AI-Powered ROV for Water Quality & Anomaly Detection

TEAM 020

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AE EE ICS 5 ME CHE

Smart Water Solution

- Water pollution is a serious issue affecting human health, marine life, and industries. Our AI-powered underwater robot helps by monitoring water quality in real time. It provides early alerts for pollution such as oil spills or chemical contamination, helping users act faster and prevent damage.
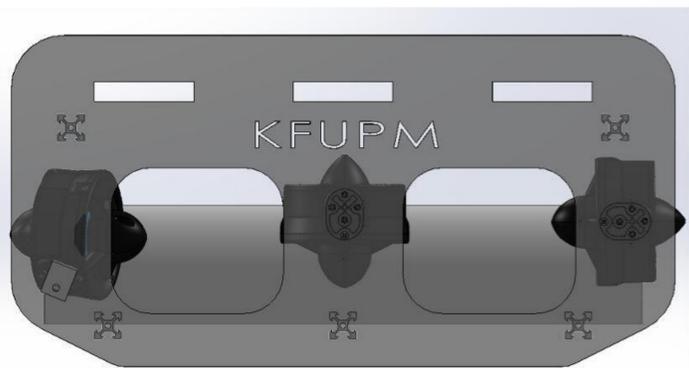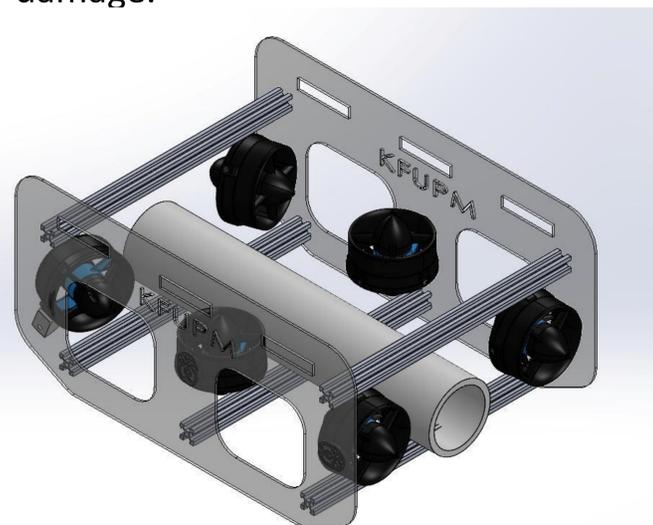
3D CAD Model of ROV

Constraints & Specifications

Our ROV was built to meet specific design limitations and technical goals, all of which were fulfilled and validated through testing. The technical constraints included real-time AI detection affected by camera resolution and frame rate, dashboard update requirements of every one second, sensor accuracy exceeding 90%, and waterproof, easily replaceable electronics. Environmentally, the ROV had to use non-toxic, corrosion-resistant materials suitable for both freshwater and saltwater use. Physically, the ROV needed a hydrodynamic shape to minimize drag and energy consumption, weigh less than 10 kg, measure between 40 and 50 cm in length, maintain 0° tilt stability, and minimize vortex generation. In terms of performance, it was required to operate within a 50-meter range and at a depth of 10 meters, run continuously for over 30 minutes, update sensor data every second, detect anomalies in real time, and utilize pH, turbidity, and temperature sensors with over 90% accuracy.
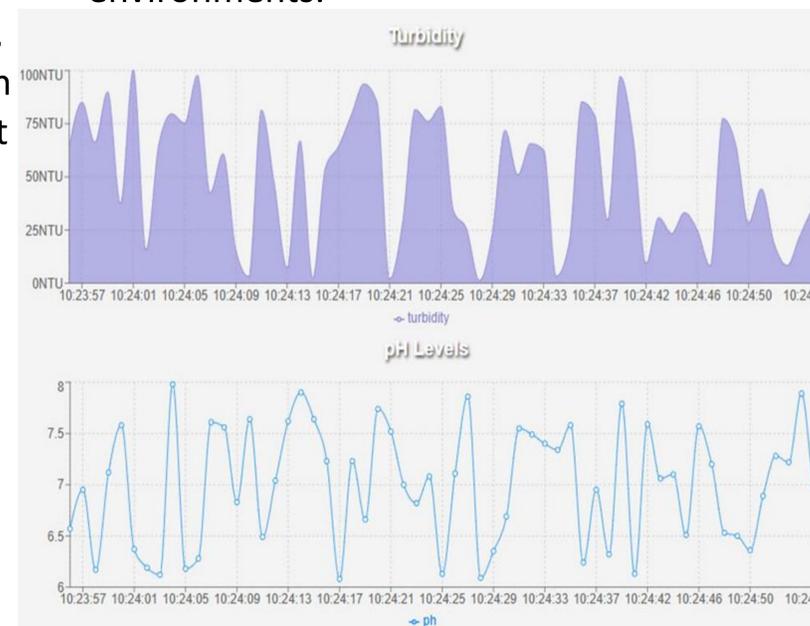
Prototype Overview

- We successfully built and tested a fully functional prototype:
- Lightweight waterproof body using corrosion-resistant material
- Integrated camera and AI software to detect visual anomalies
- High-accuracy sensors for pH, turbidity, and temperature
- RS-485 remote control communication up to 50 meters
- 24V power supply running over 30 minutes
- The ROV can be deployed easily and is safe to operate in various water environments.

Sensor Dashboard Data Trends
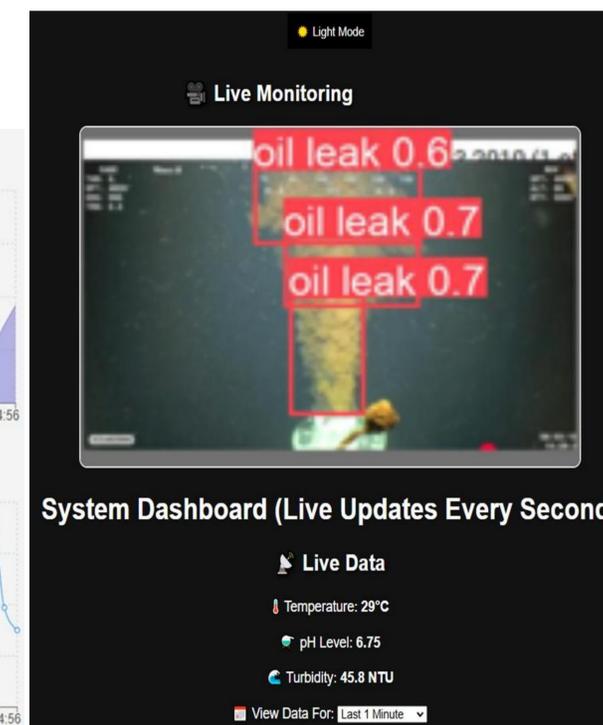
Validation and Testing

- We confirmed system performance through the following:
- Live data from sensors updated every second during trials
- Control system operated reliably at 50 m distance
- Stable movement and full function tested at 10 m depth
- AI software successfully flagged test anomalies like oil slicks
- System met all target specs listed in the design phase.

Live Monitoring Interface