Soft Robotic Eel

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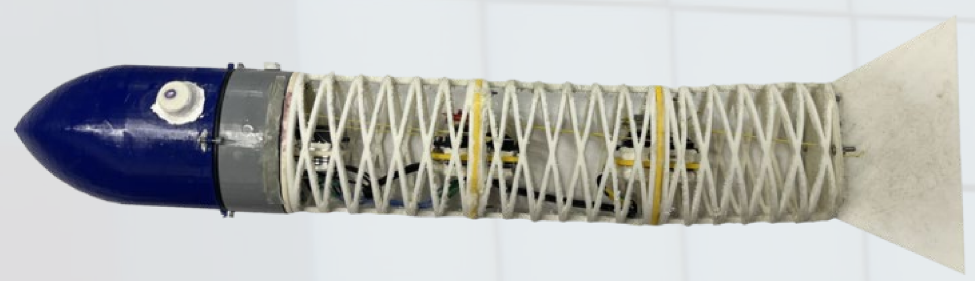
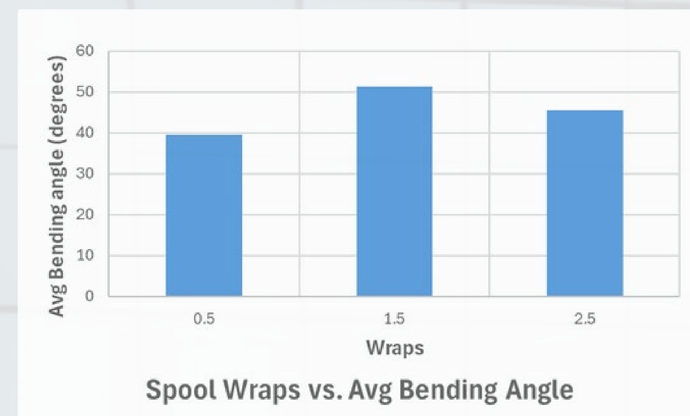
Overview and Objectives

- Expanded on previous project
- Increase movement speed
- Propulsion through anguilliform movement
- Allow for future scalability
- Modular design



Testing

- Bending angle
- Speed
- Material
- Water tightness

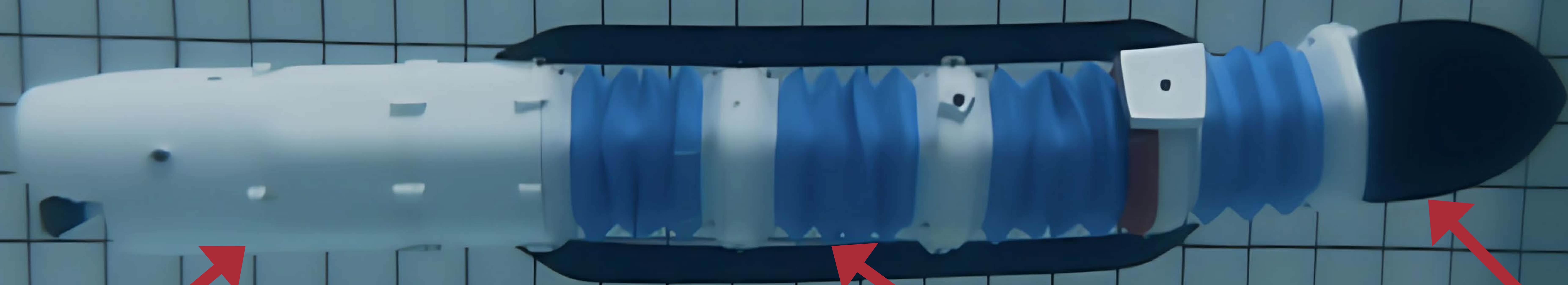


Software

- Bend angle is based on sine wave function
- Amplitude: 120 °
- Frequency: 1 Hz
- Phase Shift: 2π/3

Challenges

- Accordion Segments
  - Difficult to print and repair
  - Prone to tearing
- Motors
  - Limited torque output
  - Constrained by internal space
- Electronics
  - Small watertight compartment
  - Tight wiring layout
  - Limited space for battery



Head

- Houses battery and control board
- All components are 3D printed from PLA to protect delicate parts during motion
- The battery compartment is also designed to house future sensors
- Acrylic conformal coating was added to all compartment surfaces

Waterproofing

- Protecting the ESP32, PCB and servos from water was a top priority
- Marine-grade epoxy was applied to servos and wire connectors
- The ESP32 is enclosed in a watertight compartment within the head module

Modules

- Houses 360° servo motor and spool of fishing line
- Bends by rotating spool to pull on the passive end
- Each module can bend up to ~51° in either direction from center

Tail

- Final module of the eel
- Passive design
- Uses existing momentum for forward propulsion
- Tail end is constructed from NinjaFlex, a more rigid yet flexible TPE