BINUS UNIVERSITY
SCHOOL OF COMPUTER SCIENCE

SENSOR SYSTEM DETECTION TOOL

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System Sensor Detection Tool Information Changes in Color and Temperature Sustainable Home Environment Water

introduction

Water quality is one of the most critical factors that significantly impact human health and environmental sustainability, particularly within household settings. Traditional methods for monitoring water quality typically involve laboratory testing... they often come with several drawbacks: high costs, the need for sophisticated equipment, and reliance on skilled personnel...

The research aims to design and develop an integrated sensor system that detects changes in water color and provides immediate feedback about overall water quality.

Research Outputs - Water Quality Monitoring System

- **1 Prototype System**
  IoT-based Water Quality Monitoring Device with integrated TCS230 colorimetric sensor, turbidity sensor, DS18B20 temperature sensor, and ESP8266 WiFi module
- **1 Scientific Publication (Target: Scopus-indexed journal)**
  "IoT-Based Water Quality Monitoring System Using Colorimetric and Machine Learning Classification for Sustainable Home Environment"
- **1 Intellectual Property (Patent Application)**
  "Smart Water Quality Detection System with Real-time Colorimetric Analysis and IoT Integration"

Additional Outputs

- **1 Mobile Application Development**
  Android/iOS app for real-time water quality monitoring with Telegram integration and dashboard visualization
- **1 Course Material Enhancement**
  Integration of IoT-based environmental monitoring systems into Computer Science curriculum for practical learning
- **1 Conference Presentation**
  Presentation at International Conference on Internet of Things and Smart Systems
- **1 Training Module**
  Workshop materials for community education on household water quality monitoring
- **1 Technical Documentation**
  Complete system manual including installation guide, calibration procedures, and maintenance protocols

"Real-Time Water Quality Assessment Using IoT-Based Sensor Integration and Machine Learning Classification Techniques"

Developed and implemented an integrated IoT-based water quality monitoring system that combines colorimetric sensors with advanced machine learning algorithms to achieve over 95% accuracy in water contamination detection.

The system utilizes TCS230 color sensors, turbidity sensors, and DS18B20 temperature sensors, particularly excelling in detecting chemical pollutants, organic contamination, and pH level changes.

Despite comprehensive sensor integration, continuous model optimization is required for better classification accuracy across varying environmental conditions.

"Enhancing Detection Accuracy through Optimal Machine Learning Algorithm Selection for Water Quality Classification"

Developed and tested multiple machine learning models, including K-Nearest Neighbor (KNN), Support Vector Machine (SVM), Random Forest, and Decision Tree algorithms, to classify water quality parameters with over 92% accuracy.

Random Forest achieved the highest accuracy of 96% in detecting water contamination patterns; however, some water quality parameters still require model improvements for better real-time classification performance under diverse environmental conditions.

"Optimizing Water Quality Monitoring: The Integration of IoT Sensors with Advanced Classification Models"

Compared KNN, SVM, Random Forest, and Decision Tree algorithms for water quality assessment, finding Random Forest to offer the best balance of speed and accuracy, particularly excelling in detecting turbidity changes and chemical contamination. The system demonstrates superior performance with clear water samples and moderate pollution levels, despite some models performing inconsistently across different water contamination types, especially with highly turbid or chemically complex samples.

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