TEXAS A&M UNIVERSITY Engineering

FASH: Fashion and Wearable Robots

Project Lead: Aarathi Devakumar

Members: Micah Davidson-Grow, Paige Fariss, Alan Luong, Fatimah Mohammed, Abraham Rice, Natalia Rodriguez, Prisha Shukla, Kai Tinnin, Vivian VanCleve, Aditya Veeramony

TEXAS A&M UNIVERSITY ROBOTICS TEAM & LEADERSHIP EXPERIENCE

Project Statement

The purpose of this project is to explore how fashion can be integrated into engineering and robotics. The design consists of automated wings that follow the movement of the user via a two gear mechanism. The wings change color and are aesthetically pleasing; demonstrating how art and technology can merge together.

Wing Design

- The inspiration behind the design was Odette from Swan Lake, who is cursed to remain a swan during the daytime and be a human at nighttime. In previous iterations of the ballet, there have not been physical wings on the performer, so we wanted to improve on previous iterations and implement moveable wings based on those found on swans in nature.
- These wings are attached to two different wing rods with accompanying motors, allowing for each wing to move individually, depending on the input from the flex sensors.

Previous performance of Swan Lake

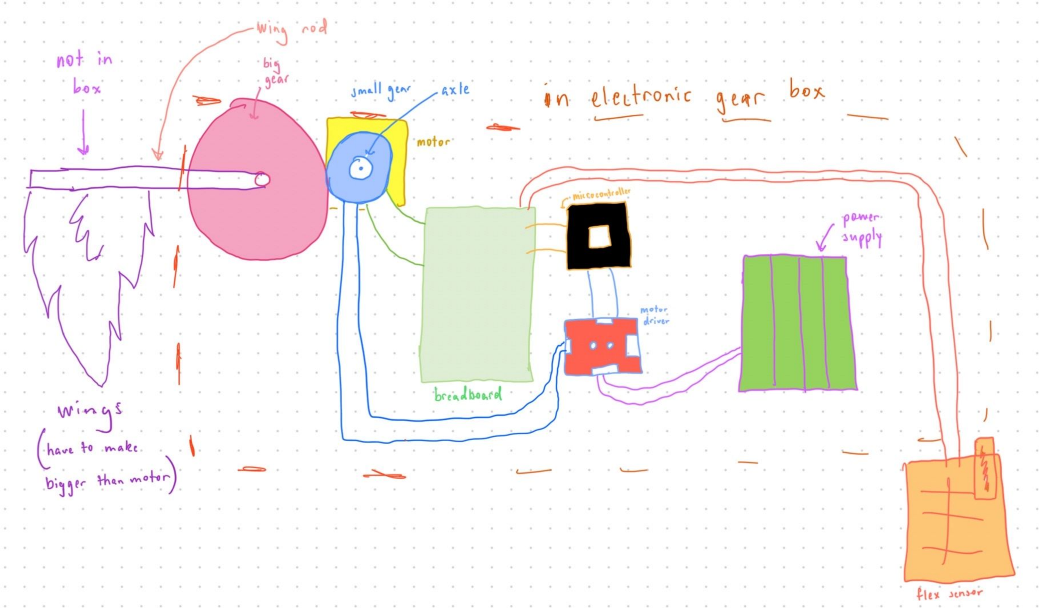


Figure 1: *Gear and control system for wings*

Next Steps

- The hardware consists of two gears. The wing is attached to the larger of the two by a rod. The smaller of the gears is connected to a motor.
- The motor is attached to a breadboard circuit and motor driver connected to a power supply that creates energy for it to rotate. The power supply is also connected to the microcontroller, which assists with the breadboard timing and logic
- The rotation of the small gear in turn rotates the larger gear and makes the wing go up and down. The larger gear does not make a full rotation, as that would cause the wing to move in circles. Instead, there is a maximum level that the large gear can turn before it must start turning in the opposite direction.
- The movement of the wings is made to resemble the wings of a bird, moving up and down.
- There will also be a system with the microcontroller and another breadboard connected to 220 Ohm resistors and a RGB LED. The LED will have fiber optic cables secured to it to be used in lightning up the wings.
- The wings will be handcrafted so that the lightweight fiber optic cables are seamlessly embedded into the wings. The moving and lighting mechanisms will be compacted to fit inside the ballet top on the back behind the wings.

Software

Our Software Team has been working on:

- Arduino IDE to write and upload code to the ESP32.
- Convert raw sensor values to meaningful metrics (e.g., angle of bend, posture level).
- Implement thresholds to trigger specific actions when sensors bend past certain points.
- Send signals to LEDs, motors, or other modules based on sensor data.

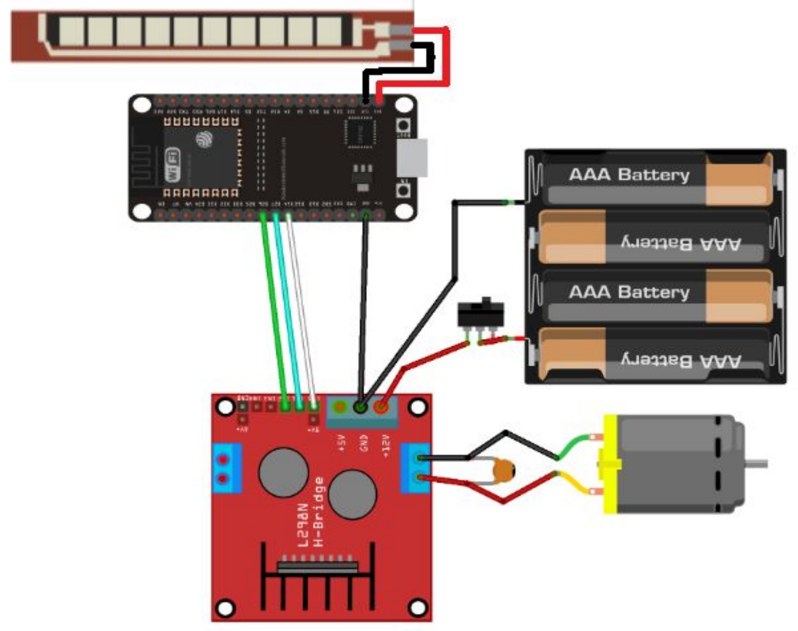
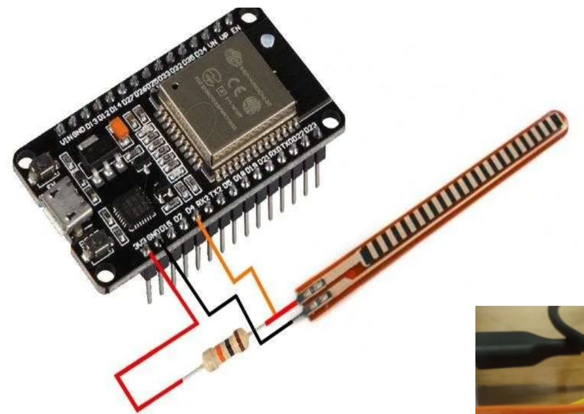
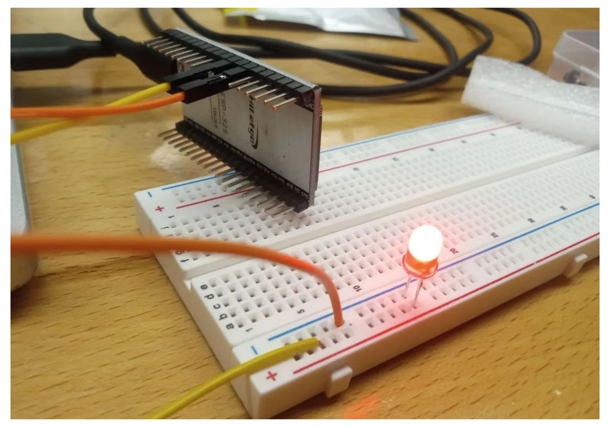


Figure 2: *Electronics Gearbox for Wings, Battery Box, L298, TT Brushless Motor, and Flex Sensor*

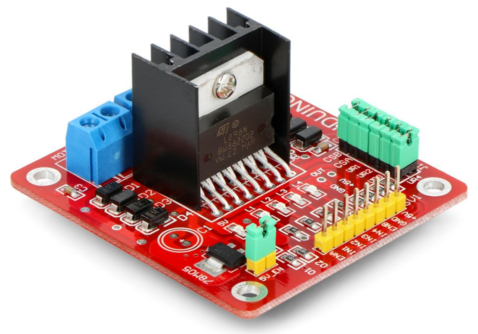
Electrical & Control



ESP-32



Testing of ESP-32



L298N

- ESP32 interprets sensor data to determine when to activate outputs like motors or LEDs.
- L298N motor driver integrated for potential actuation based on sensor input.
- Flex sensor connected to ESP32 analog pins to detect bending caused by back and shoulders motion.
- Overall, ESP32 reads flex sensor input through a breadboard and interprets signals to control outputs with a motor control through the L298N.

Next Steps

The next steps for FASH include:

- Designing and modeling a full scale version of the wings
- Implementing linear actuators on the wing system
- Connecting the wings to bluetooth to change colors to music
- Designing a 3D printed fabric feather ballet corset and tutu for overall design

This design showcases the potential of interactive fashion as both an automation challenge and human-centered expression, bridging the gap between technology and performance art.

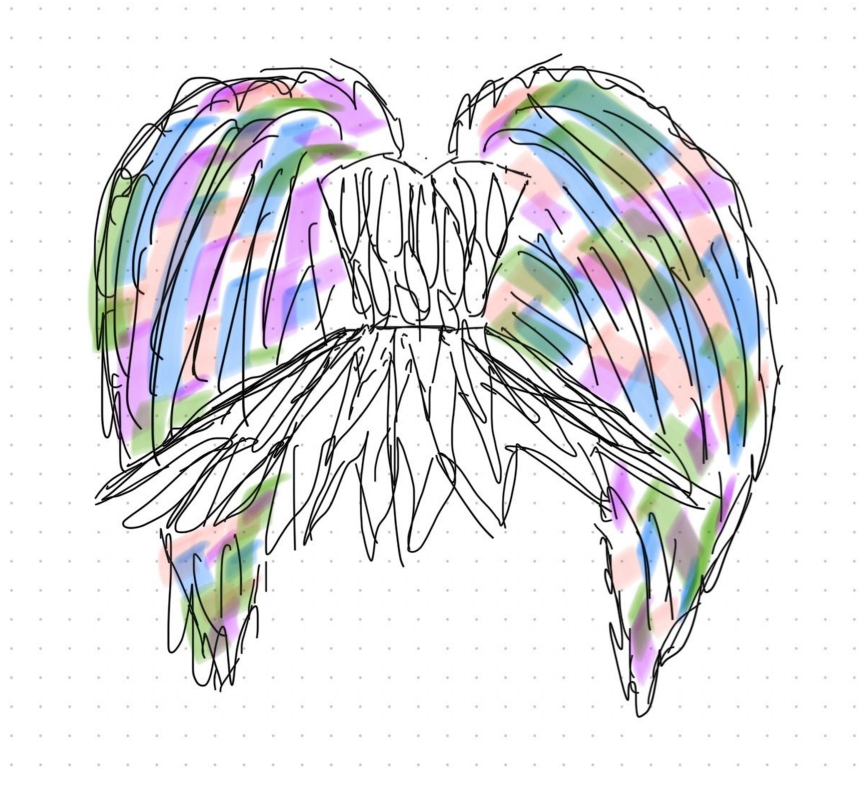


Figure 3: *Sketch of Fiber-Optic Wings, Ballet Corset and Tutu*

Shoulder Blade Distance Testing