IOT SYSTEM FOR MONITORING QUALITY OF WATER.

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***ABSTRACT* : Water as a natural resource has so much impact on human lives. Pollution of water is one of the main threats in recent times as drinking water is getting contaminated and pollution. This paper represents an IoT (Internet of things) based WQM (Water quality management) system that aids in continuous measurement of water condition based on four physical parameters i.e., temperature, pH, conductivity and turbidity properties. Four sensors are connected with ESP32 microcontroller in discrete way to detect the water parameters. Extracted data from the sensors are transmitted to a desktop and smart mobile application developed in BLYNK platform and compared with standard values.**

***KEYWORDS* : IOT, Water quality monitoring, Real-time system, pH sensor, Temperature sensor, Turbidity sensor, Conductivity sensor, ESP32 microcontroller, Mobile app.**

I. INTRODUCTION:

The drinking water is more precious and valuable for all the human beings so the quality of water should be monitored in real time. Nowadays water quality monitoring in real time faces challenges because of global warming, limited water resources, growing, population, etc. Hence, there is a need of developing better methodologies to monitor the water quality parameters in real time. [1]. The water is limited and essential resource for industry, agriculture, and all the creatures existing on earth including human being. Any imbalance in water quality would severely affect the health of the humans, animals and also affect the ecological balance among species. [2]. Therefore, various water quality parameters such as pH, temperature, turbidity and conductivity should be monitored in real time. [3]. The water quality parameter pH show water is acidic or basic. Pure water has 7 pH value, less than 7 values indicate acidity and more than 7 indicate alkalinity. The normal range of pH is 6 to 8.5. In drinking water if the normal range of doesn't maintain it causes the irritation to the eyes, skin and mucous membranes. Also, it causes the skin disorders. Turbidity indicate the degree at which the water loses its transparency. It is considered as a good measure of the quality of water. Water temperature, indicates how water is hot or cold.

II. LITERATURE SURVEY:

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[Wireless communication developments are creating new sensor capabilities. The current developments in the field of sensor networks are critical for environmental applications Internet of Things (IoT) allows connections among various devices with the ability to exchange and gather data. IoT also extends its capability to environmental issues in addition to automation industry by using industry 4.00. As water is one of the basic needs of human survival, it is required to incorporate some mechanism to monitor water quality time to time. Around 47% of deaths are cased due to contaminated water in the world. Hence, there is a necessity to ensure supply of purified drinking water for the people both in cities and villages Water Quality Monitoring (WQM) is a cost-effective and efficient system designed to monitor drinking water quality which makes use of Internet of Things (IoT) technology. [1]

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Water pollution is one of the biggest fears for the green globalization. In order to ensure the safe supply of the drinking water the quality needs to be monitor in real time. In this paper we present a design and development of a low cost system for real time monitoring of the water quality in IOT (internet of things). The system consist of several sensors is used to measuring physical and chemical parameters of the water. The parameters such as temperature, PH, turbidity, flow sensor of the water can be measured. The measured values from the sensors can be processed by the core controller. The Arduino model can be used as a core controller. Finally, the sensor data can be viewed on internet using WI-FI system. [2]

Nikhil Kedia entitled "Water Quality Monitoring for Rural Areas A Sensor Cloud Based Economical Project," Published in 2015 1st International Conference on Next Generation Computing Technologies (NGCT-2015) Dehradun, India. This paper highlights the entire water quality monitoring methods, sensors, embedded design, and information dissipation procedure, role of government, network operator and villagers in ensuring proper information dissipation. It also explores the Sensor Cloud domain. While automatically improving the water quality is not feasible at this point, efficient use of technology and economic practices can help improve wates quality and awareness among people. [3]

Jayti Bhatt, Jignesh Patoliya entitled "Real Time Water Quality Monitoring System" This paper describes to ensure the safe supply of drinking water the quality should be monitored in real time for that purpose new approach IOT (Internet of Things) based water quality monitoring has been proposed. In this paper, we present the design of IOT based water quality monitoring system that monitor the quality of water in real time. This system consists some sensors which measure the water quality parameter such as pH, turbidity, conductivity, dissolved oxygen, temperature. The measured values from the sensors are processed by microcontroller and this processed values are transmitted remotely to the core controller that

is raspberry pi using Zigbee protocol. Finally, sensors data can view on internet browser application using cloud computing. [4]

III. METHODOLOGY:

Water sensing node integrates sensors in real-time water quality monitoring and it includes temperature sensor, pH sensor, turbidity sensor, and conductivity monitoring. Since water quality is an important aspect in human life, this project contributes in the direction of monitoring the quality of water. The system proposed here is a water quality monitoring system in the Microcontroller platform that measures the pH, conductivity, temperature, and presence of suspended items on the water bodies like lakes and rivers using sensors. These sensed parameters are sent to the authorized person via Wi-Fi, so that proper action can be taken by the authority in cleaning the water bodies to reduce the possible health problem that could occur.

The proposed system consists of 3 major stages. Sensing stage, Computing and controlling and Communication stage.

PROPOSEED SYSTEM:

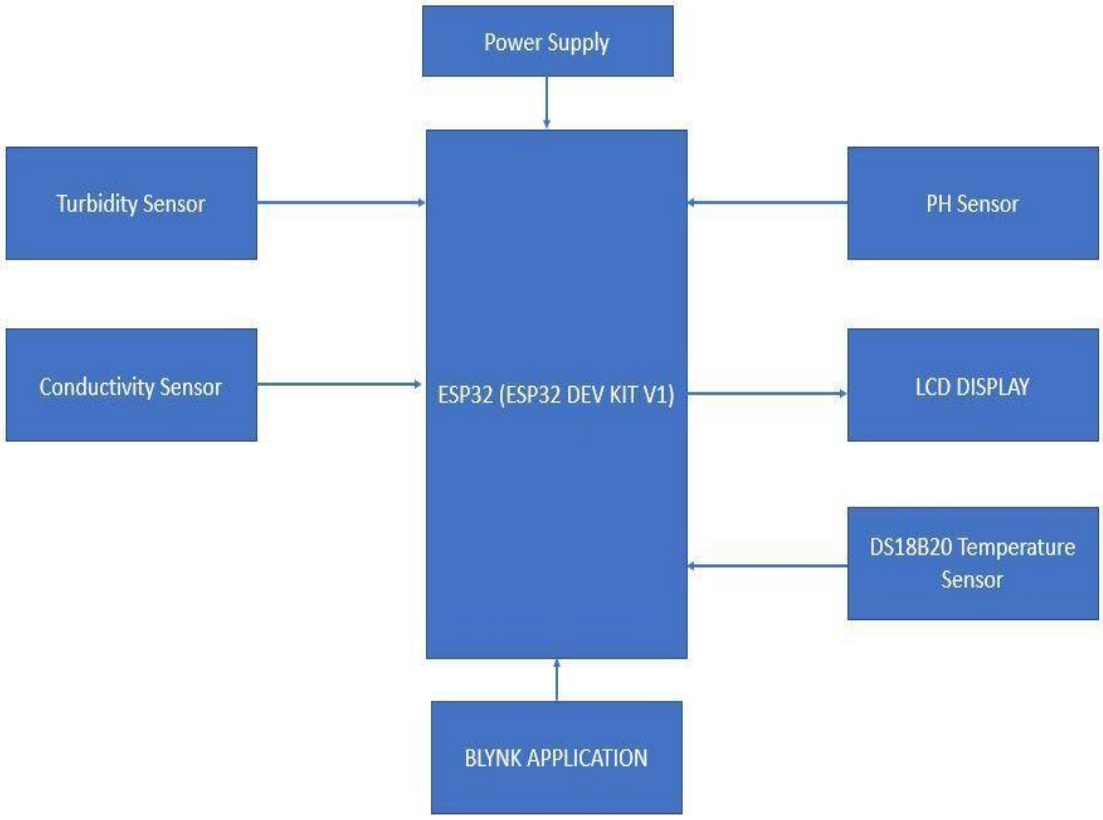
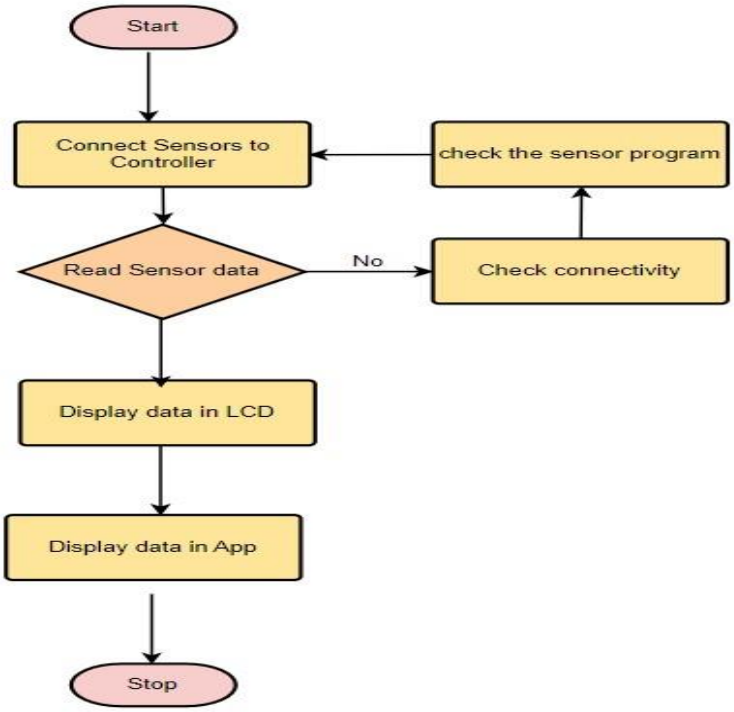


Fig: Block diagram of our project



OVERALL ALGORITHM FOR PROPOSED SYSTEM ESP32 MICROCONTROLLER

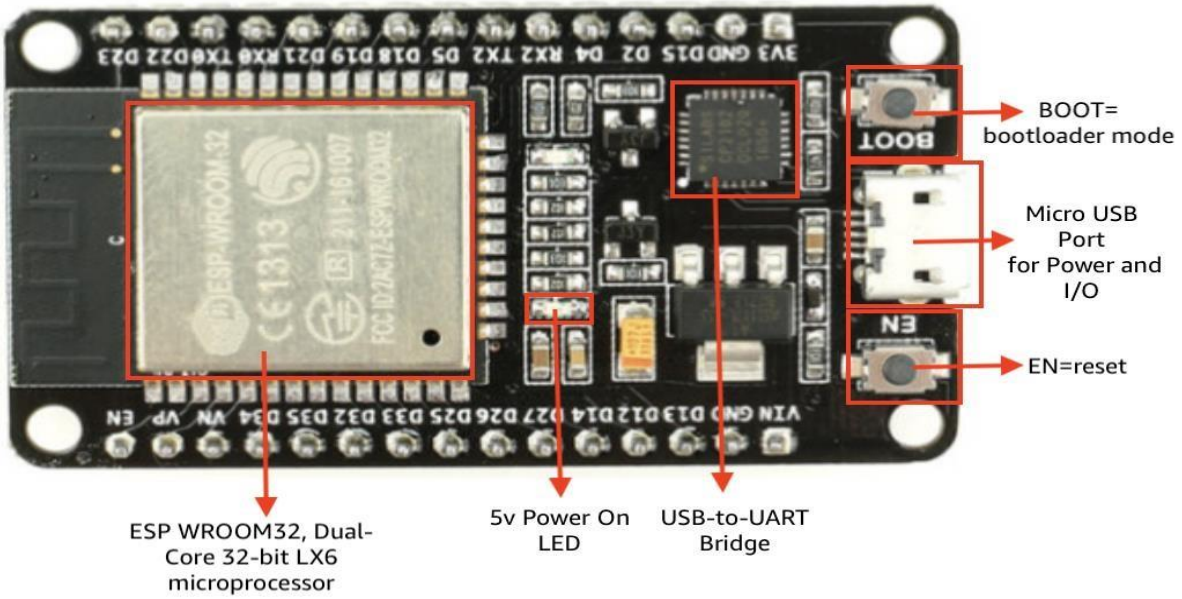
ESP32 is a low-cost, low-power Microcontroller with an integrated Wi-Fi and Bluetooth. It is the successor to the ESP8266 which is also a low-cost Wi-Fi microchip albeit with limited vastly limited functionality. It is an integrated antenna and RF balun, power amplifier, low-noise amplifiers, filters, and power management module. The entire solution takes up the least amount of printed circuit board area. This board is used with 2.4 GHz dual-mode Wi-Fi and Bluetooth chips by TSMC 40nm low power technology, power and RF properties best, which is safe, reliable, and scale-able to a variety of applications. The ESP32 supports three types of I/O modes with each GPIO Pin: Digital, Analog and Internal Sensors.

Analog: Used to send/receive analog data using the following functions:

Digital: Used to send/receive digital data using the following functions

Internal Sensors: This mode allows us to fetch internal sensor data from the ESP32 itself. The three sensors available are as follows:

- Internal Temperature Sensor
- Hall Effect Sensor
- Touch Sensor



ESP32 MICROCONTROLLER

The Sensing stage consists of following sensors.

- **pH sensor**: pH, commonly used for water measurements, is a measure of acidity and alkalinity, or the caustic and base present in a given solution. It is generally expressed with a numeric scale ranging from 0-14. The value 7 represents neutrality. The numbers on the scale increase with increasing alkalinity, while the numbers on the scale decrease with increasing acidity. Each unit of change represents a tenfold change in acidity or alkalinity. The pH value is also equal to the negative logarithm of the hydrogen-ion concentration or hydrogen-ion activity. pH values for some common solutions are listed in the table to the right.

- **Temperature sensor**: Due to microbial activities temperature of water may increase which is one of the factor deciding the purity. The temperature sensor measures the temperature of water. The DS18B20 is a 1-wire programmable Temperature sensor from maxim integrated. It is widely used to measure temperature in hard environments like in chemical solutions, mines or soil etc. The constriction of the sensor is rugged and also can be purchased with a waterproof option making the mounting process easy. It can measure a wide range of temperature from -55°C to +125° with a decent accuracy of ±5°C. Each sensor has a unique address and requires only one pin of the MCU to transfer data so it a very good choice for measuring temperature at multiple points without compromising much of your digital pins on the microcontroller.

pH and Temperature sensors

- **Conductivity sensor**: It checks the salinity of water. This parameter affects aquatic life. A microcontroller (MCU for microcontroller unit) is a small computer single metal-oxide-semiconductor (MOS) integrated circuit chip. In modern terminology, it is similar to, but less sophisticated than, a system on a chip (SoC); an SoC may include a microcontroller as one of its components. A microcontroller contains one or more CPUs (processor cores) along with memory and programmable input/output peripherals. Program memory in the form of ferroelectric RAM, NOR flash or OTP ROM is also often included on chip, as well as a small amount of RAM. Microcontrollers are designed for embedded applications, in contrast to the microprocessors used in personal computers or other general purpose applications consisting of various discrete chips.

Conductivity sensor

Turbidity Sensor: is defined as the reduction of transparency of a liquid caused by the presence of undissolved suspended matter. The origin of the particles found in seawater can be mineral (such as clay and silts) or organic (such as particulate organic matter or living organisms like plankton). Turbidity is not, however, a direct measure of suspended particles in water, but a measure of the scattering effect such particles have on light. Particles interact with incident light absorbing it and scattering it in all directions. The spatial distribution of scattered light depends on the ratio of particle size to wavelength of incident light. Particles much smaller than the wavelength of incident light exhibit a fairly symmetrical scattering distribution with approximately equal amounts of light scattered both forward and backward.

Turbidity Sensor

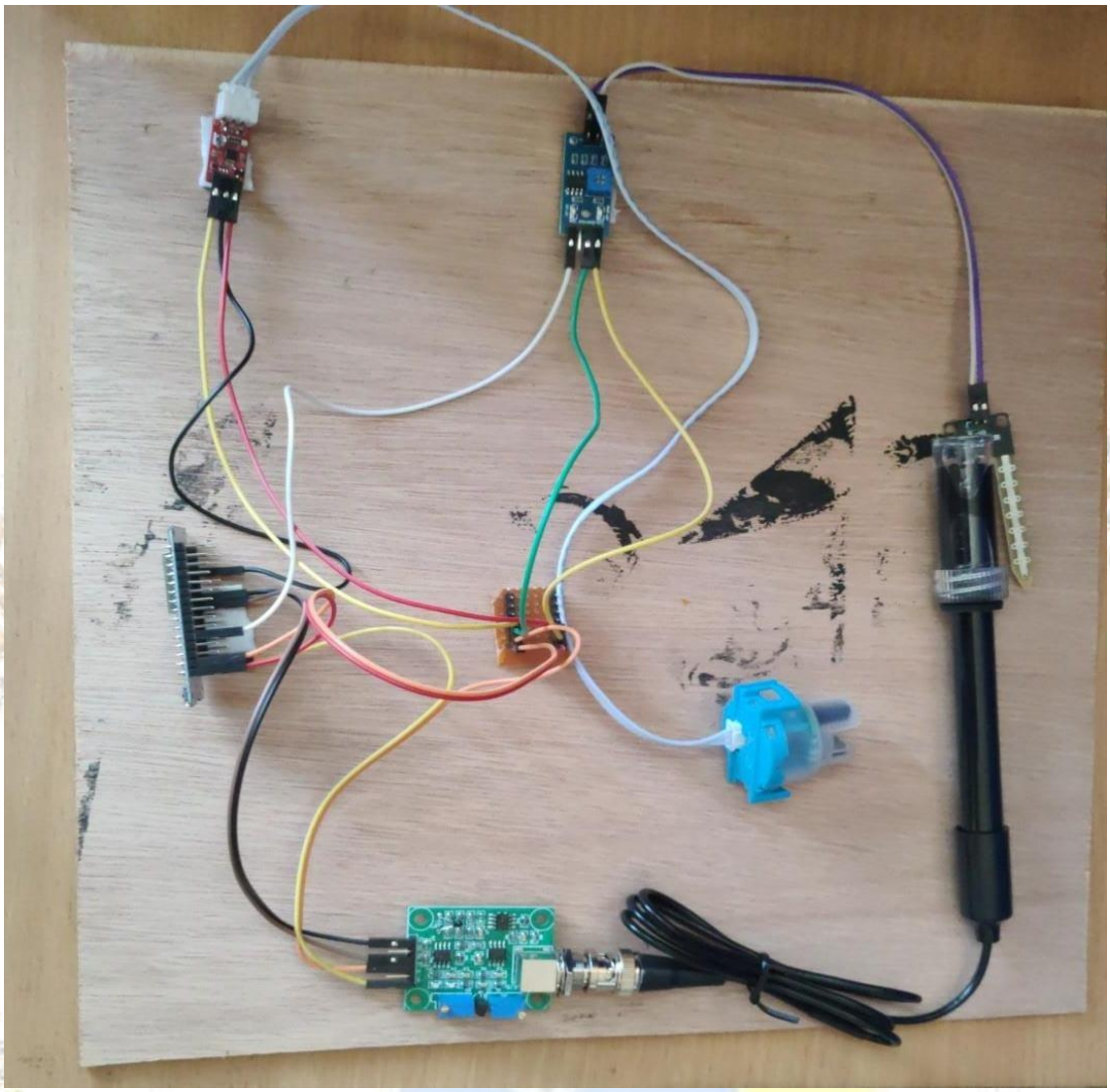
IV. IMPLEMENTATION

All components of the monitoring system that were previously discussed are complete. The application is designed, the code is written and tested, and the hardware is connected. The next step is to connect all the parts correctly and check if the system operates as expected and if the obtained results are acceptable. The test was performed on drinking water, with samples taken from various sources.

The hardware components are correctly connected so that they can get a value for the appropriate parameter, hopefully in an acceptable range. When designing the device, the focus is on the design of the end-user application.

The microcontroller is powered via a USB cable connected to a computer, but of course, there is the possibility of developing and expanding this device for further power supply from a battery or solar energy through a solar collector. The critical element for Internet access, the Wi-Fi module, is powered in the same way. the fully connected system measures the parameters.

Once the first step in the final test is completed, i.e. the components are connected, it is necessary to execute the appropriate code in order to be able to read and display the values obtained during the testing of the water sample. Concrete testing performed on relatively clean water, as expected the values obtained will be minimal below t normal clean/water limits. The corresponding test results displayed on the blynk monitor.



HARDWARE PARTS CONNECTION

V. RESULT AND OBSERVATIONS

LOGIN PAGE: On the front screen, one can login as user. If we login as user we have the option of login id , password and it automatically generates a outputs in mobile application in the platform of blynk.

ANDROID MOBILE OUTPUT CONCLUSION:

Monitoring of turbidity, pH, temperature, conductivity of water makes use of water detection sensors with unique advantage. The system can monitor water quality automatically, and it is low in cost and does not require people on duty so the water quality testing is likely to be more economical, convenient and fast. The system has good flexibility. Only by replacing the corresponding sensors and changing the relevent software programs, this system can be used to monitor other water quality parameters. The operation is simple. The system can be expanded to monitor hydrologic, air pollution, industrial and agricultural production and so on. It as widespread and extension values. To implement this need to deploy the sensor device in environment for collecting the data and

analysis. It can interact with other objects through network. Then the network collected data and analysis the data results will be available to the end users through wifi.

FUTURE SCOPE:

- In future we use IOT concept in this project.
- Detecting the more parameters for most secure purpose.
- Increase the parameters by addition of multiple sensors. • By interfacing relay we controls the supply of water.

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