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VIRTUAL INSTRUMENTATION

EEE4035

PROJECT REPORT FILE

Under the Guidance of

Prof. Dr. Jaganatha Pandian B.

HARDAWRE BASED WATER LEVEL MONITORING USING LABVIEW

TEAM:

HARSH KUMAR (20BEI0088)

PRAKHAR RAI (20BEE0082)

UJJAWAL TRIPATHI (20BEI0012)

Abstract

This paper presents the water tank depth sensor system design for measurement of water level using Arduino software. Here we used a float to measure the water resistance, and from that measurement it calculates how full the tank is. This sensor switches ON the pump when the water level in the tank goes low and switches it OFF as soon as the water level reaches a pre- determined level. The sensor analog output is fed to the Arduino board as an input signal. The Arduino then reads the height of the water and reports the depth of the tank.

The same program is interfaced with LabVIEW and in the front panel of LabVIEW which we can visually see the level of water tank and how the motor is ON and OFF depend on the water level requirement.

PROBLEM STATEMENT

Most residential areas face the problem of running out of water and wastage/overflow of water in water tanks due to uncontrolled and unchecked supply of water. It becomes difficult for consumers to estimate the level of water in tanks. When the pump is left ON, they usually do not realize that the water tank is filled and in fact is spilling, which results in wastage of a precious resource.

Water is a precious resource in most parts of the world and many people rely on water tanks to supplement their water supply by storing collected rainwater or water pumped from a well or bore. But how do you measure how full a tank is? Tanks are constructed of opaque material to prevent algae growth and are often kept closed up to prevent mosquito infestation or access by rodents, so it's inconvenient to physically look inside. And besides, having a way to measure tank depth electronically opens a world of possibilities, such as automatic control of pumps to fill tanks when they get low or to disable irrigation systems when not enough water is available.

Water level indicator and control system is used to solve these issues associated with water storage and consumption. It will also allow to check the level of water using sensor so that whenever the water level drops, pump gets turned ON automatically. Not only that, whenever there is an overflow condition sensed by the sensor in the tank, the pump gets turned off automatically. This system monitors and controls water consumption data and aims to prevents wastage of water.

LITERATURE REVIEW

We referred the following papers to do a literature survey on previously existing solutions and technologies:

1. Variety of controlling systems are introduced in E. V. Ebere and O. O. Francisca, “Microcontroller based Automatic Water level Control System” and “S. Pudasaini, A. Pathak, S. Dhakal, and M. Paudel, “Automatic Water Level Controller with Short Messaging Service (SMS) Notification,” to overcome the problem and to automatically pump up and control the water level in the overhead tank like a microcontroller based automatic water level control system using AT89C52 microcontroller.

2. Authors in A. A. M. Eltaieb and Z. J. Min, “Automatic Water Level Control System,” an automatic water level controller is developed and implemented. Arduino Uno has been chosen to automate the process of water pumping. Water level detection in both source and overhead tanks, switch on/off the pump accordingly are the main controlling signals the circuit. Liquid Crystal Display (LCD) display is used to show important data.

3. Water Level Monitoring System using IOT by Priya J, Sailusha Chekuri. This method helped us to understand the use of Bluetooth modules and how it can be made as portable device.

4. “Microcontroller Based Automated Water Level Sensing and Controlling: Design and Implementation Issue” proposes Liquid Crystal Display (LCD) display use to show important data and interfacing via a microcontroller to manipulate data.

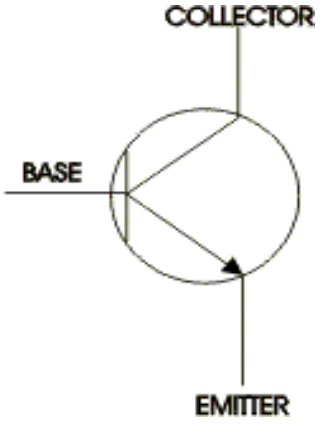
COMPONENTS USED:

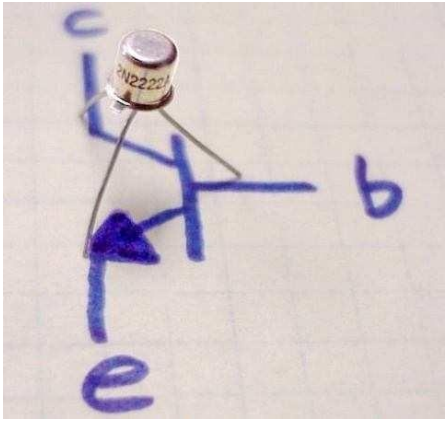
2.1 SUBMERSIBLE PUMP:

A submersible pump (or electric submersible pump (ESP)) is a device which has a hermetically sealed motor close-coupled to the pump body. The whole assembly is submerged in the fluid to be pumped.

2.2 TRANSISTOR:

The transistor is the fundamental building block of modern electronic devices, and is ubiquitous in modern electronic systems. Transistors are manufactured in different shapes but they have three leads (legs). They are Base, Emitter and Collector. The diagram below shows the symbol of an *NPN* transistor.





2.3 RESISTOR:

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. The current through a resistor is in direct proportion tothe voltage across the resistor's terminals. This relationship is represented by Ohm's law:

$$I = \frac{V}{R}$$

T0-220

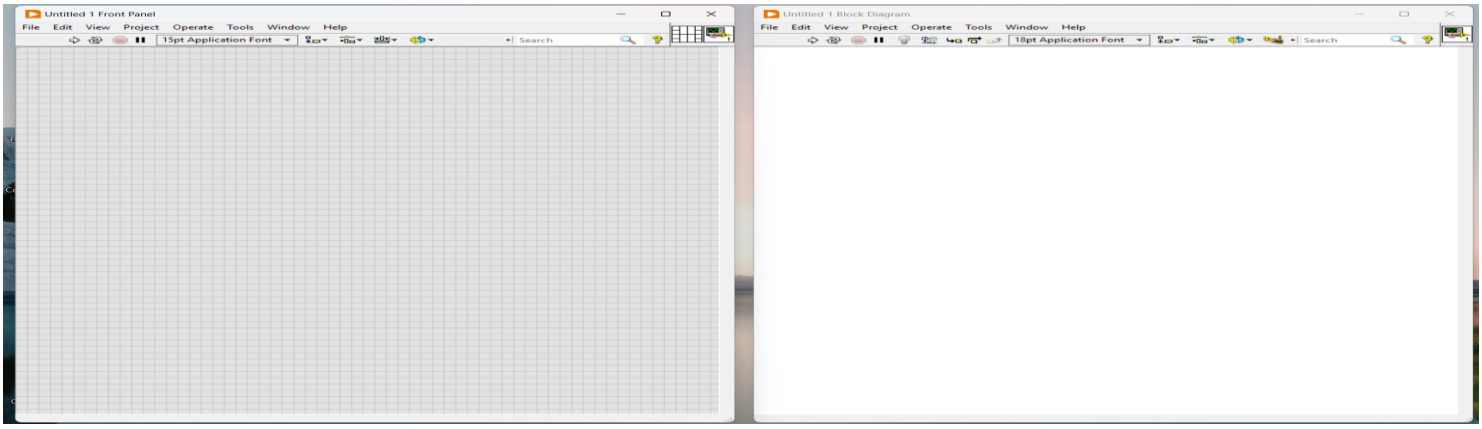
2.4 WATER TANK:

A water tank is a container for storing water. The need for a water tank is as old as civilized man, providing storage of water for drinking water, irrigation-agriculture, fire- suppression, agricultural farming both for plants and livestock, chemical manufacturing, food preparation as well as many other applications.

2.5 Jumper wire

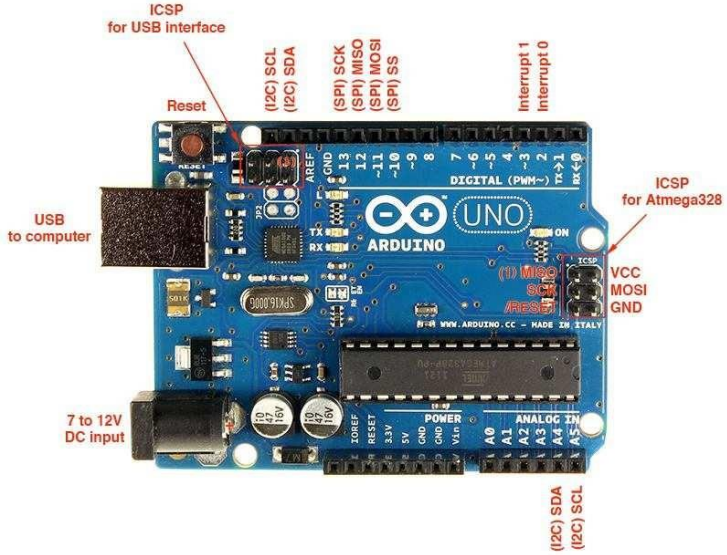
LABVIEW

LabVIEW is a graphical programming language for instrumentation, data-acquision & analysis, automation & control and communication. LabVIEW is a program development application, much like various commercial C/C++, FORTRAN or BASIC development systems.



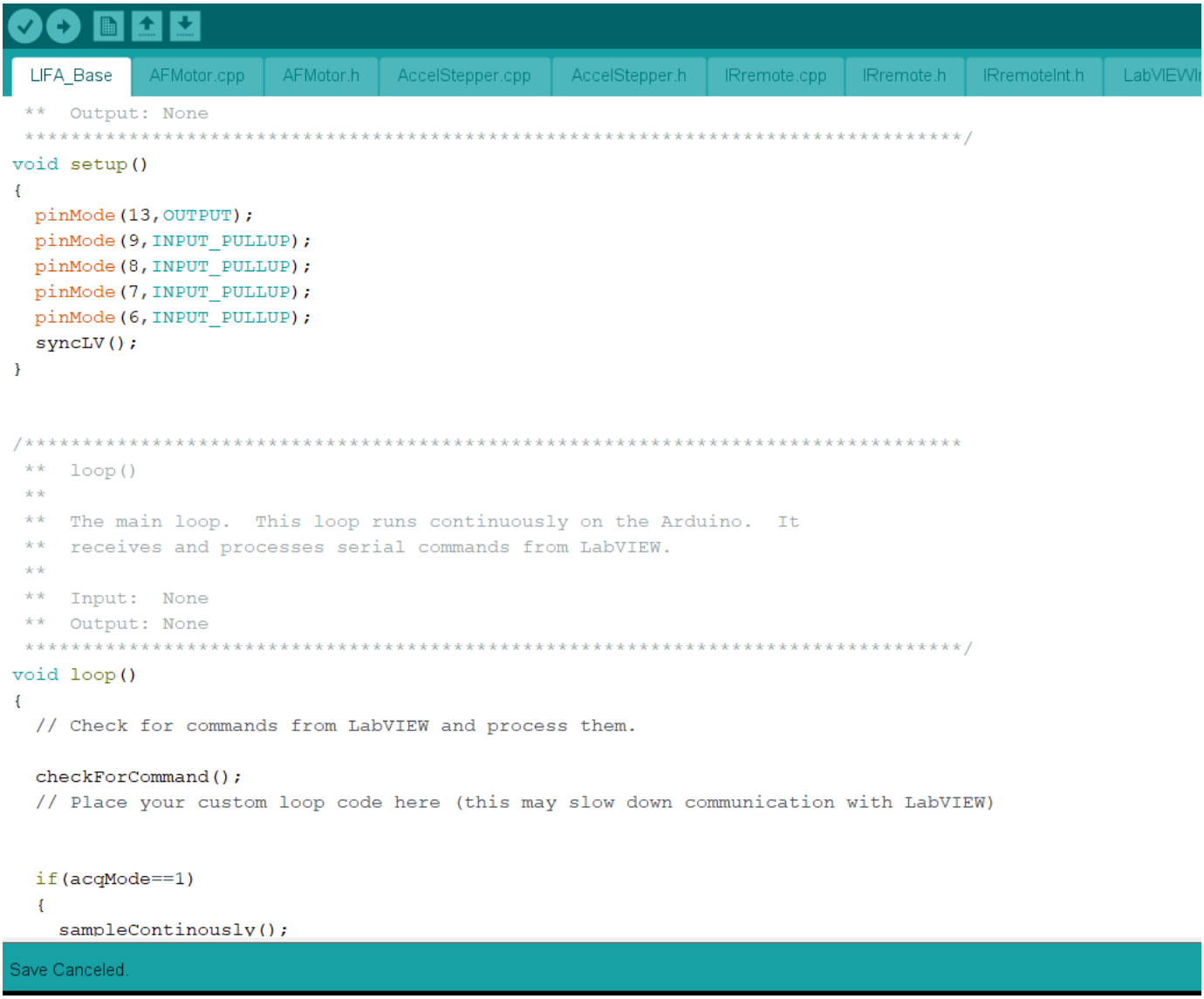
ARDUINO

Arduino is an open-source single-board microcontroller, descendant of the open-source Wiring platform, designed to make the process of using electronics in multidisciplinary projects.



SOFTWARE:

The Arduino integrated development environment (IDE) is a cross-platform application written in Java, and is derived from the IDE for the Processing programming language and the Wiring projects.



LABVIEW ARDUINO INTERFACE

The LabVIEW Interface for Arduino (LIFA) provides an interface between LabVIEW and an Arduino. LIFA was developed and tested using an Arduino Uno but should work with most Arduino compatible hardware.

ARDUINO FIRMWARE:

After installing LIFA, the Arduino firmware can be found in **<LabVIEW>\vi.lib\LabVIEW Interface for Arduino\Firmware\LIFA_Base\LIFA_Base.ino**. The firmware consists of two main functions:

```
syncLV()
```

syncLV() is called in the setup function and establishes the connection between the Arduino andLabVIEW. This function should only be called once when the Arduino boots.

```
Check For Command();
```

Check For Command() is called repeatedly inside the main loop of the Arduino sketch. This command checks the Arduino serial buffer for data from LabVIEW. If a full packet is available this command will process the packet and send the appropriate response to LabVIEW.

DESIGN DETAILS

CHECKING SERIAL PORT OF ARDUINO:

MY COMPUTER

⇩

MANAGER

⇩

DEVICE MANAGER

⇩

SERIAL PORT

⇩

COM

⇩

SCAN

⇩

UPGRADE DRIVER

⇩

SAVE

STEPS FOR CODING:

MY COMPUTER

⇩

PROGRAM FILES

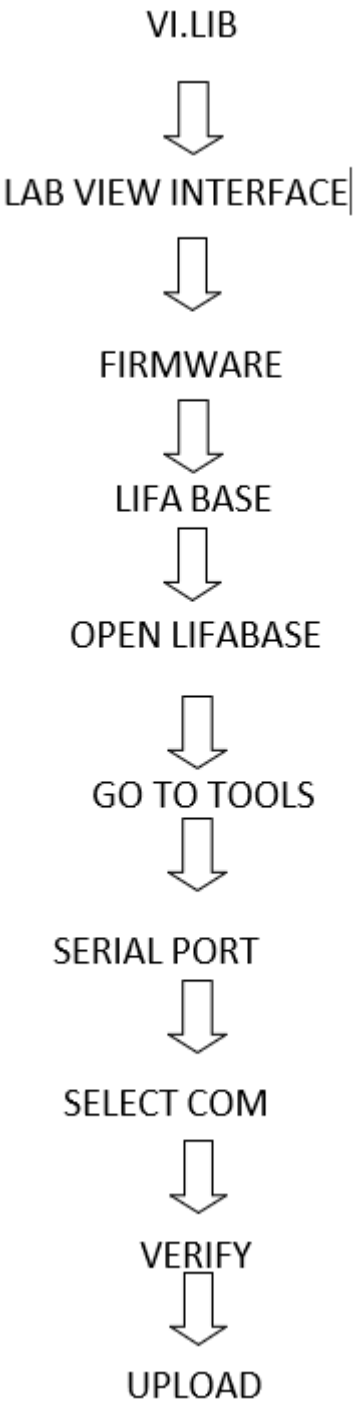
⇩

NATIONAL INSTRUMENTS

⇩

LAB VIEW 2012

⇩

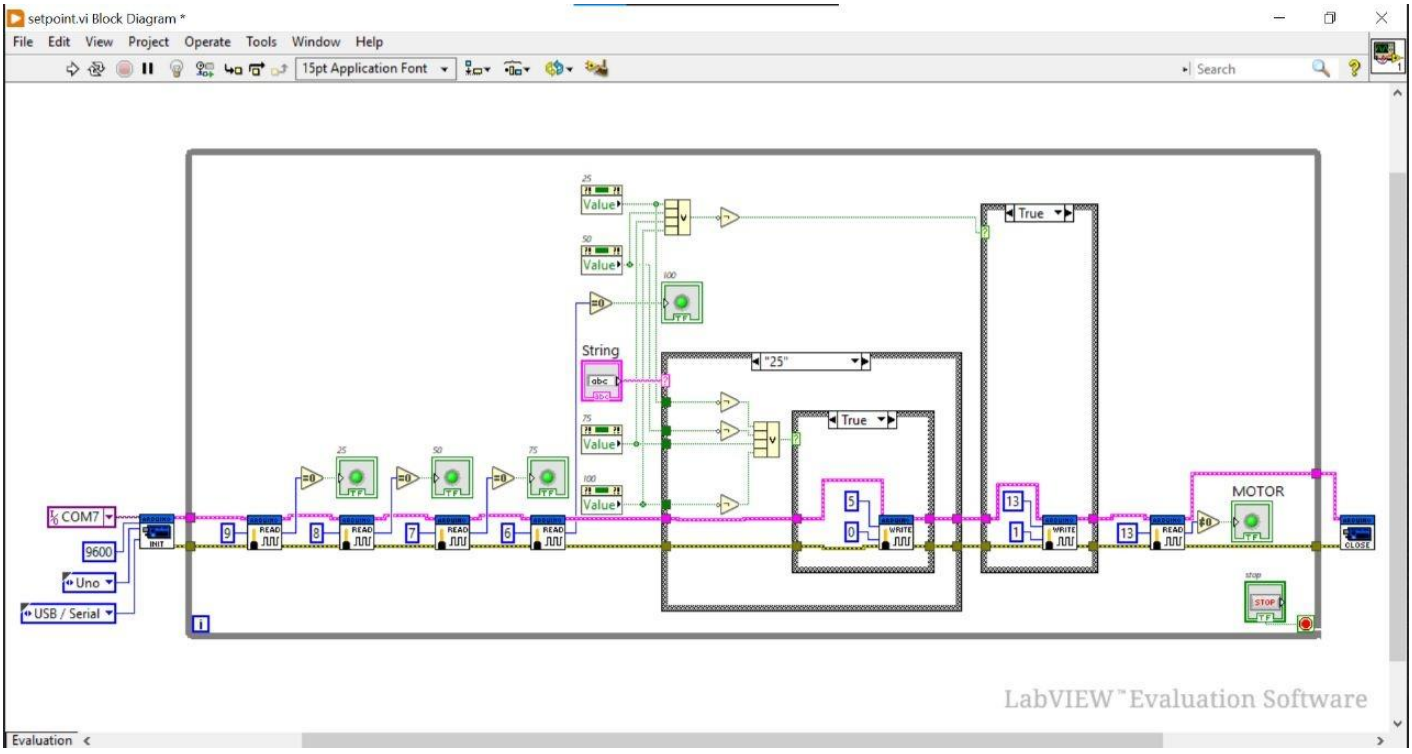

VI.LIB
LAB VIEW INTERFACE
FIRMWARE
LIFA BASE
OPEN LIFABASE
GO TO TOOLS
SERIAL PORT
SELECT COM
VERIFY
UPLOAD

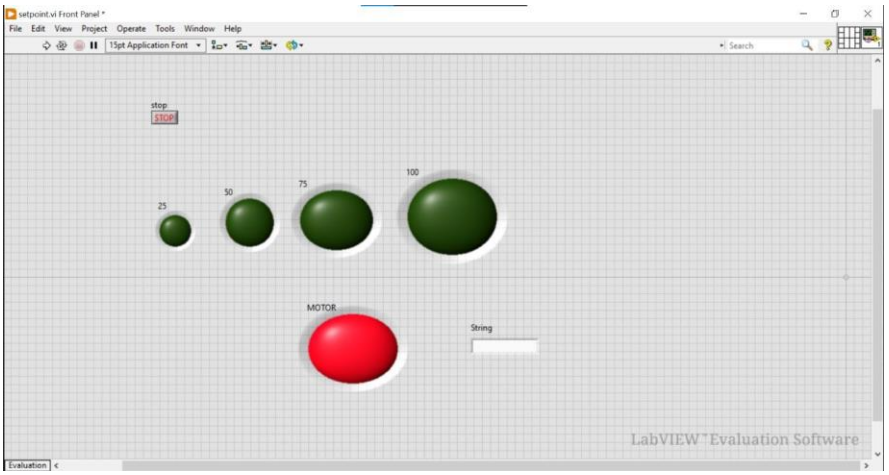
WORKING MECHANISM:

LabVIEW is a software installed in a PC or LAPTOP with Arduino interface. The float senses the water level and gives reference voltage to arduino. This reference voltage is the water level of the tank. This signal is fed to the LabVIEW as an input, there the signal is compared with minimumand maximum levels.

The output of LabVIEW is fed to the digital write of Arduino as a input signal. The output of digital write is given as a signal to the base of transistor. The transistor controls the relay based on the signal, the relay turns ON and OFF themotor based on the level of water. The pump turns ON when the water level is low and turns OFF when the water levelreaches to a maximum level. Again, the pump turns ON when the water level reaches to a minimum level.

SIMULATION





HARDWARE CIRCUIT:

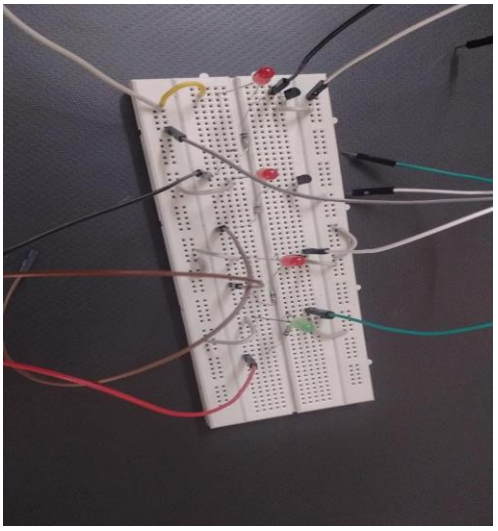


Fig 7.2 Hardware circuit

ADVANTAGES AND APPLICATIONS

ADVANTAGES:

- No Man power required to operate, as fully automatic
- Easy installation and Low maintenance
- Advance Technology and simple to use
- Saves water, motor and energy

APPLICATIONS:

Automatic Water level Controller for Hotels, Factories, Homes Apartments, colleges, Commercial Complexes, etc., It can be fixed for single phase motor, Single PhaseSubmersibles, open well, Bore well and Sump. Many models available

in different ranges.

FEATURES COVERED:

This project deals how to control the water level automatically by using labview and arduino. Hence, we have an automatic water level controller with the following features:

- No Man power required to operate, as fully automatic
- Easy installation and Low maintenance
- Advance Technology and simple to use

9.2 SCOPE FOR FUTURE WORK:

1. Facilitating the replacement of multiple MOSFET switches in parallel with a single (less expensive) IGBT, without a compromise of the switching frequency. The design conceptsdeveloped were then extended to the design of active clamp fly-back this can be used for many applications.
2. The active-clamp switch "on-time," might further improve converter efficiency and also "self-driven" active-clamp switches might reduce costs associated with the extra control circuitry these networks require.

REFERENCE:

[1] Ebere, E.V. and Francisca, O.O., 2013. Microcontroller based automatic water level control system. International Journal of Innovative Research in Computer and Communication Engineering, 1(6), pp.1390-1396.

[2] Pudasaini, S., Pathak, A., Dhakal, S. and Paudel, M., 2014. Automatic water level controller with short messaging service (SMS) notification. International Journal of Scientific and Research Publications, 4(9), pp.1-4.

[3] Eltaieb, A.A.M. and Min, Z.J., 2015. Automatic water level control system. Int. J. Sci. Res, 4(12), pp.1505-1509.

[4] Priya, J. and Chekuri, S., 2017. water level monitoring system using IoT. International Research Journal of Engineering and Technology (IRJET), 4(12), pp.1813-1817.

[5] Reza, S.K., Tariq, S.A.M. and Reza, S.M., 2010, October. Microcontroller based automated water level sensing and controlling: design and implementation issue. In Proceedings of the world congress on engineering and computer science (Vol. 1, pp. 20-22).

VIDEO LINK of RESULTS:

VIRTUAL INSTRUMENTATION COURSE PROJECT: HARDWARE BASED WATER LEVEL MONITORING SYSTEM USING LABVIEW - YouTube