LITERATURE REVIEW

In **"IoT based Smart Water Quality Monitoring System"** authored by Varsha Lakshmikantha et la [16]. Water pollution ensues when lethal materials move into water sources like ponds, rivers, lakes, seas and oceans, gets dissolved and suspends in water or gets deposited on the bed. Pollution will degrade the quality and purity of water. Ensuring pure and safer water is really challenging due to undue sources of chemicals and contaminants. Pollution of water can be instigated by numerous ways; one of the main reasons for pollution is industrial waste is charge and city sewage.

Secondary sources of pollution are pollutants that enter the water from soils or from atmosphere via rain or from groundwater systems. Usually, soils and groundwater comprises of residues of modern practices in agriculture and also indecorously disposed wastes from industries. The major pollutants of water include viruses, bacteria, fertilizers, parasites, pharmaceutical products, pesticides, nitrates, fecal waste, phosphates radioactive substances and plastics. These materials will not alter the color of the water always, but they might be indiscernible contaminants.Hence small quantity of water from such water resources and marine organisms are examined for determining the water quality. Declining quality of water is detrimental to the health, environment and economy.

David Malpass, President of the World Bank cautions about the influence on economy: "Deteriorating water quality is stalling economic growth and exacerbating poverty in many countries". It means that, if the biological oxygen demand, the pointer used for measurement of organic pollution in water, surpasses the threshold, the Gross Domestic Product (GDP) growth of the constituencies surrounded by the allied water basins will decrease by a third.

The consequences of water pollution or poor water quality are:

- Destruction of biodiversity: Pollution of water reduces aquatic ecosystems and initiates unrestrained increase of phytoplankton in water resources.
- Food chain contamination: Fishing carried out in polluted water resources and utilization of waste water for agriculture and livestock husbandry may lead to addition of toxins or contaminants into foods that are injurious to the health after consumption.
- Scarcity of drinkable water: If pollution of water increases or quality of drinking water is not maintained, then there will be no clean water for drinking or public health or sanitization, in rural as well as urban areas.
- Disease: According to WHO (World Health Organization) information, roughly 2 billion people across the world do not have any option for pure water resources, but they have to drink water polluted by excrement, which exposes them to many ailments.
- Infant mortality: As per WHO, diarrhoeal diseases associated with lacking of hygiene results in death of nearly 1,000 children per day across the world.

In **"Iot based Smart Water Quality Monitoring System"** authoured by Monira Mukta et al [11]. This paper represents an IoT (Internet of things) based smart water quality monitoring (SWQM) system that aids in continuous measurement of water condition based on four physical parameters i.e., temperature, pH, electric conductivity and turbidity properties. Four sensors are connected with arduino-uno in discrete way to detect the water parameters. Extracted data from the sensors are transmitted to a desktop application developed in .NET platform and compared with the WHO (World Health Organization) standard values. Based on the measured result, the proposed SWQM system can successfully analyze the water parameters using fast forest binary classifier to classify whether the test water sample is drinkable or not.

With the rapid increase of world population, water management becomes an important issue specially in industrial, agricultural and other sectors. Most of the people around the world lack behind drinkable water. Every year many people are suffering from various fatal diseases caused by water pollution. Research has found that around 5 million death is caused only because of drinking unsafe water. Research by WHO (World Health Organization) shows that almost 1.4 million of child death can be prevented by providing drinkable water to them. The primary objective of this project is to introduce an intelligent water quality monitoring system in IoT (Internet of Things) platform which would help to monitoring different physical parameters of the drinkable water rather than relying on manual process. Moreover, IoT is a system of alliance among various devices and the competence of deportation data over the system. Several research works have been conducted in recent times to develop intelligent system to identify and monitor water parameters. For real time monitoring of water quality and delivery, an in-pipe monitoring system based on sensor nodes is proposed. Their proposed architecture focused on the low cost, lightweight implementation, pipeline electrochemical system and the sensors that are used for this architecture are optical sensors. This system is appropriate for large amount categorizations enabling an approach to water purchaser, water distributers and water supremacies. Authors in has developed a broker-less architecture framework for both publisher and subscriber for monitoring water quality. They analyzed the measured data of temperature, pH and dissolved oxygen from water samples and results an inversely proportional relationship among them. An IoT based remote sensing system is introduced for collecting, monitoring and analyzing water quality in remote area for Fizi. In article, a smart IoT based technology is explained for real time water quality monitoring system. An industrial water quality monitoring system using four different sensors e.g. turbidity, pH, temperature and level of water is developed. The goal of this research is to develop a smart water quality monitoring (SWQM) system using the IoT platform. Four physical parameters: temperature, pH, conductivity and turbidity of different water samples are measured via four sperate sensors equipped with Arduino Uno. The extracted sensor data are analyzed using the fast forest binary classifier. A desktop application is developed in .NET platform to identify whether the tested water samples are safe or unsafe for human consumption.

In **"Managing High pH in Freshwater Ponds"** authored by Craig S. Tucker et al [7]. The term “pH” is a mathematical transformation of the hydrogen ion (H+)concentration; it conveniently expresses the acidity or basicity of water. The lowercase letter “p” refers to “power” or exponent, and pH is defined as the negative logarithm of the hydrogen ion concentration. Each change of one pH unit represents a ten-fold change in hydrogen ion concentration. The pH scale is usually represented as ranging from 0 to 14, but pH can extend beyond those values. At 25 °C, pH 7.0 describes the neutral point of water at which the concentrations of hydrogen and hydroxyl ions (OH-) are equal (each at 10-7 moles/L). Conditions become more acidic as pH decreases and more basic as pH increases.The pH of freshwater ecosystems can fluctuate considerably within daily and seasonal timeframes, and most freshwa-ter animals have evolved to tolerate a relatively wide environmental pH range. Animals can, however, become stressed or die when exposed to pH extremes or when pH changes rapidly, even if the change occurs within a pH range that is normally tolerated. In addition to the direct effects of pH on aquatic animals, the hydrogen ion concentration affects aqueous equilibria involving ammonia, hydrogen sulfide, chlorine and dissolved metals. The interactions of pH with these variables are often more important than the direct effects of pH on aquaticanimals. Direct “pH toxicity” is relatively rare in aquaculture ponds because farm sites and water supplies are selected to provide a desirable environment for culture, which should include a pH of approximately 6 to 9. However, certain conditions may cause pH to rise or fall outside the tolerable range, killing the animals being cultured. This publication addresses the most common of these situations—when excessive underwa-ter photosynthesis causes pH to rise to high, basic levels. There are no precise guidelines for high pH tolerance, but pH values above 9.5 or 10 are generally considered undesirable in aquaculture ponds.

pH of natural waters

Pure water exposed to air has an acidic pH of about 5.6 because carbon dioxide hydrates in water to form carbonic acid, which dissociates to hydrogen ion and bicarbonate (HCO3-):$CO2 + H2O \rightleftharpoons H2CO3 \rightleftharpoons H+ + HCO3$-Natural waters are never pure, though, because water is a powerful solvent. Water dissolves some of every gas or solid it contacts, and some of these dissolved substances affect the water’s pH. Bicarbonate and carbonate ($CO32$-) are negatively charged ions (anions) common in most waters. These basic anions are derived from the dissolution of limestone and they increase the pH of water.

In **"Design and Implementation of Real-Time Mobile-based Water Temperature Monitoring System"** authored by Paul Bokingkito & Orven Ebarle Llantos. Aquaculture in the Philippines contributes significantly to the country's food security, employment, and foreign exchange generation. Aquaculture is growing much faster than capture fisheries. However, according to the Fisheries and Aquaculture Department of the Food and Agriculture Organization of the United Nations, the global position of the Philippines in aquaculture production has fallen steadily from 4th place in 1985 to 12th place today. The Philippines now contributes only a little over one percent of global farmed fish production compared to five percent previously. In Lake Sebu, Southern Philippines, several cases of catastrophic massive fish kill has been reported in 2016 and in February 2017 that caused up to 50 tons of fish went to waste leading to an increased in prices of Tilapia as a result of lack of supply. The sudden changes in the weather and temperature affecting water quality are the cause of the fish kill. Thus, the incident disclosed the Bureau of Fisheries and Aquatic Resources to monitor the water quality of the lake. Water quality monitoring plays an important role in aquaculture to ensure sustainable good water quality. In several studies on the development of water quality monitoring system, the temperature is considered as one of the significant water parameter. Water temperature has an important part in determining the distribution of aquatic organisms, physicochemical water characteristics, and rates of ecological processes such as nutrient cycling. Also, water temperature is a key water quality variable because it influences all other water quality parameters such as dissolved oxygen concentrations. In this age of international trade and increasing global population, the aquaculture industry needs to plan and implement a technology that will address issues concerning global food security. In modern aquaculture management, a remote water quality monitoring and computer-controlled intensive culture is the future trend in aquaculture. Water quality monitoring determines the goodness of water for specific purposes. The water quality tests give information about the health of the water resources. One of the technological revolutions of computing and communications is the Internet of Things (IoT). It is a smart interconnected device that sense, interpret and react to the environment due to the combination of the internet and embedded sensors system. The challenged for this emerging technology is how to craft a system that collects and monitors water temperature of a water resource in real-time. The objective of this study is to design and develop an efficient and cost effective real-time mobile-based water temperature monitoring system that could aid the aquaculture farmers in the improvement of the aquaculture industry. The Representational State Transfer (REST) architectural design is used to connect and collects real -time water temperature that consists sensor and core-controller, database server and RESTful APIs. In general, the system could provide information that includes normal range, maximum, minimum, average and findings of the collected temperatures that provide decision support to help and guide fisher folks in avoiding distress to fish and obtaining the optimum water temperature range. Also, the system could display the water temperature being monitored continuously in real time directly to the stakeholders' mobile devices and collects long-term of data.

In **"Sending Messages Using Arduino and GSM Module"** authored by Bryan Amper, Max Angelo, it is evident that already the idea of sending SMS when there is any emergency, has been proven to work effectively. therefore, we are going to implement the same using FastSMS Software. with the help of the FastSMS, we are going to alert the people nearby if at all there is a problem detected in the quality of water. if Ph levels dropped to unwanted acidic levels, automatically a message would be pushed to the end user. apart from that various other conditions could be inputted.

REFERENCES:

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