WATER QUALITY FROM MOBILE CAPTURED AND GOOGLE EARTH IMAGES

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This qualitative review includes findings from several case studies focusing on the development of smartphone applications for water quality measurement. This combination of studies highlights the importance of using smartphone technology to improve water quality monitoring. Various methods and approaches are being explored, from integrating sensors with smartphones to machine learning algorithms for data analysis. Important considerations include the accuracy, reliability, and immediacy of these applications, as well as the potential for widespread distribution and user interaction. Advances in microsensors and wireless communications technology have made it easier to integrate water quality monitoring with smartphones, enabling quick and easy data collection. Additionally, machine learning shows promise in improving the accuracy of water quality measurements by analyzing complex data. But challenges such as measurement, data interpretation, and user interface design are areas of ongoing research and development. Overall, these studies collectively promote the advancement of smartphone-based water quality monitoring and provide valuable information and methods for future research and practical use.

Keywords—KIVY, Linear Regression , Heirarichal clustering

I. INTRODUCTION

The development of smartphone technology has led to new ways of solving environmental problems, especially in the field of water quality monitoring. This review is based on findings from several case studies focusing on the development of smartphone applications for water quality assessment. As smartphones spread around the world, using these tools for environmental monitoring is beneficial and problem-solving. Integration of sensors and data analysis systems with smartphones can monitor water quality, replacing traditional monitoring. Additionally, advances in sensor miniaturization and wireless connectivity facilitate the integration of these systems with smartphones, allowing users to contribute to environmental monitoring. This introduction sets the stage for an exploration of the processes, problems, and practices that can be identified in a research paper and shows how to combine them to create a tool. Easy and effective way to monitor water quality using smartphones.

II. PROBLEM DEFINATION

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Problem Overview

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The water quality monitoring problem involves many aspects, including selecting and integrating appropriate sensors, developing robust data analysis systems, and creating user relationships for smartphone use. Conventional care, although effective, is often limited by factors such as cost, effort, and limited scope. Smartphone-based solutions overcome these limitations by providing real-time monitoring capabilities, allowing users to measure water quality in multiple locations. Key challenges include improving the accuracy and reliability of measurements, optimizing data processing systems for mobile devices, and addressing user interactions. Wanted to improve usability and interactivity. This issue describes various problems encountered in the development of smartphone applications for monitoring water quality and emphasizes the importance of collaboration to solve these problems.

III. Literature Survey

Article by P. R. Adhikari, S. A. Khan, and A. "Water quality assessment using smartphone devices: A case study in Bangladesh" [1] A. Khan proposed a method to measure water quality using a smartphone device. The authors conducted a case study in Bangladesh to test the effectiveness of their approach. They found that their method could analyze water parameters such as pH, turbidity and conductivity. This method could be an important tool for monitoring water quality in developing countries where traditional water quality measurements are often limited.

[17]Mushtaq et al. In their paper titled "Smartphone-based water quality monitoring system using low-cost sensors: A case study in Pakistan," they propose a smartphone-based water quality monitoring system using low-cost sensors. The system is designed to be efficient and easy to use, especially in areas with limited resources. The authors used this method in a case study in Pakistan and demonstrated its feasibility and effectiveness in a real environment. This study demonstrates the potential of this approach in water monitoring more broadly, particularly in areas where expensive monitoring equipment is not available.

A. M. S. Islam's article describes the development of two water quality sensors designed for use with smartphones. These sensors are portable, low cost, easy to use and accurate. The first model is an iPhone device that uses the phone's camera and clicks to get colored text. The second model is a personal sensor that communicates with an Android smartphone via Bluetooth. Both models can measure pH, chlorine concentration and alkalinity.

[5]M. Bagherian's article discusses the use of the Internet of Things (IoT) in water quality monitoring. The author talks about the importance of clean water and the dangers of water pollution. This article reviews recent research on IoT-based water quality monitoring systems designed for home use. The various technologies and sensors used in these systems are described, as well as the challenges and future directions in this field of research.

[8]M. Commentaries by Bagherian and M. Nezamabadi describe a low-cost multiple indicator of water quality. The system is designed to overcome the limitations of traditional water monitoring technology, which can be expensive,

time-consuming and difficult. The proposed system is user-friendly, easy to use and cost-effective. It uses electrochemical devices to monitor various water contaminants.

Bennett et al.'s work "Automated drone imagery for mapping coral reef surfaces using Google Earth Engine." A semi-automatic workflow is proposed for monitoring drone images of coral reefs. This approach combines Google Earth Engine with free software to simplify the work, improve access for researchers, and make the steps more efficient. The authors successfully classified coral, sand, and rock/dead coral with high precision, demonstrating a useful tool for monitoring coral reefs using drones.

In “Intelligent monitoring of water quality based on image analysis,” Zhou et al. Address the limitations of water quality monitoring, especially in small and medium-sized water bodies. They proposed a new method that uses image analysis and normalization techniques to analyze camera images at different locations and times. This method allows fast, mobile and continuous monitoring of water quality at low cost by solving problems such as changes in light, shadow and reflection. This study demonstrated high accuracy compared to traditional monitoring sites, demonstrating its potential to be a valuable contribution to water quality assessment.

[18]In “Colorimetric Water Quality Sensing Using Mobile Smartphones,” Samuel Schaefer explores the use of smartphones to monitor water quality through colorimetric sensing. This method uses the color change of certain chemicals in response to poor water quality. The authors explored the possibility of using a smartphone camera and color charts for water measurement that are easy to measure water quality, can provide good results, and are easy to use.

[19]The article “Water quality monitoring and mapping tools using paper-based sensors and mobile phones” by Sicard et al. Provide reasonable costs for water quality analysis. It combines paper sensors, specifically microfluidic paper analyzers (μPADs), with mobile phones to measure water in space. The μPADs change color in response to various contaminants in the water, and the smartphone camera captures the color change, which is analyzed by a special app to measure the details. This method provides a low-cost, user-friendly and efficient solution for monitoring water quality, especially in limited areas.

[20]“Water measurement and modification of water quality based on smartphone camera” by Gao et al. A new method to measure water quality using a smartphone camera has been proposed. In this method, a smartphone camera is used to capture the light reflected from the water and extract information about the water by analyzing the images. These data are used to estimate important water parameters such as sechi pan depth and turbidity and are promising for areas without expensive monitoring equipment.

[12]In the article "Research on the Development of Image-Based Water Analysis Using Development Methods", the development of water analysis algorithms by integrating them into regional development is discussed. This method is used for imaging to improve the identification and identification of water in the image and increase accuracy. Research may include theoretical background for regional development, practical experimental results, and discussion of applications such as flood monitoring. Overall, it helps improve image processing technology for water research and provides improvements for practical use in environmental management and hydrological research.

[21]The article "Algorithm for Removing Floating Contaminant Image Targets Based on the Immune Outlier Region" describes an algorithm to remove floating contaminant targets from images using the weak mass region method. This approach uses

a well-defined immunological technique to identify and isolate areas of contamination. Studies can expand theoretical models and experimental evidence to support pollution monitoring and control. These methods, which integrate regional mass containment into the target extraction process, show early promise in contamination detection and mitigation strategies that will lead to environmental protection and public health measures.

[22]The paper "Underwater Image Detection Using Hybrid K-Tree Algorithm" presents a new method for underwater image detection using hybrid K-tree algorithm. This algorithm combines the advantages of K-tree data modeling with other technologies to identify underwater objects and features. These studies may include hybrid algorithm design and theoretical explanations for practical applications such as underwater observations or ocean research. Using this new method, the algorithm improves the analysis of underwater images and could help advance advances in fields such as marine biology, oceanography and underwater research.

IV. METHODOLOGY

- Sensor selection: Determine which sensor to use for water quality measurement based on accuracy and compatibility with smartphone integration.
- Sensor integration: Integrate selected sensors with smartphones by replacing hardware or connecting other accessories via wired or wireless interfaces.
- Data collection and processing: Use the pressure sensor API or custom software interface to obtain sensor readings, then perform calibration and configuration to ensure accurate data.
- Algorithm Development: Develop machine learning algorithms to analyze sensor data and predict water quality.
- Application Development: Develop smartphone applications for data visualization, analysis and user interaction.
- Validation and testing: Check the application's performance against the reference model and perform field testing to measure reliability based on the difference between one round.

A. Algorithms

Machine learning algorithms: Allow computers to learn from data and make predictions or decisions without needing detailed explanations. Linear regression models the relationship between dependent and independent variables by fitting an equation to observed data. Decision trees iteratively partition the feature space based on the most common points to build a predictive model. The support vector machine finds the best hyperplane separating classes in high space. Neural networks consist of layers of interconnected neurons that process input data through dense connections to generate output predictions.

Image processing algorithms: Use digital images to extract information or improve visual quality. Edge detection algorithms identify edges and regions in an image, such as the Sobel operator, which uses masks to detect changes. Image segmentation algorithms divide the image into regions or objects, often using techniques such as K-means segmentation to group pixels with similar properties. Image filtering algorithms change pixel values to achieve effects such as blurring or sharpening. Gaussian blur is often used to create smooth images.

Kalman filter: An iterative algorithm that predicts the condition of the engine based on noise measurements. Kalman filters are frequently used in monitoring devices, especially when processing noisy data.

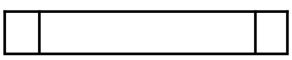
YOLO (You Only Look): Real-time object detection algorithm based on deep learning. YOLO divides an image into grids and predicts bounding boxes and class capabilities for each cell in a single pass through a neural network.

SURF (Robust Feature Acceleration): Feature detection and annotation algorithms for image matching and object recognition. SURF is known for its scalability and flexibility.

Linear Regression: A simple yet powerful algorithm for estimating continuous probabilities. It models the relationship between one or more independent variables and dependent variables by fitting linear equations to observed data.

Hierarchical clustering : It groups similar objects into clusters and creates a dendrogram that shows the arrangement of the clusters. It is versatile and helps analyze data in fields such as biology and business knowledge.

B. Design flow



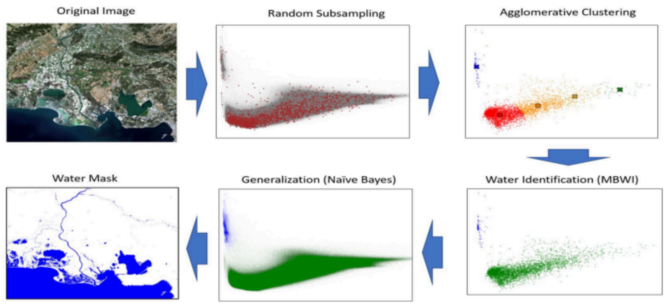


Figure 1.1 (Heirarichal clustering)

In figure 1.1: Machine learning helps identify water bodies in sa tellite images. A naive Bayesian classifier was trai ned on pixels subsampled using the water feature. The training model with maximum difference in w ater quality (MBWI) is then applied to the entire i mage to create a final water mask that classifies th e pixel as water or soil.

Platform used

Kivy:

Kivy is an open source Python framework for building multi-touch applications. It supports various platforms such as Android, iOS, Windows, Linux and macOS. Kivy allows you to create cross-platform applications with user compatibility.

One of Kivy's greatest strengths is its powerful tools and widgets that facilitate rapid app development without simple changes. Its language-independent nature allows developers to take advantage of Python's simplicity and expressiveness while integrating with other languages such as Java or Objective-C when necessary. Kivy's support for touch input, navigation, animation and media enhances the user experience, making it ideal for creating interactive applications from games to multimedia presentations, business tools and educational software.

Overall, Kivy enables developers to express their creativity and turn their ideas into reality with minimal effort, providing its diverse and powerful technology that has become a useful platform for Python development in the environment today.

V. Output

First view of User Interface-

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