An Innovative Crowdsourcing Approach to Monitoring Freshwater Bodies

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Freshwater pollution is a major environmental threat across the globe, exacerbated by the lack of ongoing scientific data about health of freshwater bodies. One way to address this problem is to crowdsource monitoring of freshwater bodies to interested citizens. To enable this I developed an integrated mobile phone app and a highly cost-effective monitoring kit consisting of an electronic sensing device and chemical test strips. The Arduino microcontroller based electronic device measures total dissolved solids, electrical conductivity, salinity, dissolved oxygen, and temperature of a water sample, and transmits this data to a mobile app via Bluetooth. The app also measures levels of pH, Hardness, Alkalinity, total Chlorine, total Bromine, free Chlorine, Iron, Copper, Phosphates, Nitrates, and Nitrites using a novel mobile camera based color detection and contaminant mapping method that avoids human subjectivity in detecting color changes in chemical test strips. The mobile app geo-tags and uploads all collected data to a global cloud platform that enables interactive monitoring, selection, and visualization of fresh water bodies using maps, time periods of interest, or contamination levels. The platform also classifies the overall health of a water body, determines usability of water for various purposes, compares detected contaminant levels against permissible limits, generates recommended actions for a polluted water body based on monitored parameters, and tracks water conditions before and after specific actions. Crowdsourced data from school children who monitored ten lakes over several months, along with accuracy tests, showed that this end-to-end monitoring system indeed provides reliable data and valuable insights on changing conditions of freshwater bodies.

Awards Won:

Second Award of $2,000

U.S. Agency for International Development: USAID Global Development Innovation First Place Award of $3000

ASU Rob and Melani Walton Sustainability Solutions Service: Award of $2,500

King Abdulaziz &amp

his Companions Foundation for Giftedness and Creativity: Award of $1,000 for Water Technology