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I.   Title of presentation: Development of IoT Water Quality Monitoring System

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III.   Abstract:

a.   <u>Purpose</u>

The purpose of this project is to develop a system which can perform a real-time monitoring for the water reuse system. Moreover, the system is designed to collect critical water reuse data to improve the household water use and water conservation purposes.

b.   <u>Background</u>

As water demand continues to increase across the globe, the availability of potable water continues to decrease, arising from the climate changes and limited water resources. Huge pressure is placed on the urban water system and its efficiency is however limited by the lack of sustainable water management. Accounting all these factors, water reuse seems to be one of the viable solutions. Water reuse is a method that reclaims water from a variety of sources, then treats and reuses the water for other beneficial purposes such as agricultural and irrigation, potable water supplies, etc.

Although many water reuse projects have been developed, many projects are rather lack of monitoring and maintenance. Thus, this project aims to integrate sensors into the water reuse project which allows concurrent analysis and monitoring of the water quality to preserve the water reuse system. These data can be collected through IoT system to improve water management in cities.

c. Objectives

- To integrate the water quality sensors and performance of water quality measurement.

- To send and store the water measurement data in cloud storage.

d. Content

The IoT water quality monitoring system consists of two parts which are the water quality measurement and data logging using cloud server. The water quality measurement uses various sensors that are paired with Arduino UNO Wi-Fi Rev.2 board, that served as the microcontroller, in measuring the water level and water quality parameters such as turbidity, total dissolved solids (TDS), conductivity and pH value. These water quality parameters are extremely important as these values determine the quality of the water. Using the IoT system, the data obtained from the water quality measurement are uploaded to cloud server ThingSpeak using the Wi-Fi module on Arduino UNO Wi-Fi Rev.2 board. ThingSpeak has a lot of built-in apps such as MATLAB Analysis, React, ThingHTTP, and other functions, which allows different post processing analyses. In the preliminary development, as can be seen from Figure 1, the IoT water quality monitoring system incorporates water level and water turbidity sensors.
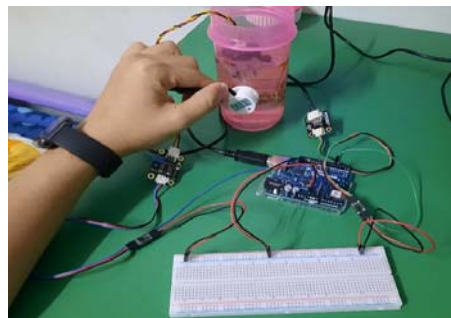

Figure 1: Demonstration of the IoT water quality monitoring system.
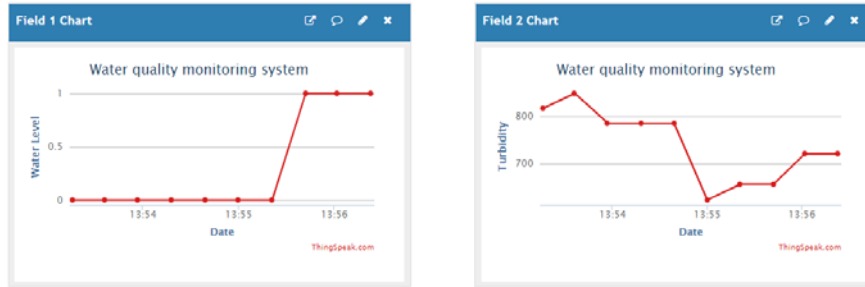
Figure 2: Data logged to ThingSpeak.

The advantages of the IoT water quality monitoring system includes that the data can be accessed anytime and anywhere, without the need of physical presence on site. This allows authorities to act quickly if there is any abnormality in the water reuse system. Furthermore, since it is an IoT system, different IoT systems can be connected and form a large comprehensive system that can detect and control the water quality of the water reuse system.

e.   Plan for connected projects

This project is closely related to another project entitled "Image Segmentation and Fusion" which is handled by Teoh Mynn Wei from Universiti Sains Malaysia. In this project, image segmentation and fusion technique is used to count the colony-forming unit (CFU) of *E. coli* on the test piece that is used on filtered reuse water. CFU is extremely important in determining whether the water is up to standard for different use cases. After that, the analysis is uploaded to the cloud server, allowing authorities to access the data anytime and anywhere.