International Journal of Pure and Applied Mathematics
Volume 118 No. 20 2018, 9-14
ISSN: 1311-8080 (printed version); ISSN: 1314-3395 (on-line version)
url: http://www.ijpam.eu
Special Issue

ijpam.eu

IOT BASED WATER LEVEL MONITORING SYSTEM USING LABVIEW

[1]Charles A, [2]Ayylusamy C, [3]Deepak Raj J, [4]Keerthi Kumar, [5]Thiruvarasan KE
[1]Assistant Professor, Karpagam College of Engineering, Coimbatore, Tamil Nadu, India
[2,3,4,5]UG Students, Karpagam College of Engineering, Coimbatore, Tamil Nadu, India
[1]charlesindia@gmail.com

Abstract: In this paper we discuss the design and implementation of the IoT based system for management of the water distribution system in a large area. The monitoring of water tank is implemented with nodeMCU and Ultrasonic sensor. Water depth of the tank is measured by ultrasonic sensor. Hence the water level present in the tank is known. Depending on the sensor reading nodeMCU sends the data to Google cloud platform and we can retrieve the data from the webpage that will displays in LabVIEW front panel. Advantage of this system is it provides non-contact water level measurement using ultrasonic sensor and nodeMCU.

Keywords: Water level monitoring, Ultrasonic sensor, LabVIEW, NodeMCU ESP8266,DAQ 6009

1. Introduction

Almost one-fifth of the world's population, live in areas of water scarcity, and by 2025 water scarcity is expected to affect more than 1.8 billion people, hurting agriculture workers and poor formers. Water scarcity is among the main problem to be faced by many societies and the world in the 21st century. Water use has been growing more than twice the rate of population increase in the century. In such places, large storage tanks are used as intermediary buffers to smooth the water distribution and meet peak demands. In addition, most household and offices also have large local storage tanks to water supply.

During these days it is essential to keep overhead tanks in apartments, industries, high rise flats in order to store water and use. Here, from ground level water is pumped to overhead tanks according to water level requirement in the tank.

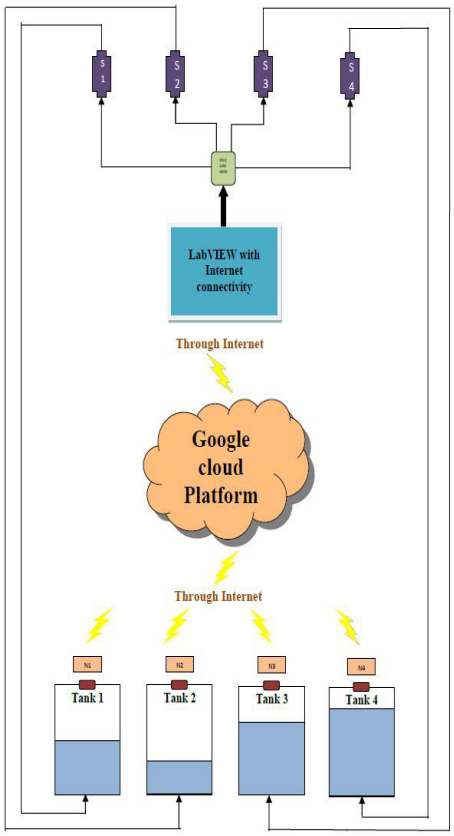
With the advent of the Internet of Things, the water distribution system is a natural choice for instrumentation with a network of sensors that can communicate with each other and gather data for analytics, so that more efficient distribution and management of water and its related assets is possible.

Our key contribution is a low cost ultrasonic sensor that can measure the water level of water in tanks up to a depth of 10 meter, In various overhead tanks and ground reservoirs across the remote locations.

2. Proposed System

In this the water is transferred to several tanks from the ground water or dam or any other larger water stored mediums. Where water to the tanks is pumped up by motor and each pumps connected to each tanks is provided with the solenoid valve. The solenoid valve which is used to control the water flow through the pumps to the tanks by giving electrical pulse to the valves. And where , Each tanks is connected to the separate IoT device and an ultrasonic sensor , where the ultrasonic sensors that measures the water level in the tanks and the data is passed to the IoT devices in the certain period of intervals. Then, the water level measured in the tanks that is in IoT devices is transferred to the google cloud platform, where the details of each tanks is updated in the cloud through the IoT devices. In the cloud the details such as the water level, the updated time of the data in the cloud is also displayed in a period of interval.

The LabVIEW which is a graphical medium interface where the setup of the tank with the solenoid valve is done . The system with the LabVIEW setup of tank is connected to NI DAQ 6009, each pin's in the NI DAQ 6009 acts as input where the pins are connected to the valves of the pump . On knowing the water level of the each tanks through the cloud, we can adjust the valves in the LabVIEW and control the water flow through the required tank pump in the real world with the help of NI DAQ 6009.



3. Components Description

3.1.1 NodeMCU

NodeMCU is one of the open source IoT platform. It consists of wireless firmware which runs in the ESP8266 SoC from Espress if systems, and hardware that's based at the ESP-12 module. The time period "NodeMCU" wich the aid of default refers to the wi-firmware in place on the kits. The wi-firmware uses the Lua scripting language. it's miles primarily based at the assignment, and constructed at the Express if Non-OS SDK for ESP8266. It makes use of many open supply projects, such as spiffs. NodeMCU was created after some time the ESP8266 got here out. The ESP8266 is a System on chip integrated with a Ten silica Xtensa LX106 middle, widely utilized in IoT applications. NodeMCU announced on 13 Oct 2014, then dedicated the first wireless of nodemcu-wireless firmware .After some months later, the project expanded to consist of an open-hardware platform whilst developer dedicated the gerber wi-fi of an ESP8266 board, named devkit v0.9. some other important replace become made on 30 Jan 2015, whilst Devsaurus ported the toNodeMCU undertaking, permitting NodeMCU to effortlessly drive to app.

Figure 2. NodeMCU Module.

3.1.2 Ultrasonic Sensor

Ultrasonic Sensing/ manipulate basics An Ultrasonic sensor is a device that can measure the distance by using sound waves. It measures distance by sending out a sound wave at a specific frequency which transducers have piezoelectric crystals which resonate to a desired frequency and convert electric power into acoustic power. And then transmitted inside the shape of a cone, are think about something from a goal again to the transducer. An output signal is produced to perform a few sort of indicating or manipulate function. A small distance from the sensor is needed to offer a delay so that the “echoes” can be interpreted. The targets would have any kind of reflective shape – even round objects. Which are a noncontact type water level measurement sensor and the measurement ranges from 2cm-4m. The transmitter transmits ultrasonic wave when the wave hits the obstacle it get reflected back and received at receiver and they are convert to electric wave. Output of sensor is in term of centimeter or inches. Operating voltage is 5V with 40Hz frequency.

Figure 3. Ultrasonic Sensor.

3.1.3 LabVIEW

Virtual Instrument Engineering Workbench (Lab VIEW)is developed by National Instruments..This is a system-design platform and we can develop the program and we can simulate and visual as graphical . LabVIEW front panel :

The Controls palette contains the controls and indicators we use to create the front panel. we access the Controls Palette from the front panel window by selecting View and Controls Palette Numeric Controls and Indicators The numeric data type can represent numbers of various LabVIEW front panel :Block diagram objects include terminals, subVIs, functions, constants, structures, and wires, which transfer data among other block diagram objects. LabVIEW includes supporting drivers for interfacing to devices, instruments, camera, and other devices. We can interface with the hardware by witting direct bus commands drivers and that provide native LabVIEW function nodes for controlling the device. National Instruments which has thousands of device drivers available for download on the NI Instrument Driver Network (IDNet).

3.1.4 DAQ (USB-6009)

The USB-6009 is a low-cost, multifunction DAQ device. It offers analog Input and Output, digital Input and Output, and a 32-bit counter. The USB-6009 provides basic functionality for applications such as simple data logging, portable measurements, and academic lab experiments. This USB-6009 features for a lightweight mechanical enclosure with this bus powered for easy portability. We can easily connect sensors and signals to the USB-6009 with screw-terminal connectivity. The included NI-DAQmx driver and configuration utility simplify configuration and measurements.

Figure 3. DAQ (USB-6009).

4. Labview Structure For Receiving Data From Cloud Server

4.1 LabVIEW front panel

The tank system was controlled with a personal computer. This computer was equipped with a National Instruments, NI, DAQ data acquisition card and the LabVIEW graphical programming language. The data acquisition card used was the NI DAQ USB-6009. This combination of hardware and software made it easy to focus on building the programs necessary to control the tank system.

4.2 LabVIEW block diagram

In this block diagram the level of water is shown by graphically on continuous function in LabVIEW .If the tank gets lower level of water, we should switch on the solenoid valve to tank gets high water level from lower level. The solenoid valve is gets turned ON by USB-6009(DAQ Assist) with LabVIEW the major function of DAQ is sending digital pulse to the solenoid to switch ON. When tank is gets upper water level.

5. Advantages

1) Reduce the wastage of energy.
2) Reduce the wastage of water.
3) Reduce physical efforts.
4) Reduce maintenance.

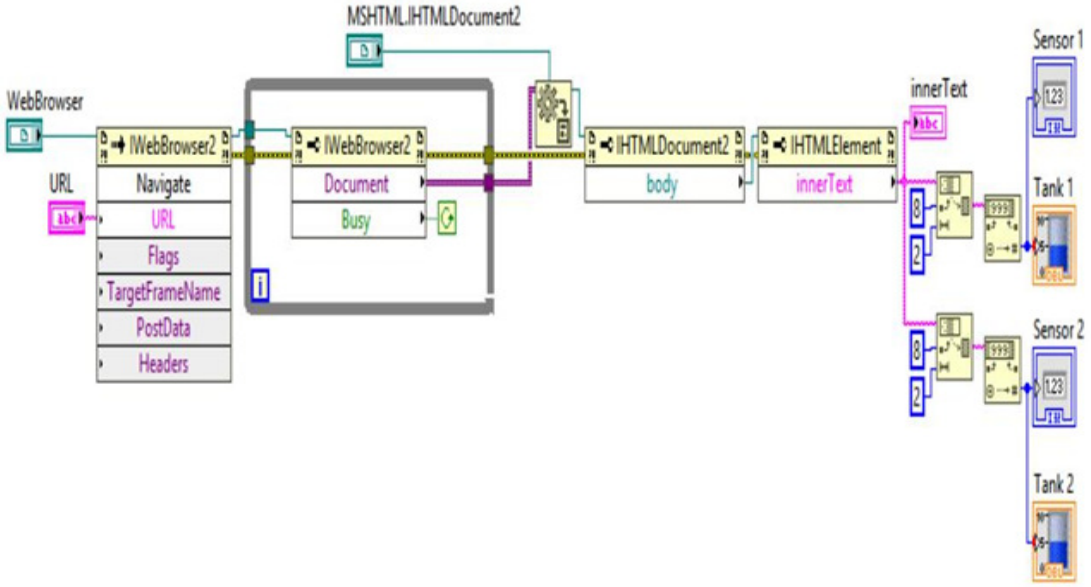


Figure 4. Block Diagram

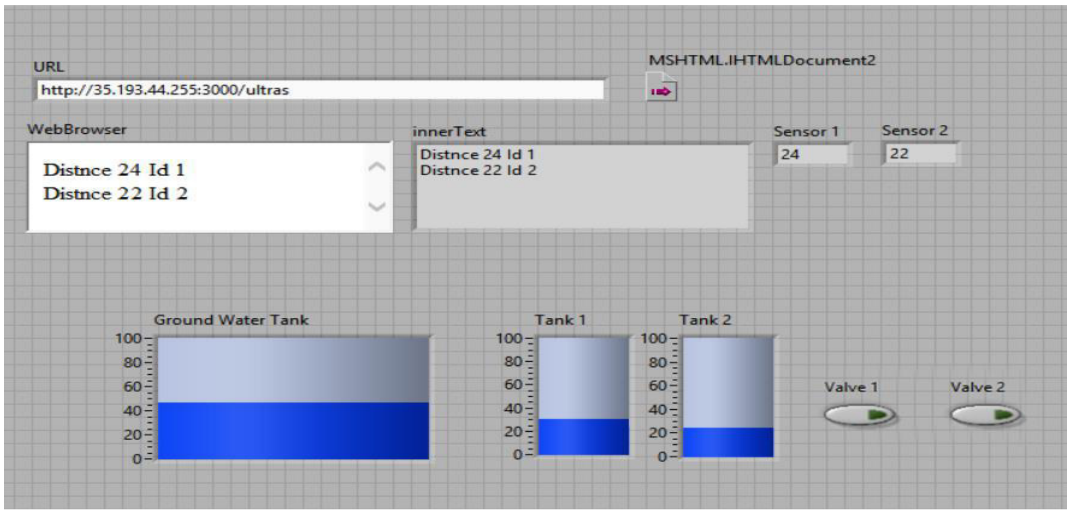


Figure 5. Front Panel

5. Conclusion

Thus we conclude that the design of IoT based water level monitoring using ultrasonic sensor, NodeMCU and LabVIEW has been achieved. This model can be used in various applications like factories, apartments, colleges and in agriculture. There may be other software used for designing this model but LabVIEW is the simplest of them all.

References

[1] S. M. Khaled Reza, Shah Ahsanuzzaman Md. Tariq, "Microcontroller Based Automated Water Level Sensing and Controlling: Design and Implementation Issue", Proceedings of the World Congress on Engineering and Computer Science 2010 Vol I WCECS 2010, October 20-22, 2010, San Francisco, USA.

[2] Neena Mani, Sudeesh T.P, Vinu Joseph, Titto V.D, Shamnas P.S, "Design and Implementation of a

Fully Automated Water Level Indicator", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering 2014 Vol 3 Issue 2, February 2014.

[3] International journal of advanced research in computer and communication engineering Vol 1, Issue 8, October 2012. International journal of emerging technology and advanced engineering (ISSN 2250-2459) Volume 4, Issue 3, March 2014.

[4] Priya B. Patel, Viraj M. Choksi, Swapna Jadhav, M.B. Potdar, PhD(2016) "Smart Motion Detection System using Raspberry Pi", International Journal of Applied Information Systems (IJAIS), Vol10 – No.5, February 2016.

[5] P.Mukesh Aravind, S.Sukhumar,C.Karthik, M. Jagadeeshraja, L.Manivannan, Dr.N.Suthanthira vanitha., "PLC Based Automation Corporation water Distribution System Using Solar Energy". Publised by international journal of engineering research & technology, volume 2.

[6] Wai Zhao, Jayanand Jegatheesan and Son Chee Loon(2015) Exploring "IOT Application Using Raspberry Pi, InterCheanational Journal of Computer Networks and Applications",Vol 2, Issue 1, January - February,2015.

[7] Jadhav, G. J(2014), "Design and Implementation of Advanced ARM Based Surveillance System using Wireless Communication, International Journal of Advance Research in Computer Science and Management Studies"Vol 2,2014.

[8] Carey Williamson, "Introduction to LabView Programming Including Arduino Toolkit".

[9] Davande V.M., Dhanawade P.C. and Sutar V.B., 2016. Real Time Temperature Monitoring Using LABVIEW and Arduino Vaibhav, Int. J. Innov. Res. Comput. Commun. Eng., 4:3409–3415, doi:10.15680/IJIRCCE.2016.

[10] Jena S.P., Aman S. and Das R., 2015. Computerized Green House Data Acquisition System Using Arduino with LabVIEW, pp.2350–2357.

[11] S.V.Manikanthan and T.Padmapriya "Recent Trends In M2m Communications In 4g Networks And Evolution Towards 5g", International Journal of Pure and Applied Mathematics, ISSN NO:1314-3395, Vol-115, Issue -8, Sep 2017.

[12] T. Padmapriya and V. Saminadan, "Inter-cell Load Balancing technique for multi-class traffic in MIMO-LTE-A Networks", International Journal of Electrical, Electronics and Data Communication (IJEEDC), ISSN: 2320- 2084, vol.3, no.8, pp. 22-26, Aug 2015.

[13] Arunkumar, T.S. Sivakumaran, K. Ramash Kumar, "Improved Performance of Linear Quadratic Regulator plus Fuzzy Logic Controller for Positive Output Super Lift Luo-Converter," Journal of Electrical Engineering, Vol. 16, Edition:3, 2016, pp. 397-408.