VISVESVARAYA TECHNOLOGICAL UNIVERSITY

AUTOMATIC HAND SANITIZER DISPENSER

A MINI PROJECT REPORT

Submitted by

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In partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

IN

ELECTRONICS AND COMMUNICATION

ENGINERRING

2020-21

NEW HORIZON
COLLEGE OF ENGINEERING
Autonomous College Permanently Affiliated to VTU, Approved by AICTE & UGC
Accredited by NAAC with 'A' Grade.

BENGALURU-560103

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CERTIFICATE

Certified that the Mini project entitled **"Automatic Hand Sanitizer dispenser"** is carried out by bearing **Mr.Abhinay Kumar Reddy C** bearing **USN: 1NH18EC026**, bonafide students of NHCE, Bengaluru in partial fulfillment for the award of Bachelor of Engineering in Electronics and Communication of the Visweswaraya Technological University, Belagavi during the year 2020-21. It is certified that all corrections and suggestions indicated for Internal Assessment have been incorporated in the report deposited in the department library. The mini project report has been approved as it satisfies the academic requirements in respect of the mini project work prescribed for the said degree.

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ACKNOWLEDGEMENT

The satisfaction that accompany the successful completion of any task would be, but impossible without the mention of the people who made it possible, whose constant guidance and encouragement helped us succeed.

We thank **Dr. Mohan Manghnani**, Chairman of **New Horizon Educational Institution**, for providing necessary infrastructure and creating good environment.

We also record here the constant encouragement and facilities extended to us by **Dr.Manjunatha**, Principal, NHCE and **Dr. Sanjeev Sharma**, Head of the department of Electronics and Communication Engineering. We extend sincere gratitude to them.

We sincerely acknowledge the encouragement, timely help and guidance to us by our beloved guide **Mr.Santhosh Krishna B V** to complete the project within stipulated time successfully.

Finally, a note of thanks to the teaching and non-teaching staff of electronics and communication department for their co-operation extended to us, who helped us directly or indirectly in this successful completion of mini project.

C Abhinay Kumar Reddy

(1NH18EC026)

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ABSTRACT

As we know that COVID-19 disease is spreading wildly and our government and doctors are telling us that we can avoid this disease by washing hands regularly. But what if someone who is not infected with Covid-19 touches the hand sanitizer previously used by the COVID-19 infected person? This action will also infect a normal person. So how will you protect your apartment, your hospitals? The answer to these questions is the use of automatic hand sanitizer dispenser. Here we are trying to make an automatic hand sanitizer dispenser in the simplest and cost effective was as possible. We are going to use an Arduino uno as the heart of the project through which we can control all the other components that are going to be used in this project. An ultrasonic sensor is used to detect the presence of the hand below the nozzle of the dispenser which activates the code in the Arduino and initializes the complete process, once the signal from the ultrasonic senser is sent to the Arduino, the distance between the hand and the senser is calculated with a formula that will be implemented in the code written in the Arduino uno and as the appropriate distance is reached by the hand, the next functions are implemented. When the ultrasonic sensor sends signals and the appropriate distance reached is confirmed, the Arduino sends out a signal to the relay, which in turn activated the submerged water pump. This water pump is on for a certain particular interval of time in which appropriate amount of hand sanitizer is dispensed to the user. And after the sanitizer is dispensed, the pump turns off and the program ends.

CHAPTER 1

INTRODUCTION

Over the last months the COVID-19 pandemic has been spreading chaos all around the world. There are countless infections and unfortunately many casualties. One of the most important measures suggested by the World Health Organization is constant hand washing with either soap or hand sanitizers. But one of the most significant problems is the way we do it and that is by physically touching the dispenser which eliminates the whole purpose of the action and even creates a great risk of infection. So we, being engineering students decided to create something using an Arduino Uno board that could combat this problem, but I also wanted it to be cheap and to be able to be attached to many different dispensers easily, quickly and effectively! And this is exactly what we made, an accessory that can be attached to most hand sanitizer/soap dispensers and turn them completely hands-free and automatic.

Problem Statement: No matter what, there is no truly contactless hand sanitizer dispensing system. In this increasingly worsening covid pandemic situation, one of the most important things needed to keep ourselves safe from the virus is the hand sanitizer, and even though we use the sanitizer, we cannot be really safe about it too, as in public places, a lot of people would have used that and there is no telling that it is safe.

Objectives: To develop a completely contactless hand sanitizer dispensing system. Hence we decided to develop a simple and easy completely contactless hand sanitizer system and optimized it in such a way that, anybody anywhere can use it completely easily and even maintain it really easily and be completely safe form the covid virus.

CHAPTER 2

LITERATURE SURVEY

Title of Paper	Author	Year of Publication	Inference
A novel coronavirus outbreak of global health concern	Wang C et.al	2020	Coronavirus is deadly
A new coronavirus associated with human respiratory disease	Wu F et.al	2020	Coronavirus effects people with respiratory disease easily
Pumping Dispensor	Cittadino AM et,al	2012	Pumpable Soap Dispensers
Dispenser for hand sanitizer	Iseri M et.al	2015	Hand sanitizer Dispenser Pump
Introduction of non medical products	Ministry of food and Drug safety, Korea	2020	Coronavirus spreads easily through unwashed hands and utensils

Table 2.1 : Literature Survey

CHAPTER 3

PROPOSED METHODOLOGY

The idea is simple: whenever a user places his or her hand beneath the sanitizer bottle, a small amount of liquid sanitizer is automatically dispensed. This is similar to public hand dryers. Whenever hands are placed beneath it, hot air is triggered to dry them.

To detect motion, two kinds of sensors are currently available: passive infrared (PIR) and ultrasonic. Ultrasonic sensors are best suited for this application. Their range is up to one meter and we can adjust this according to our needs.

For this project, let's use the HC-SR04 ultrasonic sensor. HC-SR04 is a popular ultrasonic sensor that can be interfaced with a variety of microcontrollers. We're going to use Arduino Uno.

In this project, we aim to make an automatic hand sanitizer dispenser using as less materiel and as simple and efficient as possible. An ultrasonic sensor is used to detect the hand when someone needs sanitizer and make it completely contactless. When the senser detects the hand, an Arduino is used as the heart of the project to control all the functions of the dispenser.

A submersible pump is used to pump the sanitizer from the tank. Since the Arduino cannot deliver enough voltage for the pump to run on its own, a relay is used to provide sufficient voltage for the pump to run.

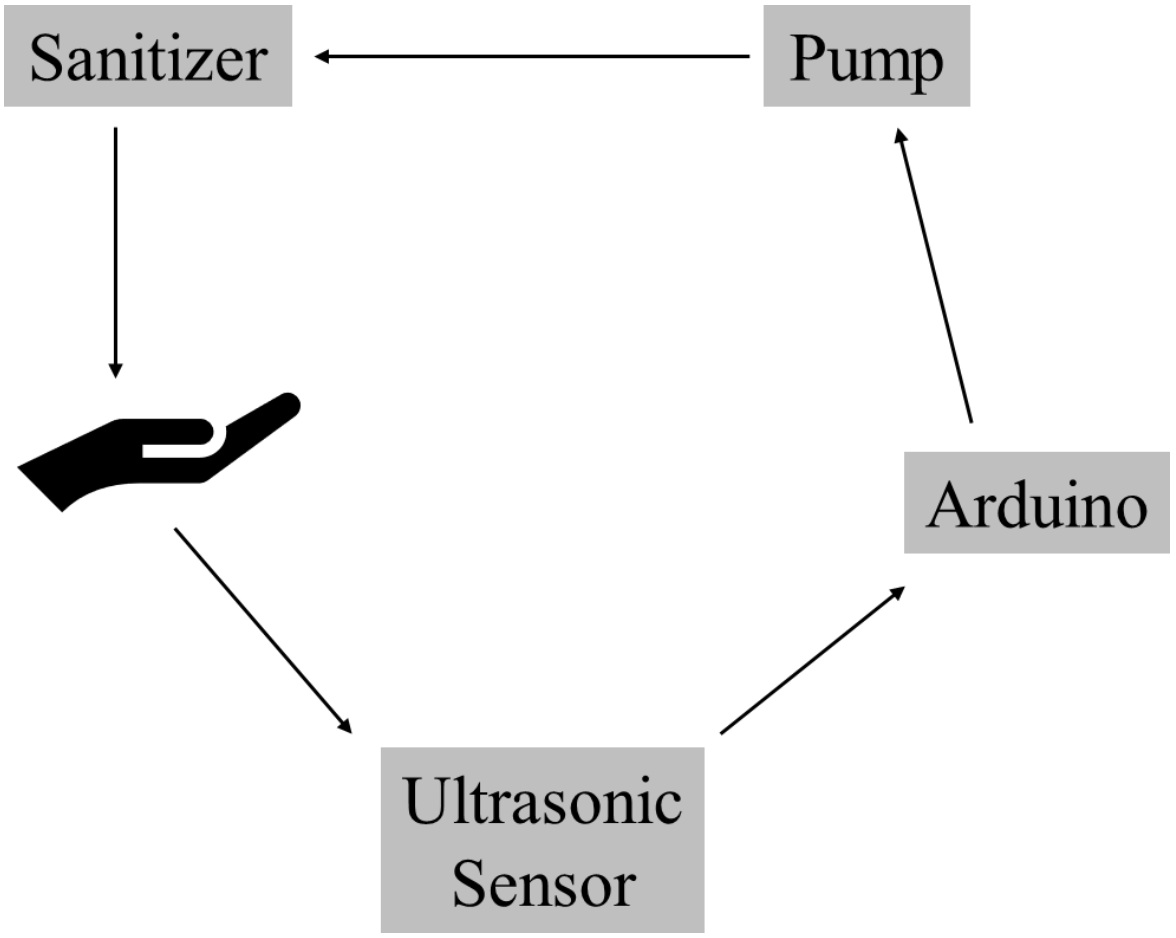

Fig 3.1 : FUNCTIONAL BLOCK DIAGRAM

Ultrasonic sensor : Ultrasonic transducers and ultrasonic sensors are devices that generate or sense ultrasound energy. They can be divided into three broad categories: transmitters, receivers and transceivers. Transmitters convert electrical signals into ultrasound, receivers convert ultrasound into electrical signals, and transceivers can both transmit and receive ultrasound. In a similar way to radar and sonar, ultrasonic transducers are used in systems which evaluate targets by interpreting the reflected signals. For example, by measuring the time between sending a signal and receiving an echo the distance of an object can be calculated. Passive ultrasonic sensors are basically microphone that detect ultrasonic noise that is present under certain conditions. The design of transducer can vary greatly depending on its use: those used for medical diagnostic purposes, for example the range-finding applications listed above, are generally lower power than those used for the purpose of changing the properties of the liquid medium, or targets immersed in the liquid medium, through chemical, biological or physical effects. The latter class include ultrasonic probes and

ultrasonic baths, which apply ultrasonic energy to agitate particles, clean, erode, or disrupt biological cells, in a wide range of materials.

Here we are using a very basic and cost effective ultrasonic sensor to determine the distance of placement of hand in order to dispose the sanitizer effectively.

Arduino: Arduino is an open-source hardware and software company, project and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices. Its hardware products are licensed under a CC-BY-SA license, while software is licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially from the official website or through authorized distributors. Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards ('shields') or breadboards (for prototyping) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers can be programmed using the C and C++ programming languages, using a standard API which is also known as the "Arduino language". In addition to using traditional compiler toolchains, the Arduino project provides an integrated development environment (IDE) and a command line tool (arduino-cli) developed in Go.

Here we are using an Arduino uno as the heart of this project to control all the equipment that are the ultrasonic sensor which acts as the initiator to the project and the submersible pump which pumps sanitizer when a the ultrasonic sensor sends the signal to the Arduino.

Pump : A submersible pump (or sub pump, 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. The main advantage of this type of pump is that it prevents pump cavitation, a problem associated with a high elevation difference between pump and the fluid surface. Submersible pumps push fluid to the surface as opposed to jet pumps which create a vacuum and rely upon atmospheric pressure. Submersibles use

pressurised fluid from the surface to drive a hydraulic motor downhole, rather than an electric motor, and are used in heavy oil applications with heated water as the motive fluid.

Here we are using a 6v submersible pump kept inside a sanitizer tank to pump the sanitizer.

Sanitizer : Hand sanitizer is a liquid, gel, or foam generally used to decrease infectious agents on the hands. In most settings hand washing with soap and water is generally preferred Hand sanitizer is less effective at killing certain kinds of germs, such as norovirus and Clostridium difficile and unlike hand washing, it cannot physically remove harmful chemicals. People may incorrectly wipe off hand sanitizer before it has dried, and some are less effective because their alcohol concentrations are too low. In most healthcare settings alcohol-based hand sanitizers are preferable to hand washing with soap and water, because it may be better tolerated and is more effective at reducing bacteria. Hand washing with soap and water, however, should be carried out if contamination can be seen, or following the use of the toilet. The general use of non-alcohol-based hand sanitizers has no recommendations. Alcohol-based versions typically contain some combination of isopropyl alcohol, ethanol (ethyl alcohol), or n-propanol, with versions containing 60% to 95% alcohol the most effective. Care should be taken as they are flammable. Alcohol-based hand sanitizer works against a wide variety of microorganisms but not spores. Compounds such as glycerol may be added to prevent drying of the skin. Some versions contain fragrances; however, these are discouraged due to the risk of allergic reactions. Non-alcohol based versions typically contain benzalkonium chloride or triclosan; but are less effective than alcohol-based ones. Alcohol has been used as an antiseptic at least as early as 1363 with evidence to support its use becoming available in the late 1800s. Alcohol-based hand sanitizer has been commonly used in Europe since at least the 1980s. The alcohol-based version is on the World Health Organization's List of Essential Medicines, the safest and most effective medicines needed in a health system.

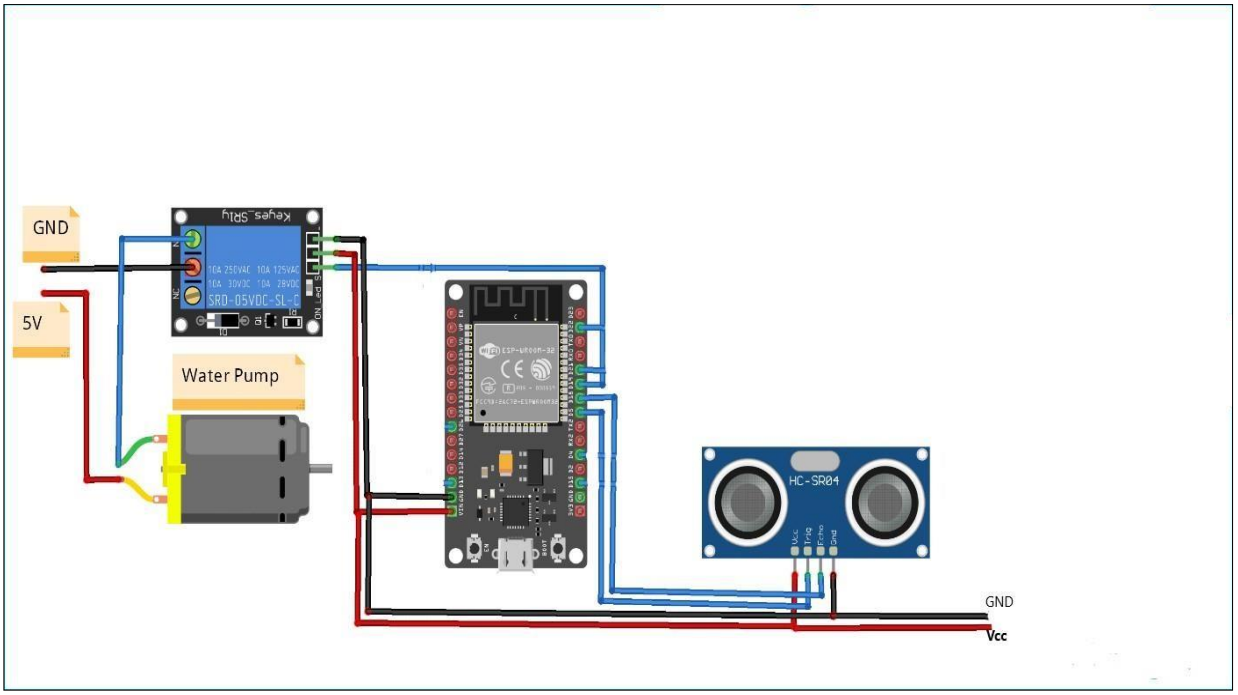

Fig 3.2:CIRCUIT DIAGRAM

3.1 COMPONENTS REQUIRED

S.No.	Required Components	Remarks	Quantity
1	Ultrasonic Sensor	5V	1
2	Arduino	UNO	1
3	Relay	10 V	1
4	Water pump	3-6 V 80-120 L/H DC Magnetic driving	1
5	Battery	9V	1
6	Jumper wires	SOS	1
5	Battery	9V	1

Table 3.1 : Components Required

ARDUINO UNO:

Fig 3.3: ARDUINO UNO

"Uno" signifies **"one"** in Italian and was picked to stamp the underlying arrival of Arduino programming. The Uno board is the first in a progression of USB-based Arduino sheets; it and form 1.0 of the Arduino IDE were the reference variants of Arduino, which have now advanced to fresher deliveries. The ATmega328 on the board comes pre-customized with a bootloader that permits transferring new code to it without the utilization of an outside equipment software engineer. While the Uno conveys utilizing the first STK500 convention, it contrasts from all previous sheets in that it doesn't utilize the FTDI USB-to-chronic driver chip. All things being equal, it utilizes the Atmega16U2 (Atmega8U2 up to variant R2) customized as a USB to chronic converter.

Technical specifications:

Microcontroller	ATmega328P – 8 bit AVR family microcontroller
Operating Voltage	5V
Recommended Input Voltage	7-12V
Input Voltage Limits	6-20V
Analog Input Pins	6 (A0 – A5)
Digital I/O Pins	14 (Out of which 6 provide PWM output)
DC Current on I/O Pins	40 mA
DC Current on 3.3V Pin	50 mA
Flash Memory	32 KB (0.5 KB is used for Bootloader)
SRAM	2 KB
EEPROM	1 KB
Frequency (Clock Speed)	16 MHz

Table 3.2 : Specifications of arduino

Communication:

The Arduino Uno has various offices for speaking with a PC, another Arduino board, or other microcontrollers. Nonetheless, on Windows record is required. Arduino Software (IDE) incorporates a chronic screen which permits straightforward literary information to be shipped off and from the board. The RX and TX LEDs on the board will streak when information is being sent through the USB-to sequential chip and USB association with the PC (however not for sequential correspondence on pins 0 and 1). A Software Serial library permits sequential correspondence on any of the Uno's computerized pins.

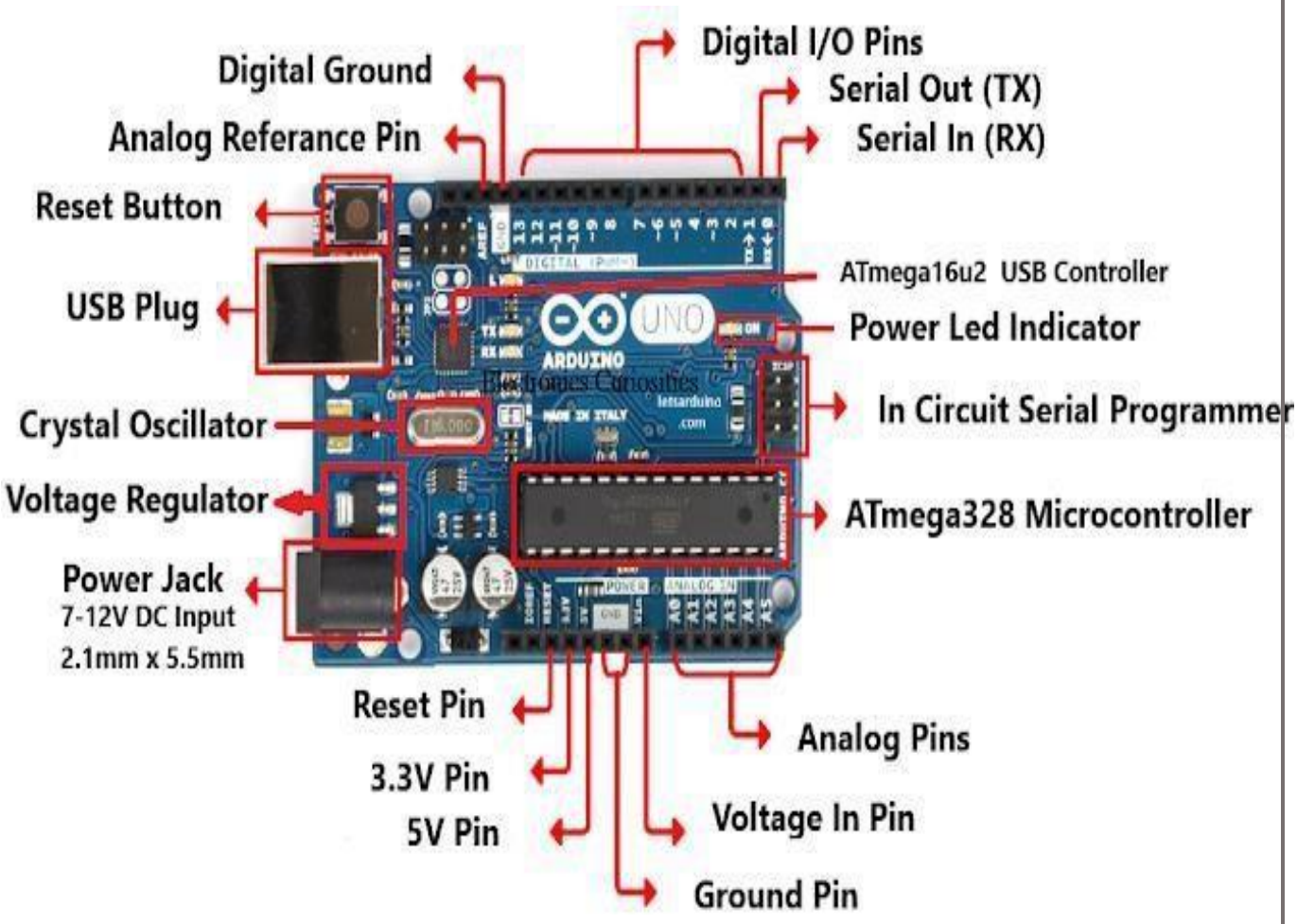

Fig 3.4: PIN DESCRIPTION OF ARDUINO UNO

Difference between Arduino UNO and NANO:

- Both Arduino UNO and Arduino NANO come with similar functionality with a little difference in terms of PCB layout, size and form factor.
- Arduino UNO is a microcontroller board based on at mega 328 and has 14 digital pins out of which 6 are PWM pins. It has 6 analog pins interfaced on the board. No extra peripheral is required. It is a complete ready to use that requires no prior technical skills to get on hands-on experience. Arduino UNO can be powered by using DC power jack, battery or simple plug to the computer using USB cable.
- Arduino Nano is small and compact when compared to Arduino UNO. It doesn't have DC power jack and comes with Mini US instead of regular USB Nano has 2 extra analog pins than UNO. Nano is breadboard friendly whereas UNO lacks this nature. However, both devices run at5V, 40 mA and 16MHz frequency.

Name	Arduino Nano	Arduino Uno
MCU	Atmega328p/Atmega 168.	Atmega328p
Power	5V	5V
Input Voltage	7 -12 V	7 – 12 V
Maximum Current Rating	40mA	40mA
Clock Frequency	16MHz	16MHz
Flash Memory	16KB/32KB	32KB
USB	Mini	Standard
USART	Yes	Yes
SRAM	1KB/2KB	2KB
PWM	6 out of 14 digital pins	6 out of 14 digital pins
GPIO	14	14
Analog Pins	8	6
EEPROM	512bytes/1KB	1KB

Difference between Arduino Uno and Arduino Nano

Fig 3.5: DIFFERENCE BETWEEN ARDUINO UNO AND ARDUINO NANO

Arduino Architecture

Essentially, the processor of the Arduino board utilizes the Harvard engineering where the program code and program information have separate memory. It comprises of two recollections, for example, program memory and information memory. Wherein the information is put away in information memory and the code is put away in the blaze program memory. The Atmega328 microcontroller has 32kb of glimmer memory, 2kb of SRAM 1kb of EPROM and works with a 16MHz clock speed. It's an electronic gadget its utilized for seeming well and good and control more actual world then the work stations and ARDUINO is open source electronic prototyping Platform dependent on a basic microcontroller board we can build up the climate for composing programming for the board to permitting make intelligent electronic gadget.

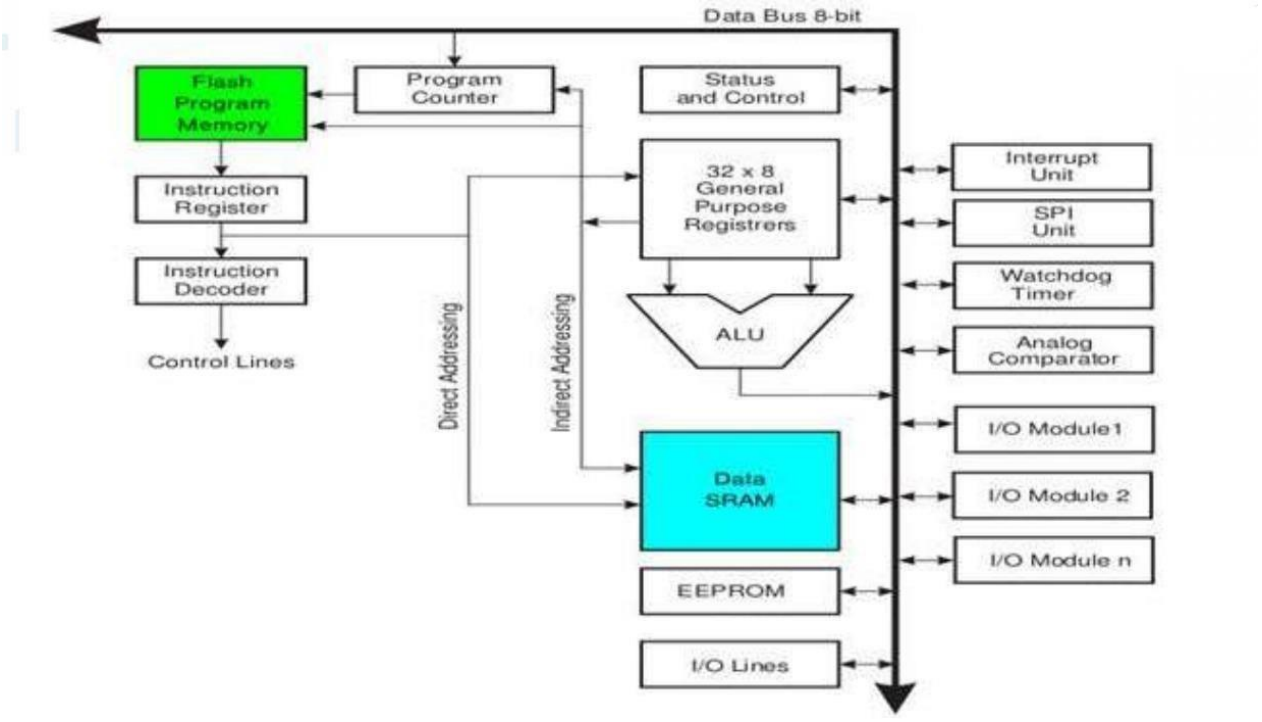

Fig3.6: Arduino Architecture

ARDUINO can be utilized to create intelligent articles, taking contributions from a verity of switcher or sensor and controlling an assortment of lights, engines and other actual yield, ARDUINO they can speak with programming running your PC .The

ARDUINO programming language is an execution of wiring a comparable actual registering stage .which depends on the preparing interactive media programming climate .For programming the microcontrollers ARDUINO stage give an incorporated improvement climate (IDE) in view of the handling venture .it incorporates uphold for c and C++ programming dialects.

SOFTWARE DESCRIPTION

We are using Arduino develop environment. This software works in windows, Linux and mac OS. The programming can be written in java, C, C++. Arduino IDE provides software library for wiring programs as well. We can view output on the screen in the form of values or in the form of graph depending on what the user wants. The source code for the IDE is delivered under the GNU General Public License, variant 2. The Arduino IDE underpins the dialects C and C++ utilizing unique principles of code structuring. Additionally, included with the IDE distribution. The Arduino IDE utilizes the program to change over the executable code into a book document. By default, is utilized as the transferring apparatus to streak the client code onto official Arduino boards.

Arduino Pro IDE

With the rising prevalence of Arduino as a product stage, different sellers began to actualize custom open-source compilers and apparatuses (centers) that can assemble and transfer portrayals to other microcontrollers that are not upheld by Arduino's authentic line of microcontrollers. In October 2019 the Arduino affiliation began giving early induction to another Arduino Pro IDE with troubleshooting and other advanced features.

Advantages of using Arduino:

- No experience required to begin
- Genuinely ease, contingent upon shields you need
- Loads of representations and shields accessible
- No outside developer or force supply required

Disadvantages of using Arduino:

- AVR microcontroller is not understandable

- Sketches and shields are tough to change
- Debugger is not included for syntax verification
- C experience and some developer tools experience is not obtained

CHAPTER 4

RESULT AND DISCUSSION

The project works successfully and the sanitizer is dispensed in the right amount with zero contact and is one of the safest methods to dispense hand sanitizer in public places.

RELAY

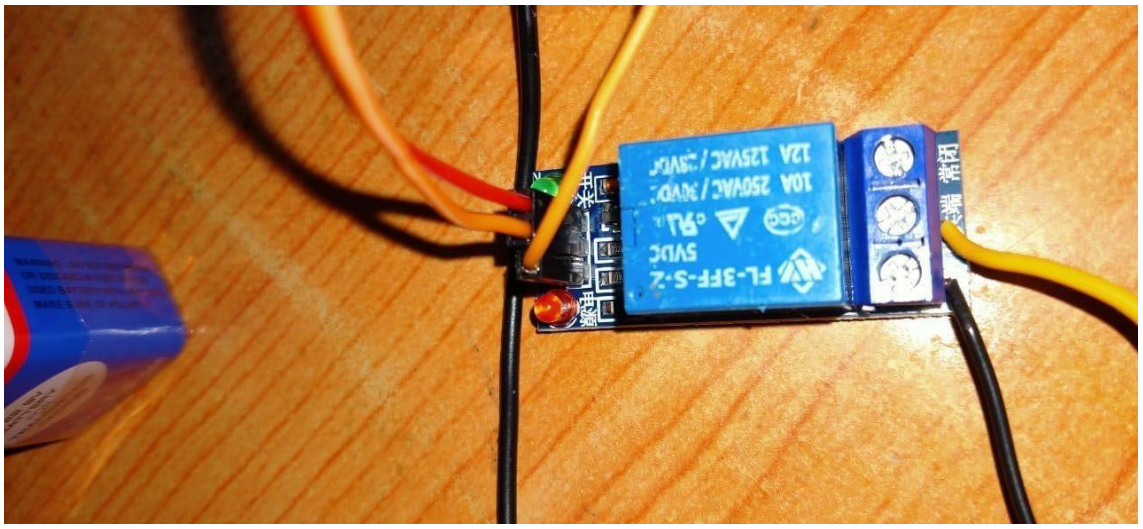

Fig 4.1 : Relay

In this figure you can see the relay that we have used, FL-#FF-S_Z relay which is a 5 volt relay with integrated connections making it easily usable to the users.

ARDUINO

Fig 4.2 : Arduino

This is the Arduino uno that we have used, built and manufactured by Arduino company itself, although they were the original makers, this Arduino is still very bulky and the processors on it are very big and not completely space optimized.

ULTRASONIC SENSOR

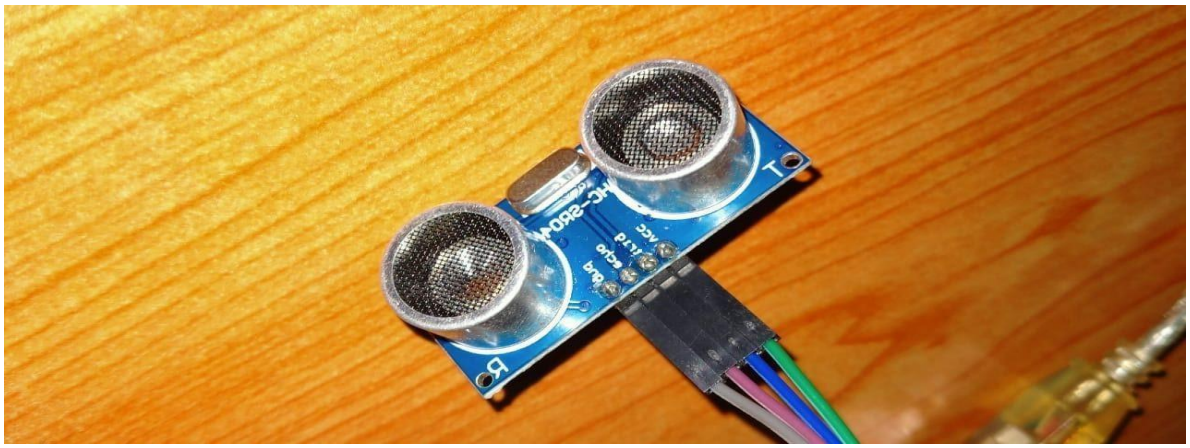

Fig 4.3 : Ultrasonic sensor

This is a standard ultrasonic sensor that we have used, it is a very basic ultrasonic sensor which can be coded to measure distances quite accurately for its price point and build quality.

FULL PROJECT SETUP

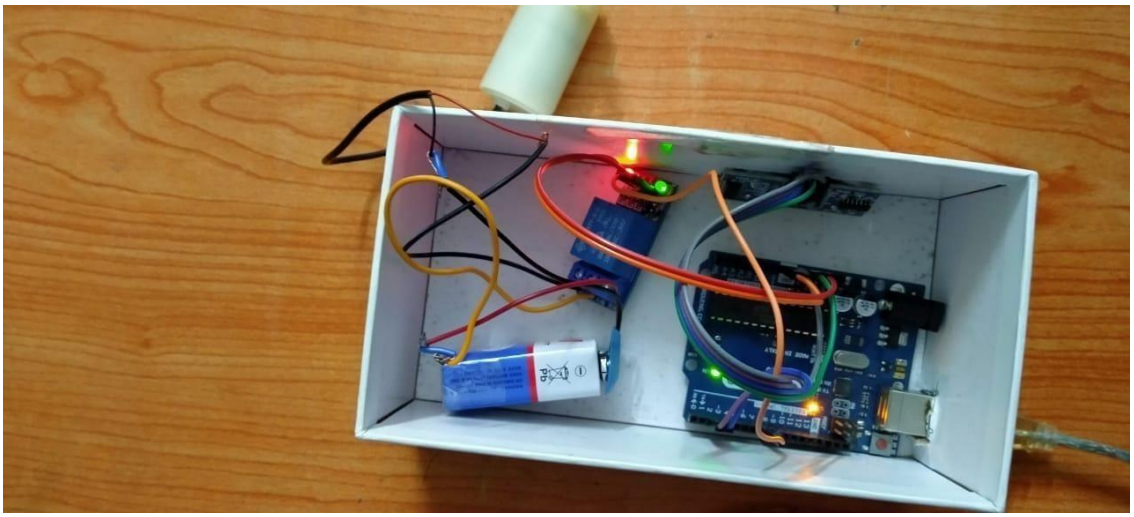

Fig 4.4 : Full project setup

Here is the complete project setup in working condition and completely functional and compact in an optimized way.

Fig 4.5 : Concealed project setup

And here is the concealed setup of the project to make it as presentable as possible.

CHAPTER 5

CONCLUSION AND FUTURE SCOPE

Hand sanitizers usually operate by squirting sanitizer liquid when one presses a pump with one's hand. Some hand sanitizers on the market are automatically pumped. However, sanitizer containers and pump devices are designed to be compatible only between products produced by the same manufacturer.

To address this problem, we have designed an automatic hand sanitizer system that is compatible with various containers. With the proposed device, it is possible to avoid many people coming into contact with the pump handle, thus preventing fomite viral transmission and making the use of hand sanitizer much more convenient. Moreover, the system squirts a certain amount of hand sanitizer at all times, making it easy to manage refills and replacement. Furthermore, it can operate compatibly with various designs of sanitizer containers, so consumers do not need repurchase a container for the liquid if they replace the hand sanitizer. Thus, it is economical and eco-friendly by decreasing waste emissions. The automatic hand sanitizer device proposed by this paper is ultimately expected to contribute to contactless hand disinfection in public places and virus infection prevention.

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