Triton

Team 11
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Team 11

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Introduction

- Ecologists from UMass Amherst are interested in studying spawning behavior of river herring

- No economical solution for underwater exploration in ponds/lakes

- Triton will enable researchers to observe and record underwater biological phenomena
System Overview

Base Station (Subsystem 1)

Wi-Fi Buoy (Subsystem 2)

ROV (Subsystem 3)

Piston Ballast (Subsystem 4)
System Block Diagram (Before)

Base Station (Computer)
- PC User Interface
  - Flight Control
  - Heads-Up Display
- Homeplug Adapter

ROV
- BeagleBone Black
- Controller Board
- Li-FePO4 Batteries

Sensor Network
- Camera HD Webcam
- LED Lightboard

Mechanical System
- Servo
- Motor/Propeller

Tether
System Block Diagram (After)

Base Station (Computer)
- PC User Interface
  - Flight Control
  - Heads-Up Display
- Sensor Data Display
- Homeplug Adapter
- TX-RX Wi-Fi Adapter

Wi-Fi Buoy
- Battery Pack
- Raspberry Pi
- Driver
- Li-FePO4 Batteries

Piston Ballast Engine
- Depth Sensor
- Motor
- Lead screw

ROV
- BeagleBone Black
- Controller Board
- Li-FePO4 Batteries

Sensor Network
- IMU/Compass/Depth Module
- Humidity Sensor
- Camera HD Webcam
- LED Light board

Mechanical System
- Servo
- Motor/Propeller

Existing ECE
- Existing ME
- New ECE
- New ME
Subsystem 1: Base Station

- Wireless controls/video feed
- Video saving on local drive
- SSH control for piston ballast
Subsystem 2: Wi-Fi Buoy

- Raspberry Pi Model B + Wi-Fi Adapter
- Wi-Fi Setup

![Image of Raspberry Pi and Wi-Fi adapter](image.png)

**Distance vs. Latency**

- X-axis: Distance (ft.)
- Y-axis: Latency (ms)

Graph showing latency increasing with distance.
Subsystem 2: Wi-Fi Buoy Continue...

- Electronic enclosure
- Reduced tether length
Subsystem 3: ROV

- Rehabilitation process
- Depth/compass sensor
- Humidity sensor
Subsystem 4: Piston Ballast

- Piston ballast design
- Driver for piston ballast
- Closed-loop control
# Requirement Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Goal</th>
<th>Actual</th>
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</thead>
<tbody>
<tr>
<td>Battery Life</td>
<td>~3h</td>
<td>2.2h</td>
</tr>
<tr>
<td>Wi-Fi Range</td>
<td>&lt;300ft</td>
<td>250ft</td>
</tr>
<tr>
<td>Depth</td>
<td>20ft</td>
<td>&lt;20ft</td>
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<tr>
<td>Video Quality</td>
<td>High Quality</td>
<td>=1080p Full HD at 30fps</td>
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</tbody>
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Proposed FPR Deliverables

- Successful lake test for the ROV
- Fully integrated ballast system
- Finalized Wi-Fi setup and buoy design
- HD video capture and storage capabilities onboard the buoy and computer base station
- Implementation of humidity sensor with UI alert
Demonstration
Lake Test - Tethered
Lake Test - Wi-Fi Buoy
Lake Test - Wireless
Piston Ballast
Questions?