Crowd-Sourced Detection and Mapping of Nitrate Water Pollutants via a Mobile Web-Based Image Analysis System

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Countless fertilizers and plant-conditioning products utilize nitrates, which when presented into an ecosystem with surrounding bodies of water, catalyze the dangerous process of eutrophication. Eutrophication is both a rapid process and difficult to detect due to the volatility of nitrate influx into bodies of water. During the day phytoplankton populations grow exponentially where nitrates are present in abundance, while at night most die off, which results in a serious drop in dissolved oxygen levels during the night because of decomposers. To combat this drop in dissolved oxygen levels effectively, a crowd-sourcing detection method is essential in order to accurately, efficiently, and rapidly tag problematic zones. Furthermore, by introducing both a Sulphanilamide coupled with N-(1-naphthyl)-ethylenediamine dihydrochloride compound, and zinc powder into the water sample, and by measuring the color emitted from the solution, through image analysis and supervised machine learning—once both compounds are added to the water sample—the mobile platform will be able to measure the quantity of nitrates that are present in the given water source. The mobile image analysis system uses a picture's RGB values to correlate color intensity to nitrate concentration through an R-based shiny web-based application. Through the implementation of colorimetric analysis of given solutions by the utilization of the user's phone camera, one may attain information on nitrate concentration levels in the tested body of water, which will be uploaded to a database that all contributors may access, thus allowing for the general population to acquire knowledge about their surrounding aqueous environments.

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Second Award of $2,000

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