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IOT BASED WATER QUALITY MANAGEMENT FOR AQUACULTURE USING WIRELESS SENSOR NETWORKS

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Abstract-All living creatures depend on water as their major source of nutrition, but due to unequal water distribution, some of them did not receive enough of it due to improper management practises that did not preserve water quality. The sensor in the water distribution system cannot be easily interfaced with by the traditional management methodology. Consequently, we suggested a better IoT-based smart water management system (Internet of Things). The method uses a flow metre, PH Sensor, solenoid valve, take an apartment complex, for instance, where fifty individuals use water every day and where the water runs through a solenoid valve with a flow metre. With specific access limits for using water, each apartment has a separate flow metre and solenoid value that analyses data through IoT. When the worry reaches the limit, the tap automatically closes if the particular apartment finishes the water level, decides the notification message by IoT, and stops the water via solenoid value afterwards. The pH sensor measures the water quality and distribution of the concerned person with clean water procedures, and the controller senses the sensor data and output level.
Keywords: pH, IoT, TDS, Temperature, Sensor.

INTRODUCTION

Water is becoming more and more in demand as urban infrastructure expands. Leaks, inadvertent sloth, and human mistake are just a few of the many potential causes of poor water management. Uneven water supply is another problem. The water supply is managed by a programmable management mechanism to cut down on water use. Water levels can be successfully prevented by monitoring water supplies. Urban water supply monitoring systems have so gained interest in recent years. The drinking water supply and the water users are connected by the water frame.

The water supply system is intended to provide continuous water delivery, water quality control, monitoring, and maintenance because it is a crucial component. Limitations brought on by water availability, water quality, the storage capacity of water tanks and water towers, and diversification of water use must be addressed. Control technical parameters, detect water usage, and take these steps. The system has a flow sensor, pH sensor, and logical control. The distribution system is connected to one or more central automation master stations that communicate with additional automation operations. While the control command system retains indirect control over the physical components, programmable logic control does not.

Freshwater is clearly forbidden as a means of distribution, drinking water production, leisure, and gardening. Gatherings Engineering using the Water technique and Water Flow approach is accessible through Water Management. It aims to provide addresses each quarter and widely disseminates CEOs' apparent business progress. The purpose of board applications is to talk about building standards and how they affect development. Our main testing objective at the moment is to support better and quicker design implementation measures. In contrast to characteristics made up by others, we exercise our water board on the chance to directly collaborate. The sector mandate on water is an additional option for the water board. Everyone receives water from the legislature at a reasonable rate. Flow metering with water distribution is the name of this technique for calculating how much water each person uses.

Water metres are used in residential or commercial buildings that are supplied by public water supply systems in many apartment sectors. These metres are used to measure the system and determine the flow through a particular area of the system. Applications to make innovations feasible and to grow and improve services are also delayed as a result of inquiry management. In contrast to privately held corporations, the legislature has a duty and must protect people's human rights in this way if the government fails to regulate water simply.

A water distribution system is made up of a number of parts, including tanks, pumps, valves, and pipelines. Water is delivered from the source to each dwelling via a pipeline system. The design and operation of a water distribution system is the most crucial factor for a lifetime of anticipated loading conditions. A water distribution system must also be able to support atypical circumstances such pipe breaks, mechanical failure of pipes, valves, and control systems, power outages, and incorrect demand forecasts. The network of gadgets that are connected to the internet is known as the "Internet of Things" (IoT). A valid dispersion is created by water distribution that is constantly monitored, allowing for variations in supply line length, flow rate, and tank content. Simply said, the Internet of Things (IoT) is a technique for adding electronics, sensors, programming, and other characteristics to commonplace items.

EXISTING METHOD

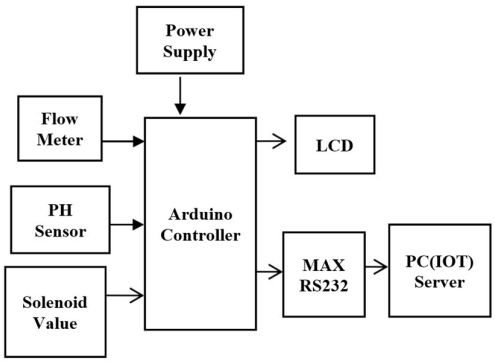
Zones have traditionally been used to distribute water. On the off chance that another region grows up around the city, another water dissemination zone is laid out, complete with something like a creative public water tank. Even in specific societies, zones, or areas, manual water control valves are used to distribute water among societies or zones. Manual water control valves are utilized because there is a limited supply of flood water that can supply water to all societies or areas within that zone.

While other valves in that zone are closed to maintain the lowest possible water level so that water can reach the destination, this manual water control valve is opened to supply water to a

specific area at a particular time. While other valves in that zone are closed to maintain the lowest possible water pressure so that water can reach its destination, this manual water control valve is opened to supply water to a specific area at a specific time. Water quality is not monitored at endpoints where there is a risk of water contamination due to rust in the pipeline, a hole in the pipeline, or other factors. Additionally, water quality is only monitored at municipal water tanks that are zoned. Regardless of whether water quality is observed at endpoints, the time has come drinking and work concentrated, and it is improbable that all endpoints will be covered. Consequently, a sophisticated water distribution system is necessary.

PROPOSED METHOD

The analogue data collected by each sensor is sent to the microcontroller using this method via an analogue to digital converter. After the controller unit processed the digital data, the parameters were sent to the user of the instrument via IOT after analysis and identification of the water quality were completed. The controller's LCD unit will show the same information. The corporation authorities will take the necessary action for their subsequent decision based on the data they have received. Water contamination and water level will be managed as a result. The negative log of the hydrogen ion concentration is used to define PH, which is a measure of how basic or acidic the water is. The water temperature tells you how hot or cold the water is. This temperature sensor is a digital model, which provides precise readings.



automated systems and devices that will be supplied by the DC power supply, the transformer is employed to modify the supply voltage. It has the ability to disconnect itself from the supply line, which is a crucial security feature. To stop undesired electrical noise signals from entering the power supply and potentially interrupting the stack, internal shielding may also be used.

WATER LEVEL SENSOR

IMPLEMENTATION

Although most electronic devices and circuits need a dc supply, electrical power is usually always produced, transported, and distributed in the form of ac due to cost concerns. Batteries and dry cells are both suitable for this. They are indeed portable and ripple-free, but in comparison to conventional DC power sources, their voltages are low, they need to be replaced frequently, and they are costly. Almost all modern electronic devices have a circuit that transforms ac power into DC power. The part of a piece of equipment that converts AC to DC

is called a DC power supply. Typically, a power transformer is located at the input of the power source. Following the smoothing filter is a voltage regulator circuit, then a rectifier (diode circuit). The block diagram depicts the basic power supply as consisting of four parts: a transformer, an inverter, a screen, and a controller

The Water Level Sensor is a simple, efficient high- level/drop recognition sensor that gauges the water level by measuring the volume of drops on exposed traces created by a sequence of parallel wires. It is easy to convert water to an analogue signal and read the output analogue values directly on the controller development board to produce the level alert effect. Sensors that measure the level of water are used to keep an eye on and regulate the flow of a fluid in a confined area. The point level of a liquid may be determined using one of several different types of liquid level sensors. A magnetic float is used in some types, and it moves up and down in step with the liquid level within the container.

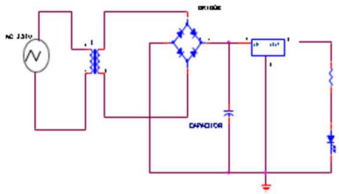
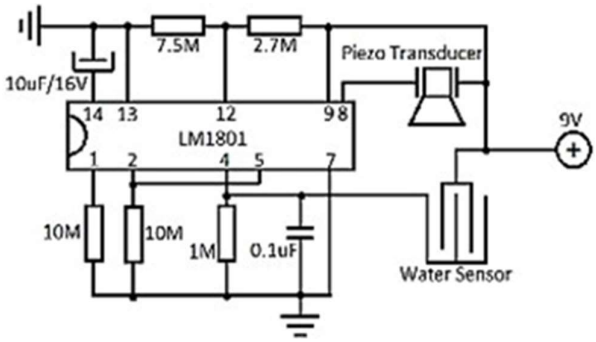


Diagram of a power supply



Water Level Sensor The LCD shows the voltage reading that was given. The first of a sequence of messages that appear when the project is switched on is the name of the application. After the controller sketch The output of the DC power supply is utilized to keep the voltage across the load constant. Let's examine each component of the DC power supply's operations in more depth. To fulfill the requirements of the solid-state enters the system and circuit, the voltage delivered to the street light is shown on the LCD screen. The 16X2 LCD is linked to the controller board by connecting its data pins to pins 3 through 6 on the controller board.

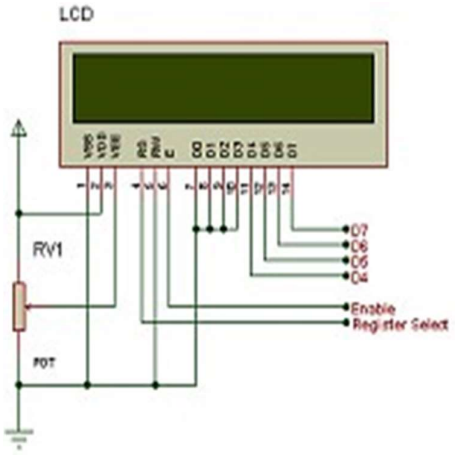
The Micro Controller's pins 13 and 12 are linked, respectively, to the RS and E pins of the LCD. The RW pin on the LCD is assumed.

LCD WORKING PRINCIPLE

Simulation in Schematic for LCD

A liquid crystal molecule has a propensity to loosen when an electrical current is applied to it. This is the underlying idea of LCDs. As a result, both the angle of the top diffraction grating and the angle at which light enters the chemically split glass material vary. As a result, a limited quantity of light may enter a particular region of the LCD through the deeply split glass. Because of this, one spot will get darker than the others. The LCD uses the concept of light

blocking to function. The rear of the LCDs is set up with a mirrored mirror while they are being constructed. An electrode plane formed of indium-tin-oxide is retained on top of a deeply split glass with a negative impact.

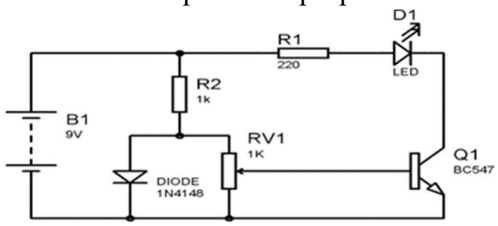


TEMPERATURE SENSOR

Temperature sensors come in a variety of forms, from straightforward ON/OFF thermostatic controls for home hot water heaters to very sensitive semiconductor versions for complicated process control furnace facilities. In science courses in primary school, we learned that heat (kinetic energy) is created when molecules and atoms move, and that the greater the movement, the more heat is produced.

Temperature sensors quantify how much heat energy, or even coldness, is generated by a given item or

system, enabling us to "feel" or detect any physical change in that temperature and generating an analogue or digital output. Depending on the application, temperature sensors come in a range of sizes and forms, each with a unique set of properties.



Sensor for Temperature

Despite being affordable and accessible throughout a broad working range, typical squeeze type temperature sensors have a significant hysteresis range when employed as temperature sensors from the moment the electrical contacts open to the moment they close once again. It may be set at 20°C, for instance, but not open or close until 22°C or 18°C.

PH SENSOR

PH is a numerical representation of the gram-equivalent per quart of hydrogen ion concentration in any solution. It falls between 0 and 14. The amount of hydrogen ions per mole of solution is calculated using a logarithmic scale. While basic solutions with a low hydrogen

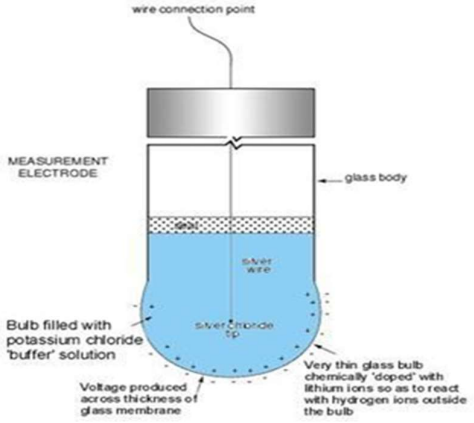
concentration have a pH value between 8 and 14, acidic solutions with a large concentration of hydrogen ions have a pH value between 0 and 7. The solution is neutral, as shown by the pH value of 7. The alkalinity or tartness of a solution is determined by its PH.

The basics of pH sensors or metres

The fundamental idea behind a measuring cylinder is that when two liquids come into contact, an electrochemical charge is created that may be measured. In other words, when a liquid inside a glass enclosure is placed inside a solution other than that of water, there are electrochemical possibilities between liquid phases.

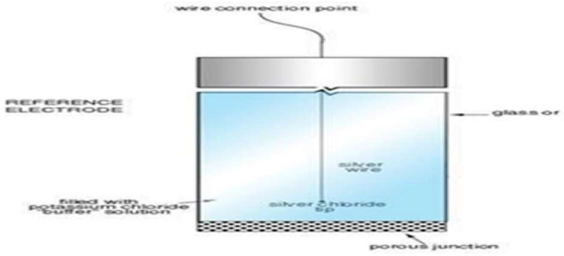
COMPONENTS OF PH SENSORS

A glass tube with a tiny glass bulb attached serves as a measuring electrode, and it is filled with a potassium chloride solution with a known pH of 7. A block of silver chloride has a silver element connected to it as well. It generates the voltage necessary to calculate the pH of an aqueous solution. It is an electrode made up of the following 4 parts:



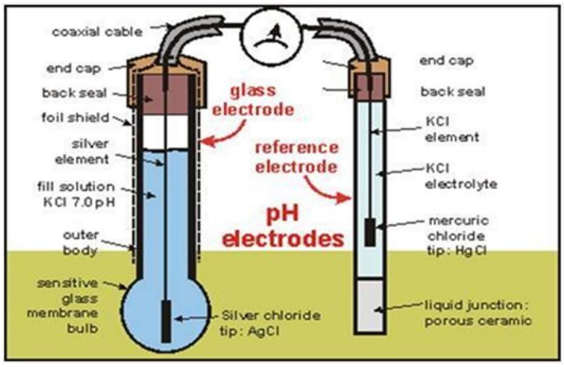
Measuring Electrode

A reference electrode It has a glass tube with potassium chloride solution inside of it, and the other end is near a block of mercury chloride. It serves to provide a steady zero voltage linkage across the whole circuit.

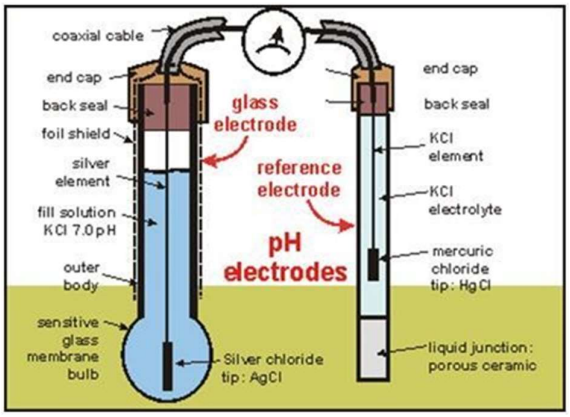


Reference Electrode

Preamplifier, This gadget transforms the pH electrode's high impedance signal into a low impedance signal. It strengthens and stabilises the signal, making it more resistant to electrical noise. Preamplifier Analyser or Communication Module is used to display electrical impulses from the sensor and contains a temperature sensor to account for temperature variations.



Transmitter or Analyzer



pH Sensor Operation

A beaker holding a solution whose pH has to be calculated is where the electrode is placed. As an ion- selective agent, the glass bulb doped with lithium ions that is welded to the measuring cathode allows hydrogen ions from the unknown solution to move past the barrier and interact with the glass, producing an electrochemical potential associated with the hydrogen ions.

As a result, the hydrogen ion concentration affects the measured electrode potential. On the other hand, the reference electrode options offer a constant reference point against which the measuring electrode is measured and do not alter with the hydrogen ions. A low-resistance connection that completes the circuit is produced when a neutral solution is allowed to exchange ions with an unidentified solution through a porous separator. The hydrogen ion concentration or pH of the system, as it was before being strengthened and sent to the digital mustimeter, may be directly measured by the potential difference between the two electrodes.

MAX232

Max232 was produced by Maxim Integrated Products. When voltage level conversion is necessary to make TTL devices compatible with PC serial ports and vice versa, this IC is frequently employed in RS232 communication systems. This chip's charge pumps raise the voltage to the required level. It has a +_7.4 volt output and is supplied by a single +4 volt power supply. MAX232 is offered in a number of configurations, such as 16 Pin Dip and Dual Drivers. It can serve as a hardware layer converter to enable simultaneous communication between two systems. A number of issues with the conversion of signal voltage levels can be resolved using the adaptable IC Max232. "MAX232N," where "N" denotes the PDIP packaging style, which is the most popular and simple to sell.MAX232D, where "D" denotes the SOIC package, which

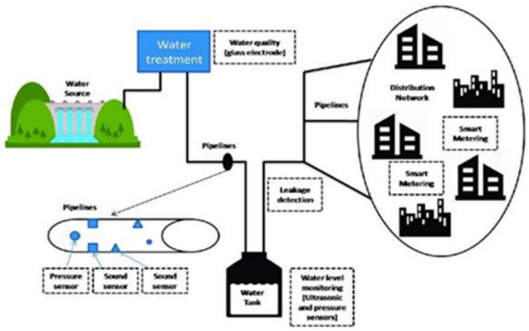
is challenging to market and needs to be utilised properly by a qualified expert. building of MAX232.

Commonly found in 16-pin DIP packaging is MAX232. Three main components make up IT. It can only be powered by 4 volts in order to make its power supply compatible with the majority of embedded systems. The voltage doubling in the first block is accomplished using IC switched capacitor methods. The second block doubles the voltage and then transforms it into +10 and

-10. Two transmitters and two receivers that convert voltage levels make up the third block.

Max232 requires a minimum of four external capacitors as external components. With a voltage rating of at least

16 volts, their values can range from 1 uF to 10 polymers. This multifunctional controller is available in a variety of models, each with a unique set of characteristics. For appropriate functioning, different capacitor values are necessary.



Architecture of Internet of Thing using water distribution system.

The main goal is to create a unique IDM system that conveys communication between the "things" in IOT (human users and various devices including computing and smart devices, sensors, actuators, and so on). The system is looked at from both a business and technical perspective in relation to the defined system needs.

The theoretical examination of several suggested IDM and communication technologies for M2M and IOT heterogeneous networks is the initial step. A use-case scenario outlines how the technology may be put to use in a practical setting. After that, the author suggests a brand-new, user-centric IDM system architecture. To demonstrate how the system interacts, a class diagram scheme and a UML diagram are both employed. The standard STSO connection and authentication processes are depicted in UML sequence diagrams. The Internet of Things (IOT) is an emerging subject with significant technological, social, and economic implications. The way we work and live is about to change when objects are paired with internet connection and strong data analytics capabilities. However, the Internet of Things also presents substantial obstacles that can prevent its potential advantages from being realized. Because so many diverse technologies must cooperate in an IOT system, standardization is one of them. Any IOT device, regardless of manufacturer or technology, would be able to connect to any other device in a fully interoperable ecosystem. Interoperability is more difficult in reality. Open standards can help with interoperability; however, it is unclear which tactics should be used to develop standards that provide some functional openness. Therefore, this study investigates

how open standards has been implemented by industry players and what consequences it has for innovation. An exploratory research has been conducted utilizing a theoretical framework that incorporates components from the complex technological system, dominant design theory, standardization theory, and lead users. With the use of qualitative data analysis and classification, more than 140 documents have been examined.

The findings demonstrate that many standards now predominate the market and that standardization is mostly driven by proprietary techniques by businesses, creating a fragmented IOT landscape where devices are only partially compatible with one another. Actors in the field are increasingly aware that IOT only succeeds if gadgets are completely interoperable. The development of middleware that connects devices using various technologies, user-driven learning, and open-source platforms are a few examples of tactics that enable complete interoperability. Due to the open nature of IOT, dominating configurations are produced in which its constituent parts may be moved around depending on the situation. This has effects on creativity. Innovation in the IOT comes from connecting components since it is not a concentrated sector where a dominant design drives incremental innovation.

CONCLUSION

According to the present point, the automatic system supplies a constant flow of water. Due to the significant reduction in human resources, the project is automated. Automation results in water waste, time savings, and ensures system adoption in the water supply. The technique can also entirely eliminate an unequal water distribution system. so that everyone has access to the same amount of water. When compared to the current system, it is more efficient and can control the monthly utilization of water levels. The system bases its prices on a computation of water use and requires a matching payment from users. Technology and Internet of Things technology are used to give water from the credit amount per user to fill the credit metre.

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