An Integrated Algae Mitigation System to Seek & Abate Harmful Algal Blooms (Year 5)

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Surges in Harmful Algal Blooms (HABs) due to fallouts of anthropogenic activities and climate change are recurrently impairing water quality. Biodiverse ecosystems like the Indian River Lagoon are warping into algae-based habitats, rendering an expensive recovery. Current reactionary methodologies provide minimalistic spatiotemporal intelligence for proactive HAB mitigation. To sustainably eradicate HABs and improve water quality, an Integrated Algae Mitigation System with three components to abate HABs was engineered. This system utilizes actionable data, which is systemically acquired through IoT sensors, systematically processed, and presented in a meaningful form for rapid response. Regional Scanning was achieved via remote sensing to narrow down water bodies of interest, complemented by multispectral assessments using an aerial drone to understand degrees of algal intensity. Targeted Measurements were conducted by engineering a floatation device with sensors to capture water metrics for HAB verification. Localized Abatement was accomplished by suppressing algae using agents, followed by remediation using an engineered sweeper attached to an underwater vehicle. Real-time data acquisition and actionable insights were achieved in the cloud hub for subsequent prescriptive analytics. The system was tested using Chlorella vulgaris algae. Hydrogen peroxide successfully suppressed the algae evidenced by the declining dissolved oxygen (DO2) and pH levels. A machine learning model with 90% accuracy predicted DO2, a proxy for algal environment using Total Dissolved Solids, a proxy for algal density. This detection and remediation solution can help marine engineers sustainably tackle blooms for pristine waters saving local economies in millions.

Awards Won:

Second Award of $2,000

NC State College of Engineering: Alternates (not read aloud)