Automatic Water Dispenser Using IOT

SALONI M. KHAPEKAR[1], GAURAW S. WANDILE[2], CHAITALI S. SARVE[3], BHAVNA S. HARINKHEDE[4], SNEHA M. KHOBRAGADE[5], PROF. NISHA K. WARAMBHE[6]
[1, 2, 3, 4, 5, 6] *Priyadarshini JL College of Engineering*

Abstract*— As our previous paper we know that water is one of the essential elements that a living being need to keep healthy. Human indeed needs to consume a minimum of 4L water a day to stay dehydrated and healthy. When it comes to healthcare, water quality must be of per amount importance. Especially, among those who are immunocompromised and those high dependency patients in critical care units. We are familiar with the term "Automatic", these days we want each and every gadget of ours to be automatic. The device automatic water dispenser is a machine that helps to reduce the work done manually in terms of water supply. When it comes to dialysis patients, they require a limited amount of water after dialysis. With the help of this dispenser, patients gets limited amount of water as they suggested by the doctor after dialysis. The entire sequence of operation is controlled by an Arduino Uno. Nozzle is fabricated for the water to dispense from the tank. Hardware design using Arduino and other hardware components such as LCD, relay, ultrasonic sensor, flow sensor, RFID sensor, etc.

Index Terms*— RFID sensor, relay, LCD, ultrasonic sensor.

I. INTRODUCTION

In a day to day life water is very essential for public, for patients they need limited amount of water. This project titled automatic water dispenser using IOT is a modern approach to the conventional water dispenser. The people who suffer from diabetes after dialysis they need water. Normally they require 1000 ml of water in a day and at a time they should drink 100ml of water at a time. If patients do not get water in correct amount then they face problem and sometimes they get overdose of water.

To overcome this we are making Automatic Water Dispenser using IOT without touching faucet/ nozzle. With the help of this dispenser they can drink limited amount of water at a time. For different patients we can set different limit of water as suggested by doctor. In this system we are using ultrasonic sensor to detect the glass, bottle, or container. It can sense up to 10-15cm distance of container. We are using flow sensor connected to the relay to control the water level.

The water pump used to pump the water from tank. LCD is used to provide various messages to the patients. With the help of this component the message which display on LCD patients know what the procedure is proceed in device. The main component of our project is RFID sensor. RFID stands for Radio Frequency Identification. It is an automatic identification technology used from or storing data on to RFID tags without any physical contact.

An RFID system primarily comprises of RFID tags, RFID reader, Middleware and a Backend database. RFID tags are uniquely and universally identified by an identification sequence. The operational frequency of the RFID card ranges from 125 kHz to 2.4 GHz. We are using RFID sensor to identify the patients and provide the efficient amount of water.

II. LITERATURE SURVEY

In[1] Amrith Poonacha M, Bharath M G, Chandraprakash P, Mahesh Kulakarni, Rakshith Gowda H proposed Automatic Liquid Dispenser based on User Quantitative Demand. In this it aims at the user specified the fluid and its quantity from the dispenser. The entire sequence of operation is controlled by a microcontroller Arduino Uno Atmega 328p. Electromagnetic valve i.e. solenoid valve is fabricated for the liquid to dispense from the tank. This project is simulated using software tool called proteus8 ISIS professional and then further it is being implemented into hardware design using Arduino and Other hardware components.

In[2] Mr. Akash Chowdry, Mr. Prathap S Gautham, Dwarakanath S K proposed Automatic Water Dispenser. In this system they use proximity switch which is connected to a relay which controls the water

solenoid which acts as a valve to control the water flow to the tap.

In [3] Diksha P. Lanjewar, Sayali A. Wanjari, Prachi P. Kuthe, Poonam P. Danao, Khushbu Patil proposed RFID Card and Coin Based Water Dispensing Machine. This paper includes water dispensing machines which is an integrated system. This machine can operated by coin as well as card in order to dispense required amount of water. This system is based on RFID card and coin detection system in which if any card or coin is detected then water or any liquid will get dispensed from the nozzle.

In [4] Mohita Parashar, Roopa Patil, Siddharth Singh, Vipul VedMohan, K.S. Rekha proposed Water Level Monitoring System in Water Dispensers using IOT. In this project main concentration is to manage the water dispensers by measuring the water levels. The system monitors the water dispensers by ultrasonic sensors placed over the dispensers and compare the level with threshold volume of the dispenser and then informs about the level of water left in the water dispenser via a mobile application to administrator.

In [5] Yudi Kristyawan, Zahid Faizal Kholil proposed Automatic Water Dispenser based on hand Gesture detection Using Arduino. This study aims to make an automatic water dispenser wo several amps.ithtout touching the faucet. The position of glass is validated by the ultrasonic sensor HC-SR04 and water will flow for 30 seconds into the glass. The entire input and output process is controlled using Arduino.

III. PRINCIPLE OF WORKING

We are making an Automatic Water Dispenser Using IOT for dialysis Patients. When the device starts, first of all message appears on the LCD that “Welcome Water Dispenser” and then “Place the Bottle, Tap RFID card”. After placing the bottle the ultrasonic sensor will detect the bottle and display the message “Bottle is detected”. After that another message will be display “Tap the RFID card”. When we tap the card to the RFID reader it will detect the card and send the signal to Arduino. Then water will pour in the bottle. The internal working of this device is it turn on the relay by sending the signal form Arduino and start the motor pump. The motor will pump water by setting the limit of water using the water flow sensor. Water flow will flow only the limit amount of water which patients require. If Arduino does not get signal relay will remain off and further procedure will not proceed. If we do not place the bottle and tap the RFID card then device will not be able to pour the water and “Bottle not detected” message will display on LCD. When we place the bottle then only water will pour otherwise not.

Only 100ml water will be poured at a time. A patient will get water only 3-4 times a day. If a patient exceeds the limit and taps the card then a message of limit exceeded will appear on LCD and water will not be poured. If RFID card is not detected or not accessible then unauthorized card will be declared.

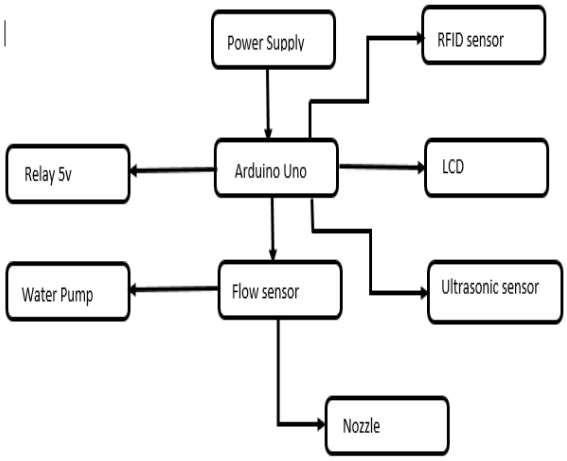


Fig. Block diagram of Automatic Water Dispenser using IOT

Component Used:

- Arduino Uno
- Relay 5v
- Water Pump
- Ultrasonic sensor
- I2C LCD
- RFID Reader and Card
- Water Flow Sensor
- Adaptor 5v
- Water Tank
- Pipe
- Nozzle

Arduino Uno:

Arduino Uno is a microcontroller board based on the ATmega328p. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 M, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to -DC adaptor or battery to get started. In this the whole device is controlled by Arduino as they sends signal to various components to proceed further.

Relay 5v:

A 5v relay is an electromechanical switch that is activated by applying a 5-volt signal to its control input. It's commonly used in electronics projects to control higher voltage/ current circuits with a lower voltage signal. The coil of the relay operates on 5 volts. Relay come in various configurations, but a typical 5v relay can switch AC or DC loads ranging from a few milliamps to few amps. Arduino sends the signal and then it turn on the motor to pump the water.

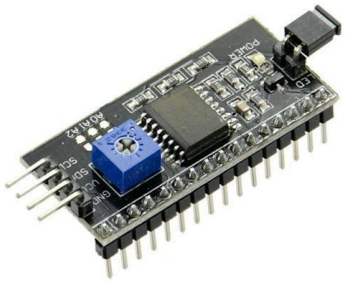
Water Pump:

DC water pump is a small electric water pump motor that powered by a 24v, 12v, 5v, 6v, or 3v direct current power supply, solar panel or battery. It use centrifugal force to pressurize, transfer or circulating water or other liquids. Compared with AC water pumps driven by 120v, 220v, 240v, 380v AC motors, DC water pump has advantages of low price, safety, high efficiency, low noise, portable, etc. As a low voltage electric water pump, DC water pumps are widely for applications that requires safety, quiet, low power consumption. We are using 5volt DC pump that depends on the relay which get on then they start the motor to pump the water. Motor pump the water to the flow sensor then further procedure proceed.

Ultrasonic Sensor:

An ultrasonic sensor is a device that measures the distance to an object by emitting ultrasonic sound waves and then calculating the time it takes for the waves to bounce back. They work by emitting ultrasonic pulses and then detecting the reflected signal. The time between emission and reception is used to calculate the distance to the object. In this ultrasonic using for detecting the bottle, glass or container.

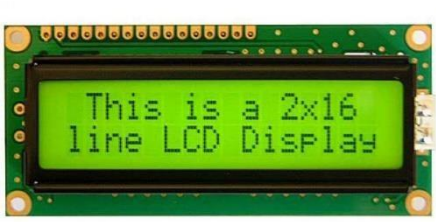
I2C:



I2C, or Inter-Integrated Circuit, is a widely used serial communication protocol that allows multiple devices to communicate with each other using a two-wire bus. It was developed by Philips (now NXP Semiconductors) and is commonly used in various electronic systems for communication between microcontrollers, sensors, actuators, and other integrated circuits. I2C uses two lines for communication: SDA (Serial Data Line) and SCL (Serial Clock Line). These lines facilitate bidirectional data transfer and clock synchronization between devices on the bus.

The I2C bus typically operates in a master-slave configuration. One device (the master) initiates and controls the communication, while other devices (slaves) respond to the master's commands or send data when requested.

LCD:



LCD stands for Liquid Crystal Display, and it is a type of flat-panel display technology that uses liquid crystals sandwiched between two layers of glass or plastic to create images. LCDs are widely used in a variety of devices, including computer monitors, television screens, digital signage, and various handheld devices. LCDs consist of several layers, including two layers of glass or plastic substrates, a layer of liquid crystals, and polarizing filters. The liquid crystals are manipulated to control the passage of light through the display. The term "liquid crystal" refers to a state of matter that has properties of both liquids and solids. The molecules in the liquid crystal layer can be aligned or manipulated to control the transmission of light.

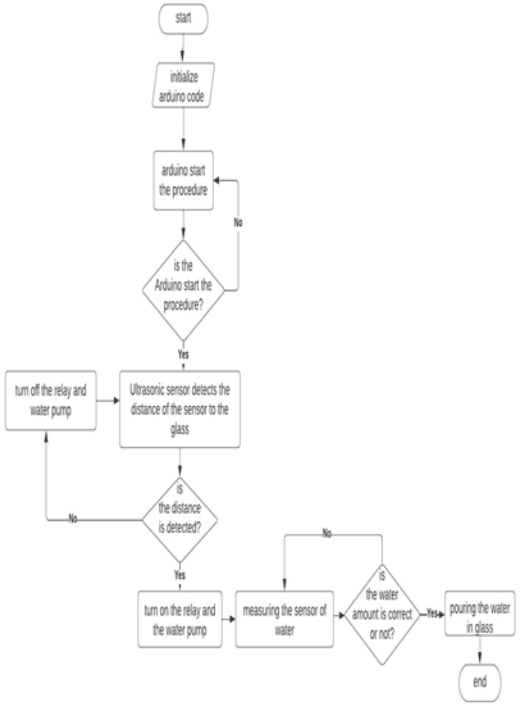
RFID reader and Card:

RFID (radio frequency identification) is a form of wireless communication that incorporates the use of electromagnetic or electrostatic coupling in the radio frequency portion of the electromagnetic spectrum to uniquely identify an object, animal or person. Every RFID system consists of three components: a scanning antenna, a transceiver and a transponder. When the scanning antenna and transceiver are combined, they are referred to as an RFID reader or interrogator. There are two types of RFID readers -- fixed readers and mobile readers. The RFID reader is a network-connected device that can be portable or permanently attached. It uses radio waves to transmit signals that activate the tag. Once activated, the tag sends a wave back to the antenna, where it is translated into data. An RFID card, also known as a proximity card or access card, is a small-sized card embedded with an RFID chip. RFID technology uses radio frequency waves to transmit data wirelessly between the card and an RFID Reader, allowing for contactless communication. These cards are widely used for various applications, including access control systems, attendance tracking, payment systems, and asset tracking.

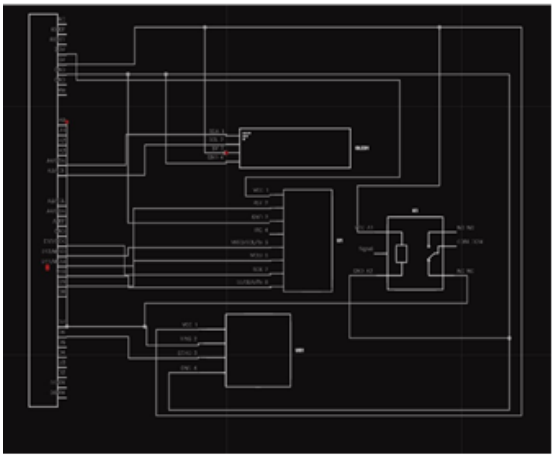
Water Flow Sensor:

YF-S201 is a water sensor technically designed to measure the flow rate and volume of the desired fluid through the pipelines. It is a low-cost water flow sensor that consists of a copper body and water rotor. In addition to this, it also contains an internal circuit of the Hall Effect sensor that works on the principle of electromagnetism and provides pulses at the output pin. It is a power-friendly and MCU compatible device with a flow rate of a maximum of 30 liters per minute. A small device with high accuracy finds its application from DIY projects to the industry for flow measurement.

Flow Chart:

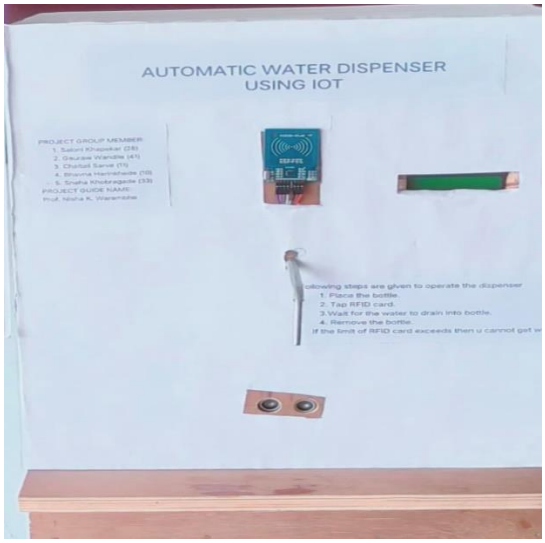


Circuit Diagram:



IV. RESULT AND DISCUSSION

The ultrasonic sensor and RFID sensor send the signal to the Arduino Uno after detecting the bottle and scan the RFID card. Arduino the other component visible join device LCD convey the active signal. Water will pump from the motor and check the flow rate from flow sensor and then dispense in the bottle. As a result patient will get limited amount of water.



Advantages and Applications:
The advantage of this device that patient will get limited amount of water. They require no plumbing. The touchless system makes the water dispenser easy to use and disinfectant. Due to the RFID sensor, only those people can use this dispenser who have a RFID card. How to use the water dispenser is fairly easy. The instruction manual does not require an expert to interpret.

Applications:
A touchless Water dispenser is a hands-free water filling station, typically used in bottle less water system. It is very useful equipment and can supply limited amount of water. Due to this, patients will get a particular amount of water as per their requirement, hence there will be no wastage of water. This hygienically method of dispensing water eliminates the need to clean and disinfect the device after every use in order to prevent germs and potential contamination. This makes it highly effective in preserving the health-related issues like kidney stones, hepatitis A, etc.

CONCLUSION

This system provide fast and effective service to the patients and it help to reduce the risk of patient's life. Apart from these, there is no wastage of water and because of limited amount of water the problem which is face due to overdose of water will not happen.

Future Scope:
This system will further used to dispense the juice or other liquid to the patients. It will use in chemical industry as a chemical dispensing machine to dispense a chemical.

REFERENCES

[1] Amerada T[1*], Shweta Jadhav[2], Sieve Maharani, Smart Water Dispenser and Monitoring Water Level in Iota and Android Environment, IJCSE, Research Paper, Vol.-7, Issue-5, May 2019,E-ISSN: 2347-2693

[2] Abhishek Srivastava[1], Shubham Dwivedi[1], Saurabh Bhardwaj[1] and Mr. Hem Chandra Joshi[2] International Journal on Emerging Technologies (Special Issue NCETST-2017 8(1): 88- 91(2017)

[3] Poonam J. Chavan, Manoj Mechkul "IoT Based Water quality Monitoring", IJMTER Journal, Vol 3, 2016, pp.746-750.

[4] 1st Anusri Nag, 2nd Sanjib Nag "Smart Water Dispensing System: A New Approach of Monitoring, Controlling and Dispensing" Emerging Technologies Volume 2 Issue 3.

[5] 1st Abhishek Srivastava , 2nd Shubham Dwivedi , 3rd Saurabh Bhardwaj, 4th Mr. Hem Chandra Joshi "Study of Automatic Water Dispenser"(Special Issue NCETST-2017) 8(1): 88-91(2017).

[6] 1st Diksha P. Lanjewar, 2nd Sayali A. Wanjari, 3rd Prachi P. Kuthe, 4th Poonam P. Danao, 5th Khushbu Patil "RFID Card and Coin Based

Water Dispensing Machine"2019 JETIR March 2019, Volume 6, Issue 3.

[7] 1st Mohita Parashar, 2nd Roopa Patil, 3rd Siddharth Singh, 4th Vipul VedMohan, 5th K. S. Rekha"Water Level Monitoring System in Water Dispensers using IoT"(IRJET) Volume: 05 Issue: 04 | Apr-2018