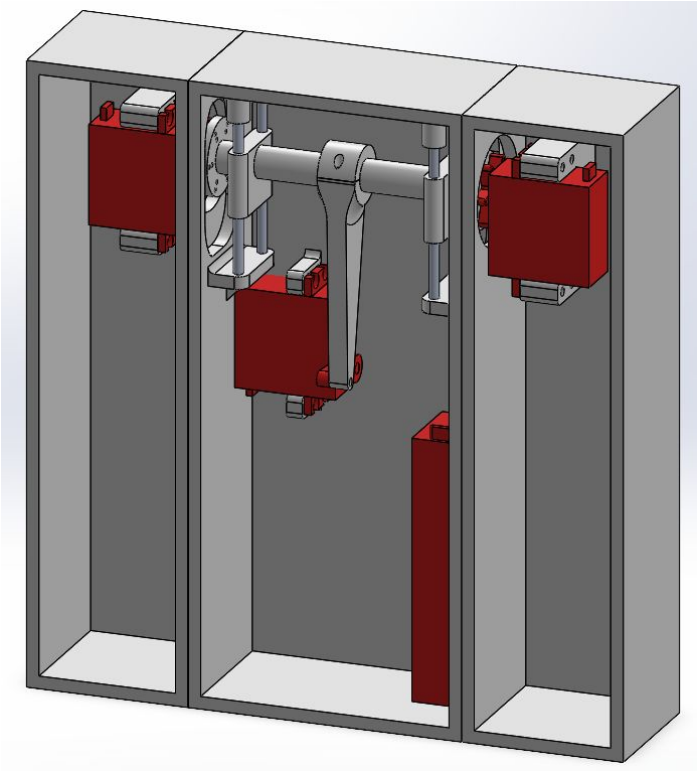
Provide a stable structural shell that will withstand deformation due to the robots natural movement

Key Components:

1. 3D Printed frame and leg assemblies
2. Walking mechanism
3. Mounting fixtures

Limitations:

1. Height limited to 10 in
2. Future Proof
    - Easily integratable with future plans

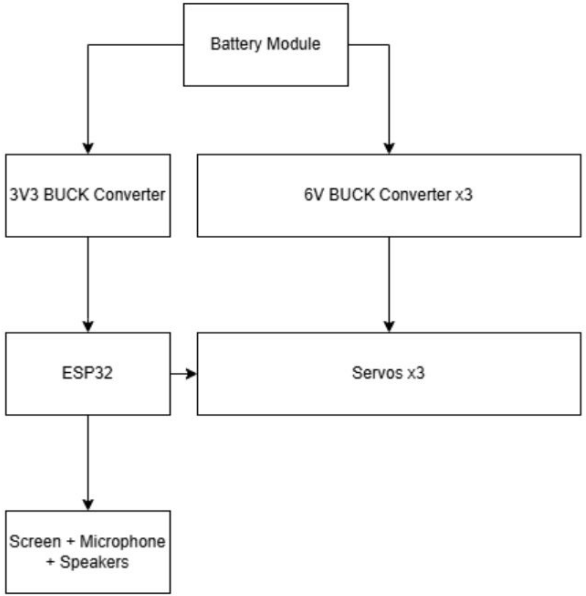


Electrical Systems

Components which serve to support motor functions, interfacing, and display.

Key Components:

- Battery Module 50C
- 4 Buck Converters to distribute load
- ESP32 for controls
- High torque servos for motor functioning
- Screen, microphone, and speakers for interfacing and display



Future Work and Challenges

Future Work:

- Design and integrate shock absorbers into shoulder joints
- Add a vision based automation system
- Make TARS conversational by integrating AI
- Optimize efficiency by reducing torque acting on the motors

Challenges:

- Stability and weight distribution
- Structural stiffness vs minimizing weight
- Power management

Outside of project Scope:

- Goal is to make a proof of concept walking robot not a movie accurate TARS with all the bells and whistles

Bill of Materials

	Component	Quantity	Price ($)
1	11.1V LIPO Battery Pack	1	16.99
2	LIPO Battery Charger	1	14.99
3	ESP32	1	17.99
4	Servo	1	44.99
5	JST Wires	1	6.99
6	Screen	1	20.99
7	Speaker	1	6.99
8	Microphone	1	7.56
9	Homemade Buck Converter	1	16.66
10	Miscellaneous Hardware	1	10

Total Price ≈ $152.3