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IoT BASED WATER FLOW MONITORING AND CONTROLLING SYSTEM

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Abstract- IoT is global network of things. In IoT things refers to devices like sensors, actuators and these things are connected together to generate some meaningful results. In IoT each of these "things" has independent identities and can be connected over a network for data sharing. This paper proposes a water monitoring and control system for water utility to reduce the current water wastage problem. This approach will help utilities controllers improve low cost water management systems, by using growing technologies and IoT is one among them. The Internet of Things (IoT) could convince be one among the foremost important methods for developing more utility-proper systems and for creating the consumption of water resources more efficient.

Keywords: *Water Flow Monitoring, Arduino UNO, sensors, Node MCU, Internet of Things*

I INTRODUCTION

IoT based liquid flow monitoring and controlling system has emerged as a basic distribution infrastructure allowing an efficient water supply. Thus, the pipeline is a significant way to transport water from water sources to consumers for short or long distances and in different conditions. Despite this tremendous growth of such system, it can be contaminated by different events such as pipe bursts and pervasive leakage problems which cause a catastrophic water loss. Consequently, this system becomes a significant challenge for structural monitoring and requires continuous control process. For that, water utilities are mainly concerned to overcome the water losses by studying the different water services such as privatization to maintain water supply carefully like it is highlighted. Other works in the industry domain are interested on defining water system resources, equipment, devices and their best geographical distribution to be efficiently exploited. Accordingly, it is very important to maintain a continuous flow monitoring of liquid to save the environment from various disasters. Furthermore, the emergent use of pipelines in industrial domain for reliable water transmission requires a serious monitoring and immediate reaction in the case of problems to reinforce the system robustness.

II METHODOLOGY

The main aim is to design and develop a system which can remotely control the water supply through a pipeline and also monitor the rate of water flow. The system consist of Arduino UNO Board as main controller, ESP8266 is Wi-Fi module used to send data to cloud server, Flow meter is present at the input side to measure the rate of flow of water for monitoring purpose, it measures the water flow rate and send the data in digital pulses to the controller. The solenoid valve is installed in system for ON/OFF control of water supply. To measure the level of water at the tank present at the outlet the level sensor is interfaced with controller, it detects the level of the water in tank continuously and sends data to controller. The 12V power supply is also design to provide power to the system.

III RESEARCH

The research is the most important stage in development of any system. This study discusses the planning and current development of system having a low cost to watch real time values and also to regulate the system using IoT. To measure various parameters of the water, many sensors are included in the system. The parameters which can be measured are like the flow rate and level of the water. Microcontroller can process the value measured from the sensors. The Arduino Uno board can be used to control the system and to access the sensor data on the internet, cloud computing can be used.

IV BLOCK DIAGRAM AND HARDWARE

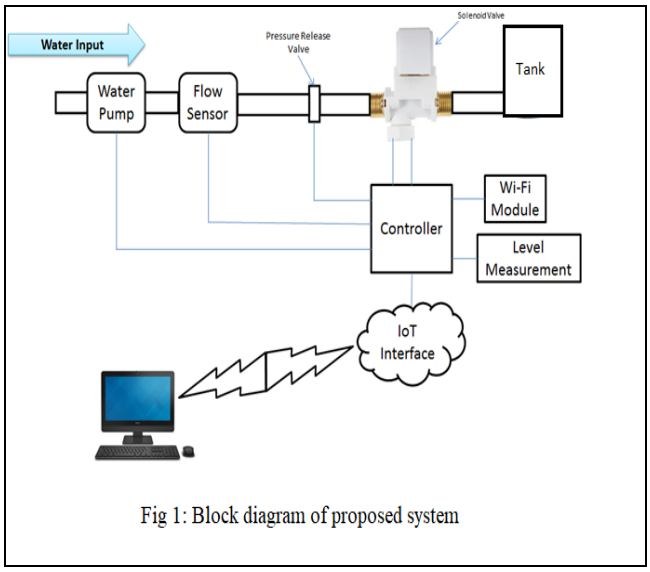


Fig 1: Block diagram of proposed system

4.1 MICROCONTROLLER

Arduino UNO is a microcontroller board. It has 14 digital Input/output pins, 6 analog inputs, a 16 Hz ceramic resonator, a USB connection, power jack, an ICSP header and a reset button. The board contains everything to support the microcontroller, simply connect it to a computer with USB cable or power it with AC to DC adapter or battery.

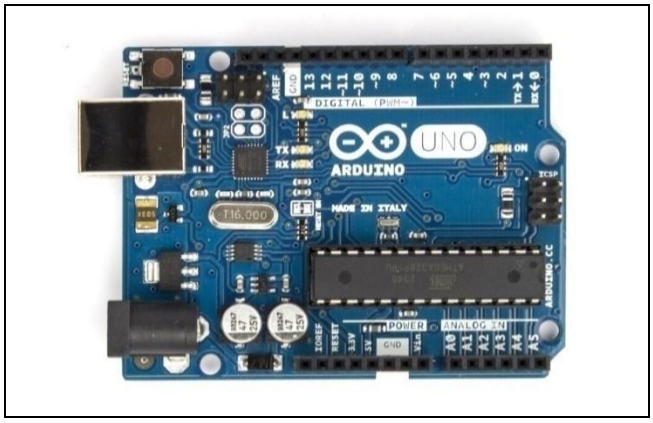


Fig 2: Arduino UNO Board

Features of Arduino UNO:

- Operating Voltage 5V
- Input Voltage 7-12V
- Input Voltage (limits) 6-20V
- Digital I/O Pins (6 PWM) 14
- Analog Input Pins 6
- DC Current per I/O Pin 40 mA

4.2 FLOW SENSOR

This sensor sits in line together with your water line, and uses a pinwheel sensor to detect how much liquid has moved through it. It can measure water flow for your solar, liquid conservation systems, liquid storage tanks, home applications, irrigation systems and other water system. The sensors are solidly constructed and give a digital pulse whenever an amount of water passes through the pipe.

Fig 3: Flow Sensor

Features:

- Working Voltage: 5 to 18V DC
- Max current draw: 15mA
- Output Type: 5V TTL
- Working Flow Rate: 1 to 30 Liters/Minute

4.3 WATER FLOW CONTROLLING VALVE

A solenoid valve is utilized as a water controlling valve. A solenoid valve is electromagnetic device. It operates on electrical supply and has two position open and close.

Fig 4: Water Flow Controlling Valve

4.4 LEVEL DETECTOR SENSOR

The HC-SR04 Ultrasonic sensor is a 4 pin module, whose pin names are VCC, Trigger, Echo and Ground respectively. This sensor is utilised in many applications where measuring distance or sensing objects are required.

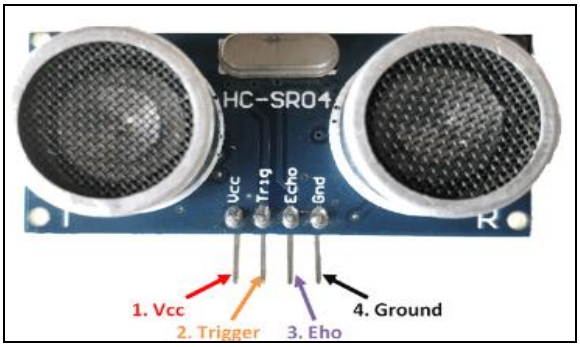


Fig 5: Level Detector Sensor

The transmitter of ultrasonic sensor transmits an ultrasonic wave, this wave travels in air and when it gets objected by any material it gets reflected toward the sensor and this reflected wave is observed by the ultrasonic receiver module.

HC-SR04 Sensor Features:

- Operating voltage: 5V
- Practical Measuring Distance: 2cm to 80cm
- Accuracy: 3mm
- Measuring angle covered: <15°
- Operating Current: <15mA
- Operating Frequency: 40Hz

4.5 WI-FI MODULE

The Node MCU (Micro Controller Unit) is an open source software and hardware development environment that is built around a system-on-a-chip called the ESP8266 module. The ESP8266 module is designed and manufactured by Express and it contains all important elements of the modern computer: CPU, RAM, networking (Wi-Fi), and the modern operating system. That makes it an excellent choice for this system design.

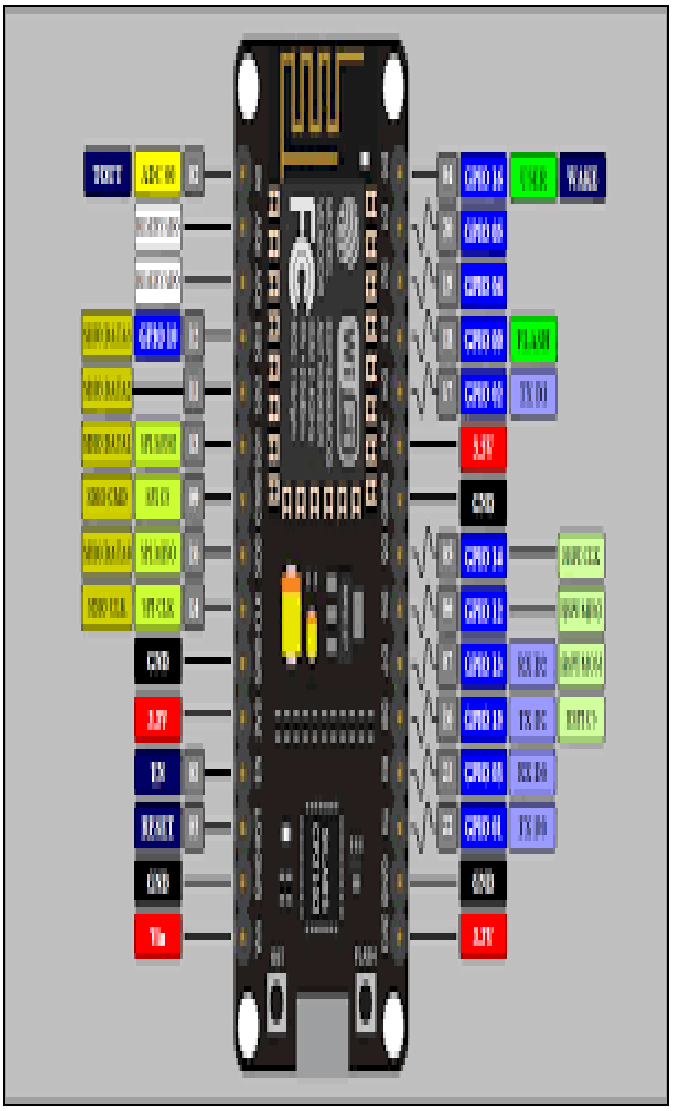


Fig 6: Node MCU

It has two key components.

1. An open source ESP8266 firmware that's built on top of the chip manufacturer's proprietary SDK. The firmware provides an easy programming environment supported eLua (embedded Lua), which is a very easy and fast scripting language with the developer community. For newcomers, the Lua scripting language is easy to learn and to add on Node MCU are often programmed with the Android IDE too.

2. A development kit board that incorporates the ESP8266 chip on a standard circuit board. The board has a built-in USB port that is already wired with chip, hardware reset button, Wi-Fi antenna, LED lights, and standard-sized GPIO pins.

4.6 POWER SUPPLY

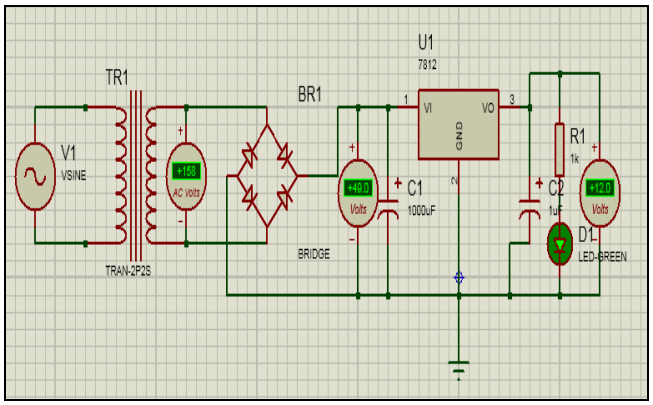


Fig 7: Schematic of 12V Power Supply

V SOFTWARE IMPLEMENTATION

ARDUINO IDE:

Minimal Arduino C/C++ sketches, as seen by the Arduino IDE programmer, consist of only two functions.

• Setup (): This function is named once when a sketch starts after power-up or reset. The function is used to initialize input and output pin modes, variables and other libraries needed within the sketch.

• Loop (): After setup () has been called, function loop () is executed repeatedly within the main program. The function controls the board until the board is powered off or be reset.

This program uses the functions pin Mode (), digital Write (), and delay (), which are provided by the internal libraries included in the IDE environment.

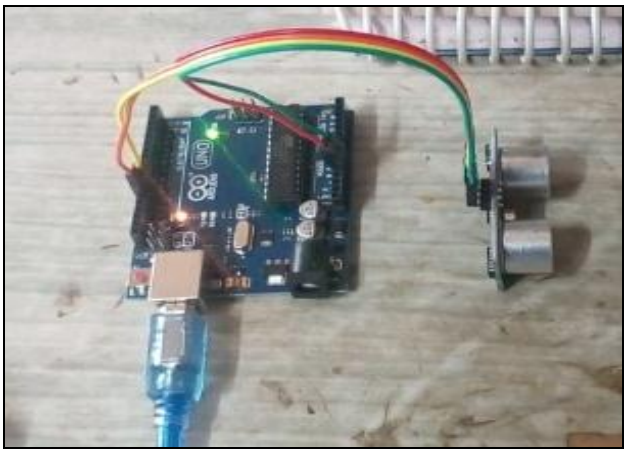
Programming language:

The programming language utilized in this project is PYTHON. It is a general purpose programming language we are using python for programming.

ThingSpeak: The ThingSpeak is an open source Internet of Things (IOT) application and Application Programming Interface to store and retrieve data from connected sensors and devices using the HTTP protocol over the web or via a Local Area Network. ThingSpeak allows the production of sensor logging applications, location tracking applications and a social network of things with status updates.

ThingSpeak was originally launched by ioBridge as a service in support of IOT applications in 2010. ThingSpeak has integrated support from the numerical computing software which is known as Matlab from MathWorks allowing ThingSpeak users to research and visualize uploaded data using it.

VI INTERFACING OF ULTRASONIC SENSOR WITH ARDUINO AND RESULT



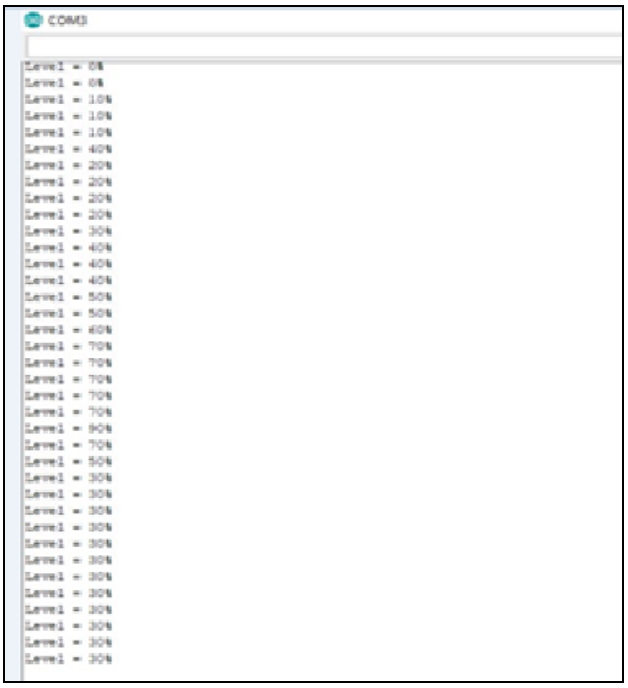


Fig 8: Interfacing Of Ultrasonic Sensor with Arduino

VII CONCLUSION

This paper is presented the development of IoT based water monitoring and control system. For this some sensors are used. The collected data from the all the sensors are used for analysis purpose for water supply distribution. The data is send to the cloud server with help of Wi-Fi module ESP8266. Water flow monitoring

and controlling system is recently concerned by IOT services which inspect remote pipelines, enhance their monitoring process and allow a real time controlling and adequate data processing.

VIII ACKNOWLEDGEMENT

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REFERENCES

[1] Pratika Bhondve, Nikita Chaudhari, Saloni Thakur, "IoT Based Water Management System Using Arduino", International Research Journal of Engineering and Technology (IRJET) Volume: 06 Issue: 06 | June 2019

[2] Pragati Damor, Kirtikumar J Sharma, "IoT based Water Monitoring System: A Review", International Journal of Advance Engineering and Research Development Volume 4, Issue 6, June -2017

[3]http://www.arduino.org/products/boards/arduino-uno

[4] https://en.m.wikipedia.org/wiki/ThingSpeak

[5] https://sunrobotics.co.in/sensors/water-flow-sensor-dn50-2

[6]https://components101.com/ultrasonic-sensor-working-pinout-datasheet

[7] https://www.hobbyist.co.nz/?q=iot-starter-kit