Saving Our Waterways: Autonomous Dissolved Oxygen Generation Vehicle

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Pollution in large water bodies threatens freshwater reservoir supply, aquatic life, and indirectly poses risks for humans. Current solutions addressing large-scale water body pollution are limited to detection and data collection of pollutants. To provide a sustainable and cost-effective treatment solution for large-scale pollution, this research examined increasing the dissolved oxygen (DO) levels in large water bodies, a major determinant of water quality. Many pollutants, such as blue-green algae and active pharmaceuticals cause depletion of DO, and ultimately results in mass deaths of aquatic life. The use of a Venturi module, based on Bernoulli's principle, has been prior proven to increase dissolved oxygen at a stationary position. The proposed design introduces a new approach to mobilize the Venturi module on an autonomous water vehicle for the oxygenation of larger water bodies including ponds and lakes. Through an iterative design process, the robotic vehicle was optimized based on DO values and qualitative stability data. The apparatus can increase DO from 1 mg/L to 6.5 - 7 mg/L of 300 liters of water in 17-18 minutes on a stationary platform. The autonomous vehicle designed and built in this study addresses a vital element of water quality problems and provides a low-cost (<$200) and sustainable approach to protecting aquatic life against large-scale water pollution. Use of motion planning algorithms and photovoltaic cells are considered for a self-powered autonomous vehicle in deployment at large-acreage water bodies for longer periods of time.