

RESEARCH PAPER ON IOT BASED WATER QUALITY MONITORING SYSTEM USING SOLAR ENERGY

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Abstract

This work presents a water quality checking framework utilizing IOT innovation and controlled by sun based board. To screen water quality over various destinations as an ongoing application, an incredible framework design comprised by site is recommended. The WI-FI module is associated utilizing IOT innovation. Plan and execution of a model utilizing one hub controlled by sunlight based cell and IOT innovation is the difficult work. Information gathered by sensors at the Water Plant side like TDS, PH, turbidity, conductivity, and temperature is sent through IOT to the Website. Information gathered from the distant webpage can be shown in visual configuration also as it very well may be broke down utilizing diverse recreation instruments at site. This epic framework has benefits like no fossil fuel byproduct, low force utilization, more adaptable to convey at far off site, etc.

Keywords: IOT, PH Sensor, Turbidity Sensor, TDS (Total Dissolved Solid) Sensor, Conductivity Sensor, Temperature Sensor, Wi-Fi.

I. INTRODUCTION

Nature of water and the relentless water supply is the need of reliably. Sun controlled energy is the impact for such contemplations. The sun based energies can be limit in the batteries for the relentless electric energy's necessities.[1] The water attributes limits like turbidity, TDS (Total Dissolve solids), PH are also need for unadulterated water supply for ventures. The Invent of Internet progressions gives extra benefits for noticing the water quality reserve. There are various possibilities for using IOT networks inside the water/wastewater organizations. Data transmission can be checked using present day distant I/O contraptions and board. Water defilement is the contamination of water bodies. [2] Water defilement happens when poisons are delivered clearly or indirectly into water bodies without agreeable treatment to take out terrible combinations. Water pollution impacts plants and natural elements living in these \.[1] The water qualities limits like turbidity, TDS (Total Dissolve solids), PH are furthermore need for unadulterated water supply for endeavors. The Invent of Internet progressions gives extra benefits for noticing the water quality reserve. There are various possibilities for using IOT networks inside the water/wastewater organizations. Data transmission can be checked using current far off I/O contraptions and board. Water tainting is the contamination of water bodies. [2] Water tainting happens when poisons are delivered directly or indirectly into water bodies without acceptable treatment to dispose of frightful combinations. Water tainting impacts plants and natural substances living in these streams. Water defilement impacts drinking water, waterways, lakes and seas everywhere on the world.[3] This subsequently hurts human wellbeing and the regular habitat. Here you can discover more about water contamination and how you can deal with forestall it. They are regularly made of silicon gem cuts called cells, glass, a polymer sponsorship, and aluminum outlining. Sunlight based boards can change in type, size, shape, and shading. By and large the "size" of a PV module alludes to the board's appraised yield wattage or power producing potential. [5]

II. TYPES OF SENSOR

Turbidity Sensor

Turbidity is brought about by particles suspended or broke down in water that disperses light causing the water to seem overcast or dinky. Particulate matter can incorporate residue, particularly earth and sediment, fine natural and inorganic matter, solvent shaded natural mixtures, green growth, and other tiny life forms.

Sensor Specification:

Operating Voltage: 5V DC
 Operating Current: 40mA (MAX)
 Response Time: <500ms
 Insulation Resistance: 100M (Min)
 Output Method: Analog
 Analog output: 0-4.5V
 Digital Output: High/Low-level signal

TDS (Total Dissolve solid) Sensor

TDS is a condensing for Total Dissolved Solids in a fluid, remembering natural and inorganic substances for a sub-atomic, ionic, or miniature granular suspended structure. TDS is by and large communicated in parts per million (ppm) or as milligrams per liter (mg/L). TDS is straightforwardly identified with the nature of water i.e., the lower a TDS figure, the cleaner the water. For instance, invert assimilation cleaned water will have a TDS somewhere in the range of 0 and 10, while faucet water will shift somewhere in the range of 20 and 300, contingent upon where you live on the planet.



Fig.2 TDS (Total Dissolve solid) Sensor

Sensor Specification:

Input Voltage: 3.3 ~ 5.5V
 Output Voltage: 0 ~ 2.3V
 Working Current: 3 ~ 6mA
 TDS Measurement Range: 0 ~ 1000ppm
 TDS Measurement Accuracy: $\pm 10\%$ FS (25 °C)
 TDS probe with Number of Needle: 2

PH Sensor

A PH Sensor is one of the most essential tools that are typically used for water measurements. This type of sensor is able to measure the amount of alkalinity and acidity in water and other solution. To calculate the PH of an aqueous solution you need to know the concentration of hydronium ion .It is measured on a Scale of 0 to 14 PH.



Fig.3 PH Sensor

Sensor Specification:

Module Power: 5.00V
 Module Size: 43mm×32mm
 Measuring Range: 0-14PH
 Measuring Temperature: 0-60 °C
 Accuracy: ± 0.1pH (25 °C)
 Response Time: ≤ 1min
 pH Sensor with BNC Connector

Conductivity Sensor

Conductivity Sensor measures the ability of a section to Conduct on Electric current. It is the presence of ions a solution that allow the solutions to be conductive. Two Conductivity rods will be used as conductivity probe for measuring of conductivity of water.

Temperature Sensor

A temperature sensor is an electronic device that measures the temperature of its environmental and converts I/p data into electronic data to record monitor. The basic principle of working of the temperature sensor is the voltage across the diode terminal. If the voltage increase the temperature also rises followed by a voltage drop between the transmitter terminal of base and emitter.

III. BLOCK DIAGRAM

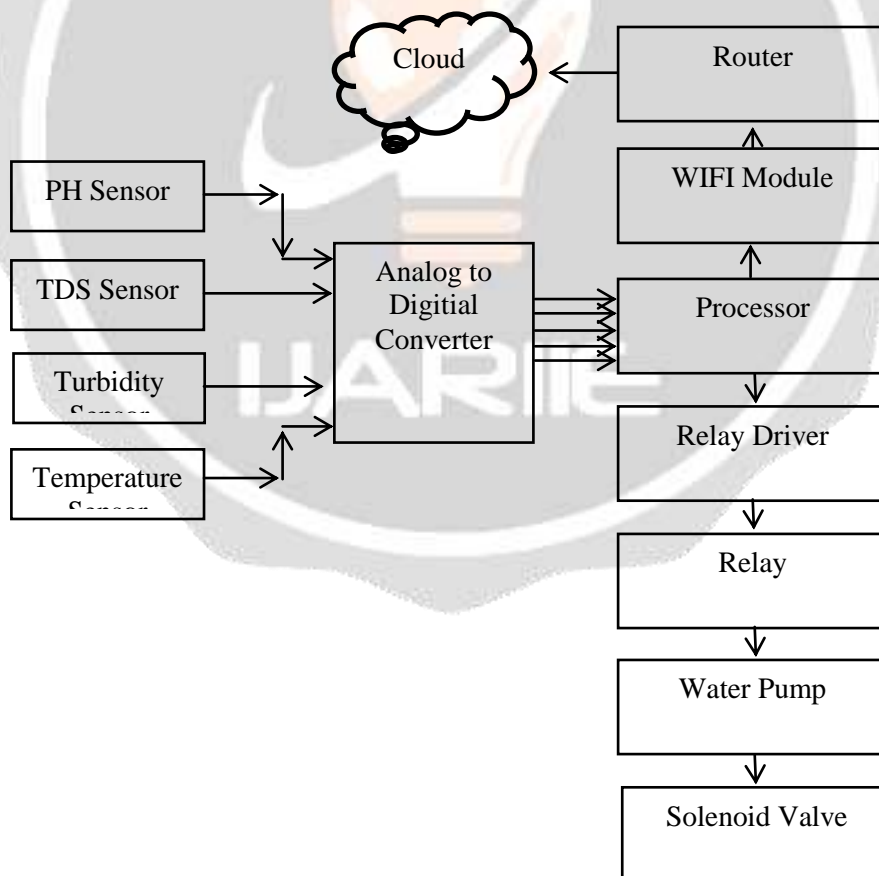
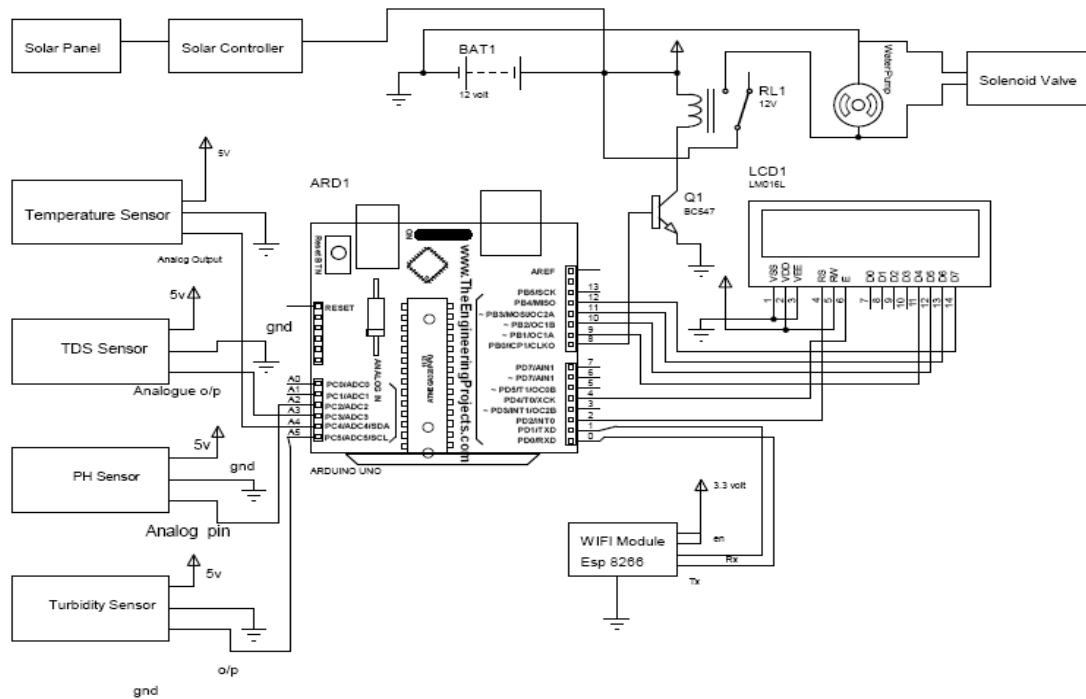


Fig. IOT Based Water Quality Monitoring System

Description:

Water pH value is calculated and will be displayed on LCD (Liquid Crystal Display). The same values will be sent to website of concern department for monitoring. If the values of parameters differ from the normal values of water parameters, then the supply of water will be interrupted. The Solar Panel will be the main source for charging the system. The Battery will be charged with the help of Solar Charger.

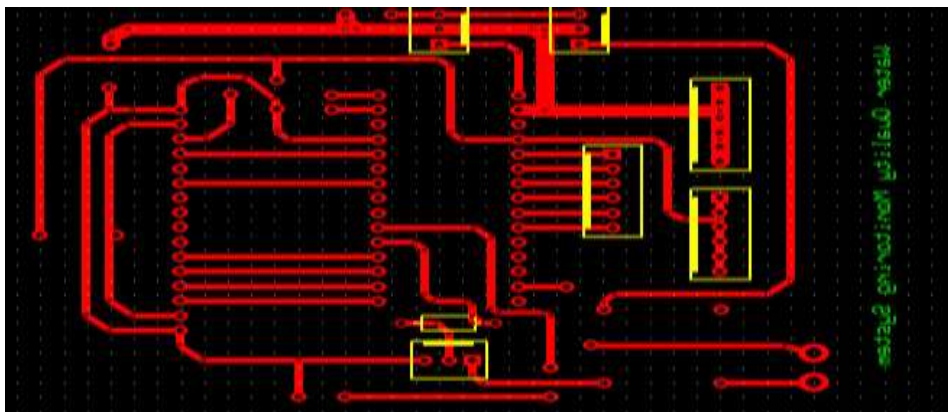
Circuit Diagram:



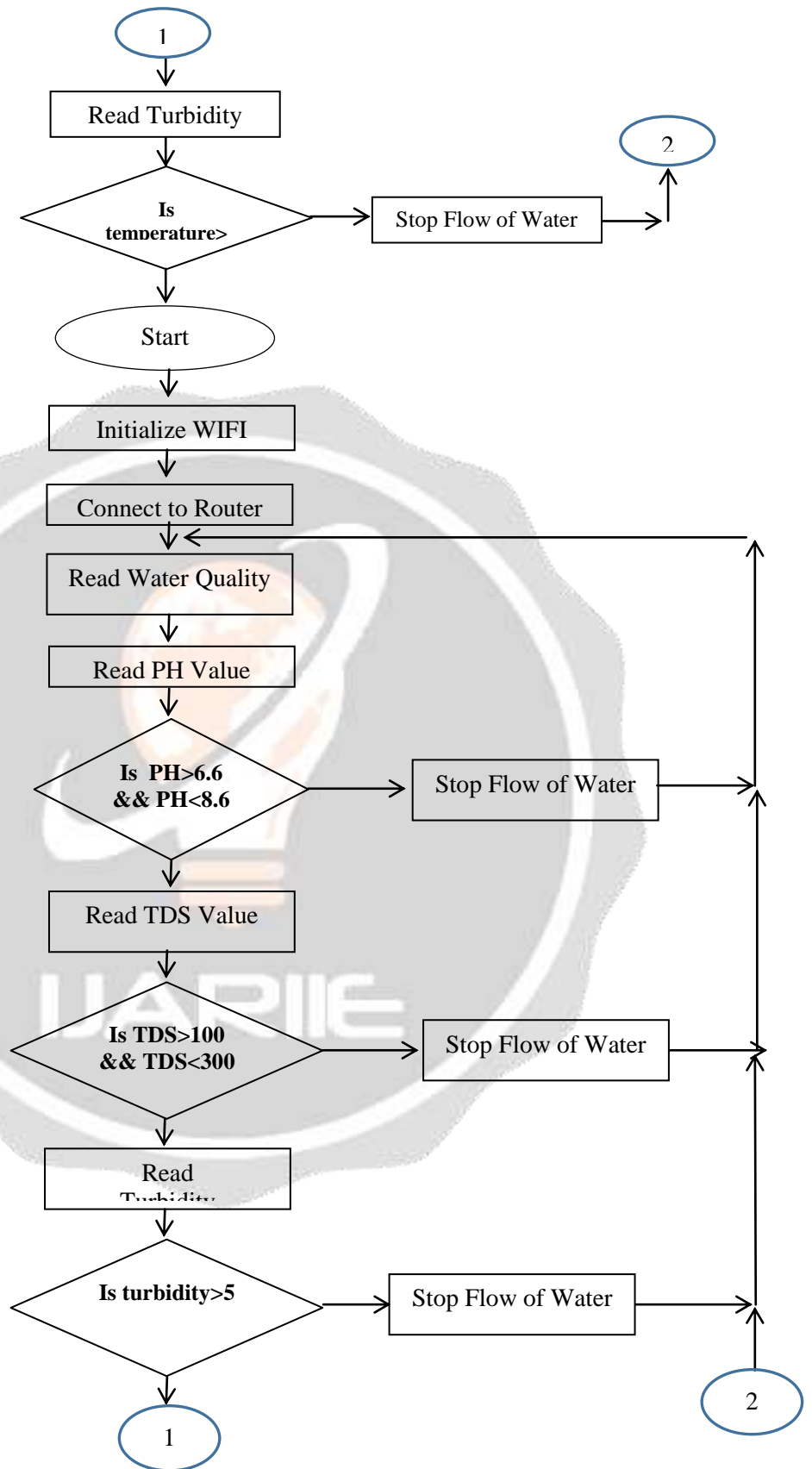
Description

The System consists of water sensors like, TDS, Turbidity, PH Sensor, conductivity. In the above circuit the sensors are interface with the analog pins of the ARDUINO UNO board. The analog pins reads the sensors values and according calculate these values and is converted into the digital values according to the formula generate from sensors and is displayed on the LCD module. The sensors when dips into the water, the processors calculate the values of these sensors and compare with the standard defined values for drinking water. If the value of the water parameters differs, then the microcontrollers stop the flow or supply of water to the concern and raise alarm. These water parameters are also sending to the web server with the help of WIFI Module 8266. WIFI Module is connected with the USART pins of the ARDUINO Board. Program is developed with the help of ARDUINO IDE (Integrated Development Environment). The language used is of C++

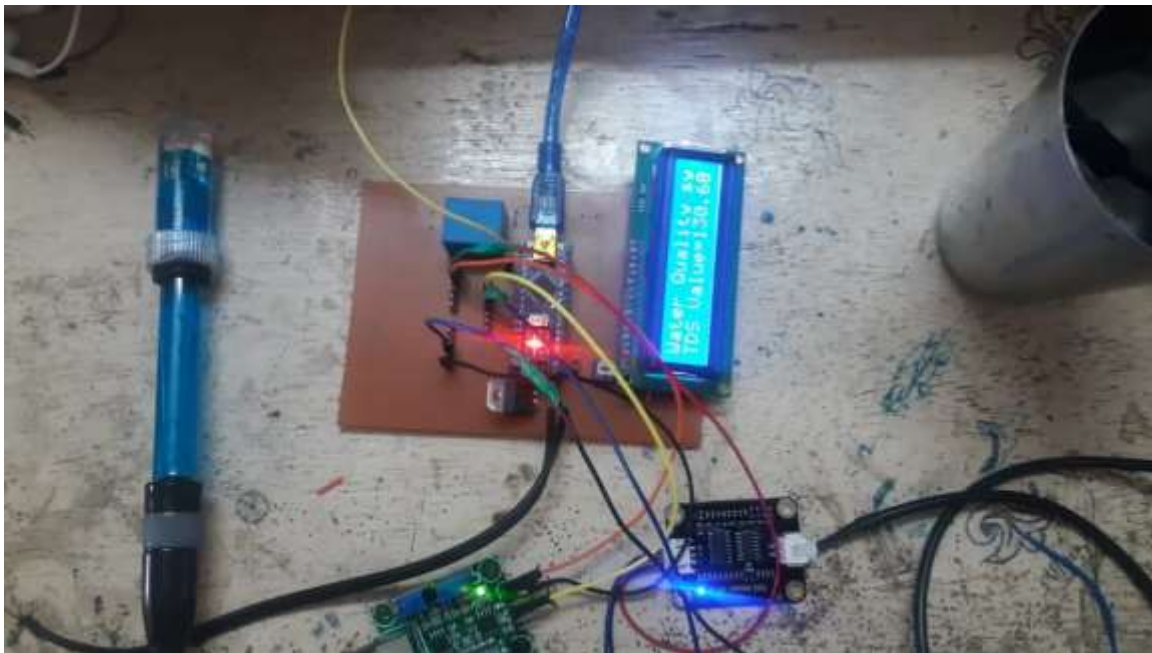
Layout Design



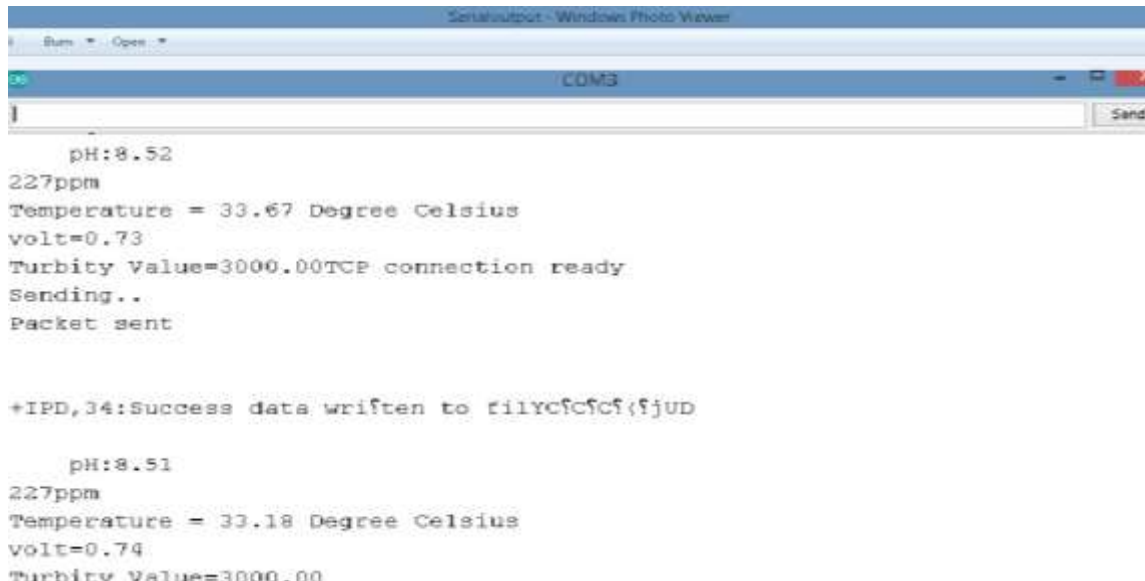
Flow chart:



Result



Serial Port Display Showing Water Quality Parameters



Server Side Water Quality Parameters Display on Web Page

The PH Value ="8.52"The TDS Value ="229.17"The Temperature Value ="33.18"The Turbidity Value ="3000.00"

Drinking Water Parameters

1) TDS (Total Dissolved Solids)

TDS Level (Milligram/Litre)	Remarks
Less than 50	Unacceptable as it lacks essential minerals
50-150	Acceptable for drinking . The TDS level is ideal for areas where the water polluted by sewage or industrial waste
150-250	Good. The water is ideal for people with cardiovascular disease

2) Common water pH levels

Type of water	pH level
Tap water	Varies; typically about 7.5
Distilled reverse osmosis water	5 to 7
Common bottled waters	6.5 to 7.5
Bottled waters labeled as alkaline	8 to 9
Ocean water	About 8
Acid rain	5 to 5.5

3) Turbidity

For **drinking water**, the World Health Organization has suggested <1 nephelometric **turbidity** unit (NTU) for **water** that will undergo disinfection and <4 NTU for **water** to be acceptable to the naked eye (World Health Organization 2011)

4) Conductivity of Water

Pure distilled and deionized **water** has a **conductivity** of 0.05 $\mu\text{S}/\text{cm}$, which corresponds to a resistivity of 18 megohm-cm ($\text{M}\Omega$). Seawater has a **conductivity** of 50 mS/cm , and **drinking water** has a **conductivity** of 200 to 800 $\mu\text{S}/\text{cm}$.

Advantage:

The system will be fully automatic with enhanced sensors.
The Supply of Water will be automatically cut off when the water is not pure.
The Alarm System to alert the concerned peoples

Application:

It is applicable for water purification plants in large as well as Small Scale Industry.
Can be applied to home or office or education institutes
The higher turbidity and imbalanced pH in water supply used for drinking, agriculture and industry use is a serious issue.
At such place quality control can be done by monitoring and necessary action for quality improvement.

IV. CONCLUSION

The System is tested and working perfectly. The Parameters like PH Value, TDS Value, Temperature Value, and Turbidity is tested with the reference instruments, and the values are coming successfully. The WIFI Module is also working and gets connected with the internet Router. The Values of the parameters are displayed on the web page. The Water pump starts the flow of water when the parameters are good for drinking water, else it stops the water automatically. The Power to this system is given by through solar system

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