A Project report on

WATER DISPENSER USING RFID

Submitted in partial fulfillment of the requirements for the award of the degree of

BACHELOR OF TECHNOLOGY

in

ELECTRONICS AND COMMUNICATION ENGINEERING

by

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SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY

(Autonomous)

(Affiliated to JNTUA, Approved by AICTE, New Delhi, Accredited by NAAC with 'A' grade & Accredited by NBA (B. TECH ECE, EEE & CSE))

Rotarypuram Village, B K Samudram Mandal, Ananthapuramu - 515701

2023-2024

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Certificate

This is to certify that the project report entitled Water Dispenser Using RFID is the bonafide work carried out by Ranjitha Bai K bearing Roll Number 204G1A0483, Sushmitha P bearing Roll Number 204G1A04A9, Sasi Kiran T bearing Roll Number 204G1A0495 and Pavan Kalyan B bearing Roll Number 204G1A0474 in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology in Electronics and Communication Engineering during the academic year 2023-2024.

Project Guide	**Head of the Department**
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Dept. of ECE	Dept. of ECE

Date:

Place: Anantapur

EXTERNAL EXAMINER

DECLARATION

We, Ms. Ranjitha Bai K with reg no:204G1A0483, Ms. Sushmitha P with reg no: 204G1A04A9, Mr. Sasi Kiran T with reg no: 204G1A0495, Mr. Pavan Kalyan B with reg no: 204G1A0474 students of SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY, Rotarypuram, hereby declares that the dissertation entitled "WATER DISPENSER USING RFID" embodies the report of our project work carried out by us during IV-year, Bachelor of Technology under the guidance of Mr. M. Rami Reddy, M. Tech,(Ph.D) Department of ECE, SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY, and this work has been submitted for the partial fulfillment of the requirements for the award of the Bachelor of Technology degree.

These results embodied in this project have not been submitted to any other University of Institute for the award of any Degree or Diploma

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ABSTRACT

The "Water Dispenser using RFID" project innovates water distribution by incorporating advanced technologies such as RFID, an Arduino Nano CPU, and sensors. It intends to address conventional dispenser difficulties, such as payment requirements while also improving efficiency, convenience, and sustainability. The Arduino Nano serves as the core controller for RFID authentication and credit verification. Users scan their RFID tags to confirm validity and credit availability, removing the need for cash transactions. Infrared sensors identify containers and release water only when necessary, reducing waste. Once validated, a relay activates the water motor for accurate dispensing, generally 100 mL, which is controlled by the Arduino Nano. An OLED panel provides real-time monitoring capabilities. Expired or inadequate credit alerts users to recharge their tags before usage, improving security and simplicity. This design streamlines operations, improves security, and helps the environment by minimizing water waste and the need for throwaway containers. Finally, the initiative demonstrates technology's role in tackling common difficulties and supporting sustainability.

Keywords— Water Dispenser, RFID, Sensors, Authentication, OLED panel, Container Identification.

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LIST OF ABBREVIATIONS

ACRONYM	DESCRIPTION
IoT	Internet of Things
IP	Internet Protocol
PC	Personal Computer
IC	Integrated Circuit
MCU	Microcontroller Unit
A-D	Analog to Digital
D-A	Digital to Analog
LCD	Liquid Crystal Display
GPIO	General Purpose Input Output
HW	Hardware
SW	Software
RAM	Random Access Memory
SRAM	Static Random Access Memory
PWM	Pulse Width Modulation
DC	Direct Current
USB	Universal Serial Bus
LED	Light Emitting Diode

I2C	Inter-Integrated Circuit
IDE	Integrated Development Environment
SPI	Serial Peripheral Interface
I / O	Input and Output

CHAPTER – 1

INTRODUCTION

Cashless operated water dispensers represent a modern fusion of technology and convenience, offering a seamless solution for accessing clean drinking water. In today's digital age, where electronic transactions have become ubiquitous, these innovative dispensers cater to the growing demand for cashless payment options in various settings. By integrating electronic payment methods such as credit/debit cards, mobile payment apps, or RFID cards, they eliminate the need for physical currency or tokens, streamlining the dispensing process and enhancing user experience.

One of the primary advantages of cashless operated water dispensers is their unparalleled convenience. Users no longer need to worry about carrying loose change or tokens to access drinking water. Instead, they can simply use their preferred electronic payment method to initiate the dispensing process, making it quick, efficient, and hassle-free. This convenience is especially beneficial in high-traffic areas such as public spaces, offices, schools, and recreational facilities, where individuals may not always have cash readily available.

Moreover, cashless operated dispensers prioritize hygiene and sanitation. By eliminating the need for physical currency, they reduce the risk of contamination and transmission of germs. Users can initiate the dispensing process without having to touch any surfaces, simply by tapping their cards or smartphones against the machine's payment terminal. This touchless operation minimizes contact and promotes a cleaner, more hygienic dispensing experience, which is particularly crucial in environments where sanitation is paramount.

Transparency and accountability are also key features of cashless operated water dispensers. Electronic payment systems enable real-time tracking of transactions, providing administrators with valuable insights into usage patterns, revenue generation, and machine performance. This transparency enhances accountability and facilitates efficient management of water resources, allowing administrators to optimize operations, identify potential issues, and ensure the uninterrupted availability of clean drinking water to users.

Furthermore, cashless operated water dispensers offer customization and integration capabilities to meet the diverse needs of different environments. They can be equipped with advanced features such as touchscreen interfaces, customizable pricing options, and integration with loyalty programs or vending management systems. This flexibility allows administrators to tailor the dispensers to specific requirements, enhance user engagement, and maximize the value proposition for both users and operators.

Another significant advantage of cashless operated dispensers is their contribution to environmental sustainability. By encouraging the use of reusable payment methods such as RFID cards or mobile apps, they help reduce the environmental impact associated with the production and disposal of paper currency and coins. This aligns with global efforts to minimize waste and promote sustainable practices, making cashless operated water dispensers not only convenient and hygienic but also environmentally responsible.

In conclusion, cashless operated water dispensers represent a forwardthinking solution that addresses the evolving needs of modern society. With their emphasis on convenience, hygiene, transparency, customization, and sustainability, these dispensers are poised to revolutionize the way drinking water is accessed and dispensed across various settings. Whether in public spaces, workplaces, educational institutions, or recreational facilities, cashless operated dispensers offer a reliable and efficient solution for ensuring the availability of clean drinking water to all.

1.1 EMBEDDED SYSTEMS:

An embedded system is a computer system designed to perform one or a few dedicated functions often with real-time computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. By contrast, a general-purpose computer, such as a personal computer

(PC), is designed to be flexible and to meet a wide range of end-user needs. Embedded systems control many devices in common use today.

Embedded systems are controlled by one or more main processing cores that are typically either microcontrollers or digital signal processors (DSP). The key characteristic, however, is being dedicated to handle a particular task, which may require very powerful processors. For example, air traffic control systems may usefully be viewed as embedded, even though they involve mainframe computers and dedicated regional and national networks between airports and radar sites. (Each radar probably includes one or more embedded systems of its own).

Since the embedded system is dedicated to specific tasks, design engineers can optimize it to reduce the size and cost of the product and increase the reliability and performance. Some embedded systems are mass-produced, benefiting from economies of scale.

Physically embedded systems range from portable devices such as digital watches and MP3 players, to large stationary installations like traffic lights, factory controllers, or the systems controlling nuclear power plants. Complexity varies from low, with a single microcontroller chip, to very high with multiple units, peripherals and networks mounted inside a large chassis or enclosure.

In general, "embedded system" is not a strictly definable term, as most systems have some element of extensibility or programmability. For example, handheld computers share some elements with embedded systems such as the operating systems and microprocessors which power them, but they allow different applications to be loaded and peripherals to be connected. Moreover, even systems which don't expose programmability as a primary feature generally need to support software updates. On a continuum from "general purpose" to "embedded", large application systems will have subcomponents at most points even if the system as a whole is "designed to perform one or a few dedicated functions” and is thus appropriate to call "embedded".

In many ways, programming for an embedded system is like programming PC 15 years ago. The hardware for the system is usually chosen to make the device as cheap as possible. Spending an extra dollar, a unit in order to make things easier to program can cost millions. Hiring a programmer for an extra month is cheap in comparison.

1.1.1 CHARACTERISTICS OF EMBEDDED SYSTEM:

Single Functioned: An Embedded System usually performs a specialized operation and does the same repeatedly. For example: A pager always functions as a pager.

Tightly Constrained: All computing systems have constraints on design metrics, but those on an embedded system can be especially tight. Design metrics is a measure of an implementation's features such as its cost, size, power, and performance. It must be of a size to fit on a single chip, must perform fast enough to process data in real time and consume minimum power to extend battery life.

Reactive and Real Time: Many Embedded Systems must continually react to changes in the system's environment and must compute certain results in real time without any delay. Consider an example of a car cruise controller; it continually monitors and reacts to speed and brake sensors. It must compute acceleration or d- accelerations repeatedly within a limited time; a delayed computation can result in failure to control of the car. HW/ SW Systems: Software is used for more features and flexibility. Hardware is used for performance and security.

1.1.2 BASIC STRUCTURE OF AN EMBEDDED SYSTEM

The following illustration shows the basic structure of an embedded system:

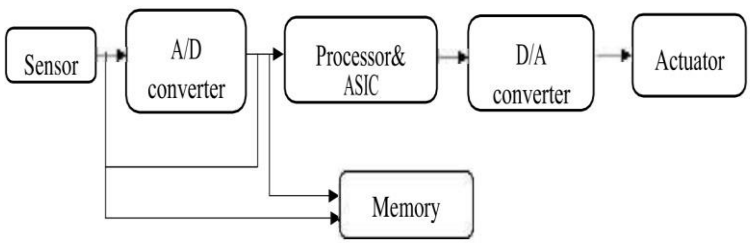

Fig. 1.1: Basic Structure of an Embedded System

Sensor: It measures the physical quantity and converts it to an electrical signal which can be read by an observer or by any electronic instrument like an A-D converter. A sensor stores the measured quantity to the memory.

A-D Converter: Analog-to-Digital converter converts the analog signal sent by the sensor into a digital signal.

1.1.3 ADVANTAGES OF EMBEDDED SYSTEMS

An Embedded System is basically a computer system used for special purpose. It is designed in a way that it performs only a few dedicated functions and has real time computing constraints. It is embedded into the complete device. The advantages of Embedded Systems are as follows

➢ They are designed to do a specific task and have real time performance constraints which must be met.

➢ They allow the system hardware to be simplified so costs are reduced.

➢ They are usually in the form of small computerized parts in larger devices which serve a general purpose.

➢ The program instructions for Embedded systems run with limited computer hardware resources, little memory and small or even non-existent keyboard or screen.

Besides these the advantages of Embedded Systems are:

• High reliability

• Fast operations

• Low cost

• Easy to manufacture

• Fewer interconnection

• Small size

1.1.4 APPLICATIONS OF EMBEDDED SYSTEMS

• Consumer Electronics - camcorders, cameras etc.

- Household Appliances - Television, DVD players, washing machine, Fridge, Microwave oven etc.
- Home Automation and Security Systems - Air conditioners, sprinklers, intruder detection alarms, closed circuit television cameras, fire alarms. • Automotive Industry - Anti-lock braking systems, engine control, ignition systems, automatic navigation systems etc.
- Computer Peripherals - Printers, scanners, fax machines.
- Computer Networking Systems - Network routers, switches, hubs, firewalls.
- Measurement and Instrumentation - Digital multi meters, digital CROs, logic analyzers.
- Banking and Retail - Automatic teller machines and currency counters, Poss.
- Card Readers - bar-code, smart card readers, hand held devices etc.
- Health Care - Different kinds of scanners, EEG, ECG machines etc.

1.2 INTERNET OF THINGS (IoT)

The Internet of Things can be described as connecting everyday objects like smart- Phones, Internet TVs, sensors and actuators to the Internet where the devices are intelligently linked together enabling new forms of communication between things and people, and between things themselves. Building IoT has advanced significantly in the last couple of years since it has added a new dimension to the world of information and communication technologies. The Internet has come a long way over the last 30 years. Old- fashioned IPv4 is giving way to IPv6 so that every device on the Internet can have its own IP address.

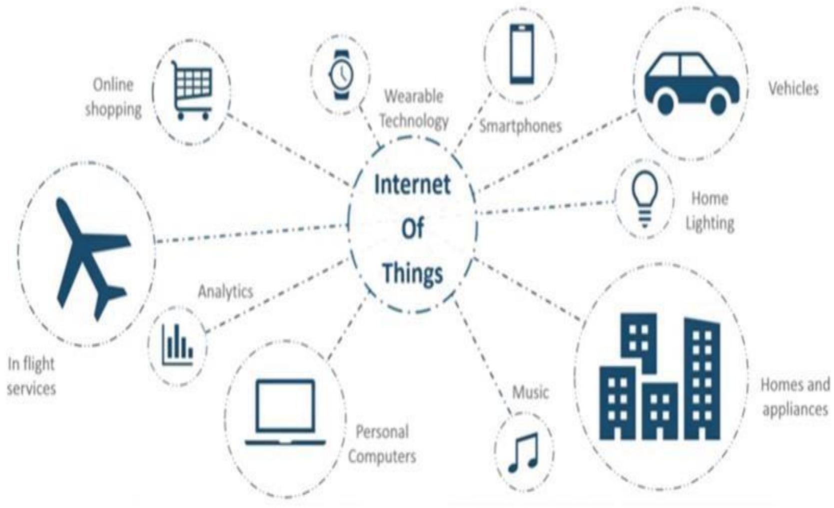

Fig. 1.2: Structure of Internet of Things

Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure. The figure of online capable devices increased 31% from 2016 to 8.4 billion in 2017. Experts estimate that the IoT will consist of about 30 billion objects by 2020. It is also estimated that the global market value of IoT will reach $7.1 trillion by 2020. The IoT allows objects to be sensed or controlled remotely across existing network infrastructure, creating for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention. When IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, virtual power plants, smart homes.

1.2.1 ARCHITECTURAL COMPONENTS OF IoT AND ITS DESCRIPTION

The hardware unit in an IoT system falls into one or more of the following categories:

➢ Processing units Storage unit

➢ Communication unit

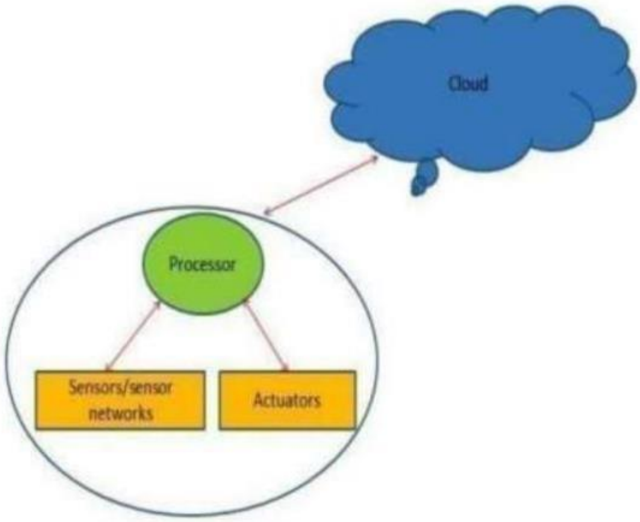

Fig. 1.3: Architecture of IoT

A person or some kind of active digital entity (e.g., a service, an application or a software agent) that has a goal. The attainment of the goal is achieved via interaction with the physical environment. This interaction is mediated by the IoT. Sensors provide information about the Physical entity they monitor. Information in this context ranges from the identity of the Physical entity to measures of the Physical state of the Physical entity. Like other devices, sensors can be attached or otherwise embedded in the Physical structure of the Physical entity or be placed in the environment and indirectly monitor entities. An example of the latter is a camera that recognizes people's faces. Information from sensors can be stored for later retrieval. Actuators can modify the Physical state of a Physical entity. Actuators can move (translate, rotate, etc.) simple Physical entities or activate/deactivate functionalities of more complexions Although the concept wasn't named until 1999, the Internet of Things has been in development for decades. The first internet connected appliance was a Coke machine at Carnegie Melon University in the early 1980s. The programmers could connect to the machine over the Internet, check the status of the machine and determine whether or not there would be a cold drink awaiting them, should they decide to make the trip down to the. The phrase "Internet of Things" was first coined by technologist Kevin Ashton way back in 1999, when he used it to describe how data captured by humans would lead to a revolution once computers started generating and collecting data by themselves without any human input. Since then, the vision of the Internet of Things has evolved due to a convergence of multiple technologies, ranging from wireless communication to the Internet and from embedded systems to micro- electromagnetically systems (MEMS).

Any device that can be embedded with electronics, software, sensors to communicate with other device is” Things”. A Things, be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low. Any other natural or man- made object that can be assigned an IP address and provided with the ability to transfer data over a network.

1.2.2 APPLICATIONS OF IoT

One of the best and the most practical applications of IoT, smart homes really take both, convenience and home security, to the next level. Though there are different levels at which IoT is applied for smart homes, the best is the one that blends intelligent utility systems and entertainment together. For instance, your electricity meter with an IoT device giving you insights into your everyday water usage, your set-top box that allows you to record shows from remote, Automatic Illumination Systems, Advanced Locking Systems, Connected Surveillance Systems all fit into this concept of smart homes. As IoT evolves, we can be sure that most of the devices will become smarter, enabling enhanced home security.

- **Smart Cities**

Not just internet access to people in a city but to the devices in it as well – that’s what smart cities are supposed to be made of. And we can proudly say that we’re going towards realizing this dream. Efforts are being made to incorporate connected technology into infrastructural requirements and some vital concerns like Traffic Management, Electricity Management, and more. All these work towards eliminating some day-to-day challenges faced by people and bring in added convenience.

- **Self-driven Cars**

We've seen a lot about self-driven cars. Google tried it out, Tesla tested it, and even Uber came up with a version of self-driven cars that it later shelved. Since it's human lives on the roads that we're dealing with, we need to ensure the technology has all that it takes to ensure better safety for the passenger and those on the roads. The cars use several sensors and embedded systems connected to the Cloud and the internet to keep generating data and sending them to the Cloud for informed decision-making through Machine Learning. Though it will take a few more years for the technology to evolve completely and for countries to amend laws and policies, what we're witnessing right now is one of the best applications of IoT.

• **Smart Grids**

One of the many useful IoT examples, a smart grid, is a holistic solution that applies an extensive range of Information Technology resources that enable existing and new gridlines to reduce electricity waste and cost. A future smart grid improves the efficiency, reliability, and economics of electricity.

• **Industrial Internet**

The Industrial Internet of Things consists of interconnected sensors, instruments, and other devices connected with computers' industrial applications like manufacturing, energy management, etc. While still being unpopular in comparison to IoT wearables and other uses, market researches like Gartner, Cisco, etc., believe the industrial internet to have the highest overall potential.

• **Smart Supply-chain Management**

Supply-chains have stuck around in the market for a while now. A common example can be Solutions for tracking goods while they are on the road. Backed with IoT technology, they are sure to stay in the market for the long run.

• **Farming**

Farming is one sector that will benefit the most from the Internet of Things (IoT). With so many developments happening on tools farmers can use for agriculture, the future is sure promising. Tools are being developed for Drip Irrigation, understanding crop patterns, Water Distribution, drones for Farm Surveillance, Fertilizers, understanding moisture levels in soil and more. These will allow farmers to come up with a more productive yield and take care of the concerns better.

• **Wearable**

Wearables remain a hot topic in the market, even today. These devices serve a wide range of purposes ranging from medical, wellness to fitness. Of all the IoT startups, Jawbone, a wearables maker, is second to none in terms of funding.

1.3 TYPES OF PROCESSORS

Processors can be of the following categories:

• General Purpose Processor (GPP) Microprocessor

• Micro controller

• Embedded Processor

• Application Specific System Processor (ASSP)

• Application Specific Instruction Processors (ASIP s)

1.4 CRITERIA FOR CHOOSING A MICROCONTROLLER

While choosing a micro controller, make sure it meets the task at hand and that it is cost effective. We must see whether an 8-bit, 16-bit or 32-bit microcontroller can best handle the computing needs of a task. In addition, the following points should be kept in mind while choosing a Microcontroller are as follows.

• Speed -What is the highest speed the microcontroller can support?

• Power Consumption - This is an important criterion for battery-powered products.

• Amount of RAM and ROM on the chip.

• Count of I/O Pins and timers on the chip.

1.5 PROBLEM STATEMENT:

1. **Technological Limitations:** The implementation of cashless operated water dispensers faces challenges related to technological limitations, including compatibility issues with different payment platforms, reliability concerns with electronic systems, and vulnerability to cyber threats such as hacking or data breaches.
2. **Socioeconomic Disparities:** Cashless operated water dispensers may exacerbate existing socioeconomic disparities by excluding marginalized communities that lack access to smartphones, credit/debit cards, or other electronic payment methods required for cashless transactions, thus widening the digital divide.
3. **Cybersecurity Risks:** Cashless payment systems are susceptible to cybersecurity risks, including data breaches, identity theft, and unauthorized access, posing significant threats to user privacy and financial security.
4. **Infrastructure Dependencies:** Cashless operated water dispensers rely on stable power supply, network connectivity, and functional hardware components for seamless operation. Dependencies on infrastructure pose risks of operational disruptions during power outages, network failures, or hardware malfunctions.
5. **Maintenance Requirements:** Cashless systems require regular maintenance, software updates, and technical support to ensure optimal performance and mitigate operational disruptions. Failure to address maintenance requirements may lead to system downtime and reduced usability.

1.6 OBJECTIVES:

The water dispensing machine dispenses water on the detection of the RFID tag. Conventionally people used cash as standard payment mode for machines. But nowadays people prefer to use digital payment options instead of cash to avoid the hassles associated with carrying cash. Provide easy and quick access to water. Ensure efficient tracking and management of water usage.

RFID Integration: Utilize RFID (Radio-Frequency Identification) technology to track and manage waste disposal activities efficiently.

User Authentication: Implement RFID tags or cards for user authentication to access the waste dispenser, ensuring only authorized individuals can use the system.

Dispensing Mechanism: Develop a mechanism for dispensing the appropriate waste disposal units (e.g., bins, bags) based on the identified waste type. **Data Logging:** Incorporate data logging functionality to record waste disposal transactions, including user identification, time, and type of waste disposed, for monitoring and analysis purposes.

Real-time Monitoring: Enable real-time monitoring of waste levels and system status to facilitate timely maintenance and replenishment of waste disposal units.

User Interface: Design a user-friendly interface for interaction with the waste dispenser system, providing clear instructions and feedback to users.

CHAPTER-2

LITERATURE SURVEY

Homma lee C [1] et al. proposed a cold and hot water dispenser with thermoelectric module systems which Consist a thermoelectric module system (TMS)-based cold-hot water dispenser. A cold-water loop, a hot water loop, a coolant loop, and a thermoelectric module make up the cold-hot water dispenser system. The thermoelectric cooling and heating modules are made up of nine and three thermoelectric plates, respectively, and four and two water blocks, respectively. The cold-hot water dispenser with TMS's chilling and heating capabilities are compared to those of a traditional cold-hot water dispenser with a compression refrigeration system (CRS). The cold-hot water dispenser with TMS may be operated at a minimum cold-water temperature of 10 to 13°C and a maximum hot water temperature of 65°C as opposed to the standard cold-hot water dispenser with CRS. The results of the study deals with recommendations for creating TMS-equipped cold-hot water dispensers.

Sateesh Kumar Kanagala et al in, developed a voice control hot-cold water dispenser system using Arduino contains solenoid valve which may completely automate the water distribution process using sensors and a solenoid tap. The device also detects the presence of glass at the counter panel in order to stop water degradation in the event that no glass is installed there. The system uses infrared (IR) sensors to recognize glass, after which the sensors send a signal to the microcontroller. The microcontroller is analysing the data that the sensors have supplied to check whether glass is there. The system has an RFID Reader that may be used to read certain tags and provide the microcontroller information about tags that are legitimate. Now that a valid tag has been located, the system sends a signal to the controller, which checks to see whether a glass is there before starting the motor to fill it with water while it is still there. The mechanism stops the water flow until the glass is discovered if it is removed while the procedure is ongoing.

Roselle Y. Pascual et al. in, proposed a low-cost dispenser-type water filtration system Although there are an increasing number of water refilling stations and a growing number of Filipino houses using commercial water, not everyone can adjust to this way of life. Another issue found is that not every location has access to such a system, such as the settlements on islands and close to the coast. The designed low-cost dispenser-type water filtration system (LCDTWFS) will provide households access to quickly clean drinking water. The apparatus is built of clay and has a 10 L volume capacity. When utilized as a ceramic filter, the clay used for filter construction contains no hazardous substances and has no impact on the filtered water. After going through the LCDTWFS, the tap water's quality was noticeably enhanced. The apparatus was put through its paces for six weeks in a row, and the results showed that the filtered water's characteristics still met PNSDW requirements.

Mohd Huarizo Pengiran Hussin et al. in [2], explained automatic water/soap dispenser and self-tissue dispenser which states that the effort to develop an automatic water/soap dispenser and self-tissue dispenser aims to stop the spread of COVID-19. The COVID-19 virus may spread by contact transmission at the washbasin and a lack of community knowledge on proper hand washing techniques. The goal of the project is to create a touchless handwashing device that assists in solving the issue of shielding individuals from the virus. The project's soap, water and tissue dispensers satisfy the need for effective hand washing since the touch transmission occurs at the sink. After putting a hand close to the sensor without touching the washbasin, the soap has been released for 0.2 seconds, or 1ml of soap, and the water has been released for 15 seconds to wash hands.

Çağlar, Ahmet [3] explained design and experimental investigation of a novel thermoelectric water dispenser unit the simultaneous provision of both hot and cold drinking water is suggested via a unique thermoelectric water dispenser device. For this, the thermoelectric water dispenser's cold and hot water tanks are filled with heat sinks that are connected to the cold and hot surfaces of a Peltier module. The cold-water tank is chilled while the hot water tank is heated by powering the thermoelectric module. The system's cooling and heating capabilities are evaluated for three different scenarios: glass-walled tanks without insulation; polyethylene-walled tanks without insulation; and polyethylene-walled tanks with insulation. According to the findings, water tanks with polyethylene walls perform better thermally than those with glass walls. Additionally, insulation of the tanks significantly improves COP, particularly on the heating side. The study's findings also suggest that TE water dispensers may compete with traditional models, with the benefits of being more compact, quieter, and powered by renewable energy sources.

Zamberlan da Silva et al. in [4] explained comparison of the bacteriological quality of tap water and bottled mineral water The bacteriological quality of 20-L bottles of mineral water from water dispensers, tap water from municipal water sources, and samples taken from freshly opened 20-L bottles of mineral water were all compared. Escherichia coli, faecal streptococci, Pseudomonas aeruginosa, Staphylococcus spp., total coliforms, thermotolerant coliforms, and heterotrophic plate count were all counted. The findings revealed that at least one coliform or indicator bacteria and/or at least one pathogenic bacterium was present in 36.4% of the tap water samples from municipal water systems and in 76.6% of the 20-L bottles of mineral water from water dispensers. Municipal tap water had better bacteriological purity when compared to samples taken from freshly opened 20-L bottles of mineral water and 20-L bottles of mineral water collected from water dispensers.

Yong Hwan Cho et al. in [5], explained smart water dispenser for companion animal’s numerous factors are contributing to the rise in the number of companion animals, and as a result, associated issues like feeding and caring for them are becoming worse. The primary issue is who will take care of the animals while their owners are away and remain outdoors. When their owner isn't home, the animals should be able to continuously and steadily drink fresh water. With the use of cutting-edge IoT devices built on ICT, this issue may be solved. In this study, we create a smart water dispenser system that delivers fresh water that is high in oxygen and regulates water supply from a distant location.

Additionally, this system uses a smartphone at a distant location to monitor and alert the volume of water being kept as well as the condition of the water dispenser. We display the dispenser's prototype, a few conceptual illustrations of its essential parts, as well as the development of a special smartphone app.

CHAPTER-3

EXISTING SYSTEM

3.1 EXISTING SYSTEM

Coin-operated water dispensers are vending machines designed to dispense water in exchange for payment, typically in the form of coins. These machines are commonly found in public places such as parks, beaches, schools, gyms, and transportation hubs, providing a convenient solution for accessing clean drinking water on-the-go. Users insert coins into the machine and select the desired quantity of water, which is then dispensed into a container brought by the user, such as a bottle or cup. While coin-operated water dispensers offer convenience, they have limitations such as dependency on coin availability, limited payment options, and maintenance needs. However, they remain a popular option for providing access to drinking water in various public settings. However, many of these existing systems have limitations. Some of them are:

Dependency on Coin Availability: Users must have the appropriate coins on hand to access water, which can be inconvenient if they do not have the necessary change.

Limited Payment Options: These machines typically only accept coins, excluding other forms of payment such as bills, credit/debit cards, or mobile payments, potentially restricting access for some users.

Maintenance Needs: Regular maintenance, including refilling water tanks, cleaning filtration systems, and emptying coin collection containers, is necessary to ensure proper operation and hygiene, which can be labor-intensive and costly for operators.

Limited Usage Scenarios: Coin-operated water dispensers may not be suitable for all environments or user demographics, such as locations where carrying coins is uncommon or where access to clean drinking water is a critical need but users may not have disposable income to pay for it.

Cost Of Operation: Operating and maintaining coin-operated water dispensers can be costly for businesses or organizations, including expenses related to water supply, electricity, maintenance, and security.

CHAPTER-4 PROPOSED SYSTEM

4.1 PROPOSED SYSTEM

An IoT-based water dispenser using RFID technology seamlessly integrates RFID tags and readers to authenticate users, granting access to dispense water based on unique identification information stored on the RFID tags. Users present their RFID tags to the reader, which then initiates the dispensing process. The system may offer options for selecting the desired volume of water, and once chosen, the dispenser releases the corresponding amount into a container.

Each dispensing transaction is logged for monitoring and analysis purposes, allowing operators to track usage patterns and ensure efficient management of the dispenser. Real-time monitoring capabilities enable operators to oversee dispenser status remotely and receive alerts for maintenance or replenishment needs.

By leveraging IoT integration, this system not only provides a convenient and secure method for accessing clean drinking water but also enables advanced functionalities such as predictive maintenance and sustainability initiatives, making it an intelligent and efficient solution for water dispensing needs.

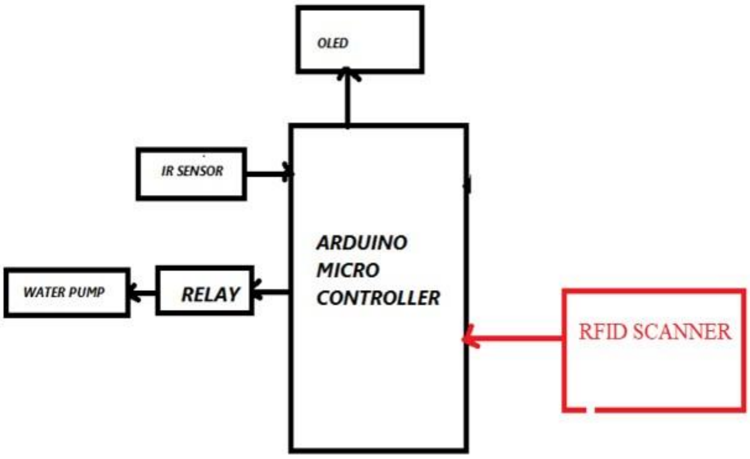

Fig. 4.1: Proposed system block diagram

4.2 WORKING PRINCIPLE:

The IoT-based water dispenser utilizing RFID technology operates through a systematic process ensuring efficient and secure water dispensing.

Firstly, as a user approaches the water dispenser, they present their RFID tag or card to the RFID reader installed on the machine. This RFID reader reads the unique identification information stored on the user's RFID tag, initiating the authentication process.

Once the RFID reader successfully authenticates the user's identity based on the information retrieved from the RFID tag, the system grants access to the water dispenser. This access control mechanism ensures that only authorized users can dispense water from the machine, enhancing security.

Users are then provided with the option to select the desired volume of water they wish to dispense. This selection is typically facilitated through a userfriendly interface integrated into the dispenser, such as a touchscreen panel or buttons. Users can choose the appropriate volume based on their needs and preferences.

Upon selecting the desired volume of water, the dispenser's mechanism is activated to release the corresponding amount of water into a container placed beneath the dispenser's nozzle. The dispensing mechanism ensures accurate delivery of the chosen volume, providing users with the exact amount of water they require.

Simultaneously, each dispensing transaction is logged by the system, capturing essential details such as user identification, dispensing volume, date, and time. This data logging feature enables operators to track usage patterns, analyze consumption trends, and generate reports for monitoring and management purposes.

Operators or administrators can also monitor the status of the water dispenser in real-time through a dedicated web-based dashboard or mobile application. This real-time monitoring capability allows them to oversee dispenser activity, monitor water levels, and receive alerts for maintenance or replenishment needs, ensuring seamless operation.

4.3 HARDWARE COMPONENTS

4.3.1 ARDUINO UNO

The Arduino UNO is a widely used open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits The board features 14 Digital and 6 Analog pins. It is programmable with the Arduino IDE via a type B USB cable. It can be powered by a USB cable or by an external 9-volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo. The hardware reference design is distributed under a Creative Commons Attribution ShareAlike 2.5 license and is available on the Arduino website. Layout and production files for some versions of the hardware are also available. "Uno" means one in Italian and was chosen to mark the release of Arduino Software (IDE) 1.0. The Uno board and version 1.0 of Arduino Software (IDE) were the reference versions of Arduino, now evolved to newer releases. The Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform. The ATmega328 on the Arduino Uno comes preprogrammed with a bootloader that allows uploading new code to it without the use of an external hardware programmer. It communicates using the original STK500 protocol. The Uno also differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 programmed as a USB-to-serial converter.

Fig. 4.2: Arduino UNO

FEATURES

ATMega328P Processor

➢ Memory

• AVR CPU at up to 16 MHz

• 32KB Flash

• 2KB SRAM

• 1KB EEPROM

➢ Security

• Power On Reset (POR)

• Brown Out Detection (BOD)

➢ Peripherals

• 2x 8-bit Timer/Counter with a dedicated period register and compare channels

• 1x 16-bit Timer/Counter with a dedicated period register, input Capture and compare channels

• 1x USART with fractional baud rate generator and start-of-frame detection

• 1x controller/peripheral Serial Peripheral Interface (SPI)

• 1x Dual mode controller/peripheral I2C

• 1x Analog Comparator (AC) with a scalable reference input

• Watchdog Timer with separate on-chip oscillator

• Six PWM channels

• Interrupt and wake-up on pin change

➢ ATMega16U2 Processor

• 8-bit AVR® RISC-based microcontroller

➢ Memory

• 16 KB ISP Flash, 512B EEPROM, 512B SRAM

•debug WIRE interface for on-chip debugging and programming

➢ Power

• 2.7-5.5 volts

TECHNICAL SPECIFICATIONS

• Microcontroller: Microchip ATmega328P

• Operating Voltage: 5 Volt

• Input Voltage: 7 to 20 Volts

• Digital I/O Pins: 14 (of which 6 provide PWM output)

• Analog Input Pins: 6

• DC Current per I/O Pin: 20 mA

• DC Current for 3.3V Pin: 50 mA

• Flash Memory: 32 KB of which 0.5 KB used by bootloader

• SRAM: 2 KB

• EEPROM: 1 KB

• Clock Speed: 16 MHz

• Length: 68.6 mm

• Width: 53.4 mm

• Weight: 25 g

POWER CONSUMPTION

Table 4.1 Power Consumption of Arduino UNO

Symbol	Description	Min	Max	Unit
VINMax	Maximum input voltage from VIN pad	6	20	V
VUSBMax	Maximum input voltage from USB connector		5.5	V
Pmax	Maximum Power Consumption	-	xx	mA

The Arduino Uno is designed to be a low-power device, making it ideal for battery-powered applications. When the board is powered via USB, it consumes around 50-100mA of current, while running on 5VDC supply, it can consume up to 200mA.

To reduce power consumption, the Uno includes a sleep mode that can be activated when the board is not in use. In sleep mode, the board draws less than 1mA of current, significantly reducing power consumption.

In addition to sleep mode, the Uno includes power-saving features such as automatic shutdown of unused peripherals, voltage regulation for low power operation, and the ability to switch off the internal oscillator. The Uno can also be optimized for low power consumption by using low-power components such as LEDs, sensors, and communication modules.

Overall, the power consumption of the Arduino Uno is relatively low, making it suitable for a wide range of battery-powered applications. However, it is important to carefully manage power consumption to ensure that the system operates efficiently and reliably.

Table 4.2 Arduino UNO Board Topology

Ref.	Description	Ref.	Description
X1	Power jack 2.1x5.5mm	U1	SPX1117M3 L-5 Regulator
X2	USB B Connector	U3	ATMEGA16U2 Module

PC1	EEE1EA470WP 25V SMD Capacitor	U5	LMV358LIST-A.9 IC
PC2	EEE1EA470WP 25V SMD Capacitor	F1	Chip Capacitor, High Density
D1	CGRA4007-G Rectifier	ICSP	Pin header connector (through hole 6)
J-ZU4	ATMEGA328P Module	ICSPI	Pin header connector (through hole 6)
Y1	ECS-160-20-4X-DU Oscillator		

BOARD TOPOLOGY

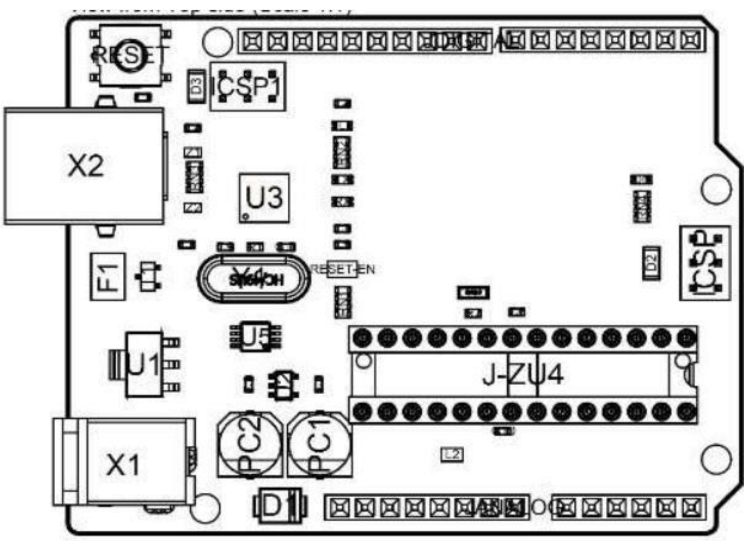

Fig. 4.3: Top View of Arduino UNO

PROCESSOR

The Main Processor is a ATmega328P running at up to 20 MHz Most of its pins are connected to the external headers, however some are reserved for internal communication with the USB Bridge coprocessor

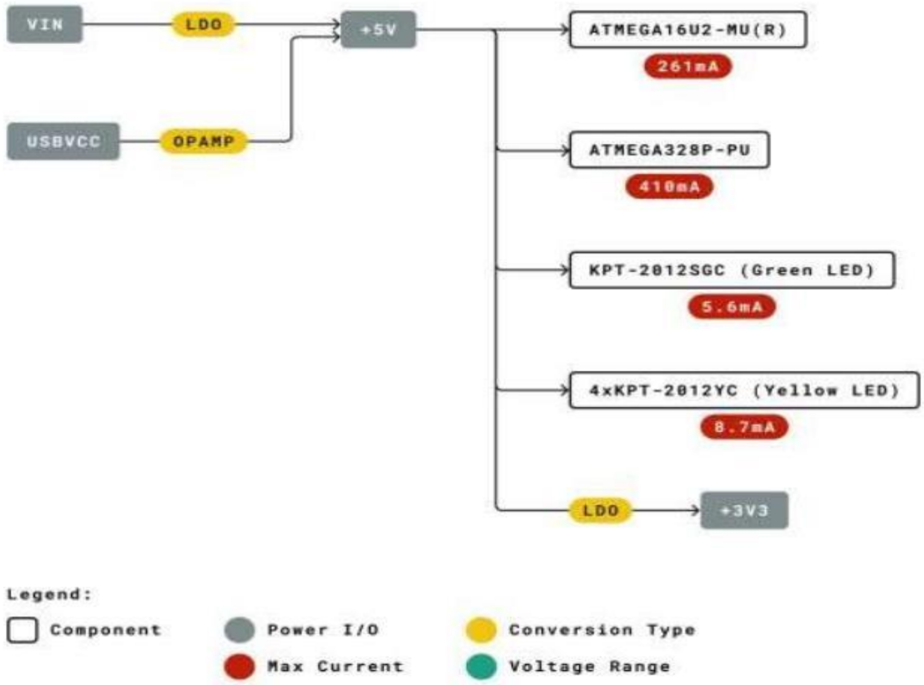

Fig. 4.4: Power Tree

CONNECTOR PINOUTS

- LED: There is a built-in LED driven by digital pin 13. When the pin is HIGH value, the LED is on, when the pin is LOW, it's off.
- VIN: The input voltage to the Arduino board when it's using an external power source (as opposed to 5 volts from the USB connection or other regulated power source). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.
- 5V: This pin outputs a regulated 5V from the regulator on the board. The board can be supplied with power either from the DC power jack (7 - 20V), the USB connector (5V), or the VIN pin of the board (7-20V). Supplying voltage via the 5V or 3.3V pins bypasses the regulator and can damage the board.
- 3V3: A 3.3-volt supply generated by the on-board regulator. Maximum current draw is 50 mA. • GND: Ground pins.

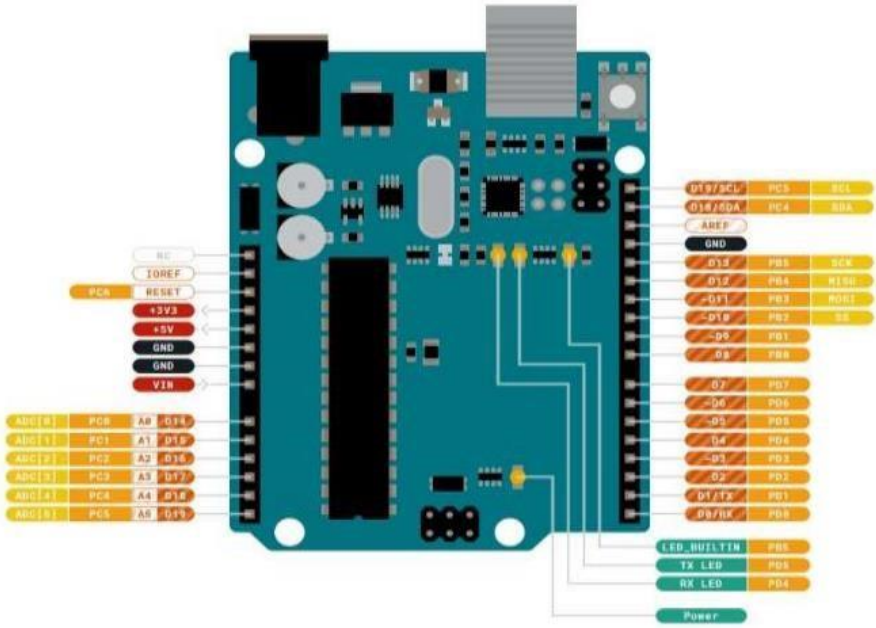

Fig. 4.5: Pin Diagram of Arduino UNO

- IOREF: This pin on the Arduino board provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power source or enable voltage translators on the outputs to work with the 5V or 3.3V.

- Serial: Pins 0 (RX) and 1 (TX). Used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega8U2 USB-to-TTL Serial chip.
- External Interrupts: Pins 2 and 3. These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.
- Reset: Typically used to add a reset button to shields which block the one on the board.

Table 4.3 Analog Pins

Pin	Function	Type	Description
1	NC	NC	Not connected
2	IOREF	IOREF	Reference for digital logic V connected 5V
3	Reset	Reset	Reset
4	+3V3	Power	+3V3 Power Rail
5	+5V	Power	+5V Power Rail
6	GND	Power	Ground
7	GND	Power	Ground
8	VIN	Power	Voltage Input
9	A0	Analog/GPIO	Analoginput0/GPIO
10	A1	Analog/GPIO	Analoginput1/GPIO
11	A2	Analog/GPIO	Analoginput2/GPIO
12	A3	Analog/GPIO	Analoginput3/GPIO
13	A4/SDA	Analog input/I2C	Analoginput4/I2C Data line
14	A5/SCL	Analog input/I2C	Analoginput5/I2C Clock line

Analog pins in Arduino Uno are a vital part of the microcontroller's functionality, allowing for the reading of analog inputs such as sensors, potentiometers, and other devices. These pins are denoted as A0 through A5 on the Arduino Uno board and operate on a voltage range from 0 to 5 volts.

One of the significant advantages of using analog pins is that they provide a high degree of precision and accuracy when reading signals. This is because they are capable of measuring subtle changes in voltage with a resolution of 10 bits, resulting in 1024 possible values. The analog pins can also be used to read values from analog sensors and convert them into digital signals that can be used by the microcontroller.

Another crucial aspect of analog pins is their ability to work with Pulse Width Modulation (PWM). PWM is a technique used to control the speed of motors and LEDs by varying the duty cycle of a square wave signal. This feature is essential in many applications, especially in robotics and automation, where precise control over the movement and behaviour of devices is required.

However, it is important to note that using multiple analog pins at once can lead to a significant increase in power consumption, which may cause issues in battery- powered projects. Therefore, it is crucial to keep power consumption in mind when using analog pins in Arduino Uno.

The analog pins on Arduino Uno are versatile and can be used in many applications, from simple temperature monitoring to complex robotic systems. They allow for precise readings of analog signals and provide the ability to control devices with PWM.

In addition to this, the analog pins are easy to use and can be programmed using the Arduino Integrated Development Environment (IDE), making them accessible to users of all skill levels. The IDE provides a wide range of libraries and examples that make it easy to get started with analog pins and develop complex projects.

Overall, the analog pins in Arduino Uno are a valuable resource for anyone looking to develop projects that require precise measurements and control of analog signals. By utilizing these pins, developers can create a wide range of applications and devices that would be difficult or impossible to achieve with digital signals alone.

Table 4.4 JDigital Pins

Pin	Function	Type	Description
1	D0	Digital/GPIO	Digital pin 0/GPIO
2	D1	Digital/GPIO	Digital pin 1/GPIO
3	D2	Digital/GPIO	Digital pin 2/GPIO
4	D3	Digital/GPIO	Digital pin 3/GPIO
5	D4	Digital/GPIO	Digital pin 4/GPIO
6	D5	Digital/GPIO	Digital pin 5/GPIO
7	D6	Digital/GPIO	Digital pin 6/GPIO
8	D7	Digital/GPIO	Digital pin 7/GPIO
9	D8	Digital/GPIO	Digital pin 8/GPIO
10	D9	Digital/GPIO	Digital pin 9/GPIO
11	SS	Digital	SPI Chip Select
12	MOSI	Digital	SPI1 Main Out Secondary In
13	MISO	Digital	SPI Main In Secondary Out
14	SCK	Digital	SPI serial clock output
15	GND	Power	Ground
16	AREF	Digital	Analog reference voltage
17	A4/SD4	Digital	Analog input 4/I2C Data line (duplicated)
18	A5/SD5	Digital	Analog input 5/I2C Clock line (duplicated)

The digital pins, also known as GPIO (General Purpose Input/Output) pins, can be configured as either input or output pins. These pins can be used to control LEDs, motors, relays, and other digital components. Each digital pin can provide or receive a maximum of 40mA of current and has an internal pullup resistor of approximately 20-50kΩ.

The digital pins of the Arduino Uno are labelled from D0 to D13. These pins can be controlled using the digital Write () and digital Read () functions in the Arduino programming language. The digital Write () function is used to set the value of a digital pin to either HIGH (5V) or LOW (0V), while the digital

Read() function is used to read the value of a Jdigital pin as either HIGH or LOW.

Some of the digital pins on the Arduino Uno board have additional functionality. For instance, pins D0 and D1 are used for serial communication, while pin D13 is connected to an onboard LED. Pin D2 and D3 are also used for interrupts, allowing the microcontroller to respond to external events.

It is worth noting that some of the digital pins are shared with other functionalities on the Arduino Uno board. For example, pin D10 is used for PWM (Pulse Width Modulation), which is a technique used to control the speed of motors or the brightness of LEDs. Additionally, pins D11, D12, and D13 are also used for SPI(Serial Peripheral Interface) communication, which is a protocol used to interface with different electronic devices.

BOARD OUTLINE & MOUNTING HOLES

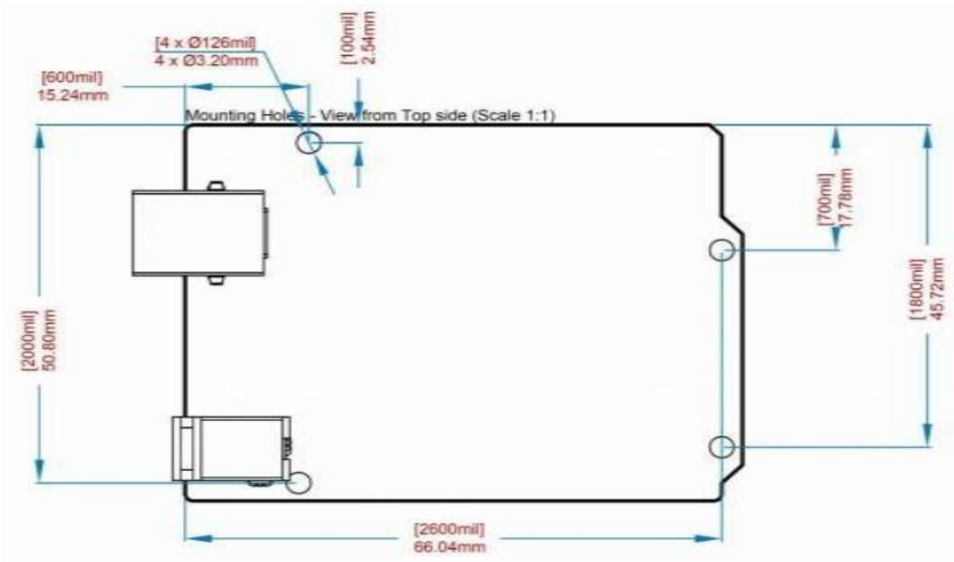

Fig. 4.6: Board Outline & Mounting Holes of Arduino UNO

The Arduino uno is a popular microcontroller board widely used for prototypingand educational purposes. It is based on the atmega328p microcontroller, which has 14 digital input/output pins, six analog inputs, and several other features. The board also includes a USB connection, power jack, and other circuitry required for programming and power supply.

One of the critical aspects of the Arduino uno board is its physical layout, which includes the board outline and mounting holes. The board outline refers to the overall shape and size of the board, while the mounting holes are used to attach the board to a surface or a project.

The board outline of the arduino uno is a rectangular shape measuring approximately 2.7 inches by 2.1 inches. It includes a variety of components and connectors, such as the USB port, power jack, icsp header, reset button, and pin headers. The pin headers are arranged in two rows, with each row containing seven pins labelled from 0 to 13. Additionally, there are two other pins labelled aref and reset.

The mounting holes on the Arduino uno are located at the corners of the board and are used to secure the board to a surface or a project. The holes have a diameter of approximately 3.2mm and are spaced 52mm apart. The location and spacing of the mounting holes are designed to be compatible with various types of enclosures and project cases.

The board outline and mounting holes of the arduino uno play a crucial role in the board's overall design and functionality. The board outline determines the placement and size of the various components, while the mounting holes provide a secure and stable attachment to a surface or a project. These features make the Arduino uno an ideal choice for a wide range of projects and applications, from simple prototyping to complex automation systems.

4.3.2 IR SENSOR:

An infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment. IR sensors can be categorized into two types: active and passive. Active IR sensors emit and detect infrared radiation using a light emitting diode (LED) and a receiver, commonly used in obstacle detection systems. Passive IR sensors, like PIR sensors, only detect infrared radiation and are commonly used in motion-based detection, such as in-home security systems. IR sensors are widely used in various applications like security systems, motion detection, temperature measurement, and proximity sensing. They offer advantages such as high accuracy, non-contact operation, and immunity to electromagnetic interference.

Fig. 4.7: IR sensor

IR sensors work by detecting heat radiation that changes over time and space due to the movement of objects emitting infrared radiation. These sensors are essential components in many devices and systems due to their reliability and versatility.

4.3.3: RFID SCANNER:

An RFID scanner, also known as an RFID reader, is a device that reads and captures information stored on RFID tags or labels. These scanners play a crucial role in various industries by providing automated visibility on goods entering, moving within, and leaving facilities. RFID scanners can be handheld, portable, or fixed, offering different features like barcode scanning capabilities, compatibility with different operating systems, and various connectivity options. They are used for tasks such as inventory management, asset tracking, and supply chain optimization. Some RFID scanners are designed for specific environments, like industrial rugged handheld readers for warehouse operations or stylish readers for customer-facing areas in retail stores.

Fig. 4.8: RFID Scanner

RFID scanners are essential tools that enhance efficiency, accuracy, and cost effectiveness in operations by reducing errors and streamlining processes.

4.3.4: RELAY

A relay is an electromagnetic switch that operates based on electromagnetic force. It consists of a coil of wire that becomes a magnet when an electric current passes through it. Relays act as bridges between devices, receiving an input signal from one device and transmitting an output to another. There are different types of relays, including latching relays that maintain their position when the circuit is powered off, non- latching relays that return to their initial position when power is removed, and high-frequency relays used in radio

Fig. 4.9: Relay

systems and industrial equipment. Relays are crucial components in various applications, such as automatic doors, gates, lighting, keyboards, and radio devices, where they control the transmission or blockage of electrical signals between devices.

4.3.5: OLED

OLED, which stands for Organic Light-Emitting Diode, is a type of light-emitting diode technology that uses organic molecules to produce light. These organic OLEDs are used in various devices like television screens, computer monitors, smartphones, and handheld game consoles. OLED displays offer several advantages over traditional OLED displays, including improved image quality with better contrast, higher brightness, fuller viewing angles, wider color ranges, and faster refresh rates. They also consume less power, have a simpler design enabling ultra-thin, flexible, foldable, and transparent displays, and are more durable. OLED technology allows for the creation of emissive displays where each pixel emits its own light, resulting in vibrant colors, fast motion, high contrast, and deep blacks. OLED displays are known for their excellent image quality and are used in a wide range of devices, with applications in mobile phones, digital cameras, VR headsets, and more. The future of OLED technology looks promising, with advancements in flexible, transparent, foldable, and rollable displays opening up new possibilities for innovative devices and applications.

4.3.5: WATER PUMP

A water pump is an essential device used to move water from one place to another, commonly employed for various purposes like increasing water pressure, rainwater harvesting, garden irrigation, and drainage. Water pumps come in different types, including submersible pumps, borehole pumps, central heating pumps, macerator pumps, and sewage pumping stations, each designed for specific applications. Submersible pumps, for instance, can be used for clean or dirty water and are placed underwater, while borehole pumps are suitable for narrow wells. Central heating pumps are crucial for heating systems, and macerator pumps are ideal for moving waste water independently. Water pumps play a significant role in many settings, from homes to industrial facilities, ensuring efficient water management and distribution.

4.4 SOFTWARE REQUIREMENTS

Fig. 4.10: Arduino IDE

The Arduino Software (IDE) is anything but difficult to-use for fledglings, yet sufficiently adaptable for cutting edge clients to exploit too. For instructors, it's helpfully in view of the Processing programming condition, so understudies figuring out how to program in that condition will be acquainted with how the Arduino IDE functions. Arduino is a model stage (open-source) in perspective of an easy to-use gear and programming. It includes a circuit board, which can be tweaked (suggested as a microcontroller) and a moment programming called Arduino IDE (Integrated Development Environment), which is used to make and exchange the PC code to the physical board.

The key highlights are:

1.Arduino sheets can read straightforward or propelled data signals from different sensors and change it into a yield, for instance, starting a motor, turning LED on/off, connect with the cloud and various distinctive exercises.

2. Unlike most past programmable circuit sheets, Arduino does not require an extra piece of gear (considered a product build) with a particular ultimate objective to stack another code onto the board.

3. Additionally, the Arduino IDE uses a streamlined interpretation of C++, making it less requesting to make sense of how to program.

4. Finally, Arduino gives a standard edge factor that breaks the components of the scaled down scale controller into a more open package.

4.4.1 OPERATION DEMO:

STEP 1: INSTALL THE ARDUINO SOFTWARE (IDE)

Download the most recent variant from this page: http://arduino.cc/en/Main/Software.

Next, continue with the establishment and please permit the driver establishment process.

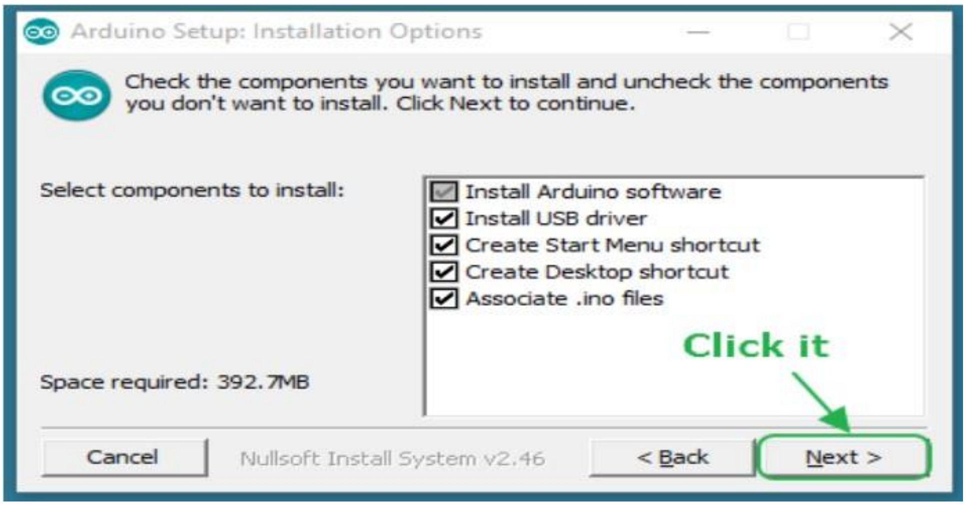

Fig. 4.11: Arduino Setup Installation Option

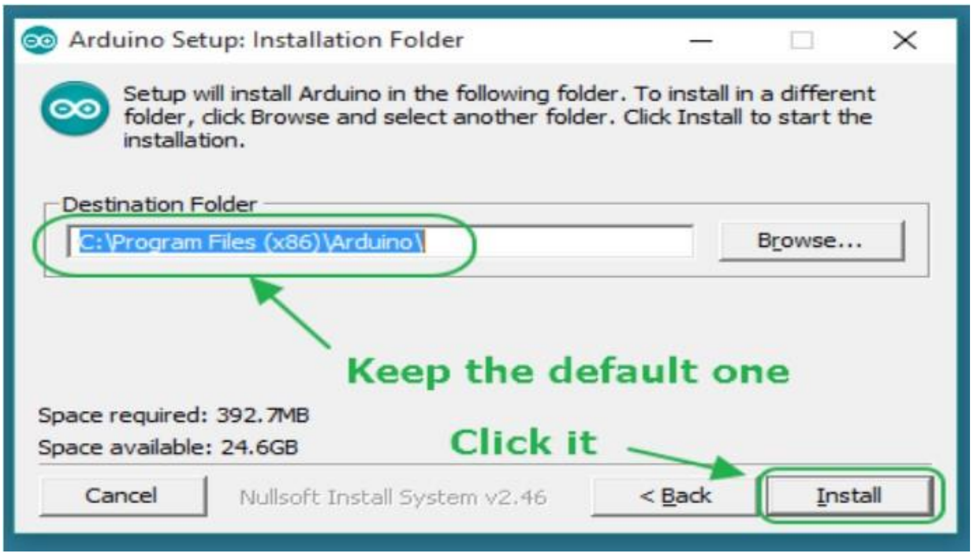

Fig. 4.12: Arduino Setup Installation Folder

Next, select the destination folder as shown above in the figure and click on install to install the Arduino IDE.

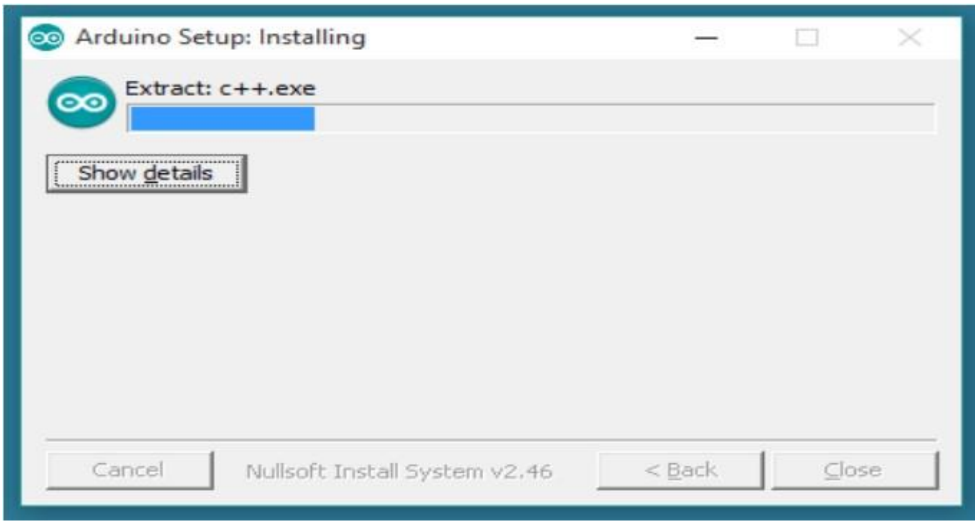

Fig. 4.13: Arduino Setup-Installing

The procedure will separate and introduce all the expected documents to execute legitimately the Arduino Software (IDE).

STEP 2: GET AN UNO R3 AND USB CABLE

In this instructional exercise, you're utilizing an Uno R3. You additionally require a standard USB link (A fitting to B plug): the kind you would associate with a USB printer, for instance.

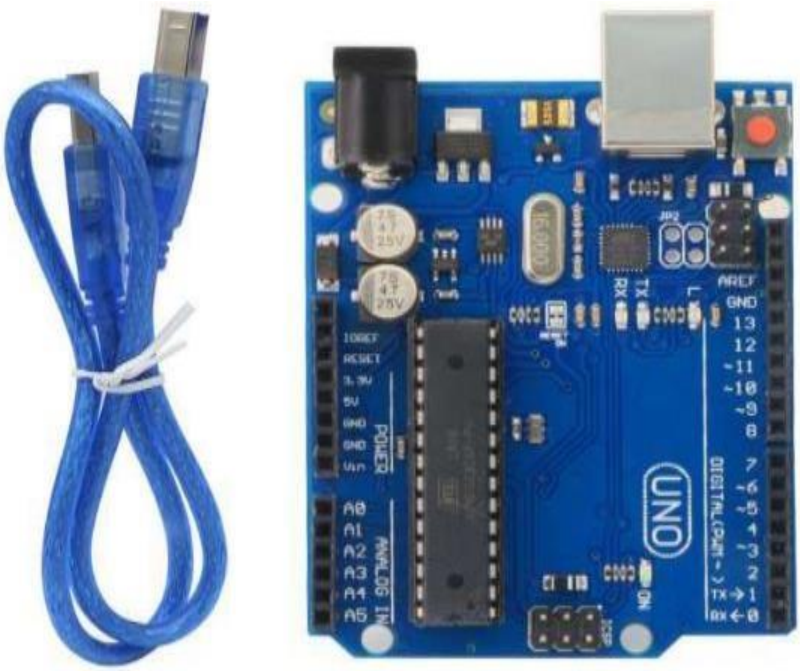

Fig. 4.14: USB Cable UNO R3 Board

STEP 3: CONNECT THE BOARD

The USB association with the PC is important to program The USB association with the PC is important to program the board and not simply to control it up. The Uno and Mega consequently draw control from either the USB or an outside power supply. Associate the board to your PC utilizing the USB link.

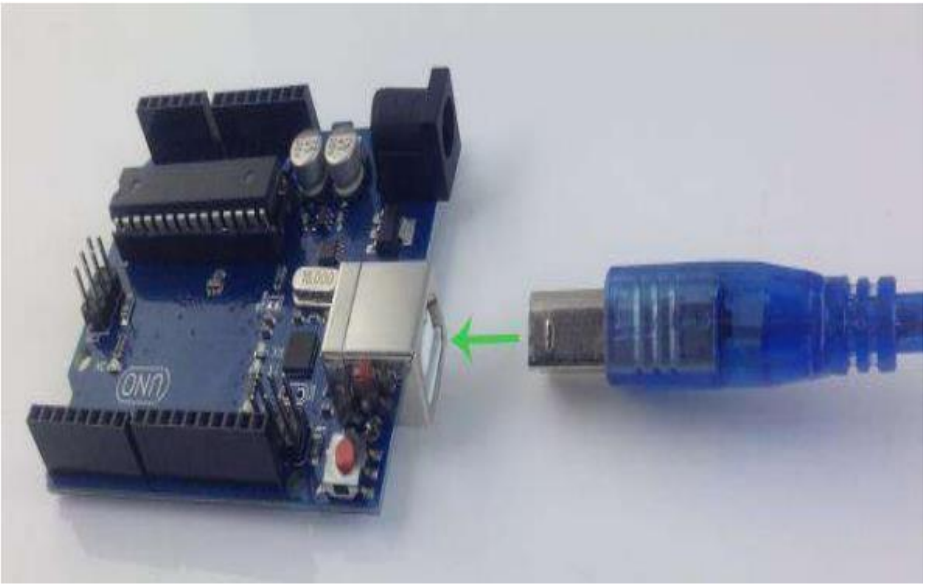

Fig. 4.15: Represents How to Connect USB Cable with UNO Board

STEP 4: OPEN LESSON 1: LED BLINK

Open the LED blink example sketch: CD > For Arduino>Demo

Code>Lesson1-LED_bink>led blink

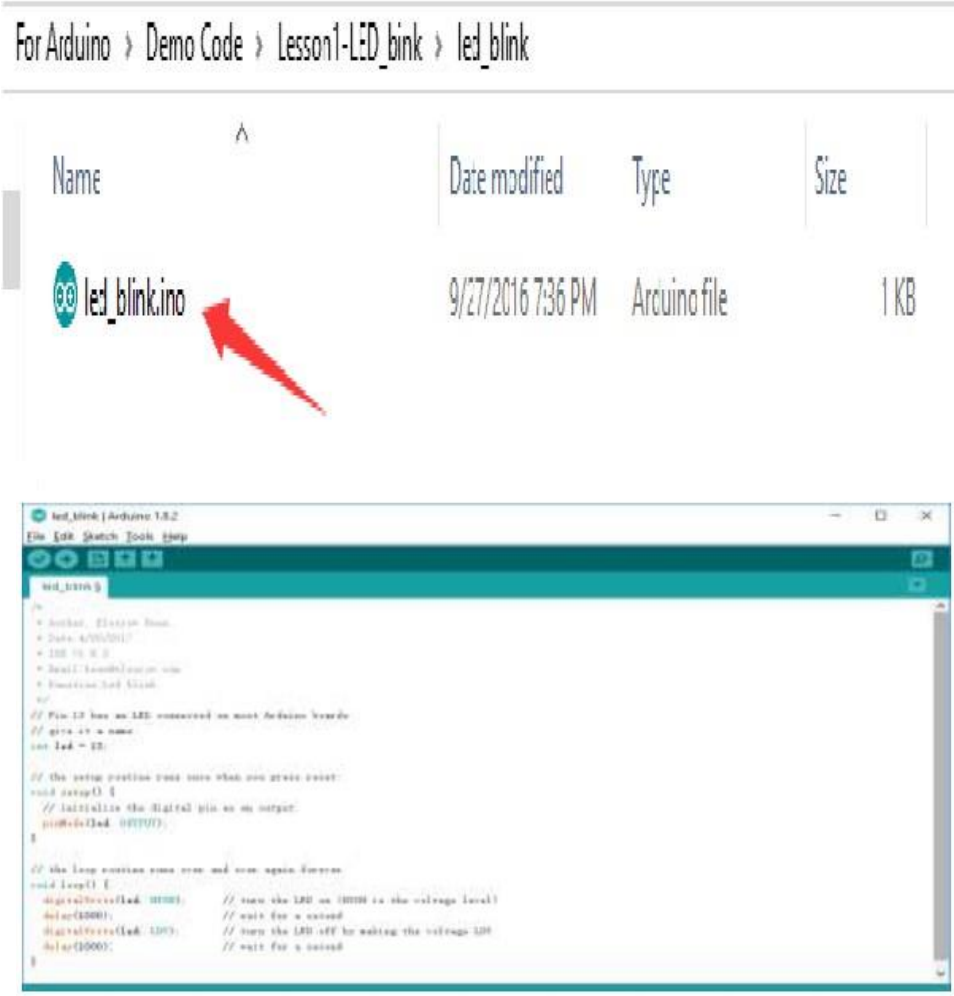

Fig. 4.16: LED Value and Program to Blink LED

STEP 5: SELECT YOUR BOARD

We'll need to select the entry in the Tools > Board menu that corresponds to our Arduino board.

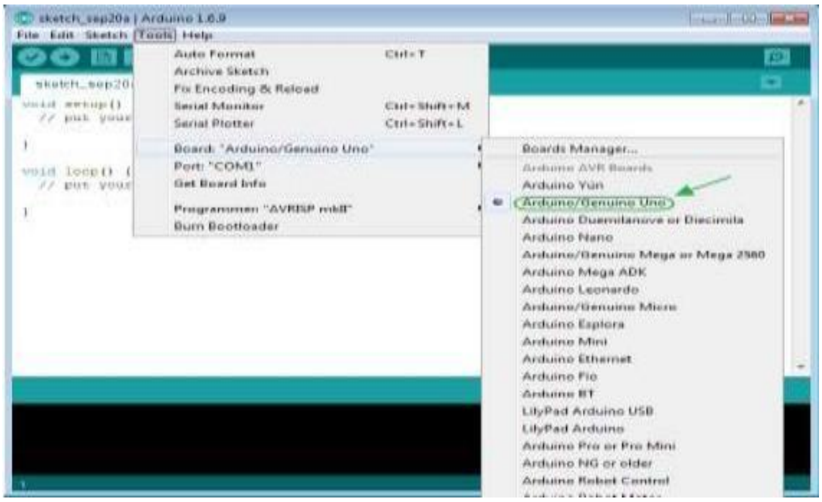

Fig. 4.17: Path to Select Board

STEP 6: SELECT YOUR SERIAL PORT

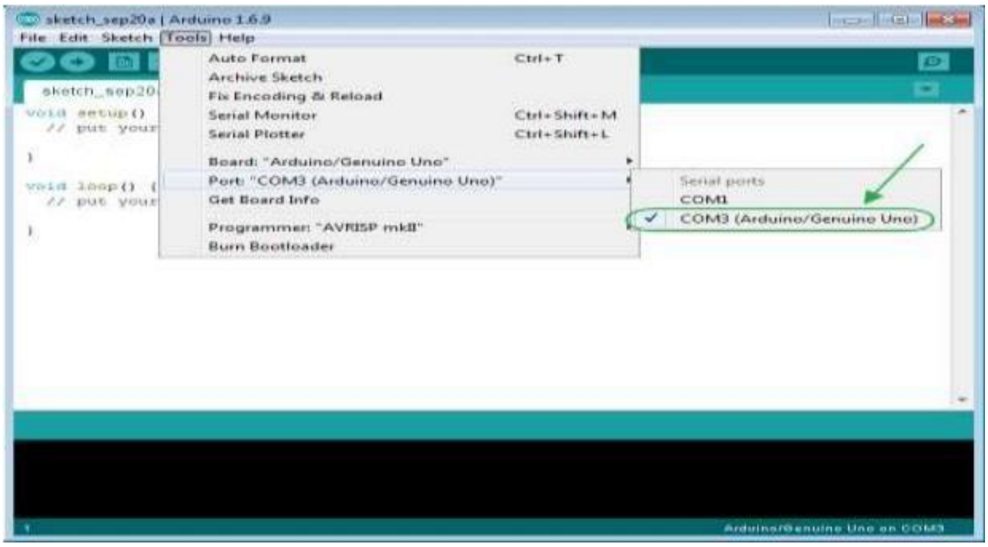

Fig. 4.18: Path to Select Serial Port

Select the serial gadget of the board from the Tools | Serial Port menu. This is probably going to be COM3 or higher (COM1andCOM2are generally held for equipment serial ports). To discover, you can detach your board and reopen the menu; the passage that vanishes ought to be the Arduino board.

Reconnect the board and select that serial port.

STEP 7: UPLOAD THE PROGRAM

Presently, essentially tap the "Transfer" catch in the earth. Hold up a couple of moments - we should see the RX and TX leds on the board blazing. On the off chance that the transfer is fruitful, the message "Done transferring." will show up in the status bar.

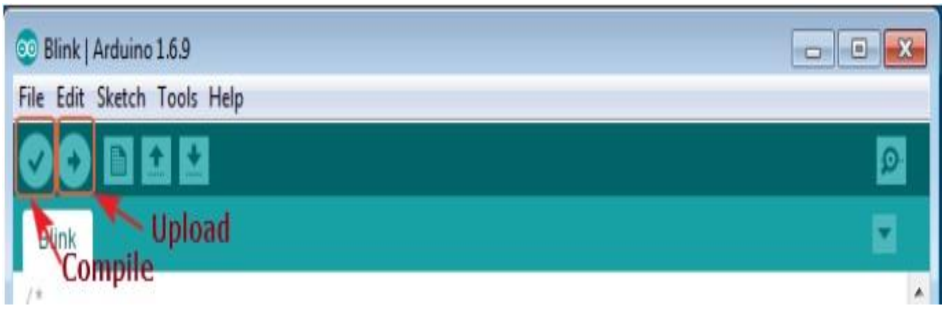

Fig. 4.19: Path to Upload

STEP 8: RESULT

A few seconds after the upload finishes, you should see the pin 13 (L) LED on the board start to blink (in orange). If it does, congratulations! We've gotten Arduino up-and-running.

4.4.2 ARDUINO INTERFACE INTRODUCTION

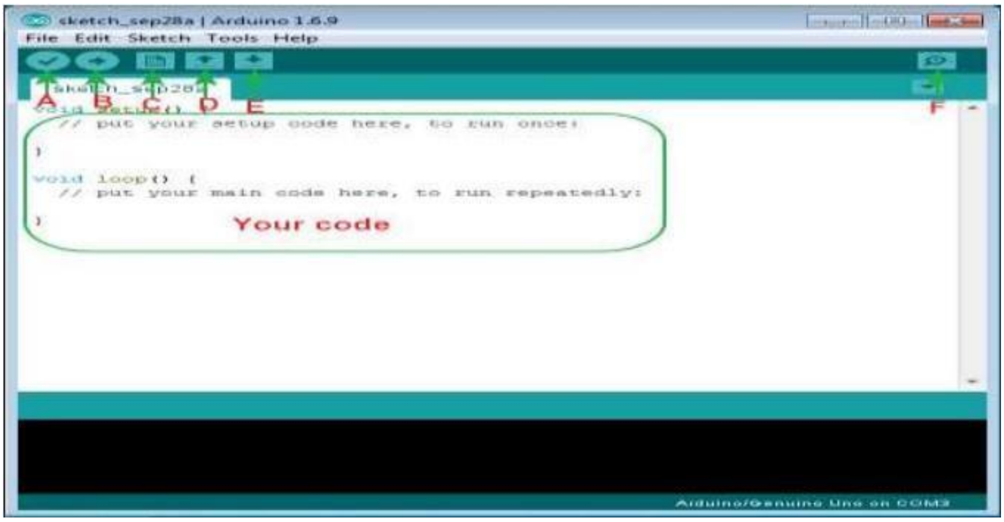

Fig. 4.20: Tools in Arduino Interface Software

A ->Compile

B ->Upload

C ->New

D ->Open

E ->Save

F ->Serial monitor

4.4.3 ADDING LIBRARY FILES

Fig. 4.21: UNO with Hardware

CHAPTER-5 RESULTS & APPLICATIONS

5.1 RESULT:

So, we got the below results of this project named "IoT Based Water Dispenser Using RFID".

Upon executing the program, we were able to see the sensors output of the Dispensing Machine in the 20x4 LCD display and upon the data has been transferred to the Thing Speak server.

Fig. 5.1: Sensor Readings on LCD

RFID Reader Modules: This module reads RFID tags found on user cards or key fobs. It talks with the microcontroller to authenticate users and retrieve account information.

Microcontroller Units (MCU): The MCU functions as the brain of the water dispenser system, directing its functioning. It receives data from the RFID reader module, performs user identification, and oversees dispensing operations.

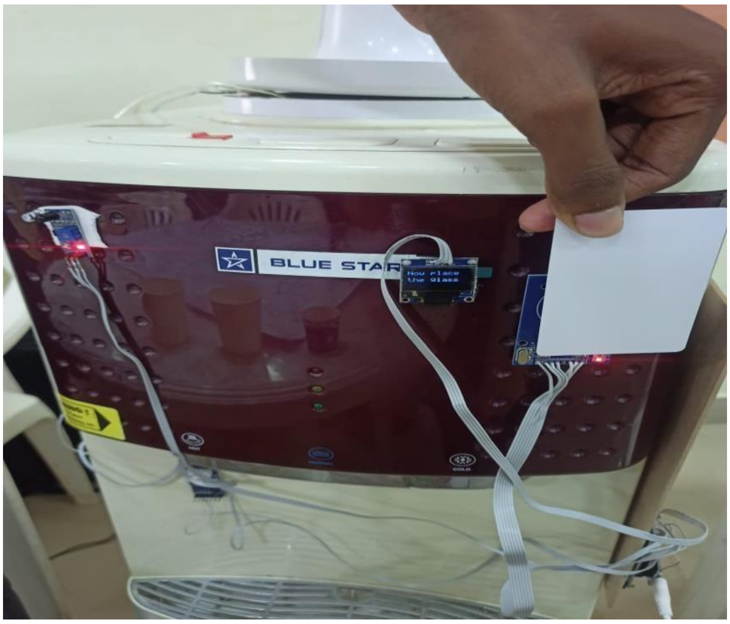

Fig. 5.2: Sensor Readings on LCD

Sensor Module: Sensor modules monitor numerous situations and events in water dispenser systems. Infrared (IR) sensors may detect the presence of containers, allowing for accurate dispensing.

Relay: The relay can act as a switch to control the dispensing mechanism. When a user presents an RFID card or tag, the RFID reader verifies the user's credentials. If the credentials are valid, the relay is activated, allowing water to be dispensed.

Water Pump: The water pump regulates the flow of water to ensure that the desired amount is dispensed accurately and efficiently. This may involve controlling the pump's speed or adjusting the pump's operation based on user input or predefined settings.

Fig. 5.3: Dispensing the water

Fig. 5.4: Hardware Arrangement

➢ The below Email is sent, when successfully detecting the valid RFID tag.

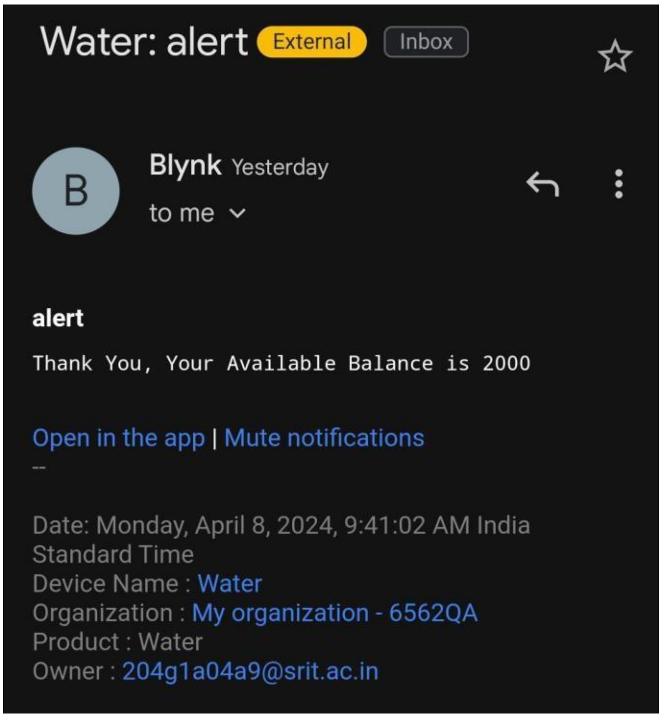

Fig. 5.5: Email Alert

5.2 APPLICATIONS

Implementing cashless operated water dispensers offers several advantages:

1.Convenience: Users can access clean drinking water without the need for physical currency or tokens, simply by using electronic payment methods such as credit/debit cards, mobile payment apps, or RFID tags. This streamlines the dispensing process, making it quick and convenient for users.

2. Hygiene: Cashless operated dispensers promote hygiene by eliminating the need for physical contact with cash or tokens. This reduces the risk of contamination and transmission of germs, ensuring a cleaner and safer dispensing experience for users.

3.Accessibility: Cashless systems enhance accessibility by catering to users who may not have cash readily available. This includes individuals who prefer electronic payment methods or those who may not carry cash regularly.

4.Efficiency: Cashless operated water dispensers enable efficient management of transactions, with real-time tracking of usage and revenue generation. This facilitates better resource allocation and optimization of operations, leading to improved efficiency.

5.Revenue Generation: Operators can generate revenue through cashless transactions, which may lead to increased profitability compared to traditional cash-based systems. Additionally, customizable pricing options and valueadded services offer opportunities for revenue diversification.

6.Environmental Sustainability: Cashless systems contribute to environmental sustainability by reducing the use of disposable cups or bottles and minimizing waste associated with cash transactions. This aligns with global efforts to promote responsible consumption and minimize environmental impact.

7.Data Insights: Cashless operated dispensers provide valuable data insights into usage patterns, user demographics, and transaction trends. This data can inform decision-making processes and strategic planning, enabling operators to optimize operations and improve service quality.

CHAPTER 6 CONCLUSION & FUTURE SCOPE

6.1 CONCLUSION

In conclusion, integrating RFID technology into water dispensers offers a multitude of benefits across various settings such as public spaces, colleges, universities, and gyms. Through this integration, water dispensers become more than just hydration stations; they become smart, efficient, and user-friendly systems.

RFID-enabled water dispensers provide enhanced security through user authentication, ensuring that only authorized individuals can access the water. Moreover, they promote personalized experiences by allowing users to customize settings such as water temperature and volume through their RFID tags.

These systems also facilitate efficient inventory management and maintenance scheduling by providing real-time data on dispenser usage and inventory levels. Additionally, RFID technology enables seamless integration with payment systems, making transactions cashless and convenient for users.

Overall, water dispensers using RFID technology represent a significant advancement in hydration solutions, offering efficiency, security, and convenience while promoting sustainability and wellness. As technology continues to evolve, RFID-enabled water dispensers have the potential to further revolutionize how we access and consume water in various public and private settings.

6.2 FUTURE SCOPE

The future scope for water dispensers using RFID technology extends across various sectors, each with unique needs and opportunities for innovation. Here's a glimpse into the potential advancements and applications in different sectors:

Healthcare Sector:

RFID-enabled water dispensers can be integrated into healthcare facilities to monitor and track patient hydration levels in real-time. This data can assist healthcare providers in ensuring optimal hydration for patients, especially those with specific medical conditions.

Water dispensers equipped with RFID technology can be linked to medication management systems, enabling patients to conveniently take their medications with water at designated intervals. This integration can improve medication adherence and patient outcomes.

Educational Institutions:

RFID-enabled water dispensers can be deployed across campus to promote hydration among students and staff. Integration with student IDs or RFID cards allows for easy access to water while enabling administrators to track hydration trends and implement targeted interventions.

Educational institutions can use RFID-enabled water dispensers as educational tools to raise awareness about water conservation and sustainability. Interactive displays and real-time data visualization can help students learn about the environmental impact of their hydration choices.

Retail Sector:

Retailers can enhance customer engagement by offering RFID-enabled water dispensers in-store. Customers can use RFID tags or loyalty cards to access complimentary water while shopping, fostering a positive shopping experience and increasing foot traffic.

Water dispensers integrated with RFID technology can provide customers with detailed information about the source and quality of the water being dispensed, promoting transparency and trust in the retail brand.

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[1]. Grierson, Philip, Numismatics,Oxford University Press, M.Banzi Getting Started with Arduino P.Pradeepa,T.Sudhalavanya, K.Suganthi, N.Suganthi, M. menagadevi[2013], "Design and Implememtation of vending machine using Verilog HDL", International Journal of Advanced Engineering Technology. [2]. Arduino Microcontroller processing for everyone,Morgan and claypool by steven Barret

[3]. Academic Journals:Look for peer-reviewed articles in academic journals related to water distribution, payment systems, and technology integration. Journals like Water Resources Management, Journal of Water Supply: Research and Technology - AQUA, and Journal of Environmental Management may have relevant articles.

[4]. Conference Proceedings:Explore proceedings from conferences related to water management, technology integration, and payment systems. Conferences like the International Water Association (IWA) World Water Congress & Exhibition or the American Water Works Association (AWWA) Annual Conference may have papers on this topic.

[5]. Industry Reports:Research reports from market research firms or industry associations may provide insights into trends, challenges, and opportunities in the water distribution sector. Reports from organizations like Frost & Sullivan, MarketsandMarkets, or the International Water Association (IWA) could be useful.

[6]. Books:Books on topics such as water management, technology adoption, and payment systems may provide in-depth coverage of cashless operated water dispensers. Search for relevant titles on platforms like Google Books or academic publishers' websites.

[7]. Online Databases:Utilize online databases such as PubMed, Google Scholar, or Scopus to search for academic papers, conference proceedings, and articles from a wide range of sources.

CONFERENCE PARTICIPATION CERTIFICATES

1st INTERNATIONAL CONFERENCE ON DATA ANALYTICS AND INTELLIGENCE COMPUTING-2024

(ICDAIC'24)

CERTIFICATE OF PARTICIPATION

This is to certify that Prof./Dr./Mr./Ms. K.RANJITHA BAI of SRINIVASA RAMANUJAN INSTITUTE OF TECHNOLOGY has presented a paper titled WATER DISPENSER USING RFID in 1st International Conference on Data Analytics and Intelligence Computing organized by the Department of Artificial Intelligence and Data Science, Velammal Institute of Technology, Chennai, TamilNadu, India on April 06, 2024.

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