Non-ROV Design Documentation

Operation

Future Gadget Lab's non-ROV device, Sea Angel, is a single-compartment vertical profiling float controlled by a buoyancy engine. To achieve a complete profile, our float undergoes a 4-stage sequence. It first waits at the surface until it receives a signal from a surface operator. Then, using Sea Angel's depth (obtained by a Blue Robotics Bar02 sensor), a PID loop continuously changes the buoyancy engine's volume, allowing the float to descend to its target depth. Once it reaches its target depth, it waits for one minute before becoming as positively buoyant as possible, returning to the surface.

Technical information

Hull

All of Sea Angel's components are stored in a Blue Robotics cast acrylic watertight enclosure, which has an inner diameter of 100 mm and a length of 300 mm. It is sealed with an aluminum end cap on one end and an acrylic dome on the other.

Battery information

Sea Angel is powered completely by 8 AA rechargeable batteries. They are all placed in 2 AA battery holders.

Fuse Calculations

We calculated the full load amps to be 2.15 A, and after multiplying by 1.5, we decided to use a 3 A fuse even though the total amperage x 1.5 came out to be 3.22 A. This decision was made due to the motor driver's current restriction, which restricts the motor's current draw to an estimated maximum of 1.25 A, down from the motor's maximum draw of 2 A.

Buoyancy Engine

Sea Angel's buoyancy engine consists of a 500 ml syringe tube and a linear actuator system, which itself operates through a 3D printed threaded rod attached to a NEMA-17 stepper motor. The linear actuator is attached to a syringe head inside the tube, allowing it to control the engine's volume.

Communication

We use an onboard ESP8266 microcontroller to control Sea Angel. By using its WiFi module, we can set it as an Access Point to host a web server, which connect to from our computer. The local website we host displays information received from Sea Angel and has buttons that allow us to send signals and commands to the float.

Systems Integration Diagram (SID)