Visvesvaraya Technological University

Belgaum, Karnataka-590 018

A Project Report on

"Semi-automated Medicine Vending Machine Using Arduino"

Project Report submitted in partial fulfillment of the requirement for the award of the degree of

Bachelor of Engineering

In

Electrical & Electronics Engineering

Submitted by

NISCHITHA A P 1CR14EE060

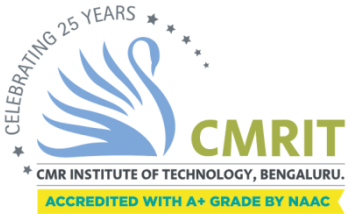
VASANTHA KUMARA S N 1CR15EE421

Under the Guidance of

Ms. NITHARA P V

Assistant Professor, Department of Electrical & Electronics Engineering

CMR Institute of Technology



CMR Institute of Technology, Bengaluru-560 037

Department of Electrical & Electronics Engineering

2019-2020

CMR INSTITUTE OF TECHNOLOGY
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
AECS Layout, Bengaluru-560 037

Certificate

Certified that the project work entitled **"Semi-Automated Medicine Vending Machine Using Arduino"** carried out by Ms Nischitha A P USN 1CR14EE060; Mr. Vasantha kumara S N, USN 1CR15EE421 are bonafied students of CMR Institute of Technology, Bengaluru, in partial fulfillment for the award of Bachelor of Engineering in Electrical & Electronics Engineering of the Visvesvaraya Technological University, Belgaum, during the year 2019-2020. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the Report deposited in the departmental library.

The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for the said Degree.

Signature of the Guide	*Signature of the HOD*	*Signature of the Principal*
Ms. Nithara P V Assistant Professor EEE Department CMRIT, Bengaluru	Dr. K. Chitra Professor & HOD EEE Department CMRIT, Bengaluru	Dr. Sanjay Jain Principal, CMRIT, Bengaluru

External Viva

Name of the Examiners	Signature & Date
1.	
2.	

CMR INSTITUTE OF TECHNOLOY
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
AECS Layout, Bengaluru-560 037

DECLARATION

We, [Ms. **Nischitha A P (1CR14EE060),** Mr.**Vasantha kumara S N (1CR15EE421)],** hereby declare that the report entitled **"Semi-Automated Medicine Vending Machine Using Arduino"** has been carried out by us under the guidance of **Ms.Nithara PV,** Assistant Professor, Department of Electrical & Electronics Engineering, CMR Institute of Technology, Bengaluru, in partial fulfillment of the requirement for the degree of **BACHELOR OF ENGINEERING in ELECTRICAL & ELECTRONICS ENGINEERING**, of Visveswaraya Technological University, Belagaum during the academic year 2019-20. The work done in this report is original and it has not been submitted for any other degree in any university.

Place: Bengaluru
Date:30/05/2020

Nischitha A P (1CR14EE060)

Vasanthakumara S N (1CR15EE421)

Abstract

An automated medical system is introduced to reduce the man power, time and energy. It is similar to an ATM through which we get the required money at any time & place. The same system is followed for the medicines also. It reduces the load for the pharmacy and hospitals. Semi-automated medicine vending machine is a machine which ensure availability of medicines 24x7, ATM will be very useful in saving life in case of an accident on highways, remote areas, rural areas and places where medical stores are not within the reach in case of emergency At least first aid can be made easily accessible with the help of this system. Medicines for B.P, diabetics, cold, fever, headache, and first aid medicines like bandage, cotton and other routinely used tablets can be obtained. The medicine will be dispensed based on the prescription in the form of QR code or can select it manually hence it is semi-automated. With this (SMVM) concept in view, another system regarding health monitoring is developed which checks the basic medical parameters like heartrate, blood pressure, body temperature, etc. By having this vending machine in the workplace or worksites without clinics or pharmacies can benefit from increased work efficiency and avoid underperformance of ill employees. It also prevents hours wasted waiting in queues at clinics for trivial problems like colds and headaches by giving the access to the basic testing equipment. It will be a better modernize, simplified, accurate & fast service provided to the people without any friction with the medical authorities.

Acknowledgement

The satisfaction and euphoria that accompany the successful completion of any task would be incomplete without the mention of people, who are responsible for the completion of the project and who made it possible, because success is outcome of hard work and perseverance, but stead fast of all is encouraging guidance. So with gratitude we acknowledge all those whose guidance and encouragement served us to motivate towards the success of the project work.

We take great pleasure in expressing our sincere thanks to ***Dr. Sanjay Jain****,* ***Principal, CMR Institute of Technolog y, Bengaluru*** *for providing an excellent academic environment in the college and for his continuous motivation towards a dynamic career. We would like to profoundly thank* ***Dr. B Narasimha Murthy****, Vice-principal of CMR Institute of Technology and the whole* ***Management*** *for providing such a healthy environment for the successful completion of the project work.*

We would like to convey our sincere gratitude to ***Dr. K Chitra****,* ***Head of Electrical and Electronics Engineering Department, CMR Institute of Technology, Bengaluru*** *for her invaluable guidance and encouragement and for providing good facilities to carry out this project work.*

We would like to express our deep sense of gratitude to ***Ms. Nithara P V, Assistant Professor, Electrical and Electronics Engineering, CMR Institute of Technology, Bengaluru*** *for his/her exemplary guidance, valuable suggestions, expert advice and encouragement to pursue this project work.*

We are thankful to all the faculties and laboratory staffs of ***Electrical and Electronics Engineering Department, CMR Institute of Technology, Bengaluru*** *for helping us in all possible manners during the entire period.*

Finally, we acknowledge the people who mean a lot to us, our parents, for their inspiration, unconditional love, support, and faith for carrying out this work to the finishing line. We want to give special thanks to all our friends who went through hard times together, cheered us on, helped us a lot, and celebrated each accomplishment.

Lastly, to the ***Almighty****, for showering His Blessings and to many more, whom we didn't mention here.*

CONTENTS

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Time plays a crucial role in every human life. As technology is rapidly increasing, man power is decreasing day by day. To reduce the human efforts number of electronic devices and gadgets were developed. One such system is an electronic ATM machine. ATM is the one stop integrated electronic machine which provide money anytime and anywhere. It is a convenient, faster and safest withdrawal method at anytime and anyplace.

With this (electronic ATM) concept in view, another system regarding health monitoring is developed. i.e. A Semi-Automated machine which yields the pharmaceuticals which is the proposal towards medical domain where health is the main concern for any human being before money. So, a Semi-Automated medicine vending machine (SMVM) is established where instead of money, medicines are dispensed.

Several people in India die due to lack of diagnosis in first place and non-availability of medicine on time. Problem arise when need of some medicine is urgent and pharmacy is not open or medicine is not in stock, especially during night time. In remote areas, rural areas and places where public turnover is less, the availability of medicines within the patient's reach is a critical issue. SMVM will help in solving these problems by providing the medicines 24x7.

Another system regarding health monitoring is integrated within the SMVM. SMVM will be one stop, single integrated machine to provide diagnosis to all the basic medical problems. It will be introduced with all modern diagnosing equipment (sensors) used to

give a detailed info about heartrate, blood pressure, body temperature, etc. SMVM will do the same work for a Hospital as an ATM machine do for a Bank. Thus, it will make it

easy to get medicines and solution for basic medical problem for people where hospitals are not in easy reach.

1.1 AIM OF THE PROJECT:

Our main aim behind SMVM is to make it a one stop solution available to a patient for most of the medical problems and to use them at places like Hostels, Airport, Railway station and rural areas where people can go for any emergency required tablets or for trivial problems like fever, vomiting, any first aid requirements like ointments, cotton, bandages etc.., or commonly used tablets for B.P, Diabetes etc.

1.2 OBJECTIVES OF THE PROJECT

The main objective of this project is to make medicines available 24/7 at any locality. This machine dispenses the medicines as per user's requirement. User can provide his/her prescription in order to get the medicines or user can choose the illness he/ she is suffering from and the medicines are dispensed as per user's illness. The user can also make sure that in particular vending machine, the required tablet is available or not and also get to know about location of the nearby vending machine. Since it is 24/7 available it will be very useful to people. This machine also provides sanitary pads and contraceptives hence it will be helpful for people who hesitate to ask for sanitary pads or condoms in pharmacy.

CHAPTER 2

LITERATURE SURVEY

1971: Joseph S Guarr. A medicine dispensing apparatus is mounted in a cabinet having a medicine receiving hopper therein. A plurality of medicine dispensing housings are mounted in the cabinet with each communicating with the hopper. A magazine containing medicine in the form of a plurality of pills, capsules, tablets, ampules and the like is movably mounted within each housing and a reciprocal plunger is engaged by each

magazine. Plunger moving means are mounted within the cabinet and are selectively

engaged and activated for moving the respective magazine from a medicine retaining position and return. Interaction of an interposer slidably mounted in each housing, an inclined slide surface in a medicine containing chamber within each magazine, and a slidable door permit ejection of a single unit of medicine such as a pill, capsule, tablet, ampul or the like from the respective magazine for each movement of the respective magazine to the medicine dispensing position.

1995: Charles W. Percy, Alvin V. Russell. A modular vending machine for dispensing a variety of different sized products with at least one array received within a cabinet, wherein the array is made up of a plurality of storage chambers with a dispensing mechanism disposed at the bottom of each chamber. The cabinet can receive any number of arrays which in turn can receive any number of storage chambers. The modular vending machine further includes a sensing device received within a receiving trough for confirming that a product has actually been dispensed. The dispensing mechanism includes a solenoid actuated plunger wherein the plunger controls the movement of a toggle member which is movable between a blocking position and a dispensing position so that only a single product is dispensed.

1999: Lawrence E, Guerra Keith W, Kudera Clayton Mehnert. A medicine vial dispensing apparatus includes a housing for storing medicine vials in a substantially axially horizontal storage orientation and a dispensing assembly for dispensing the vials in an upright orientation. The preferred embodiment includes a pair of spaced, resilient arms having respective, inwardly extending prongs that receive a vial therebetween. A slotted, rotating wheel receives a vial in the storage orientation and places it between the prongs. The closed end of the vial slips by one of the prongs while the other prong holds the interior surface of the open end until the vial attains a substantially upright orientation.

2003: Shoji Yuyama, Yasuhiro Shigeyama, Ayumu Saito, Akitomi Kohama, Masahiko Kasuya, Masaki Tujita

They invented a medicine feeding machine. This machine provides a medicine feeder apparatus comprising a plurality of cassettes each of which contains a different kind of

medicine and a base portion

on which the plurality of cassettes are mounted and which discharges the medicine in accordance with the prescription, the apparatus comprising:

an identification means which is provided on each cassette, the identification means showing information on the medicine contained in the cassette; a read means which is provided on the base portion, the read means reading the identification means of the cassette during the cassette is mounted on the base portion; and a rock means which is provided on the base portion, the rock means preventing the cassette from being mounted, whereby if the information of the medicine read from the identification by the read means does not coincide with a previously stored information, the rock means is operated, while if coincide, the rock means is released.

2004: Morihisa Shioya created A vending machine adopts a storing tray capable of storing a plurality of commodities in an upright state as storing means, and adopts means including a hand unit capable of gripping the commodity located at a taking-out portion of a predetermined storing tray as remaining in an upright state and a mechanism capable of moving the hand unit up and down, left and right, and back and forth as a common carrying-out means by a plurality of storing means. This allows the constitution of the storing means to be simplified, and the necessity of providing the carrying-out means for every storing means is eliminated so that the manufacturer's cost of the vending machine can be reduced.

2007: Mark E Frankel invented A system and method for conveying regulated pharmaceuticals to a patient in an automated manner. A database is provided that contains information on patients and the prescriptions prescribed to those patients. An automated conveying machine is supplied that contains an inventory of prepackaged pharmaceuticals that can be independently vended. An interface is provided proximate the automated conveying machine. Prescription data is entered into the interface. The prescription data identifies a specific patient and a specific prepackaged pharmaceutical. The prescription

data is compared to information in the database for confirmation. The automated conveying machine receives a confirmation signal if the prescription data is valid. If the requested prepackaged pharmaceutical is present within the inventory of said automated conveying machine and the confirmation signal has been received, then the automated conveying machine is activated. Inventory controls are present that prevent the system from overselling.

2009: John Hui invented An automated medicine dispensing system comprising a housing unit; a dispensing unit attached to the housing, the dispensing unit comprising a pump to alter a pressure in the dispensing unit, and a nozzle operatively connected to the pump via a first tube; and a base positioned below the dispensing unit, the base comprising a plurality of receptacles, each receptacle operatively connected to a sensor to detect a quantity of medicine in each receptacle, and a dispensing outlet adjacent to at least one receptacle to dispense the medicine outside the housing unit. The base may be movable
below the dispensing unit to select a desired medication. The dispensing unit may be movable over the base to select the desired medication.

2011: A medicine cart having excellent workability in filling and returning a medicine, comprising an upwardly opening cassette storing a plurality of medicines arranged in a row in an upright state and a pressing member pressing the rearmost medicine in the cassette forward. An insert guide part is formed at the pressing side end part of the pressing member so that the medicine can be inserted between the pressing member and the rearmost medicine. The pressing side end part of the pressing member having a vertical front surface and an inclined upper surface wherein both the vertical front surface and the upper surface are in the shape of a concave circular arc.

2014: Albert Jaison, Anu Simon, “Robotic pill dispenser”, IOSR journal of pharmacy and biological

science (IOSR-JPBS), e-ISSN: 2278-3008, P-ISSN:2319:7676. Volume 9, issue 4 ver. V (july-aug 2014),

60-63. THE robotic pill dispenser is based on the principle of automatically reminding patient to take their pills on time using a timer algorithm. The main feature of this project is that it can dispense pills to multiple patients. This is made possible by controlling the motion of the robot using a remote control. The remote works with the help of an X Bee module which is a Transreceiver that communicates through radio frequency. We usedPIC16f877A as our main microcontroller as it very reliable, low cost and can be easily interfaced with multiple peripherals. For an automatic pill dispenser a mechanical model that efficiently provide the pills at the required time. The pill provider model should be properly synchronized with the timer module. For achieving this we made cylinder of glass which is divided into four compartments. This cylinder is attached to the stepper motor which controlled by microcontroller through a micro stepper driver that provide precise micro step rotation of stepper motor. So, as stepper motor rotates the cylindrical rotates simultaneously. A real time is the most important part of our project that gives the exact time of pill dispenser rotation. A rover is also present that is controlled by a remote through radio frequencies which makes our pill dispenser movable. Firstly, we made algorithm for the automatic pill dispenser. Then we designed our mechanical model and interfaced all the software part and the hardware part with it. Then we made the algorithm for the remote control and made the rover model and done the software and hardware interfacing. Thirdly we attached the rover section with the automatic pill dispenser which made our project a movable automatic pill dispenser which is very robust and efficient that can be used easily for providing timely medication to patients.

2015: Abhishek Singh created a project where, the project creates an automated emergency kit machine for providing medicines or preliminary treatment on some basic diseases' symptoms. In certain areas such as highways, rural areas etc. doctors are not available nearby. So this project will solve the unavailability

of doctors in remote areas. In this project we are going to make a device which will provide the user needed medicine according to his disease.

2015: Dhanush J Nair, Sunny Nahar, "ATM transactions: A new time based approach research paper ", International journal of science, engineering, and technology research (IJSETR),volume 4,issue,6,june 2015, ISSN:2278-7798. An automated teller machine is an electronic telecommunications device that enables the customers of a financial institution to perform financial transactions, particularly cash withdrawal, without the need for a human cashier, clerk or bank teller.[1] On most modern ATMs, the customer is identified by inserting a plastic ATM card with a magnetic stripe or a plastic smart card with a chip that contains a unique card number and some security information such as an expiration date or CVVC (CVV). Authentication is provided by the customer entering a personal identification number (PIN). Using an ATM, customers can access their bank deposit or credit accounts in order to make a variety of transactions such as cash withdrawals, check balances, or credit mobile phones. If the currency being withdrawn from the ATM is different from that in which the bank account is denominated the money will be converted at an official exchange rate. Thus, ATMs often provide the best possible exchange rates for foreign travelers, and are widely used for this purpose. Initially the user has to swipe his/her smart card to activate the machine. Once he has an access to the device, he can submit his disease's symptoms through the touch screen. Then once his medicine is decided by the s/w, he will be given some coin-like tokens from an outlet. Once he receives the tokens, a message will be displayed on the screen that the user has to put these tokens in particular medicine box area. As the user puts the tokens in the specified boxes, he will receive one tablet from that box. Thus, he will get a one-time dose on the basis of his disease symptom.

2017: Philip Stinson invented A vending machine comprises a robotic arm and a pick mechanism that is coupled to the robotic arm. The pick mechanism is configured to retrieve a vendible product in the vending machine, and the robotic arm is configured to locate the pick mechanism at a location with a x-y coordinate that corresponds to the vendible product. The pick mechanism comprises a first roller, a second roller, and a belt that mechanically links the first and second rollers by forming a loop around the first and second rollers. The belt has a first portion and a second portion on opposing sides of the loop, and the second portion of the belt is coupled to the robotic arm. The pick mechanism further comprises a motor that is configured to rotate the first roller in order

to translate the first and second portions of the belt in opposite directions to each other.

The pick mechanism further comprises a picker arm extending in the z direction. The picker arm has a proximal portion closest to the first roller and a distal portion furthest from the first roller. The proximal portion is coupled to the first portion of the belt in order to be moved in the z-direction as the first roller is rotated, and the distal portion comprises a product picker for releasably attaching to the vendible product.

2018: Joel F feldman, Yeardley W. green, Stanley I.H. feldman, Jeffrey C sweeter invented An automated method which is provided for recording contents of medication packages vended from a plurality of vending machines in electronic records, such as an electronic medication administration record , that store records for a plurality of patients who are associated with respective vending machines. A vending event causes the electronic record to be populated. The contents of the medication packages vended from the vending machines are recorded in electronic records without communicating patient names or vended medications in the electronic message sent from the vending machines.

2019: Xiaoxia He, Xia Feng, Peng Liu, Yi Lyu, Hongyan Lu, Yanling Ma, Shu Liang, Fei Liu &Yan Jiang To find more effective test and intervention measures, and to achieve the first 90 of the 90–90–90 target, this study was conducted for the first time to develop and assess an innovative HIV anonymous urine test service-based vending machine and Internet at universities of China. From June to December 2016, 11 vending machines were placed in 7 pilot universities in Beijing, Sichuan, Yunnan and Heilongjiang provinces. A total of 957 HIV urine collection kits were dispensed free and also through vending machines and 378 (39.5%) urine samples were returned and 376 (99.5%) of them were qualified to be tested for HIV antibody in professional laboratories. Participants searched for confidential test results using an ID code online. Only seven (1.86%) urine samples were positive. Monitoring data showed 67.8% (255/376) participants searched for test results online, 72.2% of kits were purchased in dormitory buildings and 27.8% were purchased in teaching buildings and 88.9% were purchased between 21:00 and 24:00. In conclusion, this study analyzes the acceptability, feasibility and effectiveness of HIV testing and intervention service.

2019: Pruthvesh Desai; Biswamoy Pattnaik; Sreya Dey; T.S. Aditya; Karthik Rajaraman; M. Aarthy ATMAH comprises of an automatic medicine vending machine to dispense drugs as per a doctor's prescription. The vending mechanism is controlled by the raspberry pi which is a single board computer and the second aspect of it is the online portal for a user to check his prescriptions, and for the doctor to generate an e-prescription. The device dispenses out the prescribed medicines by the doctor when the user credentials of patients are validated from the database. The online portal is built on two fronts - a webpage and an android application which are linked to the same database. The patient can view his details and prescriptions through the android application or webpage by logging in with appropriate credentials.

2.1 DISADVANTAGES OF EXISTING SYSTEMS:

The existing systems have the following disadvantages:

- The space consumption is more.
- The interface is not user friendly.
- It is not cost efficient.
- It is not manufactured for Multi-Purpose use.
- Lack of GPS module to detect its exact location.
- Storage capacity is less.

CHAPTER 3

SYSTEM REQUIREMENTS SPECIFICATIONS

System requirements specification (SRS) is a text written to specify in detail the system components, both hardware and software, which are needed for the system implementation, along with functional and non-functional and operational requirements, as anticipated from the system.

3.1 HARDWARE SPECIFICATION:

This section gives details of the hardware components required for the system implementation:

3.1.1 MICROCONTROLLER (ARDUINO UNO):

Arduino Uno is a microcontroller board based on the ATmega328P (datasheet). It has

14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, 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. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

3.1.2 LCD:

LCD (Liquid Crystal Display) is a type of flat panel display which uses liquid crystals in its primary form of operation. LEDs have a large and varying set of use cases for consumers and businesses, as they can be commonly found in smartphones, televisions, computer monitors and instrument panels.

LCDs were a big leap in terms of the technology they replaced, which include light-emitting diode (LED) and gas-plasma displays. LCDs allowed displays to be much thinner than cathode ray tube (CRT) technology. LCDs consume much less power than LED and gas-display displays because they work on the principle of blocking light rather than emitting it. Where an LED emits light, the liquid crystals in an LCD produces an image using a backlight.

3.1.3 SUPPLY UNIT:

A supply unit is an electrical device that supplies electric power to an electrical load. The primary function of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load. As a result, power supplies are sometimes referred to as electric power converters. Some power supplies are separate

standalone pieces of equipment, while others are built into the load appliances that they

power. Examples of the latter include power supplies found in desktop computers and consumer electronics devices. Other functions that power supplies may perform include limiting the current drawn by the load to safe levels, shutting off the current in the event of an electrical fault, power conditioning to prevent electronic noise or voltage surges on the input from reaching the

load, power-factor correction, and storing energy so it can continue to power the load in the event of a temporary interruption in the source power.

3.1.4 SERVO MOTOR:

servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration.[1] It consists of a suitable motor coupled to a sensor for position feedback. It also requires a relatively sophisticated controller, often a dedicated module designed specifically for use with servomotors.

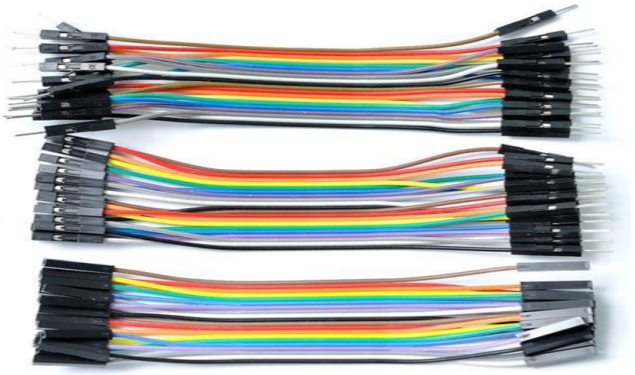
Servomotors are not a specific class of motor, although the term servomotor is often used to refer to a motor suitable for use in a closed-loop control system. A servomotor is a closed-loop servomechanism that uses position feedback to control its motion and final position. The input to its control is a signal (either analogue or digital) representing the position commanded for the output shaft.

The motor is paired with some type of position encoder to provide position and speed feedback. In the simplest case, only the position is measured. The measured position of the output is compared to the command position, the external input to the controller. If the output position differs from that required, an error signal is generated which then causes the motor to rotate in either direction, as needed to bring the output shaft to the

appropriate position. As the positions approach, the error signal reduces to zero and the

motor stops.

3.1.5 JUMPER WIRES:

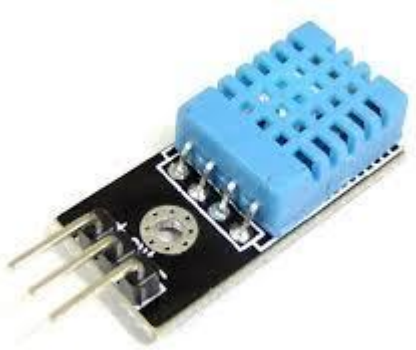


A jump wire (also known as jumper wire, or jumper) is an electrical wire, or group of them in a cable, with a connector or pin at each end (or sometimes without them – simply "tinned"), which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.[1]

Individual jump wires are fitted by inserting their "end connectors" into the slots provided in a breadboard, the header connector of a circuit board, or a piece of test equipment.

Jumper wires typically come in three versions: male-to-male, male-to-female and female-to-female. The difference between each is in the end point of the wire. Male ends have a pin protruding and can plug into things, while female ends do not and are used to plug things into. Male-to-male jumper wires are the most common and what you likely will use most often. When connecting two ports on a breadboard, a male-to-male wire is what you'll need.

3.1.6 DHT11 SENSOR



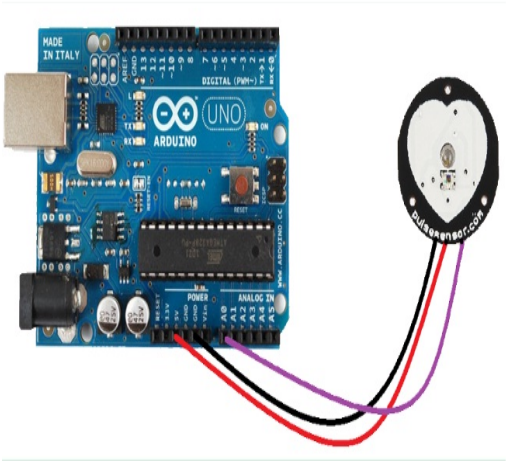
These sensors are very popular for electronics hobbyists because there are very cheap but still providing great performance. Here are the main specifications and differences between these two sensors:

The DHT22 is the more expensive version which obviously has better specifications. Its temperature measuring range is from -40 to +125 degrees Celsius with +-0.5 degrees accuracy, while the DHT11 temperature range is from 0 to 50 degrees Celsius with +-2 degrees accuracy. Also the DHT22 sensor has better humidity measuring range, from 0 to 100% with 2-5% accuracy, while the DHT11 humidity range is from 20 to 80% with 5% accuracy.

thermistor is actually a variable resistor that changes its resistance with change of the temperature. These sensors are made by sintering of semiconductive materials such as ceramics or polymers in order to provide larger changes in the resistance with just small changes in temperature. The term “NTC” means “Negative Temperature Coefficient”, which means that the resistance decreases with increase of the temperature.

The DHTxx sensors have four pins, VCC, GND, data pin and a not connected pin which has no usage. A pull-up resistor from 5K to 10K Ohms is required to keep the data line high and in order to enable the communication between the sensor and the Arduino Board. There are some versions of these sensors that come with a breakout boards with built-in pull-up resistor and they have just 3 pins

3.1.7 PULSE SENSOR



The Heartbeat rate information knowing is very useful while doing exercise, studying, etc. But, the heartbeat rate can be complicated to calculate. To overcome this problem, the pulse sensor or heartbeat sensor is used. This is a plug & play sensor mainly designed for Arduino board which can be used by makers, students, developers, artists who can utilize the heartbeat information into their projects. This sensor uses an easy optical pulse sensor along with amplification & cancellation of noise to make a circuit. By using this circuit, we can get fast and reliable heartbeat readings. This circuit can be operated with 4mA current and 5V voltage to use in mobile applications alternate name of this sensor is heartbeat sensor or heart rate sensor. The working of this sensor can be done by connecting it from the fingertip or human ear to Arduino board. So that heart rate can be easily calculated.

The main specifications of this sensor mainly include the following.
This is a hear beat detecting and biometric pulse rate sensor
Its diameter is 0.625
Its thickness is 0.125

The operating voltage is ranges +5V otherwise +3.3V

This is a plug and play type sensor

The current utilization is 4mA

Includes the circuits like Amplification & Noise cancellation

This pulse sensor is not approved by the FDA or medical. So it is used in student-level projects, not for the commercial purpose in health issues applications.

3.2 SOFTWARE SPECIFICATION:

This section gives details of the software components required for the system implementation:

3.2.1 ARDUINO IDE 1.8.10:

The **Arduino Integrated Development Environment (IDE)** is a cross-platform application (for Windows, macOS, Linux) that is written in the programming language Java. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards.

The source code for the IDE is released under the GNU General Public License, version 2. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub *main ()* into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution. The Arduino IDE employs the program *avrdude* to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

3.2.2 BLYNK ANDROID APPLICATION:

Blynk is a Platform with iOS and Android apps to control Arduino, Raspberry Pi and the likes over the Internet. It’s a digital dashboard where you can build a graphic interface for

your project by simply dragging and dropping widgets. It's really simple to set everything

up and you'll start tinkering in less than 5 mins.

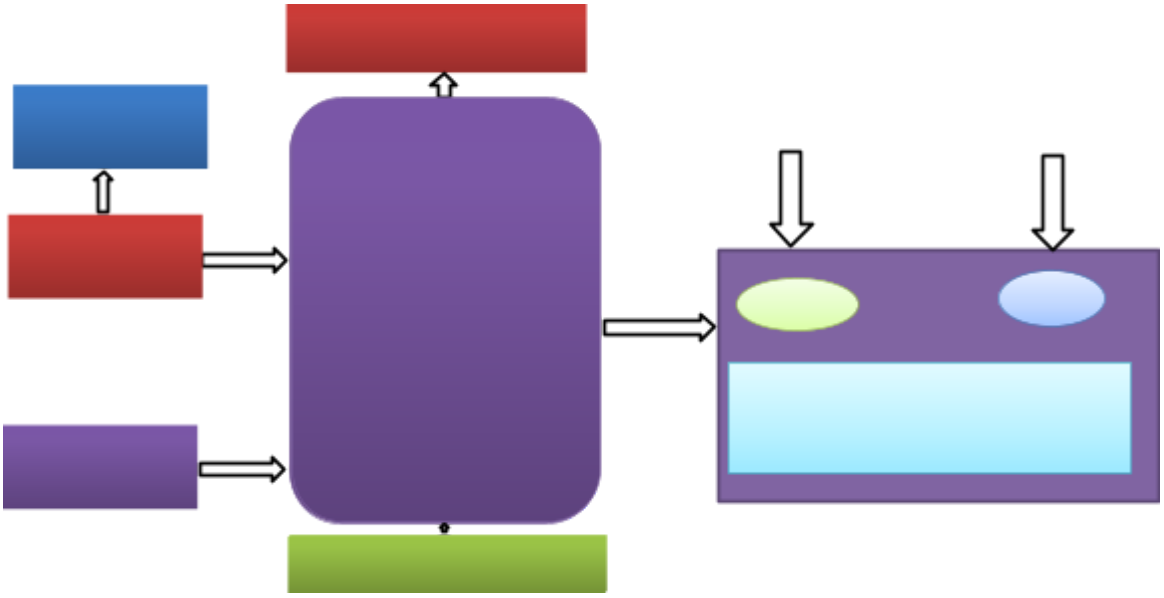
Blynk is not tied to some specific board or shield. Instead, it's supporting hardware of your choice. Whether your Arduino or Raspberry Pi is linked to the Internet over Wi-Fi, Ethernet or this new ESP8266 chip, Blynk will get you online and ready for the Internet of Your Things.

CHAPTER 4

PROPOSED SYSTEM

An automated medical system is introduced to reduce the man power, time and energy. It is similar to an ATM through which we get the required money at any time. The same system is followed for the medicines also. It reduces the load for the pharmacy and hospitals. Medicines for B.P, diabetics, cold, fever, headache, and first aid medicines like bandage, cotton and other routinely used tablets can be obtained. The medicine will be dispensed based on the prescription in the form of QR code or can select it manually hence it is semi-automated.

4.1 BLOCK DIAGRAM:



4.2 WORKING PRINCIPLE:

Our main objective behind Health ATM is to make availability of medicines a one stop solution to a patient for most of the medical problems and also to connect people with specialists in different hospitals in a better, modernize, simplified, easy and accurate way. It is similar to an ATM through which we get the required money at any time & any place. The same system is followed for the pharmaceuticals also. The basic theme of this project involves dispensing of medicines as per the user's requirements. A barcode reader is used as an input sensor. The input can also be provided by the user through the keypad, then it is forwarded to the Microcontroller for processing and for taking the required decisions in order to proceed forward.

The Microcontroller, with the help of the motor drivers, drives the concerned medicine cabinet having the medicine that the user needs. These motor drivers control the rotation of the motor that dispenses medicines from the medicine cabinet. The motor rotates the spring attached to it, which has a cavity below it. The medicine falls and arrives at the outlet of that cavity. Thus, the medicine dispensing function is fully controlled by the motor drivers. The user can then pick up the medicine from the outlet. And all the

required sensors for the basic check-ups are placed connected to the machine, it can be used to measure those certain values and the tested results are then sent to their app in the mobile.

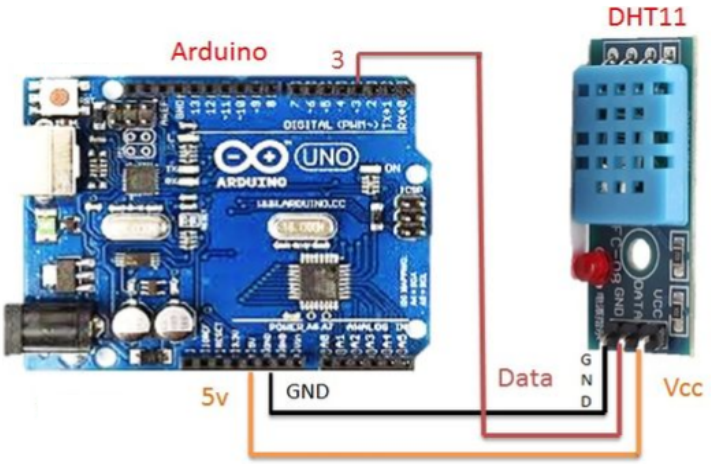
The main motive of creating such ATM is to use them at places like hostels, airports, railways and rural areas where people can go for any emergency required tablets for fever, vomiting or any first aid requirements like ointments, cotton, Bandages etc.., or common used tablets for B.P, sugar etc..,

4.3 PROGRAMS

DHT11 sensor code:

```
#include<dht.h>
dht DHT;
//  if  you require to change the pin number, Edit the pin with your arduino pin.
#define DHT11_PIN 3
void setup() {
Serial.begin(9600);
Serial.println("welcome to TechPonder Humidity and temperature Detector");    }
void loop() {   // READ DATA
int chk = DHT.read11(DHT11_PIN);
Serial.println(" Humidity " );
Serial.println(DHT.humidity, 1);
Serial.println(" Temparature ");
Serial.println(DHT.temperature, 1);
delay(2000);
}
```

Hardware connections:



Pulse sensorCode :

```
int sensor_pin = 0;

int led_pin = 13;

volatile int heart_rate;

volatile int analog_data;

volatile int time_between_beats = 600;

volatile boolean pulse_signal = false;

volatile int beat[10];         //heartbeat values will be sotred in this array

volatile int peak_value = 512;

volatile int trough_value = 512;

volatile int thresh = 525;

volatile int amplitude = 100;

volatile boolean first_heartpulse = true;

volatile boolean second_heartpulse = false;

volatile unsigned long samplecounter = 0;   //This counter will tell us the pulse timing

volatile unsigned long lastBeatTime = 0;
```

```
void setup()
```

```
{
  pinMode(led_pin,OUTPUT);
  Serial.begin(115200);
  interruptSetup();
}

void loop()
{
     Serial.print("BPM: ");
     Serial.println(heart_rate);
     delay(200); //  take a break
}

void interruptSetup()
{
  TCCR2A = 0x02;  // This will disable the PWM on pin 3 and 11
  OCR2A = 0X7C;   // This will set the top of count to 124 for the 500Hz sample rate
  TCCR2B = 0x06;  // DON'T FORCE COMPARE, 256 PRESCALER
  TIMSK2 = 0x02;  // This will enable interrupt on match between OCR2A and Timer
  sei();          // This will make sure that the global interrupts are enable
}

ISR(TIMER2_COMPA_vect)
{
  cli();
```

```
analog_data = analogRead(sensor_pin);
samplecounter += 2;
int N = samplecounter - lastBeatTime;

if(analog_data < thresh && N > (time_between_beats/5)*3)
  {
   if (analog_data < trough_value)
   {
     trough_value = analog_data;
   }
  }

if(analog_data > thresh && analog_data > peak_value)
  {
   peak_value = analog_data;
  }


 if (N > 250)
{
        if ( (analog_data > thresh) && (pulse_signal == false) && (N > (time_between_beats/5)*3) )
    {
      pulse_signal = true;
      digitalWrite(led_pin,HIGH);
      time_between_beats = samplecounter - lastBeatTime;
      lastBeatTime = samplecounter;
```

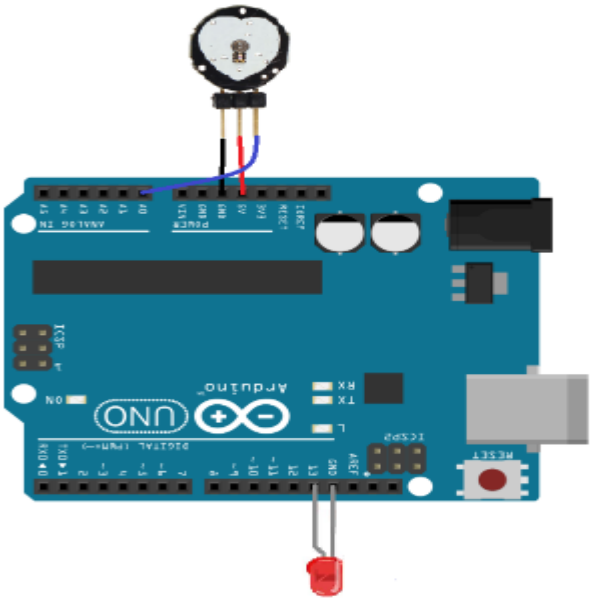
```
 if(second_heartpulse)
  {
    second_heartpulse = false;
    for(int i=0; i<=9; i++)
    {
      beat[i] = time_between_beats; //Filling the array with the heart beat values
    }
  }

  if(first_heartpulse)
  {
    first_heartpulse = false;
    second_heartpulse = true;
    sei();
    return;
  }

word runningTotal = 0;

for(int i=0; i<=8; i++)
  {
    beat[i] = beat[i+1];
    runningTotal += beat[i];
  }

beat[9] = time_between_beats;
```

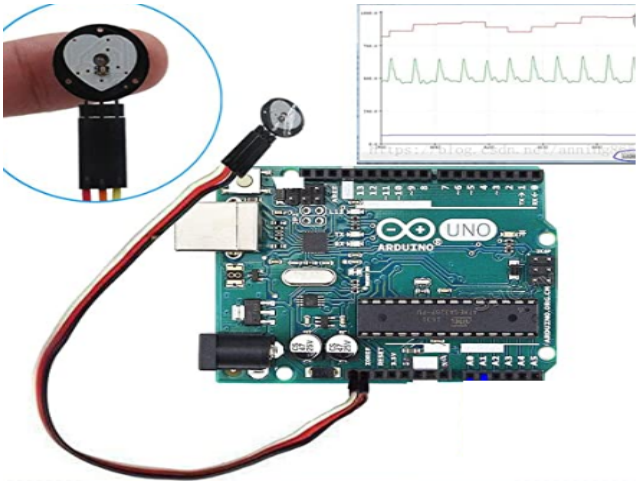
```
runningTotal += beat[9];
```

```
    runningTotal /= 10;
    heart_rate = 60000/runningTotal;
   }
}


if (analog_data < thresh && pulse_signal == true)
   {
    digitalWrite(led_pin,LOW);
    pulse_signal = false;
    amplitude = peak_value - trough_value;
    thresh = amplitude/2 + trough_value;
    peak_value = thresh;
    trough_value = thresh;
   }

if (N > 2500)
   {
    thresh = 512;
    peak_value = 512;
    trough_value = 512;
    lastBeatTime = samplecounter;
    first_heartpulse = true;
    second_heartpulse = false;
   }
```

```
  sei();
}
```

Hardware connections:





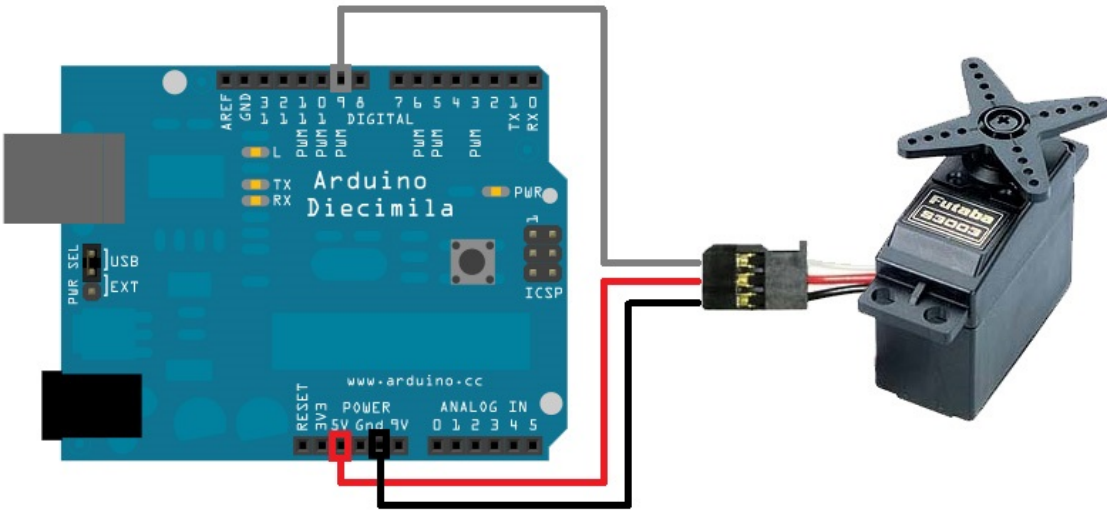
Servo Motor Code:

```
#include <Servo.h>   //including the servo library
Servo sg90;          //including a variable for servo named sg90
int servo_pin = 2;
```

```
void setup()
```

```
{
 sg90.attach(servo_pin);  //Giving the command to arduino to control pin 2 for servo
}
void loop()
{
 sg90.write(0);     // moving the servo at 0 degree
 delay(1000);
 sg90.write(45);     // moving the servo at 45 degree
 delay(1000);
 sg90.write(90);    // moving the servo at 90 degree
 delay(1000);        // wait for 1 second
 sg90.write(135);     // moving the servo at 135 degree
 delay(1000);
 sg90.write(180);   // moving the servo at 180 degrees
 delay(1000);        // wait for 1 sec
 }
```

Hardware Connections:



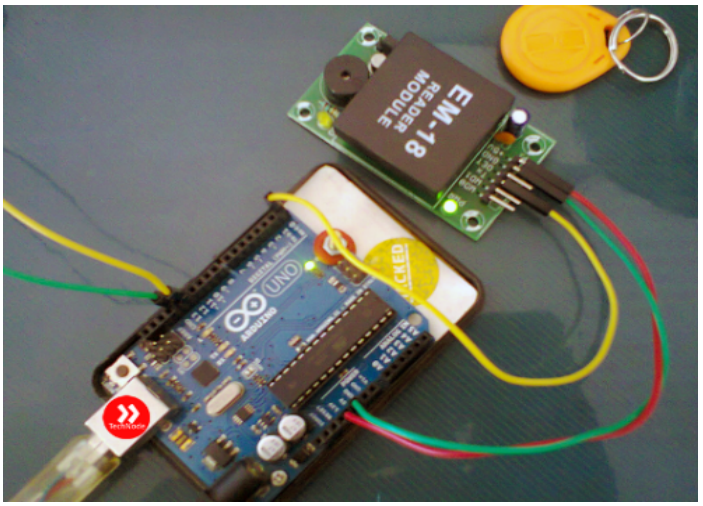
RFID READER CODE

```
int count = 0; // A variable to count the length  of the Tag DATA
```

```
void setup()
```

```
{
  Serial.begin(9600); // Initialize Serial Communication - Both with the RFID reader & the Serial Monitor

}

void loop()
{

  if(Serial.available()) // Check if there is Incoming Data in the Serial Buffer. This is data coming from the RFID reader
  {
   count = 0; // Reset count to zero
    while(Serial.available()) // Keep reading Byte by Byte from the Buffer till the Buffer is empty
   {
    char input = Serial.read(); // Read 1 Byte of data and store it in a character variable
    Serial.print(input); // Print the Byte
    count++; // Increment the Byte count after every Byte Read
     delay(5); // A small delay - Removing this might make the Program run faster and not respond properly as data from the reader could be slow
   }
   // Print Tag Length
   Serial.println();
   Serial.print("Tag Length : ");
   Serial.print(count);
   Serial.println(" Bytes");
  }
}
```

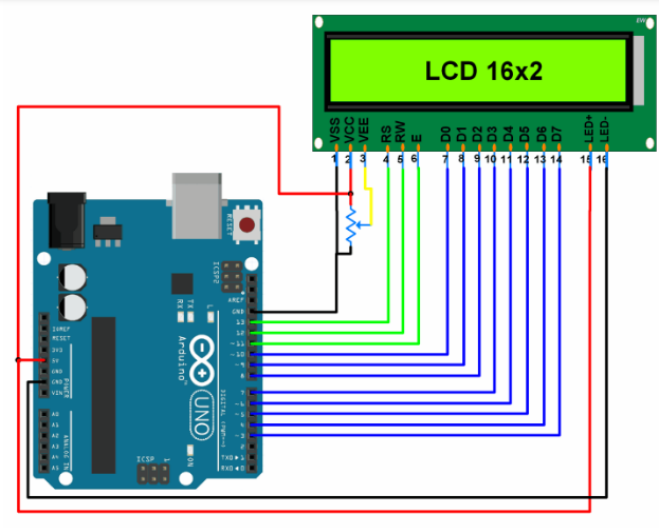
Hardware connections:



16x2 LCD code:

```
#include <LiquidCrystal.h> /* Create object named lcd of the class LiquidCrystal */
LiquidCrystal lcd(13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3); /* For 8-bit mode */ //LiquidCrystal lcd(13, 12, 11, 6, 5, 4, 3); /* For 4-bit mode */
unsigned char Character1[8] = { 0x04, 0x1F, 0x11, 0x11, 0x1F, 0x1F, 0x1F, 0x1F }; /* Custom Character 1 */
unsigned char Character2[8] = { 0x01, 0x03, 0x07, 0x1F, 0x1F, 0x07, 0x03, 0x01 }; /* Custom Character 2 */
void setup() { lcd.begin(16,2); /* Initialize 16x2 LCD */
lcd.clear(); /* Clear the LCD */
lcd.createChar(0, Character1); /* Generate custom character */ lcd.createChar(1, Character2);
}
void loop() {
lcd.setCursor(0,0); /* Set cursor to column 0 row 0 */ lcd.print("Hello!!!!"); /* Print data on display */
lcd.setCursor(0,1);
lcd.write(byte(0)); /* Write a character to display */
lcd.write(1);
}
```

Hardware Connections:



DHT11_Pulse sensor_Servo Motors code(Some components Merged code):

```
#include<dht.h>
#include <Servo.h>

Servo servoLeft;          // Define left servo
Servo servoRight;         // Define right servo
dht DHT;
//  if  you require to change the pin number, Edit the pin with your arduino pin.
#define DHT11_PIN 3


int sensor_pin = 0;

int led_pin = 13;

volatile int heart_rate;

volatile int analog_data;

volatile int time_between_beats = 600;

volatile boolean pulse_signal = false;

volatile int beat[10];         //heartbeat values will be sotred in this array

volatile int peak_value = 512;
```

```
volatile int trough_value = 512;
```

```
volatile int thresh = 525;

volatile int amplitude = 100;

volatile boolean first_heartpulse = true;

volatile boolean second_heartpulse = false;

volatile unsigned long samplecounter = 0;   //This counter will tell us the pulse timing

volatile unsigned long lastBeatTime = 0;


void setup() {
Serial.begin(9600);

pinMode(led_pin,OUTPUT);
servoLeft.attach(10);  // Set left servo to digital pin 10
  servoRight.attach(9);  // Set right servo to digital pin 9

//  Serial.begin(115200);

  interruptSetup();

}
void loop() {   // READ DATA
int chk = DHT.read11(DHT11_PIN);
Serial.println(" Humidity " );
Serial.println(DHT.humidity, 1);
Serial.println(" Temparature ");
Serial.println(DHT.temperature, 1);
delay(1000);
 Serial.print("BPM: ");

      Serial.println(heart_rate);

      delay(200); //  take a break



//motors
forward();            // Example: move forward
  delay(2000);          // Wait 2000 milliseconds (2 seconds)
  reverse();
  delay(2000);
  turnRight();
  delay(2000);
  turnLeft();
```

```
delay(2000);
```

```
  stopRobot();
  delay(2000);


}

void interruptSetup()

{

  TCCR2A = 0x02;  // This will disable the PWM on pin 3 and 11

  OCR2A = 0X7C;   // This will set the top of count to 124 for the 500Hz sample rate

  TCCR2B = 0x06;  // DON'T FORCE COMPARE, 256 PRESCALER

  TIMSK2 = 0x02;  // This will enable interrupt on match between OCR2A and Timer

  sei();          // This will make sure that the global interrupts are enable

}


ISR(TIMER2_COMPA_vect)

{

  cli();

  analog_data = analogRead(sensor_pin);

  samplecounter += 2;

  int N = samplecounter - lastBeatTime;


  if(analog_data < thresh && N > (time_between_beats/5)*3)

    {

      if (analog_data < trough_value)

      {

        trough_value = analog_data;

      }

    }
```

```
 if(analog_data > thresh && analog_data > peak_value)
   {
    peak_value = analog_data;
   }

 if (N > 250)
{
  if ( (analog_data > thresh) && (pulse_signal == false) && (N >
(time_between_beats/5)*3) )
    {
     pulse_signal = true;
     digitalWrite(led_pin,HIGH);
     time_between_beats = samplecounter - lastBeatTime;
     lastBeatTime = samplecounter;

    if(second_heartpulse)
     {
      second_heartpulse = false;
      for(int i=0; i<=9; i++)
      {
       beat[i] = time_between_beats; //Filling the array with the heart beat values
      }
     }

     if(first_heartpulse)
```

{

```
        first_heartpulse = false;
        second_heartpulse = true;
        sei();
        return;
      }

    word runningTotal = 0;

    for(int i=0; i<=8; i++)
      {
        beat[i] = beat[i+1];
        runningTotal += beat[i];
      }

    beat[9] = time_between_beats;
    runningTotal += beat[9];
    runningTotal /= 10;
    heart_rate = 60000/runningTotal;
  }
}


if (analog_data < thresh && pulse_signal == true)
  {
    digitalWrite(led_pin,LOW);
    pulse_signal = false;
```

```
amplitude = peak_value - trough_value;
```

```
      thresh = amplitude/2 + trough_value;
      peak_value = thresh;
      trough_value = thresh;
    }

  if (N > 2500)
    {
      thresh = 512;
      peak_value = 512;
      trough_value = 512;
      lastBeatTime = samplecounter;
      first_heartpulse = true;
      second_heartpulse = false;
    }

  sei();
}
void forward() {
  servoLeft.write(0);
  servoRight.write(180);
}

void reverse() {
  servoLeft.write(180);
  servoRight.write(0);
}

void turnRight() {
  servoLeft.write(180);
  servoRight.write(180);
}
void turnLeft() {
  servoLeft.write(0);
  servoRight.write(0);
```

```
}
```

```
void stopRobot() {
  servoLeft.write(90);
  servoRight.write(90);
}
```

CHAPTER 5

ADVANTAGES

- First aid can be available easily.
- 24/7 availability of medicine.
- Reduction of cost on medicine.
- If placed in the work place it helps in increasing the overall productivity of the employees**.**
- No time wasted waiting in queues at clinics for trivial problems like colds and fever.
- It helps increase efficiency by lowering dependence on manpower.
- It assures a privacy to people who hesitate to buy contraceptives from the pharmacy.
- Easy monitoring of the stock of the medicine.

Since disease name and relevant medicine will be stored in the database, the user will have to mention the disease name. The dispenser will dispense the medicine automatically for that disease.

CHAPTER 6

APPLICATIONS

- The concept is very much useful in day to day life for common people.

- This can be implemented everywhere such as shopping malls.
- It can be implemented on National Highways.
- It can be installed in Railway stations
- Its main application area will be healthcare field. It will help in increasing the network of good
- Organizations in worldwide and in providing the medical facility at the doorstep to the required one.
- It will be useful in providing medical facilities in busy areas such as Railway Stations, Airports, markets etc.
- Provide facilities to people during their journey as this can be installed in the aircrafts, rails and ships.
- This system can be used by the defense organization such as military, air force etc.
- It will help rural India to get better medical facilities at much lower costs.

CHAPTER 7

FUTURE SCOPE

By implementing medical ATM, simple medical problems will be diagnosed with an easy reach. This system can be further improved to diagnose the health problem also. A central platform can be provided for patience to interact with specialists of fields through video conferencing i.e. to provide a health ATM service.

The working scope of afore described vending machine can be further improved by expanding the database adding more functionality. The controller's capacity can be increased and it can be programmed to work like a doctor-

That is, the machine will be able to take all the vitals like the body temperature, blood pressure and other necessary details from the patient through the sensors interfaced with

the machine. Then the patient is prompted to input the symptoms that he is experiencing through multiple choices displayed on the screen. The program must be capable of computing and inter relating the various symptoms to one illness. Then based on the age of the patient that was received earlier, the dosage for the person will be recommended

CHAPTER 8

EXPECTED OUTCOME

From this concept we conclude that the SMVM is technically feasible to people. It gives availability of medicines all the time, also in rural areas.

By implementing SMVM, simple medical problems will be diagnosed with an easy reach.

The aim of the project was to test the effectiveness of the SMVM in supporting people towards better self-management of medication, which in turn leads to -

- Improved quality of the life for people and their cares.
- Increased capacity to remain independent at home.
- Reduced reliance on health and social care services.
- It will be useful in providing medical facilities in busy areas such as Railway Stations, Airports, markets, National Highways, etc.
- It will provide its service to people during their journey as this can be installed in the aircrafts, rails and ships.
- This system can be used by the defence organization such as military, air force etc.
- It will help rural India to get better medical facilities at much lower costs.

- The project will soon be launched as an open-source project in order to involve more engineering and science academia. Open-source-development would also enable the project progress swiftly and finish within time.

REFERENCES

[1] Steven Woodbine, The Complete Vending Machine. Published on 18 May 2011.

[2] Electronics For You. March 2009.

[3] Minute Med Corporation. Description of minute med vending machine made by Minute Med.

[4] Smart Cards: A Guide to Building and Managing Smart Card Applications.

[5] Wikipedia: Literature Survey and History.

[6] Wolfgang Rankle, Smart Card Handbook. Published in June 2004.

[7] Smart Crds: A case study by IBM Redbooks.

[8] Health ATM. a report on a nearly similar project by IPCBEE.

[9] Dogham Ibrahim, PIC Microcontroller Projects in C:Basic to Advanced.

[10] Ferran Reverter, Direct Sensor-to-microcontroller Interface Circuits.

[11] weblink:www.researchandmarkets.com/ (updated up to March 2016).

[12] weblink:www.buzzle.com/ (updated up to March 2016).

[13] weblink:www.slideshare.net/ (updated up to March 2016).

[14] weblink:www.scribd.com/ (updated up to March 2016).

[15] weblink:www.gizmag.com/ (updated up to March 2016)..

[15] Albert jaison, Anu simon, "Robotic pill dispenser", IOSR journal of pharmacy and biological science

(IOSR-JPBS), e-ISSN: 2278-3008, P-ISSN:2319:7676. Volume 9, issue 4 ver.V (july-aug 2014), pp 60-63.

16] I?ll keep an Eye on You: Home Robot Companion for Elderly People with Cognitive Impairment By H.-M. Gross, Ch. Schroeter, S. MuellerM. Volkhardt, E. Einhorn, A. Bley, T.LangnerCh.Martin, M. Merten..

[17] Smart Medication Dispenser: Design, Architecture and Implementation-Pei-Hsuan Tsai, Tsung-Yen Chen, Chi-Ren Yu, ChiSheng Shih, Member, IEEE, and Jane W. S. Liu, Fellow, IEEE.

[18] Dhanush J. Nair, Sunny nahar, "ATM transactions: A new time based approach research paper ",

International journal of science, engineering,and technology research(IJSETR),volume 4,issue,6,june 2015, ISSN:2278-7798.

[19] DeClaris, J.-W.; D-ATM, a working example of healthcare interoperability: From dirt path to Implications, Engineering Management, IEEE Transactions on, Volume: 46 , Issue: 3, Year: 2009 , Page(s): 4643 – 4645.

[20] Paul, D.L.; Pearlson, K.E.; McDaniel, R.R., Jr; Assessing technological barriers to telemedicine: technology-management.

[21]. Montaser N. Ramadan, Mohammad A. AI-Khedher and Sharaf A. Al-Kheder "Intelligent Anti-Theft and Tracking System for Automobiles". International Journal of Machine Learning and Computing, Vol. 2, No. 1. November 2012.

[22]. NXP Semiconductors LPC2148 Single-chip 16-bit/32-bit microcontrollers data sheet.

[23]. Survey paper on Radio Frequency Identification (RFID) Trends by Christoph Jechlitschek, (christoph.jechlitschek@gmx.de)

[24]. An Electronic Devices and Circuit Theory, Robert L Boylestad and Louis Nashelsky, Ninth edition, Pearson Education, Inc.2006

[25]http://en.wikipedia.org/wiki/Automated_teller_machine.