IOT-Enabled Water Control System:Integrated Level Monitoring and Quality Assessment

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Abstract: Human carelessness frequently affects traditional water management systems, leading to waste and runoff. To address this issue, we have created Internet of Things solutions. Plans presented by Rankin: An immediate solution for water monitoring and management in a variety of applications, including water tanks, is provided by an autonomous water level measuring and control system created especially for smart cities. The world we live in is constantly changing, and everything can improve our quality of life if we use it. With the use of an ESP8266 NodeMCU microcontroller and WiFi, this project creates a water monitoring and control system that will automatically turn on and off the pump as needed and let us know if the tank is full or empty. Water level depth detecting sensors positioned throughout the model keep gathering data, which the ESP8266 with wifi module subsequently analyzes. Low, medium, and high water are among the conditions for which the concepts are intended. In order to ensure safety and avoid damage, it uses WiFi technology to alert the user if the water level rises and turns on the water pump to remove extra water. The concept's benefits include its wide applicability, automation, and simplicity. It is also anticipated that the concepts put forth will offer dependable, practical, and efficient solutions for smart city security and water level control. The creation of a water meter that can communicate with a WiFi module to send a notification to the operator is explained in this article. The concentration of suspended particles in the water immediately correlates with the intensity of the scattered light, which is then translated into a turbidity value that is frequently given in Nephelometric Turbidity Units (NTU). By keeping an eye on the clarity of raw water and throughout water treatment procedures, turbidity sensors contribute to the safety of drinking water. In order to evaluate the effects of pollution and other variables, they are used to monitor the water quality in natural settings including rivers, lakes, and seas. An indispensable tool for determining the acidity or alkalinity of water is a pH sensor. The pH scale, which goes from 0 to

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14, is a numerical representation of the chemical makeup of water. Neutrality is represented by a pH of 7. Alkalinity is indicated by values above 7, whereas acidity is indicated by values below 7. An LCD display and Arduino cloud are used to monitor
all of this actual data. When the water level exceeds the critical level, an SMS is sent to the target expert's mobile phone with the information. The design has been thoroughly examined and can be utilized to lower the possibility of complaints about a water scarcity and stop dry running from using electricity.
Keywords: NodeMCU ESP8266 microcontroller, 16X2 LCD, Wifi, Relay module, I2C module, Water level sensor, Submersible pump, PCB, Arduino IDE, Blynk cloud application Embedded C

1. INTRODUCTION:

The worldwide community now considers the Internet to be essential. The internet has made it simple and quick for people to communicate. People from different nations can readily communicate with one another via the Internet. In addition to bringing humans together, the internet allows objects to speak with one another. The idea that things can transmit data via the internet without requiring human-to-human or human-to-computer interaction is known as the Internet of Things (IoT). Heart rate monitors, sensors that warn drivers when tire pressure dips, and garbage cans that tell users when the floor is full are examples of Internet of Things goods. Communication between machines is a component of the Internet of Things. Devices and controllers that carry sensors and actuators, including the Arduino-based processor, Raspberry Pi, Intel Edison, and Intel Galileo, are often the ones that support the Internet of Things. These boards allow for remote Internet-based monitoring and control of sensor data. In the future, the Internet of Things will be used to collect various types of sensor data, which may be utilized for market analysis, product development, and many other purposes. One of the things we use on a daily basis, particularly in Indonesia, to store water before it is utilized for bathing, laundry, and other purposes, is the water container. In order to determine how cloudy or hazy the water is, turbidity sensors use light scattering from suspended particles, which indicates the presence of pollutants like silt or algae. The principle of light scattering is used by turbidity sensors. Turbidity is lower in the lower pH range. In addition to hydrolyzing to create insoluble precipitates that trap particles, a pH greater than 7 may neutralize the charge on the particles generating turbidity in raw water. Some light is scattered in many directions rather than traveling through water with suspended particles when light is directed through it.The concentration of suspended particles in the water immediately correlates with the intensity of the scattered light, which is then translated into a turbidity value that is frequently given in Nephelometric Turbidity Units (NTU). By keeping an eye on the clarity of raw water and throughout water treatment procedures, turbidity sensors contribute to the safety of drinking water. In order to evaluate the effects of pollution and other variables, they are used to monitor the water quality in natural settings including rivers, lakes, and seas. An indispensable tool for determining the acidity or alkalinity of water is a pH sensor. The pH scale, which goes from 0 to 14, is a numerical representation of the chemical makeup of water. Neutrality is represented by a pH of 7. Alkalinity is indicated by values above 7, whereas acidity is indicated by values below 7. An LCD display and

Arduino cloud are used to monitor all of this actual data.Every time it is used, the amount of water in the container must be reduced, and we must replenish it with water so that it can be used again by others in the future. We typically have to wait for the water tank to fill up before adding more water. It takes a long time to wait for the water to fill since we frequently forget to switch off the pump or valve when filling it, and we are too sluggish to detach from the pump nozzle or valve. Therefore, the water rushes out and is squandered when we fail to switch off the pump or valve while the container is full of water.

2. EXISTING SYSTEM

1. They have to have workers.
2. Incapable of seeing remotely

3. PROPOSED SYSTEM:

In water management, the water level indicator is extremely crucial. Water should not be squandered because it is so vital. To prevent waste, we have to check the water level. In the subsequent phases, it is the primary parameter that must be read. The market routinely offers a wide variety of water meter kinds. Here, however, we are setting up a WiFi modem and high-speed water meter. Through SMS, users can remotely check the water level. Water runs out of the head in many homes, wasting needless water. The water meter system is very easy to operate. In order to determine how cloudy or hazy the water is, turbidity sensors use light scattering from suspended particles, which indicates the presence of pollutants like silt or algae. The principle of light scattering is used by turbidity sensors. Turbidity is lower in the lower pH range. In addition to hydrolyzing to create insoluble precipitates that trap particles, a pH greater than 7 may neutralize the charge on the particles generating turbidity in raw water. Some light is scattered in many directions rather than traveling through water with suspended particles when light is directed through it.

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In order to fill the tank with various liquids, a product called a water level controller regulates the water level in water tanks and pumps. Reducing wastewater and avoiding needless energy use are the primary goals of the water level controller. The reason for this is that the water level is under control, which restricts the amount of electricity used. As a result, less electricity and water are needed to regulate water.

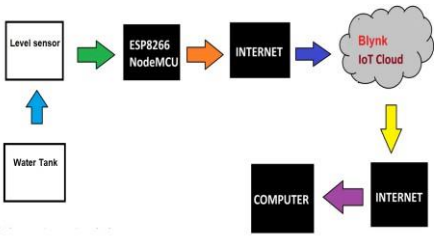

Fig.1. Block diagram of Real time water level monitoring and controlling system

3.1 WORKING PROCESSES:

To find the water level, we use level sensors. Using Blynk IoT services and integrated C programming, we enable both automated and manual water level monitoring and control using Blynk applications. By keeping an eye on the clarity of raw water and throughout water treatment procedures, turbidity sensors contribute to the safety of drinking water. In order to evaluate the effects of pollution and other variables, they are used to monitor the water quality in natural settings including rivers, lakes, and seas. An indispensable tool for determining the acidity or alkalinity of water is a pH sensor. The pH scale, which goes from 0 to 14, is a numerical representation of the chemical makeup of water. Neutrality is represented by a pH of 7. Alkalinity is indicated by values above 7, whereas acidity is indicated by values below 7. An LCD display and Arduino cloud are used to monitor all of this actual data. The motor will automatically turn off in automated mode when the tank's water level reaches 100%. We can manually store water in the tank according to our needs. such that this sophisticated system can have both automatic and manual conditions.

4. LITERATURE SURVEY:

An automatic flow control system that can be utilized as a control system was created by Hani and Myaing (2011). The pulse train is produced at the microcontroller's input frequency using the measurement unit, photocutter, and slotted disk. A software program in the PIC calculates the frequency of the sensor signal and converts it to flow rate. Check the flow rate against the predetermined speed. According to this comparison, the PIC16F628 can control the water valve by altering the water flow with a DC motor. Olambimpe (2010) conducted a study on the building and design of a liquid meter-based automatic water pump control system.

In addition to an indicator that notifies the user when there is water in the higher tank, the design has an automatic control with digital circuitry to switch the pump on and off [4]. An electronic alarm that alerts the user when there is no more water in the subterranean tank is another aspect of this design. The design and installation of a water meter based on microcontroller-based pump control was done by Omolola (2010). A digital water meter with a pump controller and a gadget that shows the water level in the tank using a seven-segment display were used in the project.

Similar to Olabimpe (2010), it indicates the tank's 100% level with a continuous sound that lasts for ten seconds. In 2004, Muhd Asran Bin Abdullah His ideas and practical application of caring for others for a few hours are nearly flawless. In terms of precise water measurement and automated water level regulation, sensors provide superior

options. The water level control circuit will prevent the pump from starting if the sump's water level is low, and it will also shut off the pump even when it is pumping if the sump's water level is low. suction. The top tank goes on.

5. HARDWARE DESCRIPITION:

5.1. ESP8266 NodeMCU:

Based on the ESP8266 Wi-Fi chip, the ESP8266 NodeMCU is a widely used, open-source, and reasonably priced development board that is perfect for Internet of Things (IoT) projects. It can be programmed using Lua scripting and the Arduino IDE. Perfect for quick prototyping, particularly if you know how to use Lua programming. Arduino: Provides an intuitive environment that is appropriate for both novice and seasoned developers. Widely utilized in Internet of Things applications, the ESP8266 is a Wi-Fi SoC that is integrated with a Tensilica Xtensa LX106 core. They accomplished this by introducing the SAM Core and the Board Manager. A "core" is the set of software elements needed by the Arduino IDE and the Board Manager to compile an Arduino C/C++ source file all the way down to the machine language of the target MCU.

An Arduino core for the ESP8266 WiFi SoC was created by several inventive ESP8266 fans and is accessible on the GitHub ESP8266 Core page. It is commonly referred to as the "ESP8266 Core for the Arduino IDE" and has emerged as one of the top software development platforms for a variety of ESP8266-based development boards and modules, including NodeMCUs.

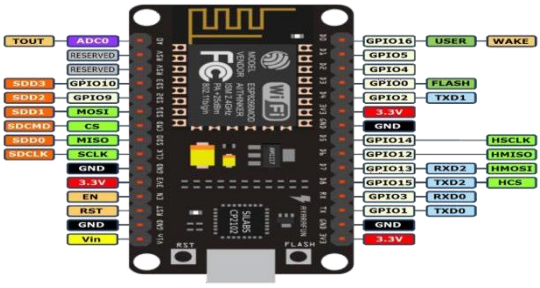

Fig.2. Pins of NodeMC U

5.2. LCD Display with I2C/IIC interface:

Fig.3.LCD with I2C module

This is the LCD 1602 parallel LCD display, which makes it easy and convenient to add 16 × 2 cost. A free LCD monitor with an effective resolution for your project. This monitor has a green background and clear lettering on a 16-character by 2-line display with great contrast. This LCD display has a lovely green backlight. This is excellent for projects that use Arduino. This display overcomes the drawback of LCD 1602 parallel LCD displays, which require roughly 8 Arduino pins to function. Thankfully, the I2C adaptor is connected straight to the display pins in this device. Therefore, a good library and I2C pins with minimal coding are all you need to connect. SDA (Serial Data Line) and SCL (Serial Clock Line) are the two communication lines used by the Philips I2C serial bus. Both require a pull-up resistor to be attached. 5V and 3.3V are the operating voltages. It is relatively simple to wire if the I2C adaptor, like this one, is soldered to the board. Typically, only four pins need to be connected. GND and VCC, naturally. Five volts are needed to run the LCD monitor. Thus, we decide to use the 5V pin. Simple text, a numerical value from a sensor (such temperature or pressure), or even the quantity of Arduino circuits can be displayed on the screen.

5.3. Buzzer - 5V:

This little PCB is capable of receiving a 5V active buzzer. Adding the buzzer to your electronic model is a smart idea. It generates sound using a solid coil

fig.4.Buzzer

5.4. Submersible Mini Water Pump - 3-6V DC:

Micro Submersible Pump, DC 3-6V This small water pump is ideal for a do-it-yourself garden water circulation system. This little submersible pump motor is inexpensive and runs on a 3–6V power source. It requires a minimum current of 220mA and has an hourly capacity of 120 liters of water. To power it, simply attach the tube to the outlet body and submerge it in water. Ensure that the water level is consistently higher than the engine. Idling can produce noise and harm the engine.

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Fig.5.Mini water pump

5.5. L298n motor driver :

The high-power L298N 2A Based Motor Driver is ideal for driving DC and stepper motors. Robu.in offers a large selection of motors. It contains an onboard 5V regulator that it may feed to an external circuit, and it employs the well-known L298 motor driver IC. Up to four DC motors can be controlled by it, or two DC motors with speed and direction control. This motor driver is ideal for controlling motors from microcontrollers, switches, relays, and other devices in robotics and mechatronics projects. Ideal for powering stepper and DC motors for robot arms, line-following robots, micro mice, etc.

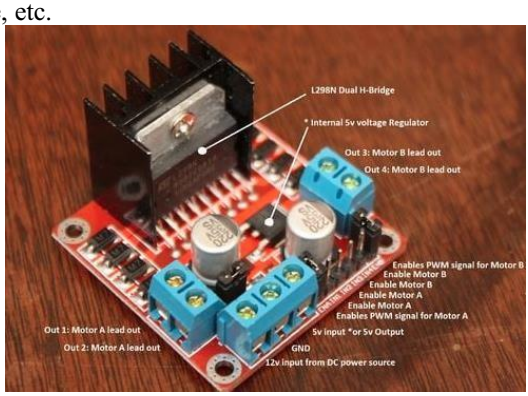

Fig.6.L298n motor driver

5.6. Turbidity sensor:

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6. ARDUINO IDE:

Writing program code and uploading it offline to the development board is simple with the Arduino software (IDE). Users with weak or nonexistent internet connections are advised to utilize it. The Arduino IDE is now available in two versions, the first of which is called IDE 1. The Arduino Software (IDE), an integrated development environment that can run both online and offline, is used to program the Arduino Uno.

7. RESULTS:

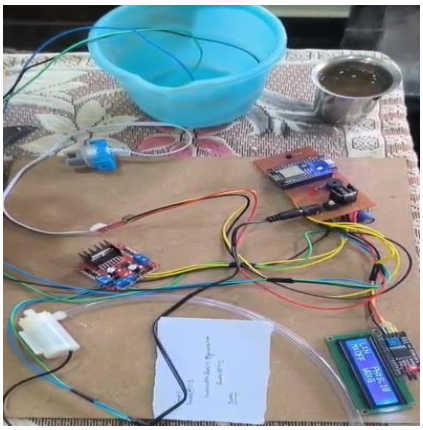

Fig.7. Water level monitoring using sensors

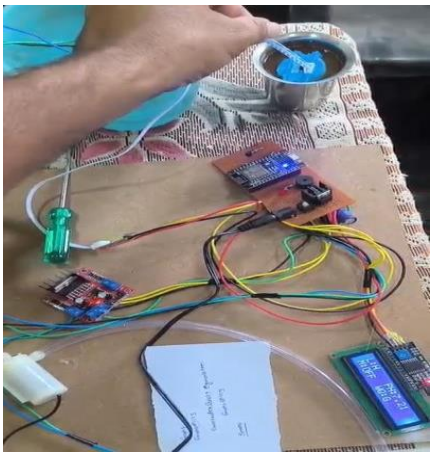

Fig.8. Water quality monitoring in dirty water using turbidity sensor

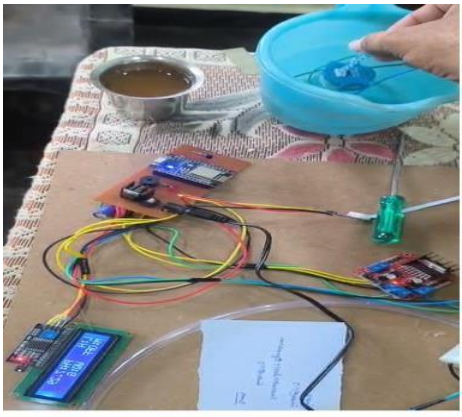

Fig.9. water quality monitoring in water

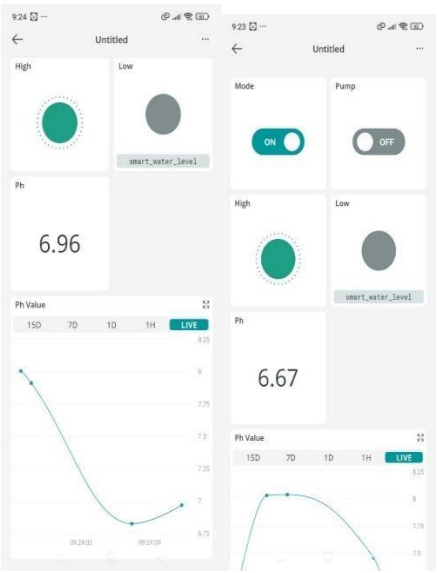

Fig.10 Arduino Cloud based real time water level and water quality ph value monitoring in cloud

8. APPLICATIONS:

ponds, rivers, water tanks, water level tanks, and apartment water tanks. Water level controllers can be used for the following purposes:
If the water level falls below the predetermined level, the automated water controller will start the engine and turn off the system as soon as the water tank has enough water Dam water levels can also be managed in this way. A. This use is helpful in agriculture, business, and the home. liquid industries, including the water and oil sectors. Tanks are filled with a variety of liquids using this approach. The water tank is filled and waste water generation is avoided because of this procedure.

9. CONCLUSION:

All systems function flawlessly, thus no special knowledge is needed. Future city development may be made possible by this system. We are aware that residences and workplaces are the primary sources of wastewater. We no longer need to be concerned about speeding because the system can also be utilized for climate control without a human-machine interface.
The water level tank can be turned on or off and its level can be reported with an alert using a wifi modem. The sewage tank is connected to another engine via the well. Encourage people to make use of Wi-Fi technology.
The manual doesn't require any involvement, and maintenance costs are minimal.
It can identify when the water tank's level is low and alert the wifi module to send a message or app to the target user's phone. network of water distribution for data on water flow. Large losses from water flow, energy consumption, and system damage from surface runoff result from the absence of historical and current data on the water

supply system's efficiency. systems for monitoring and control

10. FUTURE SCOPE:

It can identify when the water tank's level is low and alert the wifi module to send a message or app to the target user's phone. network of water distribution for data on water flow. Large losses from water flow, energy consumption, and system damage from surface runoff result from the absence of historical and current data on the water supply system's efficiency. systems for monitoring and control.

11. REFERENCES:

[1]Dipanjan Rakshit, et al. "Water level indicator" International Journal of Scientific & Engineering Research, Volume 7, Issue 4, April-2016 7 ISSN 2229-5518 IJSER © 2016 http://www.ijser.org

[2]Ding D Cooper R A Pasquina P F and Fici-Pasquina L 2011 Sensor technology for smart homes

[3]Cook D J and Das S K 2005 Smart Environments: Technology, Protocols and Applications [4] Nichols J and Myers B A, 2006 Controlling home and office appliances with smart phones IEEE Pervasive Comput. 5 3 p. 60–67

[5]Baig F Beg S and Fahad Khan M, 2012 Controlling Home Appliances Remotely through Voice Command Int. J. Comput. Appl. 48 17 p. 1–4

[6]A. Nikam, N. Warhade, R. Dhawale, S. Prabhu, G. Deshmukh, "Fully Automated System for Monitoring Water Usage using SMS and Android Application," International Research Journal of Engineering and Technology, vol. 4, issue 5, pp. 2548-2551, 2017.

[7]ATmega328pDatasheet-Atmel
https://www.microchip.com/enus/product/ATmega328?gclid=EAIaIQobChMIsJiG_r TZ9gIVIilyCh144gl6EAAYASAAEgLbSvD_BwE

[8]In Brief Description about relays from Wikipedia https://en.wikipedia.org/wiki/Relay

[9]GSM Multiple Access Scheme, http://www.eecg.toronto.edu/~nazizi/gsm/ma/ William Stallings Data and Computer Communications 7th Edition: Chapter 9 Spread Spectrum, http://juliet.stfx.ca/~lyang/csci-465/lectures/09-SpreadSpectrum-new.ppt

[10]ETS 300 608. Digital Cellular Telecommunication System (Phase 2); Specification of the Subscriber Identity Module-Mobile Equipment (SIM-ME) Interface. European Telecommunications Standards Institute. May 1998

[11]Principles and Applications of GSM by Vijay Garg

[12]C. G. Garcia, D. M. Llorian, B. P. G-Bustelo, J. M. C. Lovelle and N. Garcia-Fernandez, "Midgar:Detection of people through computer vision in the Internet of Things scenarios to improve the security in SmartCities, Smart Towns, and Smart Homes," Future Generation Computer System, 2015.

[13]J. Gubbi, R. Buyya, M. Palaniswami and S. Marusic, "Internet of Things (IoT):A Vision, architectural elements, and Future Directions," Future Generation Computer System, pp. 1645-1660, 2013.

[14]Espressif System IOT Team, "ESP8266EX," Espressif System, 2015.

[15]M. Singh and S. Goel, "Review of Arduino Microcontroller," p. 2, 2013.

[16]S. Jatmiko, A. B. Mutiara and M. Indriati, "Prototype of Water Level Detection System With Wireless," pp. 52- 59, 2012.