Project report submitted in partial fulfillment for the Degree of B. Tech in Applied Electronics & Instrumentation Engineering under West Bengal University of Technology

ARDUINO BASED LIQUID DISPENSOR SYSTEM USING PERISTALTIC PUMP

By

NAVONEEL BANERJEE (Roll No. 11705515056)
SOURAV MUKHERJEE (Roll No. 11705514030)
ARINDAM MITRA (Roll No. 11705514008)
AVIK SANYAL (Roll No. 11705515053)
SAIKAT MANDAL (Roll No. 11700510005)

Under the guidance of

Ms. NAIWRITA DEY
Assistant Professor
Department of AEIE, RCCIIT

DEPARTMENT OF APPLIED ELECTRONICS & INSTRUMENTATION ENGINEERING,RCC INSTITUTE OF INFORMATION TECHNOLOGY, CANAL SOUTH ROAD, BELIAGHATA, KOLKATA – 700015, November 2017

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NAVONEEL BANERJEE (Roll No. 11705515056)
SOURAV MUKHERJEE (Roll No. 11705514030)
ARINDAM MITRA (Roll No. 11705514008)
AVIK SANYAL (Roll No. 11705515053)
SAIKAT MANDAL (Roll No. 11700510005)

RCC INSTITUTE OF INFORMATION TECHNOLOGY
CANAL SOUTH ROAD, BELIAGHATA, KOLKATA – 700 015
PHONE : 2323 2463 FAX : (033)2323 4668
E-mail : campus@rcciit.in Website : www.rcciit.org

CERTIFICATE OF APPROVAL

The project report titled "**ARDUINO BASED LIQUID DISPENSOR SYSTEM USING PERISTALTIC PUMP**" prepared by **NAVONEEL BANERJEE**, Roll No:- 11705515056, **SOURAV MUKHERJEE**, Roll No:- 11705514030, **ARINDAM MITRA**, Roll No:- 11705514008, **AVIK SANYAL,** Roll No:- 11705515053, **SAIKAT MANDAL**, Roll No:- 11700510005 is hereby approved and certified as a creditable study in technological subjects performed in a way sufficient for its acceptance for partial fulfilment of the degree for which it is submitted.

It is to be understood that by this approval, the undersigned do not, necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein, but approve the project only for the purpose for which it is submitted.

[Supervisor]

Applied Electronics & Instrumentation Engineering

[Head of the Department]

Applied Electronics & Instrumentation Engineering

[Examiner]

RCC INSTITUTE OF INFORMATION TECHNOLOGY
CANAL SOUTH ROAD, BELIAGHATA, KOLKATA – 700 015
PHONE : 2323 2463 FAX : (033)2323 4668
E-mail : campus@rcciit.in Website : www.rcciit.org

RECOMMENDATION

I hereby recommend that the project report titled "**ARDUINO BASED LIQUID DISPENSOR SYSTEM USING PERISTALTIC PUMP**" prepared by **NAVONEEL BANERJEE**, Roll No:- 11705515056, **SOURAV MUKHERJEE**, Roll No:- 11705514030, **ARINDAM MITRA**, Roll No:- 11705514008, **AVIK SANYAL,** Roll No:- 11705515053, **SAIKAT MANDAL**, Roll No:- 11700510005 be accepted in partial fulfillment of the requirement for the Degree of Bachelor of Technology in Applied Electronics &Instrumentation Engineering, RCC Institute of Information Technology.

.....……

[Supervisor]
Applied Electronics & Instrumentation Engineering

[Head of the Department]
Applied Electronics & Instrumentation Engineering

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CHAPTER 1: INTRODUCTION

Dispensing systems deliver precise amounts of liquid in the nanoliter, microliter, and milliliter range into a microplate or tube. Bipin Mashilkar and Et al. have discussed about Microcontroller (Atmega 328p Arduino Uno Board) which is used as the controller to control the automatic operation of automated liquid dispenser machine. Microcontroller is selected as the controller because it is easier to implement and the compact size makes it easier to mount it on the system. The machine is also easy to operate and user friendly, where simple steps are needed to operate the machine. In this project microcontroller is used as the core of the system[1]. S M Khaled Reza and Et al. have discussed about microcontroller based water level sensing and controlling of a wired and wireless environment which can indicate the amount of water in the tank. Water level indication unit can use 5v LED light which will work for water level indication. By touchingdifferent water levels through water level sensor, LED should be indicated as on/off. When the sensor touches water, nozzles and connecting rod get electric connection using water conductivity [2]. Pranoti Saluke and Et al. has discussed that the majority of the system construction and implementation is in a dispensing unit, where-in there is an application processor connected to a cloud database containing pertinent details regarding consumption of every owner who has officially registered himself/herself to this modified system. Upon registration, a limit-per-month is established for the particular user. For data retrieving and manipulation in real time, 4x4 Matrix Keypad is chosen. The user is requested to type User ID and password for verification. This information is processed in the dispensing units and used to retrieve liquid consumption details of the user from the centralized database via the local servers. According to the allowance of liquid limit, it is discharged to the user. This system, though a little inflexible, is an efficacious way to ensure sustained use of liquid [3]. Fisher's handbook has discussed that the control valve manipulates a flowing fluid, such as water to compensate for the load disturbance and keep the regulated process variable as close as possible to the desired set point and in this project solenoid valve is used to control the flow of the liquid from the container electrically [4].

In our project we are using a special type of pump known as **PERISTALTIC PUMP**. Peristaltic pumps are one of the most common items that we find in our house premises; a peristaltic pump is one of the displacement pumps which are positive in nature and is used to pump various kinds of fluids. The name "Peristaltic pump" was derived the word "peristalsis" which is its pumping principle. It consists of a flexible tube, rotor with rollers, shoes or wipers, pump casing etc. The fluid is kept inside the flexible tube or hose which compress and relaxes making the inward and outward flow of the fluid. For that rollers attached with the rotor, shoe and wipers are attached to the external surface of the tube which initiates the compression and relaxation. When the rotor gets started, an under compression tube part closes compelling the liquid to move through. A cam is passed then to make the tube regain its original shape and the fluid flow is induced back to the pump, this process is called restitution.

A peristaltic pump is a pump, operated by a motor, that is able to uptake a liquid through one tube and drip it out through another tube. We can easily design a liquid dispensor system by using this peristaltic pump.

The peristaltic pump was first patented in the United States by Rufus Porter and J.D. Bradley in 1855 (U.S. Patent number 12753) as a well pump, and later by Eugene Allen in 1881 (U.S. Patent number 249285) for blood transfusions. It was developed by heart surgeon Dr. Michael DeBakey for blood transfusions while he was a medical student in 1932 and later used by him for cardiopulmonary bypasssystems. A specialized non-occlusive roller pump (US Patent 5222880)using soft flat tubing was developed in 1992 for cardiopulmonary bypass systems.

CHAPTER 2: METHODOLOGY

- **METHODOLOGY**

The methodology of the project is;

i. We have to build the circuit into veroboard.
ii. Now a 16x2 LCD display is connected with the circuit for monitoring and command giving purpose.
iii. The inlet of the 1st peristaltic pump is put in the water filled beaker 1 and the outlet is put in beaker 3.
iv. The inlet of the 2nd peristaltic pump is put in the water filled beaker 2 and the outlet is put in beaker 3.
v. Now the computer interface, i.e., connecting the arduino uno with the computer is done.
vi. Now we open the ARDUINO IDE software in the computer and write the necessary program in the simulator.
vii. Now we upload the program into arduino and click on the "VERIFY" key of the simulator.
viii. Now we can see that the pump is running by the code we wrote and we can monitor it by the 16x2 LC display.

- **PROPOSED METHOD**

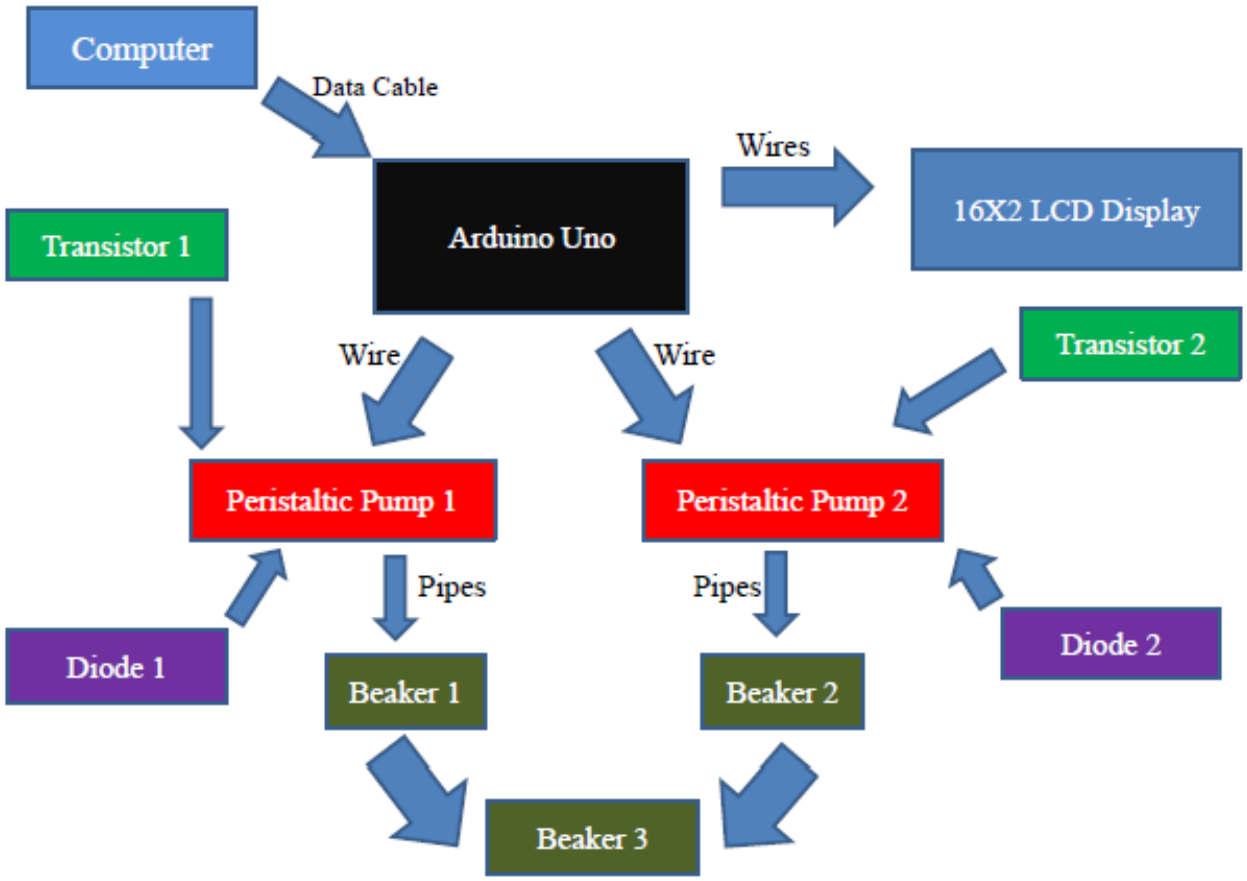

Fig 1:- Block diagram of the proposed project

CHAPTER 3: PERISTALTIC PUMP

A peristaltic pump is a positive displacement pump that transfers a wide variety of fluids. This pump doesn't have valves, seals and glands, it's an inexpensive pump to maintain. Every peristaltic pump features flexible hoses or tubes, giving an open flow path which gives a high resistance to abrasion and permits the easy flow of solids and viscous media.

The working principle of a peristaltic pump is based on moving a product through a hose, by compressing and decompressing. The 'shoes' of the pump are fixed onto the rotor of the pump, which press the fluid through the pump. The working principle is similar to how our body pumps blood, nutrition and oxygen.

The fluid is contained within a flexible tube fitted inside a circular pump casing. A rotor with a number of "rollers", "shoes", "wipers", or "lobes" attached to the external circumference of the rotor compresses the flexible tube. As the rotor turns, the part of the tube under compression is pinched closed (or "occludes") thus forcing the fluid to be pumped to move through the tube. Additionally, as the tube opens to its natural state after the passing of the cam ("restitution" or "resilience") fluid flow is induced to the pump. This process is called peristalsis and is used in many biological systems such as the gastrointestinal tract. Typically, there will be two or more rollers, or wipers, occluding the tube, trapping between them a body of fluid. The body of fluid is then transported, at ambient pressure, toward the pump outlet. Peristaltic pumps may run continuously, or they may be indexed through partial revolutions to deliver smaller amounts of fluid.

Fig 2:- A 12V DC Peristaltic Pump

TYPES:-

There are two types of peristaltic pumps. They are as follows.

1. Low pressure peristaltic pump and
2. High pressure peristaltic pump.

1. LOW PRESSURE PERISTALTIC PUMP:

These types of pumps are laboratory grade pumps designed for low pressure pumping.

2. HIGH PRESSURE PERISTALTIC PUMP:

These types of pumps are industrial graded pumps designed for high pressure pumping.
These pumps are lined with lubricants to avoid damage from abrasion and friction.

SPECIFICATIONS:-

Peristaltic pumps have two types of specifications. They are as follows:-

1) Performance specifications and
2) Design specifications.

1) PERFORMANCE SPECIFICATIONS:

These specifications are dependable on flow-rate, pressure, horsepower,power-rating, outlet diameter, operating temperature etc.

2) DESIGN SPECIFICATIONS:

Design specifications are dependable on tubing size, number of rollers, number of channels.

CALCULATION OF FLOW RATE:-

Theoretical flow rate (ml/min)

F = V * L * N RPM

Where ,

V = volume of occulated tubing (mm^3 / mm).
L = tubing length that will be occulated by pump roller (mm).
N = number of rollers on the rotor.

OCCLUSION CALCULATION:-

The minimum gap between the roller and the housing determines the maximum squeeze applied on the tubing.

The term “occlusion” is used to measure the amount of squeeze.

THEORETICAL CALCULATION:

$$y = (2t – g) / (2t) \times 100$$

where, y = occlusion,

t = wall thickness of the tubing,

g = minimum gap between roller and the housing.

The occlusion is typically 20%.

DIAGRAM:-

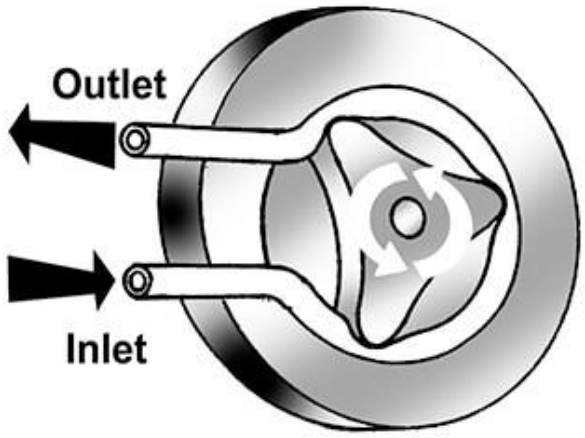

Fig 3:- Mechanism of Peristaltic Pump

RANGE:-

- Flows between 2 and 200 gpm.
- Total pressure between 10-250 psi.
- Horsepower between 0.125 to 40 hp.

Peristaltic pump can operate between this range.

PRICE:-

- 6 V DC miniature dosing home pump peristaltic head for aquarium lab white – Rs. 760.00
- 24 V peristaltic liquid pump HP dosing head for aquarium lab blue – Rs. 780.00.
- 12 V DC miniature dosing horse power peristaltic head for aquarium tank yellow – Rs. 760.00

• ADVANTAGES & DISADVANTAGES

➢ ADVANTAGES

1) Only the interior part is in touch with the fluid and as a result there are less chances of contagion.
2) Absence of valves or glands means less maintenance and manufacturing costs.
3) No Product slip, linear speed flow makes it ideal for dosing.
4) No priming needed, peristaltic pumps are self-primed and seal less with no cavitation.
5) Various types of fluids can be pumped.
6) Powerful suction and low vacuum force.
7) Can handle fluids under high pressure flow.

➢ DISADVANTAGES

1) The flexible tubing will tend to degrade with time and require periodic replacement.
2) The flow is pulsed, particularly at low rotational speeds. Therefore, these pumps are less suitable where a smooth consistent flow is required. An alternative type of positive displacement pump should then be considered.
3) Effectiveness is limited by liquid viscosity

➢ APPLICATIONS

A. Juice production
B. Pizza sauce dispensing
C. Vitamin A & D injection
D. Aspiration of tissue culture medium
E. Circulation of cell suspension in fermentation
F. Cosmetic dispensing
G. Harvesting cell media
H. Manufacturing IV bag dispensing
I. Nutrient supply for cultures
J. Spray coating dispensing
K. Sterilised media dispensing
L. Ultrafiltration
M. Acid/base dispensing
N. Adhesives for cement
O. Circuit board manufacturing
P. Dispensing glue emulsions
Q. Transfer of fuels and lubricants.

CHAPTER 4: PROTOTYPING OF THE SYSTEM

Our project requires two parts, HARDWARE and SOFTWARE.

a) Hardware requirement
   i. Aruino Uno R3,
   ii. PN2222 npn transistor,
   iii. IN40001 diode,
   iv. 12V peristaltic pump,
   v. 16x2 LCD display,
   vi. 10K pot,
   vii. 10K resistor,
   viii. Jump wires,
   ix. Beakers and
   x. Pipes.

b) Software requirement
   i. Arduino IDE.

Above stated two types of requirements are discussed briefly below.

a) HARDWARE REQUIREMENT

i. ARDUINO UNO R3

Arduino is an open-source platform used for building electronics projects. Arduino consists of both a physical programmable circuit board (often referred to as a microcontroller) and a piece of software, or IDE (Integrated Development Environment) that runs on your computer, used to write and upload computer code to the physical board.

The Arduino platform has become quite popular with people just starting out with electronics, and for good reason. Unlike most previous programmable circuit boards, the Arduino does not need a separate piece of hardware (called a programmer) in order to load new code onto the board – you can simply use a USB cable. Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program. Finally, Arduino provides a standard form factor that breaks out the functions of the micro-controller into a more accessible package.

The Arduino is a microcontroller board based on the ATmega8. It has 14 digital -input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, 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 adapter or battery to get started.

The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. Revision 2 of the Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode. Revision of the board has the following new features:

- 1.0 pinout: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. In future, shields will be compatible with both the board that uses the AVR, which operates with 5V and with the Arduino Due that operates with 3.3V. The second one is a not connected pin, that is reserved for future purposes.

- Stronger RESET circuit.
- ATmega 16U2 replace the 8U2.

"Uno" means one in Italian and is named to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards, and the reference model for the Arduino platform.

Fig. 4 :- Real Arduino UNO board

Here are some parameters of Arduino and the descriptions.

- Microcontroller - ATmega328.
- Operating voltage - 5V.
- Input voltage (recommended) - 7-12V.
- Input voltage (limits) - 6-20V.
- Digital I/O pins - 14 (D0-D13 are digital i/o; D3,D5,D6,D9,D10,D11 are PWM).
- Analog I/P pins - 6.
- Flash memory - 32KB (ATmega328).
- SRAM - 2 KB (ATmega328).
- EEPROM - 1KB (ATmega328).
- Clock speed - 1.6 MHz.
- Length - 68.6 mm.
- Width - 53.4 mm.
- Weight - 25 g.

ii. PN2222 TRANSISTOR

The **PN2222** is a common NPN bipolar junction transistor (BJT) used for general purpose low-power amplifying or switching applications. It is designed for low to medium current, low power, medium voltage, and can operate at moderately high speeds. It is often called **2N2222 NPN transistor** also.

The 2N2222 is considered a very common transistor, and is used as an exemplar of an NPN transistor. It is frequently used as a small-signal transistor, and it remains a small general purpose transistor of enduring popularity.

The PN2222/2N2222 was part of a family of devices described by Motorola at a 1962 IRE convention. Since then it has been made by many semiconductor companies, for example, Texas Instruments.

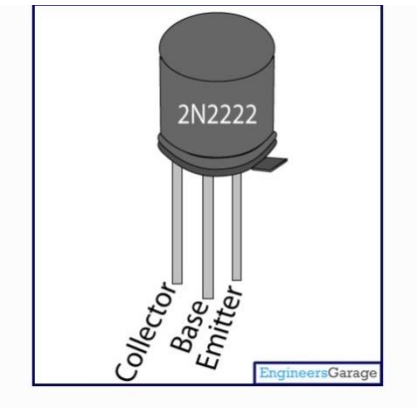

Fig 5 :- A 2N2222 NPN transistor

iii. IN4001 DIODE

The **1N400x** (or 1N4001 or 1N4000) series is a family of popular 1 A general-purpose **silicon rectifier diodes** commonly used in AC adapters for common household appliances. Its blocking voltage varies from 50 volts (1N4001) to 1000 volts (1N4007). This JEDEC device number series is available in the DO-41 axial package, and similar diodes are available in SMA and MELF surface mount packages (in other part number series).

Fig 6 :- An IN4001 diode

iv. 12V PERISTALTIC PUMP

Fig 7 :- A 12V DC peristaltic pump

Here we are using a 12V DC peristaltic pump. The specifications of the peristaltic pump are as follows:-

I. Voltage rating :- 12 V DC.
II. Current rating :- 0.75 amps.
III. Wattage rating :- 9 watt.
IV. Working condition temperature :- 0-40^{o}C.
V. Relative humidity :- < 80%.
VI. Flow rate :- 0-100 ml/min.
VII. Rotate speed :- 0.1-5000 rpm.
VIII. Driver size :- diameter 27.6 X height 37.9 (mm).
IX. Head size :- diameter 31.7 X height 20.1 (mm).
X. Equipped with pump tube (ID x OD) :- 2.5 mm inner diameter X 4.7 mm.
XI. Suitable for :- medical, chemical experiments, environmental protection.

v. 16X2 LCD DISPLAY

A **liquid-crystal display** (**LCD**) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome.LCDs are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden, such as preset words, digits, and seven-segment displays, as in a digital clock. They use the same basic technology, except that arbitrary images are made up of a large number of small pixels, while other displays have larger elements.

LCDs are used in a wide range of applications including LCD televisions, computer monitors, instrument panels, aircraft cockpit displays, and indoor and outdoor signage. Small LCD screens are common in portable consumer devices such as digital cameras, watches, calculators, and mobile telephones, including smartphones. LCD screens are also used on consumer electronics products such as DVD players, video game devices and clocks. LCD screens have replaced heavy, bulky cathode ray tube (CRT) displays in nearly all applications. LCD screens are available in a wider range of screen sizes than CRT and plasma displays, with LCD screens available in sizes ranging from tiny digital watches to very large television receivers.

Since LCD screens do not use phosphors, they do not suffer image burn-in when a static image is displayed on a screen for a long time, *e.g.*, the table frame for an airline flight schedule on an indoor sign. LCDs are, however, susceptible to image persistence.[2] The LCD screen is more energy-efficient and can be disposed of more safely than a CRT can. Its low electrical power consumption enables it to be used in battery-powered electronic equipment more efficiently than CRTs can be. By 2008, annual sales of televisions with LCD screens exceeded sales of CRT units worldwide, and the CRT became obsolete for most purposes.

Fig 8 :- A 16x2 LCD display with pin layout

vi. 10K POT

10K potentiometer is a three-terminal resistor with a sliding or rotating contact that forms an adjustable voltage divider. If only two terminals are used, one end and the wiper acts as a variable resistor whose value varies from 0 Ω to 10KΩ.

There are a number of terms in the electronics industry used to describe certain types of potentiometers:

- **slide pot** or **slider pot**: a potentiometer that is adjusted by sliding the wiper left or right (or up and down, depending on the installation), usually with a finger or thumb
- **thumb pot** or **thumbwheel pot**: a small rotating potentiometer meant to be adjusted infrequently by means of a small thumbwheel
- **trimpot** or **trimmer pot**: a trimmer potentiometer typically meant to be adjusted once or infrequently for "fine-tuning" an electrical signal.

Fig 9:- A 10K POT

vii. 10K RESISTER

It is a resistor having a value of 10K.

Fig 10 :- A 10K resistor

viii. JUMP WIRES

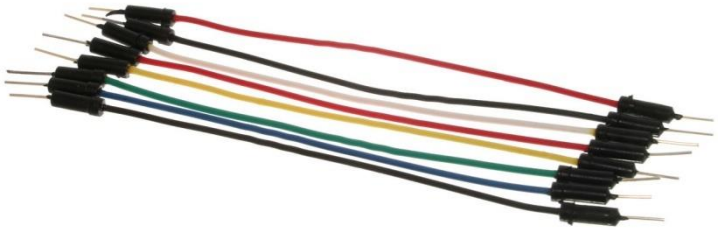

Fig 11:- Jump wires

ix. BEAKERS

Total 3 no of 100 ml beakers are used here.

Fig 12 :- A 100 ml beaker

x. PIPES

Pipes are used here in the inlets and the outlets of the peristaltic pumps.

Fig 13:- Peristaltic pump pipe

b) SOFTWARE REQUIREMENT

As explained earlier our project requires two part hardware and software. Hardware parts are explained above and software requires as follows :-

➢ Arduino IDE

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software. This software can be used with any Arduino board. The Arduino development environment contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions, and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.

Software written using Arduino are called sketches. These sketches are written in the text editor. Sketches are saved with the file extension .ino. It has features for cutting/pasting and for

searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino environment including complete error messages and other information. The bottom right-hand comes of the window displays the current board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

Fig 14 :- ARDUINO IDE software

c) FLOW DIAGRAM

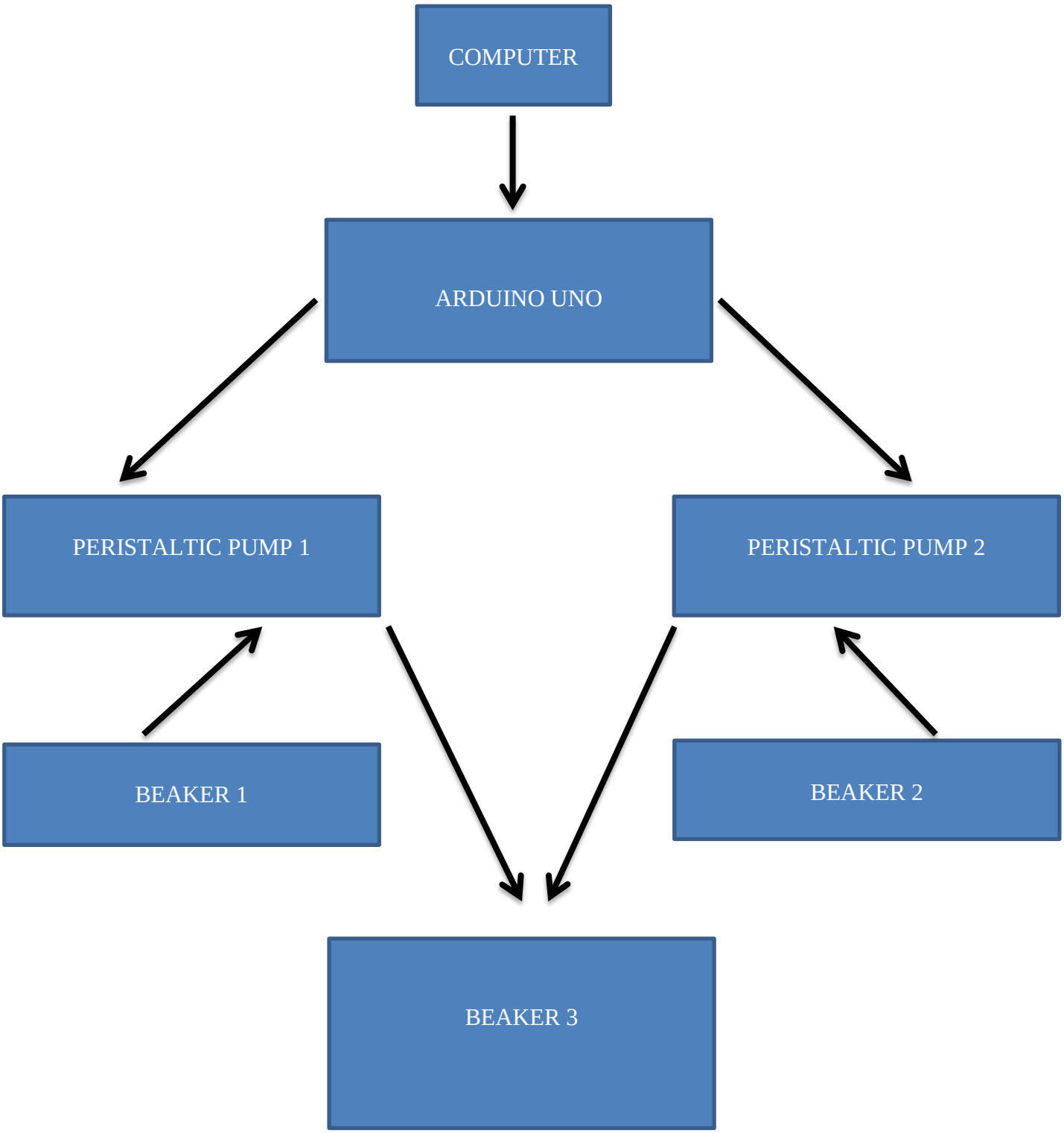

Fig 15 :- Flow Diagram

d) HARDWARE IMPLEMENTATION

We connect one of the digital pins i.e., D10 PWM/SS of ARDUINO UNO to the base of the transistor. Now the peristaltic pump turns on. So we use the arduino in this case to turn the transistor on, and, thus, peristaltic pump on and off.The collector of the transistor connects to either 5V from the arduino or the external voltage source and the peristaltic pump. So we connect power source and the load to the collector of the transistor.The emitter of the transistor simply gets connected to ground. Thus we can control the pump. Two such peristaltic pumps are connected with arduino for two different beakers.

A 16X2 LCD display is also connected with the arduino to monitor the desired volume of liquids in the beakers. In this display we can set the volume of liquids of the two beakers are we wish, i.e., we can control how much of liquid from the two beakers we have to mix.

Pump 1 takes the liquid from beaker 1 and on the other hand pump 2 takes the liquid from beaker 2. Now these liquids are mixed together in beaker 3.

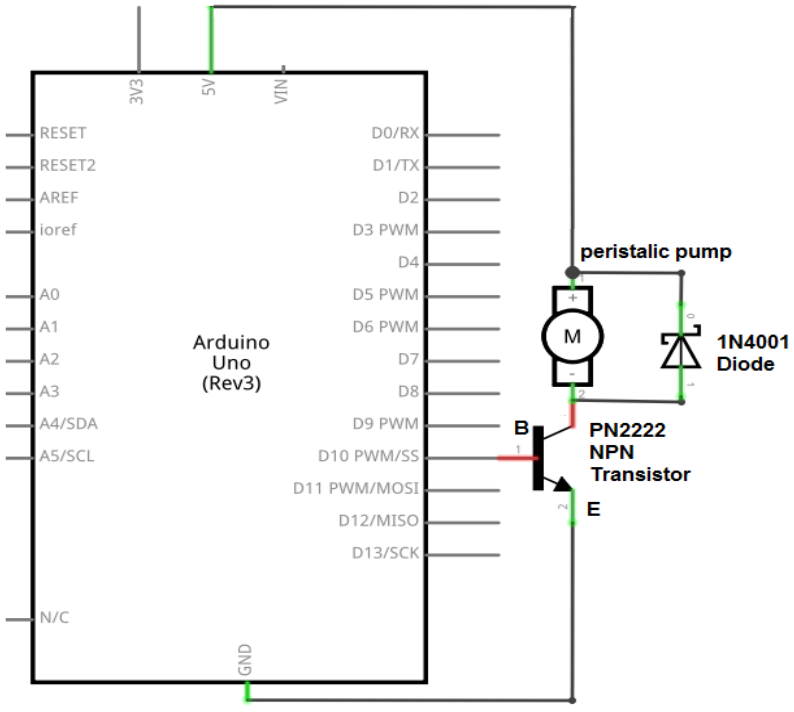

Fig 16 :- Connection of the pump with ARDUINO

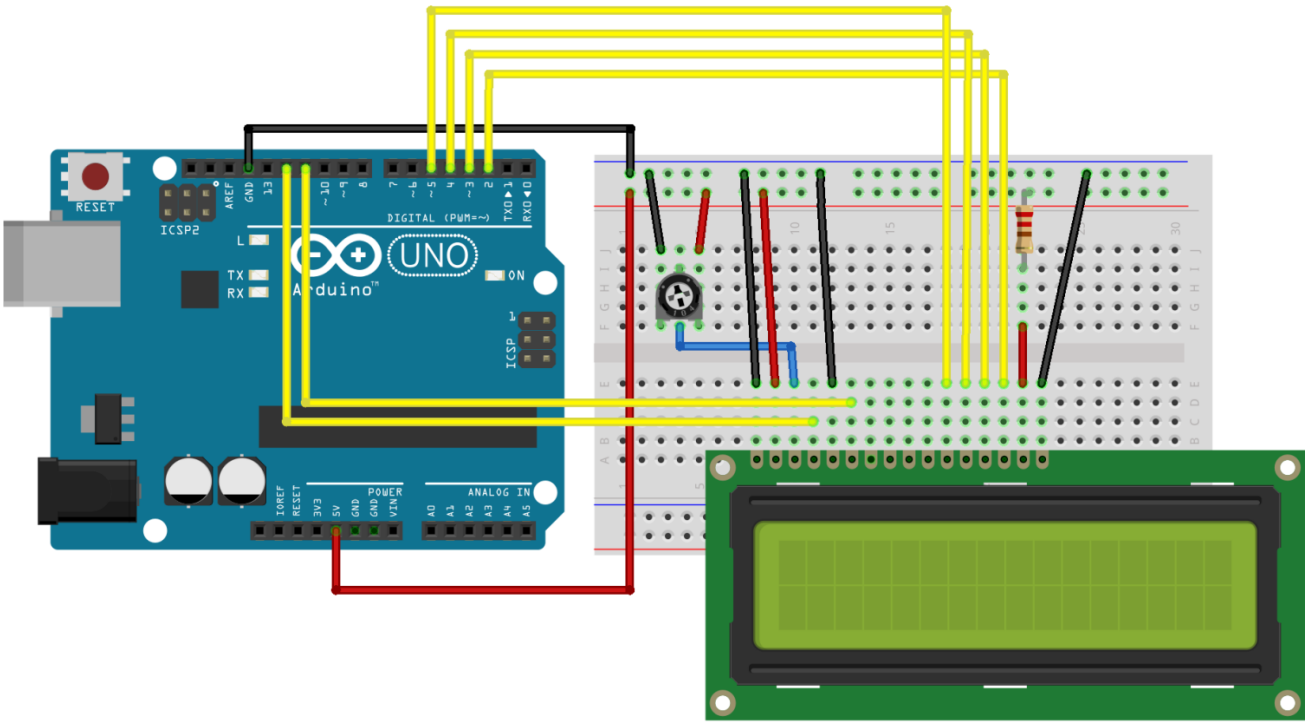

Fig 17 :- Connection of the LCD display with ARDUINO

e) SOFTWARE IMPLEMENTATION

For software implementation we require a software namely Arduino IDE. This softwareenables us to load the program in Arduino board.

Peristaltic pump has two terminals for connection. On many peristaltic pumps, one tube is longer than the other. If we want the longer tube to be the tube uptaking the liquid, then the '+ve' terminal voltage has to be connected to this end. In other words, whatever terminal of the pump has the '+ve' terminal voltage will be the tube uptaking the liquid. The other tube having the ground terminal of the power source connected with it, will be dispersing the liquid in drops.

ARDUINO UNO is a microcontroller board based on the "ATmega328P" or "ATmega328" IC. It has 14 digital i/o pins (of which 6 can be used as PWM o/p pins), 6 analog i/p pins, a 16 MHz quartz crystal, a USB connecting jack, a power jack, an ICSP header and a reset button. The o/p of the UNO is 5V, so we have to connect an external voltage source to the transistor.

We connect one of the digital pins (D10 PWM/SS) to the base of the transistor. If we want to off/on the pump, we just have to give the signal low/high to the D10 pin respectively. The emitter of the transistor simply gets connected to the ground.

Now we connect a " flyback diode" in parallel with the motor (this diode is used to eliminate flyback effect, i.e., the sudden voltage spike seen across an inductive load when its supply current is suddenly reduced or interrupted). This protects the ARDUINO microcontroller from back emf produced by the motor. To protect the microcontroller from this, many times a diode is placed in parallel reverse biased condition.

Since the motor is connected to D10 pin, we set the motor variable to the value of 10. Next we have our setup() function, which makes the motor an o/p device, since we are writing to the motor. After this we have our loop() function. In the code we set it up so that the pump is on for 5 seconds after every 30 seconds. In other words, we turn it on, leave it for 5 seconds in "ON" condition, then we turn it "OFF" for 30 seconds. This repeats over and over again.

This is how a peristaltic pump can be controlled by an ARDUINO microcontroller IC and can be used for a water dispensing system.

The code for running the peristaltic pump is written in C++ language in a computer software called “ARDUINO IDE”, can be easily downloaded from the internet.

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CHAPTER 5: EXPERIMENTAL SETUP AND RESULT

After aseembling the hardware parts we took a few snapshots of our project. We are going to put those snapshots in this chapter.

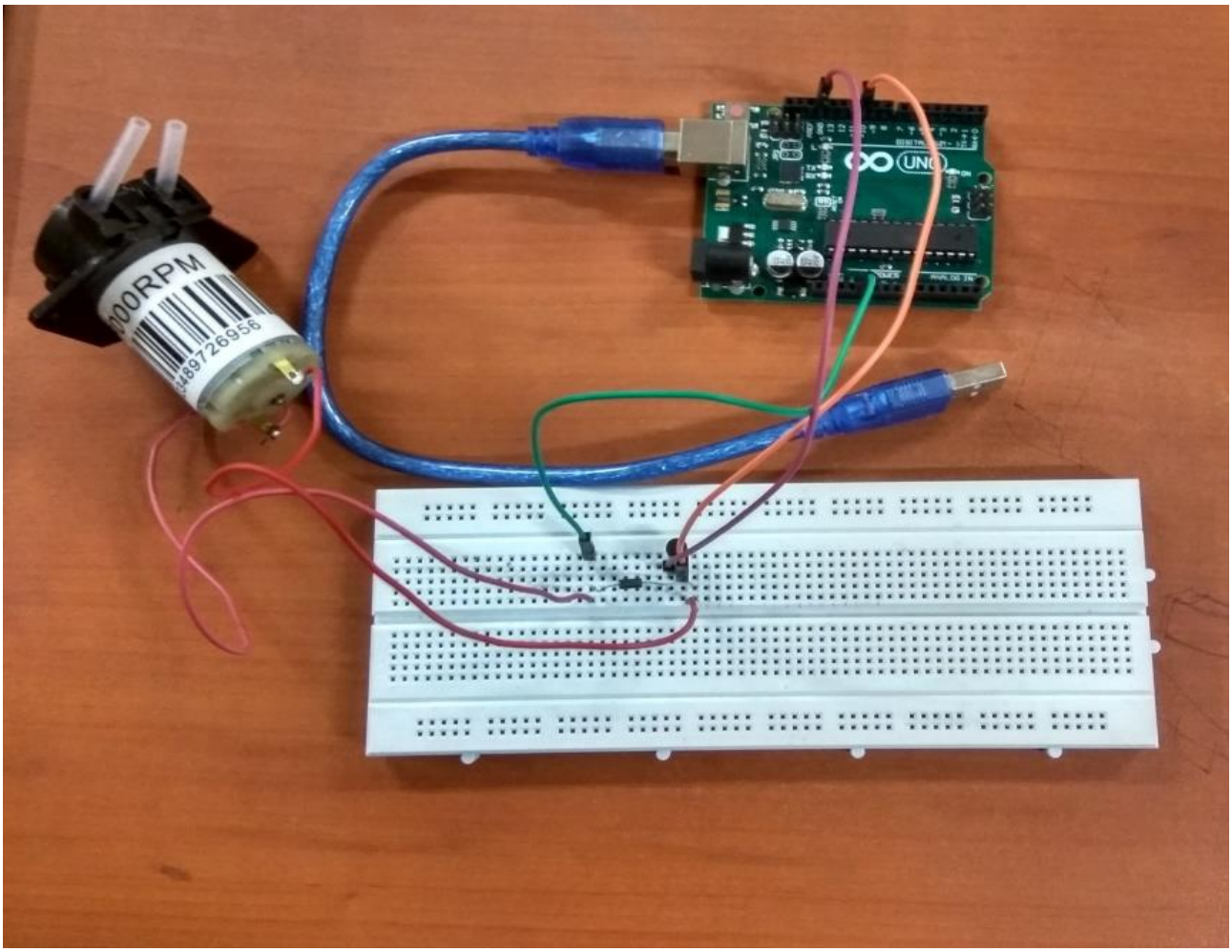

Fig 18 :- Connection of the pump with ARDUINO in a breadboard

In the above snapshot of our project we can clearly see that the peristaltic pump is connected with the arduino uno through breadboard. The PN2222 transistor and the IN4001 diode is also connected with arduino.

After the hardware assembling we uploaded the source code in the ATmega328 microprocessor of arduino. In the next snapshots we can clearly see that the program is running successfully displaying different commands.

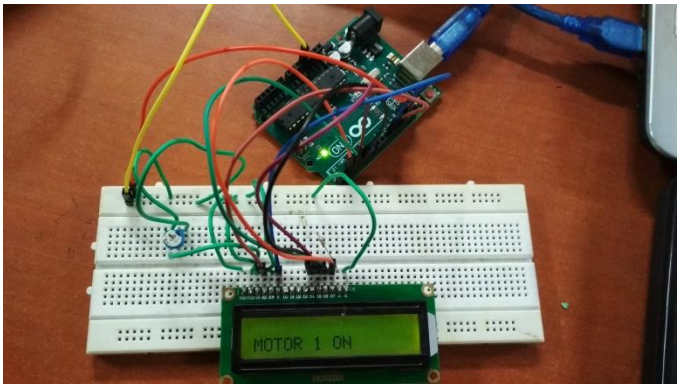

Fig 19 :- Displaying "MOTOR 1 ON" command

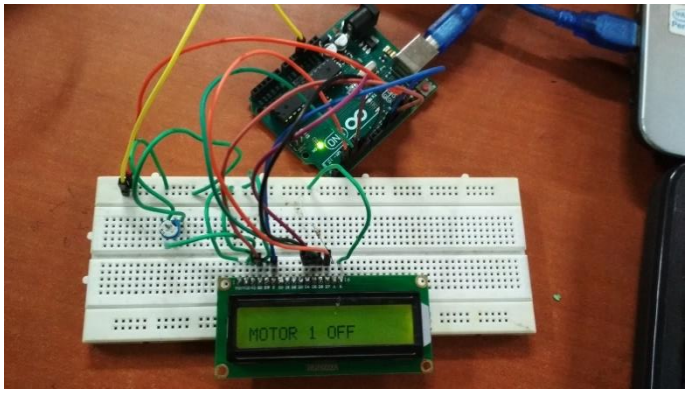

Fig 20 :- Displaying "MOTOR 1 OFF" command

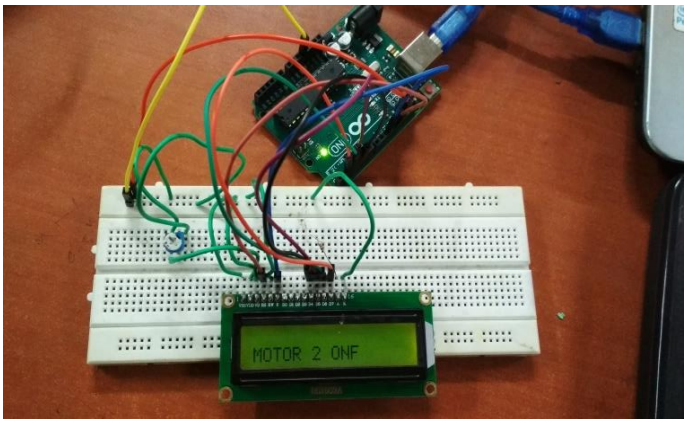

Fig 21 :- Displaying “MOTOR 2 ON” command

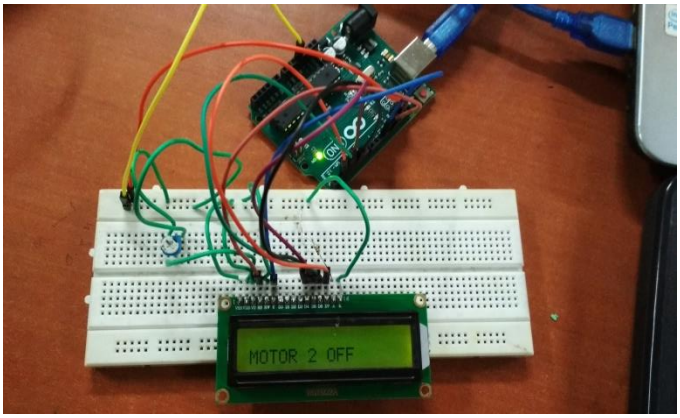

Fig 22 :- Displaying “MOTOR 2 OFF” command

We also have plotted a graph between the varying input voltage of the peristaltic pump and the time taken by the pump to completely transfer a certain amount of water from one beaker to another.

Here the amount of the water in a beaker is 60ml.

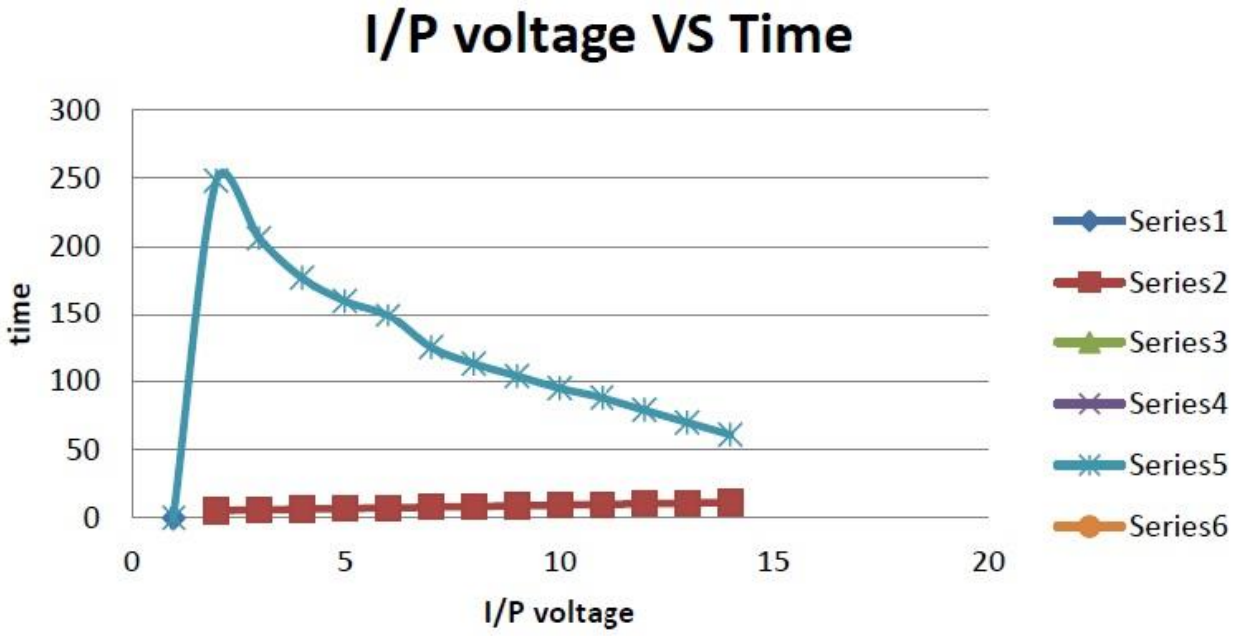

Fig 23 :- Comparison between I/P voltage and time

CHAPTER 6: CONCLUSION &FUTURE SCOPE

a) CONCLUSION

In this project we can conclude that two liquids of different volume can be mixed with one another by using one arduino uno board. The speed of the motor can be controlled by varying the input voltage of the pump. On the other hand, the volume of water taken from both beaker 1 and beaker 2 can be changed by further programming into the arduino.

b) FUTURE SCOPES

There is no limitation for improvisation, different ideas can reflect the changes in the way it is implemented, and collaboration of technology at interdisciplinary level of engineering improves the quality of the product potentially. The technology today are more powerful, and to make this module much more qualified it is built even to support any further expansion and to make it work more efficiently. Using an RFID reader and Tags as another input device and creating an environment to configure the device to synchronize with central station / server which can control multiple dispenser system wirelessly can improve the reliability and efficiency in the way the system works and also it gives consumers relish feeling to drink. Each drop of liquid that consumers drink can feel the happiness as a contribution towards our mother land planet earth in a way to save her from pollution.

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FOR SOFTWARE DOWNLOAD:

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