PROJECT REPORT

Submitted in partial fulfilment of the Requirements for the award of the Degree of

BACHELOR OF SCIENCE

(INFORMATION TECHNOLOGY)

Under the Guidance of Mrs. ARCHANA BHIDE

DEPARTMENT OF INFORMATION TECHNOLOGY

RAMNIRANJAN JHUNJHUNWALA COLLEGE

(AUTONOMOUS)

(Affiliated to University of Mumbai)

GHATKOPAR (W), MUMBAI – 400086

MAHARASHTRA 2022-23

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Hindi Vidya Prachar Samiti's

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ABSTRACT

The IoT Based Smart Kitchen sink is a modern plumbing technology that incorporates various sensors and control systems to manage water usage more efficiently. One such smart sink is equipped with a pH sensor, solenoid valve, Arduino microcontroller, and soil moisture sensor to provide a comprehensive water management system.

The pH sensor installed in the sink detects the pH level of the water, and the solenoid valve separates the water into either an acidic or alkaline stream based on the pH level. The system is controlled by an Arduino microcontroller that reads the pH level of the water and activates the solenoid valve to divert the water into the appropriate container. This process helps to reduce water waste and increase the reusability of water.

The smart sink also includes a soil moisture sensor that detects the moisture level in the soil. When the moisture level is low, the system activates a pump to release the stored alkaline water into the soil, providing a sustainable solution for watering plants and landscaping.

The benefits of a smart sink are numerous. It helps to reduce water waste and conserve water resources, contributing to sustainable living practices. Additionally, the system provides a more efficient way to manage water usage, which can lead to cost savings on water bills. The use of smart technology also reduces the need for manual intervention, making it a convenient and time-saving solution for households or other settings.

ACKNOWLEDGEMENT

Before we get into the thick of things, we would like to add a few heartfelt words for the people who were part of the **IoT BASED SMART KITCHEN SINK** project in numerous ways, people who gave unending support right from the stage the project idea was conceived.

A project report is such a comprehensive coverage; it would not have been materialised without the help of many. The four things that go on to make a successful endeavour is dedication, hard work, patience and correct guidance. Able and timely guidance not only helps in making an effort fruitful but also transforms the whole process of learning and implementing into an enjoyable experience.

In particular, I would like to thank our principal **Dr. (Mrs.) USHA MUKUNDAN**, R.J. College. I would like to give a very special honour and respect to our teacher, **Prof. ARCHANA BHIDE** who took keen interest in checking the minute details of the project work and guided us throughout the same. A sincere quote of thanks to the non-teaching staff for providing us with their time. I appreciate outstanding cooperation by them, especially for the long Lab timings that we could receive.

Last but not least I wish to avail myself of this opportunity, express a sense of gratitude and love to my friends and my beloved FAMILY for their manual support, strength and help with everything.

DECLARATION

I hereby declare that the Project entitled, "**IoT BASED SMART KITCHEN SINK**" done at **R. J. COLLEGE,** Ghatkopar(W), Mumbai, has not been in any case duplicated to submit to any other university for the award of any degree. To the best of my Knowledge other than me, No one has submitted to any other University.

The Project is done in partial fulfilment of the requirements for the award of degree of **BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY)** to be submitted as final semester project as part of our curriculum.

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Chapter 1 - INTRODUCTION

1.1. Objectives

On an average one person wastes about 0-45 litres of water per day, 125 million litres of water wasted daily. How much water do you waste in a day? Our project is designed in a way that helps the person using it lower their daily water wastage. The smart kitchen sink is a revolutionary idea that will build a prototype to save water used in the kitchen.

This sink has technology that enables the capture and storage of water during normal use, such as washing hands or dishes. The stored water might then be used for other reasons, such as watering plants or flushing the toilet, aiding in water conservation and waste reduction.

1.2. Background

The Internet of Things (IoT) refers to the interconnected network of physical devices, vehicles, buildings, and other objects that are embedded with sensors, software, and network connectivity, allowing them to collect and exchange data. IoT technology has the potential to revolutionise various industries and enable new applications by allowing devices to communicate and interact with each other and with people in a seamless and intelligent manner.

Studies have shown that the adoption of IoT technology can bring a range of benefits, including improved efficiency, productivity, and decision-making, as well as reduced costs and risks. For example, IoT can be used to optimise supply chain management, enhance asset tracking and maintenance, improve energy management, and enhance customer experience.

However, the deployment and use of IoT also raise a number of challenges and concerns, including security, privacy, interoperability, and regulation. Ensuring the security of IoT devices and networks is crucial, as cyber attacks on IoT systems can have significant consequences, such as loss of sensitive data, financial damage, and disruption of critical infrastructure.

Additionally, the collection and use of data generated by IoT devices raise privacy concerns, as individuals may be unaware of the extent to which their data is being collected and used.In summary, the literature on IoT technology highlights the potential benefits and challenges of this technology, and emphasises the importance of addressing security and privacy concerns in order to realise its full potential.

According to various studies and reports, the future of IoT technology is expected to be marked by further growth and expansion, as well as the development of new technologies and applications. Some of the key trends and developments that are expected to shape the future of IoT include:

1. Increased adoption: The adoption of IoT technology is expected to continue to grow, with more and more devices being connected to the internet and more organisations and industries adopting IoT solutions.

2. 5G and edge computing: The deployment of 5G networks and the rise of edge computing are expected to enable faster, more reliable, and more secure IoT connections, as well as enable new IoT applications that require low latency and high data rates.

3. Artificial intelligence and machine learning: The integration of artificial intelligence (AI) and machine learning into IoT systems is expected to enable more intelligent and autonomous IoT devices and systems, as well as enable new applications and capabilities.

4. Increased focus on Security and Privacy: As the number of connected devices grows, there is a need for stronger security measures to protect against cyber attacks and ensure the privacy of individuals.

5. Regulatory and Ethical considerations: The deployment and use of IoT technology raise a number of regulatory and ethical considerations, such as data privacy, interoperability, and the potential impact on employment and society.

1.3. Applications

- Household use: The smart sink can be installed in households to effectively manage and sort water based on its pH level, reducing water waste and promoting sustainable water management practices.

- Commercial use: The smart sink can be used in commercial settings, such as restaurants or hospitals, to manage and sort water waste and promote sustainable waste management practices.

- Agricultural use: The smart sink can be used in agriculture to manage and reuse water for irrigation purposes. The soil moisture sensor can be used to detect when water is needed and the stored alkaline water can be released to irrigate crops.

- Educational use: The smart sink can be used in educational settings, such as schools or universities, to demonstrate the importance of sustainable waste management practices and promote environmental awareness.

- Research use: The smart sink can be used in research settings to study the effectiveness of smart technology in promoting sustainable waste management practices and reducing the environmental impact of water waste.

1.4. Feasibility of the Project

- Availability of Components: The components mentioned in the project - pH sensor, solenoid valve, Arduino microcontroller, and soil moisture sensor - are readily available in the market. This makes it easy to procure them and integrate them into the system.

- Cost-Effective: While the initial cost of setting up the system may be higher than that of a traditional sink, the use of a smart sink can lead to cost savings on water bills over time. The system helps to reduce water waste and conserve water resources, contributing to sustainable living practices.

- Sustainable: The use of a smart sink promotes sustainability by providing a comprehensive water management system that conserves water resources, reduces water waste, and promotes the reuse of water for watering plants and landscaping.

- User-Friendly: The use of smart technology reduces the need for manual intervention, making it a convenient and time-saving solution for households or other settings.

- Scalable: The system can be scaled up or down depending on the needs of the user. It can be installed in households, offices, or other settings, making it a versatile solution for water management.

1.5. Software and Hardware Components

1.5.1. Softwares:

1. **Arduino IDE:**

Arduino IDE is an Integrated Development Environment (IDE) that allows users to write, compile, and upload code to an Arduino microcontroller board. It provides an intuitive interface for programming Arduino boards and is the most widely used tool for developing Arduino projects.

The IDE is built on the Java platform and is available for Windows, Mac OS, and Linux operating systems. It supports a variety of Arduino boards, including the Uno, Mega, Nano, and others.

The Arduino IDE includes a code editor, a serial monitor, and a compiler. The code editor has features like syntax highlighting, auto-indentation, and code completion to make coding easier. The serial monitor allows users to view data sent from the Arduino board and to send data back to the board.

Users can write programs in C++ using the Arduino language, which is a simplified version of C++. The IDE includes a library manager that makes it easy to add libraries to your project. There is also a vast community of Arduino users who share their projects and code online, making it easy to find help and inspiration.

2. **MIT app Inventor:**

MIT App Inventor is a web-based tool that allows users to create mobile apps for Android devices without requiring any prior coding experience. The platform is designed for use by students, educators, and individuals who want to create simple, interactive mobile apps.

The App Inventor interface consists of two main parts: the Designer and the Blocks Editor. The Designer is used to create the user interface of the app, while the Blocks Editor is used to add functionality and logic to the app.

The Designer allows users to drag and drop components onto the screen to create the user interface of the app. Components include buttons, text boxes, images, and more. Users can customise the properties of each component, such as the colour, size, and position.

The Blocks Editor uses a visual programming language that allows users to add functionality to the app without having to write code. Users can drag and drop blocks to create event handlers, loops, and

conditionals. They can also use blocks to interact with the device's sensors, such as the accelerometer and GPS.

3. **App**

1.5.2. Hardware components(Parts):

1. Arduino Uno
2. Soil moisture sensor
3. Solenoid Valve
4. Bluetooth module (HC-05)
5. Jumper wires
6. Mobile(Bluetooth & Application)
7. Pumps(165v)
8. pH Sensor
9. Sonar Sensor
10. Relay (2-Channels)

1. **Arduino Uno:**

Introduction:

- Arduino Uno is a microcontroller board based on the ATmega328P chip.
- It has 14 digital input/output pins, 6 analog inputs, and several power pins.
- The board is powered by either USB or an external power supply.
- It can be programmed using the Arduino IDE.
- The digital pins can be used as input or output pins, and two of them are used for serial communication.
- The analog inputs are used to read analog signals from sensors.
- The board has a reset button, and several other pins for various purposes, such as serial communication and reference voltage for analog inputs.
- Arduino Uno is widely used in electronics projects due to its versatility, ease of use, and large community of users and resources.

Specifications:

1. Digital Pins:

There are 14 digital pins, numbered from 0 to 13, on the board. They can be used as either input or output pins, depending on the needs of the project. Digital pins 0 and 1 are also used for serial communication with other devices.

2. Analog Inputs:

There are 6 analog input pins, labelled A0 to A5. They are used to read analog signals from sensors, such as light and temperature sensors. These pins can also be used as digital input/output pins if needed.

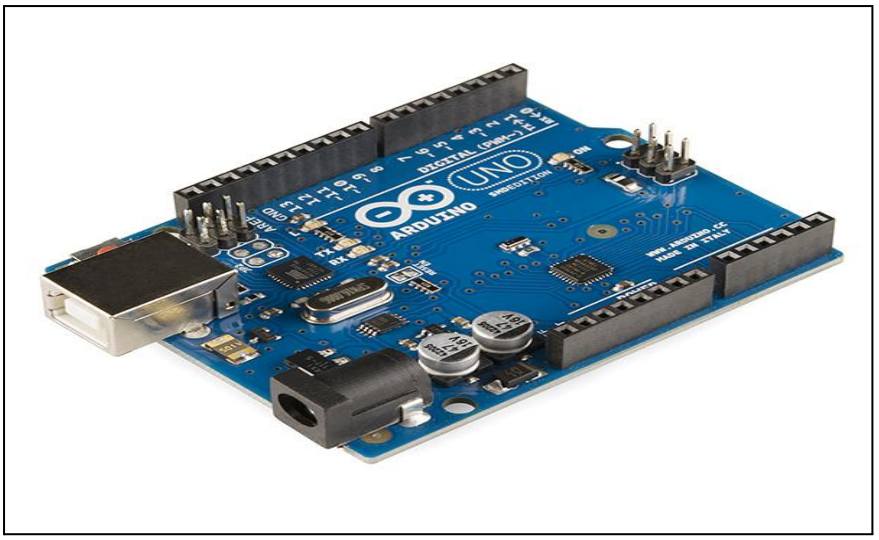
3. Power Pins:

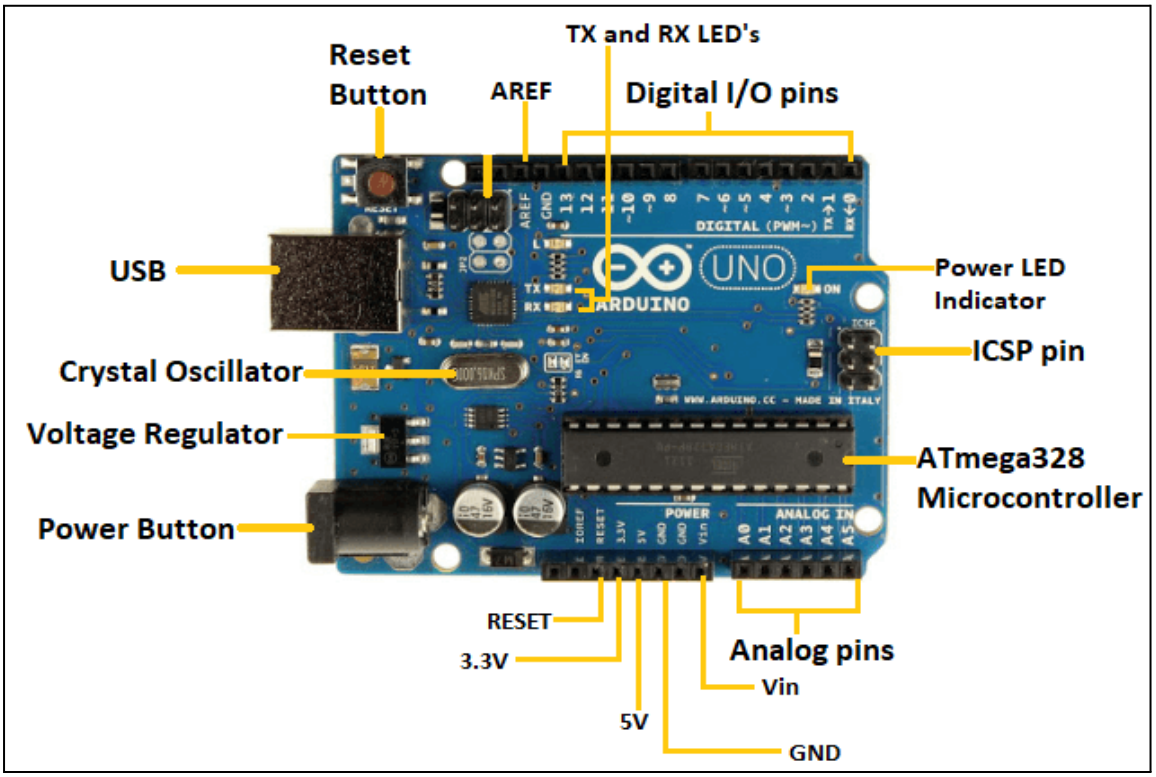
There are several power pins on the board, including the VIN pin, which is used to power the board with an external power supply. The 5V pin and 3.3V pin are used to supply power to external components connected to the board. The GND pins are used for ground connections.

4. Other Pins:

The RESET pin is used to reset the board. The TX and RX pins are used for serial communication with other devices. The AREF pin is used as a reference voltage for analog inputs.

Image:





2. Soil moisture sensor

Introduction :

- Soil moisture sensors measure the water content in soil.
- They work by measuring the electrical conductivity between two or more electrodes in the soil.

- They can be used in agriculture, gardening, and landscaping to optimize irrigation and prevent over-watering.
- Soil moisture sensors are commonly used in combination with other sensors to create a more comprehensive environmental monitoring system.
- They help to conserve water resources and promote sustainable water management practices.
- In the smart sink project mentioned in the abstract, the soil moisture sensor is likely used to detect the moisture level in the soil and trigger the release of alkaline water from the system's storage tank for watering plants and landscaping.

Specification :

➢ Inputs:

- Soil moisture sensors typically have two or more electrodes that are inserted into the soil to measure the electrical conductivity.
- They may require a power supply to operate, which can be provided by a microcontroller or other electronic device.

➢ Outputs:

- The output of a soil moisture sensor is typically an analog or digital signal that indicates the moisture level in the soil.
- This output can be used to trigger an action, such as turning on a pump to water plants or activating a solenoid valve to release stored water from the smart sink system.
- Some soil moisture sensors may also have built-in LED indicators that provide a visual indication of the moisture level.
- The output of a soil moisture sensor can be interfaced with a microcontroller, such as an Arduino, to create a more comprehensive environmental monitoring system.

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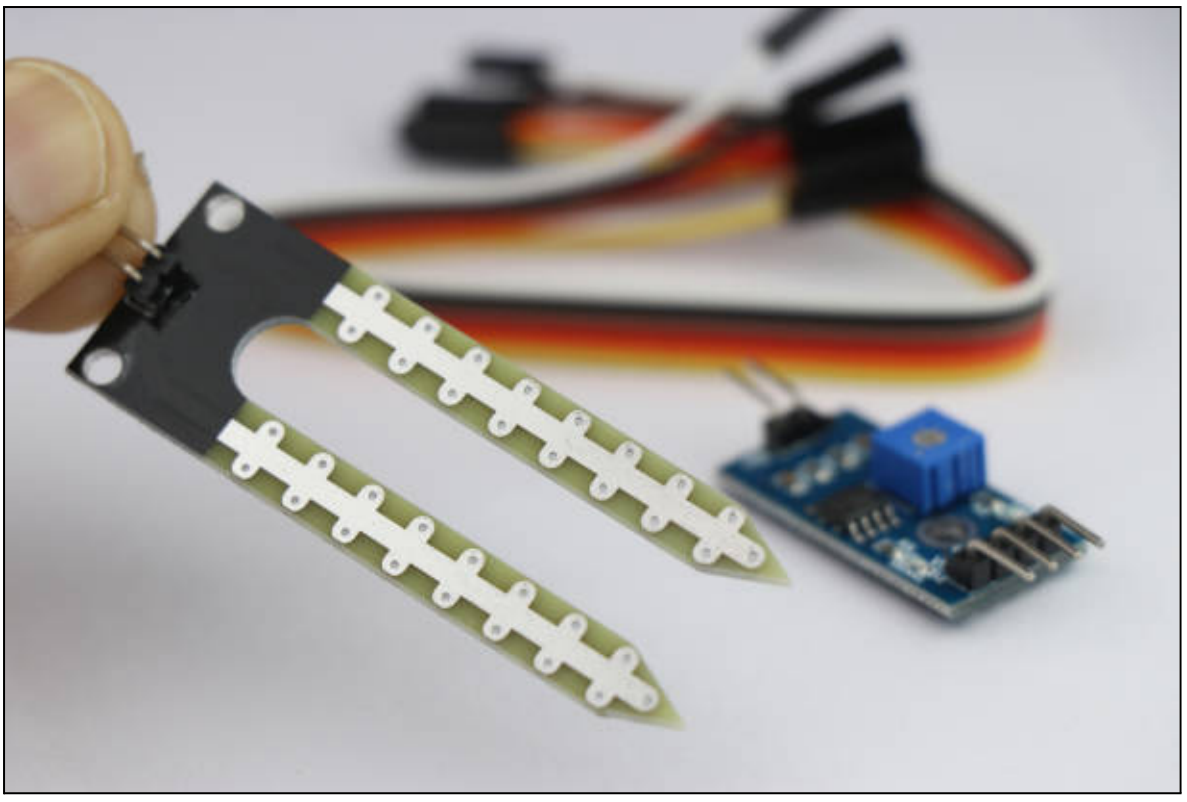

3. Solenoid Valve

Introduction :

- Solenoid valves are electromechanical devices that control the flow of fluids or gases through a system.
- They consist of a coil of wire and a plunger that moves in response to an electrical signal.
- When the coil is energised, it creates a magnetic field that pulls the plunger, opening the valve and allowing fluid or gas to flow through.
- Solenoid valves are commonly used in plumbing systems to control the flow of water or other fluids.
- They can be controlled by a microcontroller, such as an Arduino, to create an automated system that responds to environmental conditions or user input.
- In the smart sink project mentioned in the abstract, a solenoid valve is used to separate the water into either an acidic or alkaline stream based on the pH level detected by the pH sensor.
- The Arduino microcontroller reads the pH level of the water and activates the solenoid valve to divert the water into the appropriate container.

Specification :

➢ Inputs:

- Solenoid valves typically require an electrical input, usually in the form of a voltage signal, to activate the coil and open the valve.
- The input signal can be provided by a microcontroller, such as an Arduino, or by other electronic devices.

➢ Outputs:

- The output of a solenoid valve is the opening or closing of the valve, which controls the flow of fluid or gas through the system.
- Solenoid valves can be used to control the flow of various fluids or gases, such as water, air, or fuel.
- They can be used in a variety of applications, including plumbing systems, HVAC systems, and industrial automation.

- In the smart sink project mentioned in the abstract, a solenoid valve is used to separate the water into either an acidic or alkaline stream based on the pH level detected by the pH sensor.
- The Arduino microcontroller reads the pH level of the water and activates the solenoid valve to divert the water into the appropriate container.

Image :

4. Bluetooth module (HC-05)

Introduction:

- The HC-05 is a Bluetooth serial communication module that allows wireless communication between devices.
- The module operates on the Bluetooth 2.0 specification and uses the Serial Port Profile (SPP) to create a virtual serial port over Bluetooth.
- The HC-05 can be configured as either a master or a slave device, allowing it to communicate with other Bluetooth-enabled devices.
- The module uses a 2.4 GHz frequency band with a range of up to 10 metres (33 feet) in open space.
- The module communicates with a microcontroller using a serial UART interface.
- The HC-05 can be configured using AT commands sent over the serial interface to set parameters such as baud rate, device name, and pin code.
- The module can be powered by a voltage range of 3.6V to 6V and consumes very low power in standby mode.
- The HC-05 is commonly used in robotics, home automation, and other projects that require wireless communication between devices.

Specification:

- Key/EN: It is used to bring Bluetooth modules in AT commands mode. If the Key/EN pin is set to high, then this module will work in command mode. Otherwise by default it is in data mode. The default baud rate of HC-05 in command mode is 38400 bps and 9600 in data mode.

HC-05 module has two modes:

1. Data mode: Exchange of data between devices.
2. Command mode: It uses AT commands which are used to change settings of HC-05. To send these commands to the module serial (USART) port is used.

- VCC: Connect 5 V or 3.3 V to this Pin.
- GND: Ground Pin of module.
- TXD: Transmit Serial data (wirelessly received data by Bluetooth module transmitted out serially on TXD pin)

- RXD: Receive data serially (received data will be transmitted wirelessly by Bluetooth module).
- State: It tells whether a module is connected or not.

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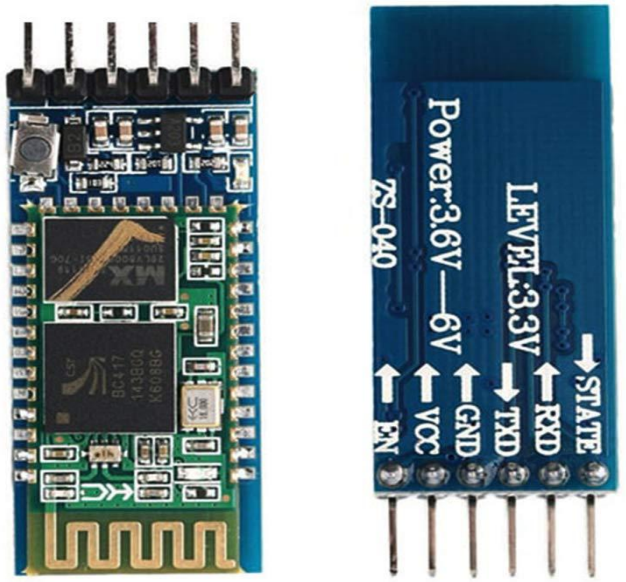
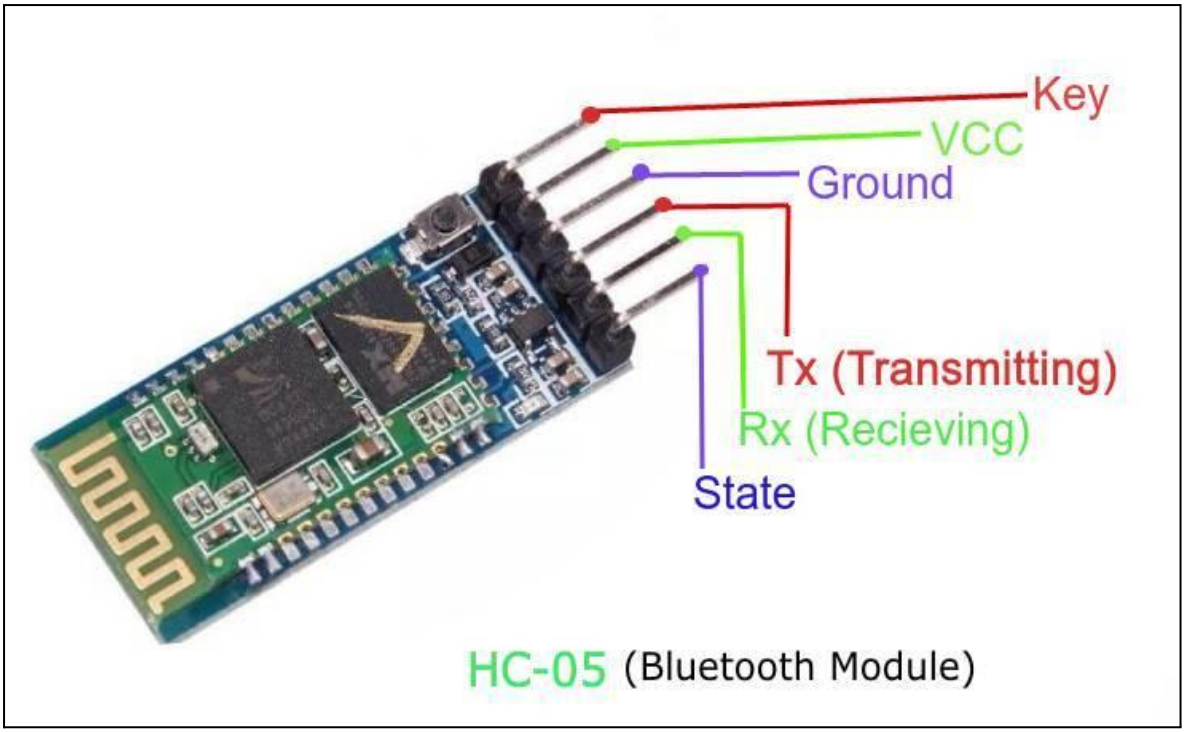




5. Jumper wires

Introduction:

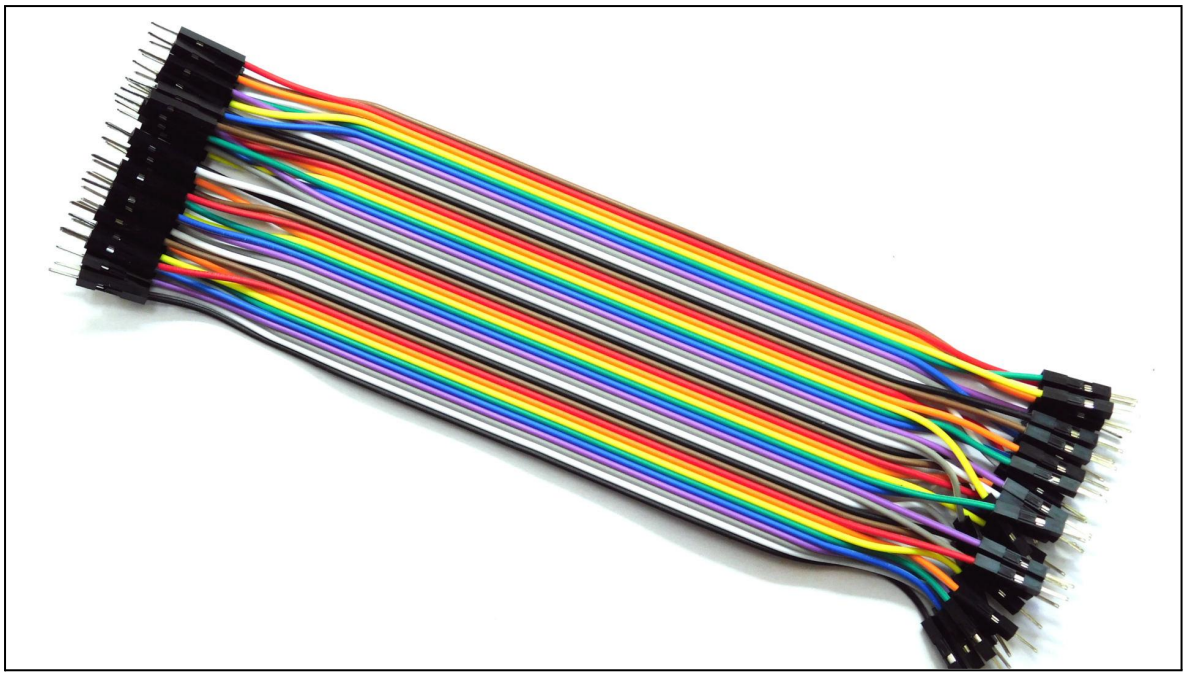
- Jumper wires are electrical cables that are employed to establish transient connections between two locations on a circuit board or other electronic device.
- They can be used to quickly and simply create connections without the use of soldering or other long-term attachment techniques.
- They are typically made of thin, flexible wire with connectors on each end. It's crucial to make sure the wires on the circuit board or other device are connected to the proper points when connecting jumper wires.
- Care must be taken to avoid short-circuiting or harming the device as the wires must be placed in the proper connectors or soldered to the correct points.
- Jumper wires are frequently used in DIY electronics projects as well as in the prototyping and testing of electronic circuits.

Specification:

- For input connections, jumper wires can be used to connect sensors, switches, or other input devices to a microcontroller or other processing unit.
- For example, a jumper wire can be used to connect a temperature sensor to a microcontroller, allowing the microcontroller to read the temperature data from the sensor.

- For output connections, jumper wires can be used to connect LEDs, motors, or other output devices to a microcontroller or other processing unit.
- For example, a jumper wire can be used to connect an LED to a microcontroller, allowing the microcontroller to turn the LED on or off based on certain conditions or inputs.

Image:



6. Mobile(Bluetooth & Application)

Introduction :

7. Pumps(165v)

Introduction:

- 165V pumps are a type of electric water pump that are designed to operate at 165 volts.
- These pumps are commonly used for agricultural, industrial, and residential purposes, such as irrigation, water supply, and wastewater treatment.
- They are often made of durable materials such as cast iron, stainless steel, or thermoplastic to ensure longevity and reliability.
- 165V pumps typically have a high flow rate and high-pressure capacity, allowing them to move large volumes of water over long distances or to high elevations.
- They can be powered by AC or DC electricity, depending on the application and power source available.
- Many 165V pumps feature built-in safety features such as automatic shut-off switches or overload protection to prevent damage and ensure safe operation.
- Maintenance for 165V pumps usually involves regular inspections, cleaning, and replacement of worn-out parts such as seals and bearings to ensure optimal performance and longevity.

Specification:

- Voltage: 165V
- Power rating: Typically between 0.5 to 3 horsepower (HP)
- Flow rate: Can vary widely depending on the pump model, ranging from around 10 to 500 gallons per minute (GPM)
- Head pressure: Typically ranges from 20 to 500 feet of head
- Construction material: Can be made of various materials such as cast iron, stainless steel, or thermoplastic
- Inlet and outlet size: Varies based on the pump model, with common sizes ranging from 1 inch to 6 inches
- Motor type: Can be either AC or DC depending on the application

- Protection features: Often equipped with built-in overload protection and automatic shut-off switches for safe operation

Image:

8. pH Sensor

Introduction :

- A pH sensor is a device that measures the acidity or alkalinity of a liquid or solution.
- It contains a sensitive electrode that generates a voltage proportional to the hydrogen ion concentration in the liquid.
- The pH sensor is composed of a pH electrode, reference electrode, and temperature sensor.
- The pH electrode is made of glass and is sensitive to changes in pH.

- The reference electrode is a stable electrode that is used to complete the electrical circuit and provide a constant voltage.
- The temperature sensor compensates for the temperature of the liquid to ensure accurate readings.
- pH sensors are commonly used in industries such as food and beverage, pharmaceuticals, and water treatment to monitor and control the pH level of their products or processes.

Specification :

- Input: The pH sensor requires a liquid or solution to measure its pH level.
- Output: The pH sensor generates a voltage output proportional to the pH level of the liquid being measured. This output is usually in the range of 0 to 5 volts or 4 to 20 milliamps (mA).

Image :

9. Sonar Sensor

Introduction :

- A sonar sensor, also known as an ultrasonic sensor, is a device that uses sound waves to detect objects and measure distance.
- It emits high-frequency sound waves, usually above the range of human hearing, and measures the time it takes for the waves to bounce back after hitting an object.
- The sensor uses the time taken for the waves to return to calculate the distance between the object and the sensor.
- Sonar sensors are commonly used in robotics and automation to detect the presence of objects and avoid collisions.

- They can also be used in security systems, parking sensors, and other applications that require distance measurements.

Specification :

- Input: The sonar sensor requires a power source to operate, typically 5 volts or 12 volts, depending on the model. It also requires a trigger signal to start emitting sound waves.
- Output: The sonar sensor generates an electrical signal output that corresponds to the distance between the sensor and the object. This output can be in the form of a voltage signal, pulse-width modulation (PWM) signal, or digital signal.

Image :

10. Relay (2-Channels)

Introduction:

- A relay is an electrically operated switch that can be used to control high voltage or current loads.
- The 2-channel relay module consists of two individual relays, each capable of switching up to 10A of current at 250V AC or 30V DC.
- The module is controlled using logic-level signals from a microcontroller or other digital circuit.

- The module can be powered using a separate power supply or by the same power source as the microcontroller.
- The relays can be used to switch on and off a wide range of devices, such as lights, motors, and appliances, in response to digital signals from a microcontroller.
- The module is often used in home automation, robotics, and other electronics projects where it is necessary to control high-power loads with a low-power signal.

Specification:

Input:

- The module is controlled using two digital input pins from a microcontroller or other digital circuit.
- The inputs are optically isolated, meaning that they are electrically isolated from the output side of the relay to protect the microcontroller from voltage spikes or other electrical noise.
- The input pins are active-low, meaning that a logic low signal (0V) will turn the relay on, and a logic high signal (5V) will turn it off.

Output:

- The module has two independent relay outputs, each capable of switching up to 10A of current at 250V AC or 30V DC.
- The relay outputs are normally open (NO) contacts, meaning that they are open when the relay is not energised (off).
- When the input pin is set to a logic low signal, the corresponding relay is energized (on), and the NO contact is closed, allowing current to flow through the load.
- When the input pin is set to a logic high signal, the corresponding relay is de-energized (off), and the NO contact is opened, interrupting the current flow to the load.

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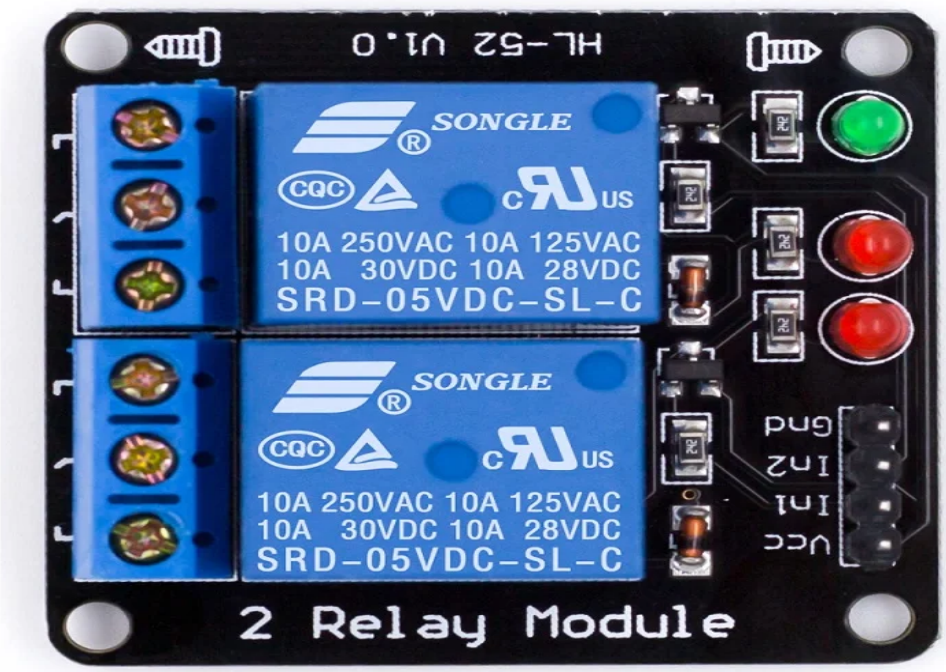
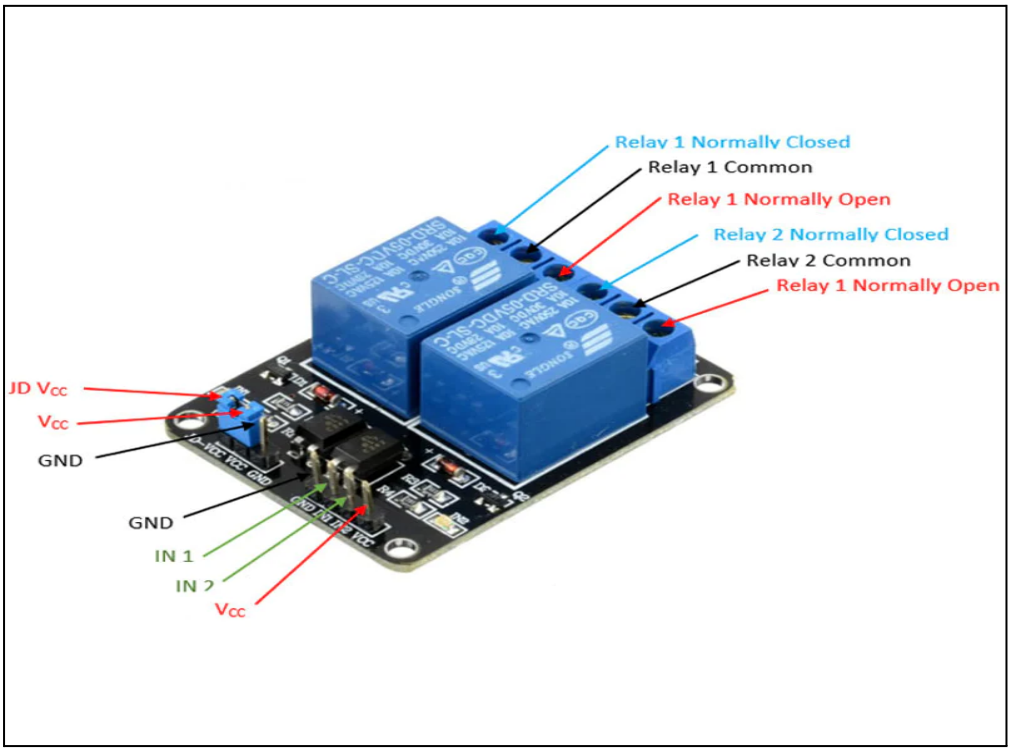

SONGLE
10A 250VAC 10A 125VAC
10A 30VDC 10A 28VDC
SRD-05VDC-SL-C
SONGLE
10A 250VAC 10A 125VAC
10A 30VDC 10A 28VDC
SRD-05VDC-SL-C
Gnd
In2
In1
Vcc
2 Relay Module


Relay 1 Normally Closed
Relay 1 Common
Relay 1 Normally Open
Relay 2 Normally Closed
Relay 2 Common
Relay 1 Normally Open
JD Vcc
Vcc
GND
GND
IN 1
IN 2
Vcc

1.6 Technology Used:

IoT Technology:

- Interconnected Devices: IoT connects various devices, machines, and objects through the internet to enable communication between them.
- Sensors: IoT devices are equipped with sensors that collect data from the environment, such as temperature, humidity, motion, and more.
- Cloud Computing: IoT technology utilises cloud computing to store and process large amounts of data generated by connected devices.
- Artificial Intelligence: With AI, IoT systems can learn from the data collected and make predictions and decisions on their own.
- Real-time Monitoring: IoT technology enables real-time monitoring of devices, allowing users to track performance, identify problems, and optimise operations.
- Remote Control: IoT devices can be controlled remotely, which is particularly useful for devices that are located in hard-to-reach places.
- Energy Efficiency: IoT technology helps optimise energy usage by reducing energy waste and improving efficiency in buildings and homes.
- Security: IoT devices are vulnerable to cyber-attacks, so security is a critical consideration for the implementation of IoT technology.
- Big Data Analytics: IoT generates vast amounts of data that can be analysed to uncover patterns, trends, and insights.
- Improved Customer Experience: IoT technology can be used to personalise customer experiences, from smart homes to wearables, by collecting and analysing data on customer behaviour and preferences.

Chapter 2 - METHODOLOGY/DESIGN

2.1. Methodology:

- pH sensor installation: The first step is to install the pH sensor in the sink. This involves using a
- screwdriver to secure the sensor in place. The sensor is typically installed in the sink basin or in the plumbing beneath the sink.

- Sensor connections: Once the pH sensor is installed, it needs to be connected to the microcontroller using wires. This involves identifying the correct pins on the microcontroller and making sure the wires are properly connected.

- Programming the microcontroller: The microcontroller needs to be programmed to read the pH level of the water in the sink and determine whether it is acidic or alkaline. This involves writing code in a programming language such as C or Arduino's own programming language to read the sensor data and make decisions based on that data.

- Solenoid valve activation: Once the pH level is determined, the solenoid valve is used to divert the water into either the acidic or alkaline container, depending on the pH level. This is done by sending an electrical signal to the solenoid valve to open or close it, depending on the desired flow of water.

- Testing the system: After the microcontroller is programmed and the solenoid valve is connected, the smart sink needs to be tested to ensure that it is accurately detecting the pH level and properly diverting the water into the appropriate container. This involves running water through the sink and observing the behaviour of the system to make sure everything is working as expected.

- Soil moisture sensor installation: The next step is to install the soil moisture sensor in the soil or plant pot. This involves placing the sensor in the soil and securing it in place.

- Sensor connections: Once the soil moisture sensor is installed, it needs to be connected to the microcontroller using wires and connections. This involves identifying the correct pins on the microcontroller and making sure the wires are properly connected.

- Programming the microcontroller: The microcontroller needs to be programmed to read the moisture level in the soil or plant pot and activate the pump to release stored alkaline water into the soil when the moisture level is low. This involves writing code in a programming language to read the sensor data and make decisions based on that data.

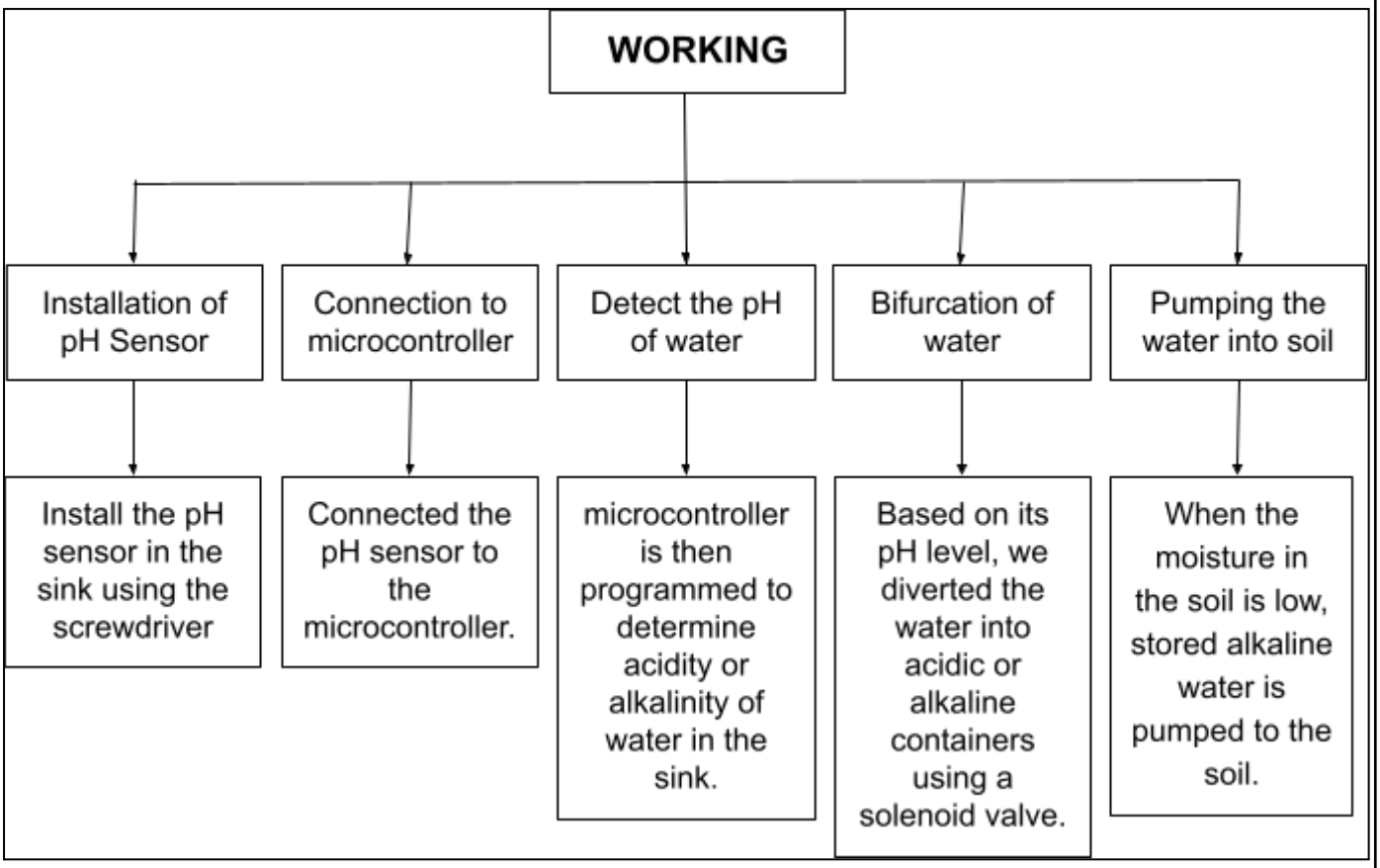
- Testing the system: After the microcontroller is programmed and the soil moisture sensor is connected, the smart sink needs to be tested to ensure that it is accurately detecting the moisture level and releasing water into the soil when necessary.

This involves observing the behaviour of the system when the soil is dry and when the pump is activated.

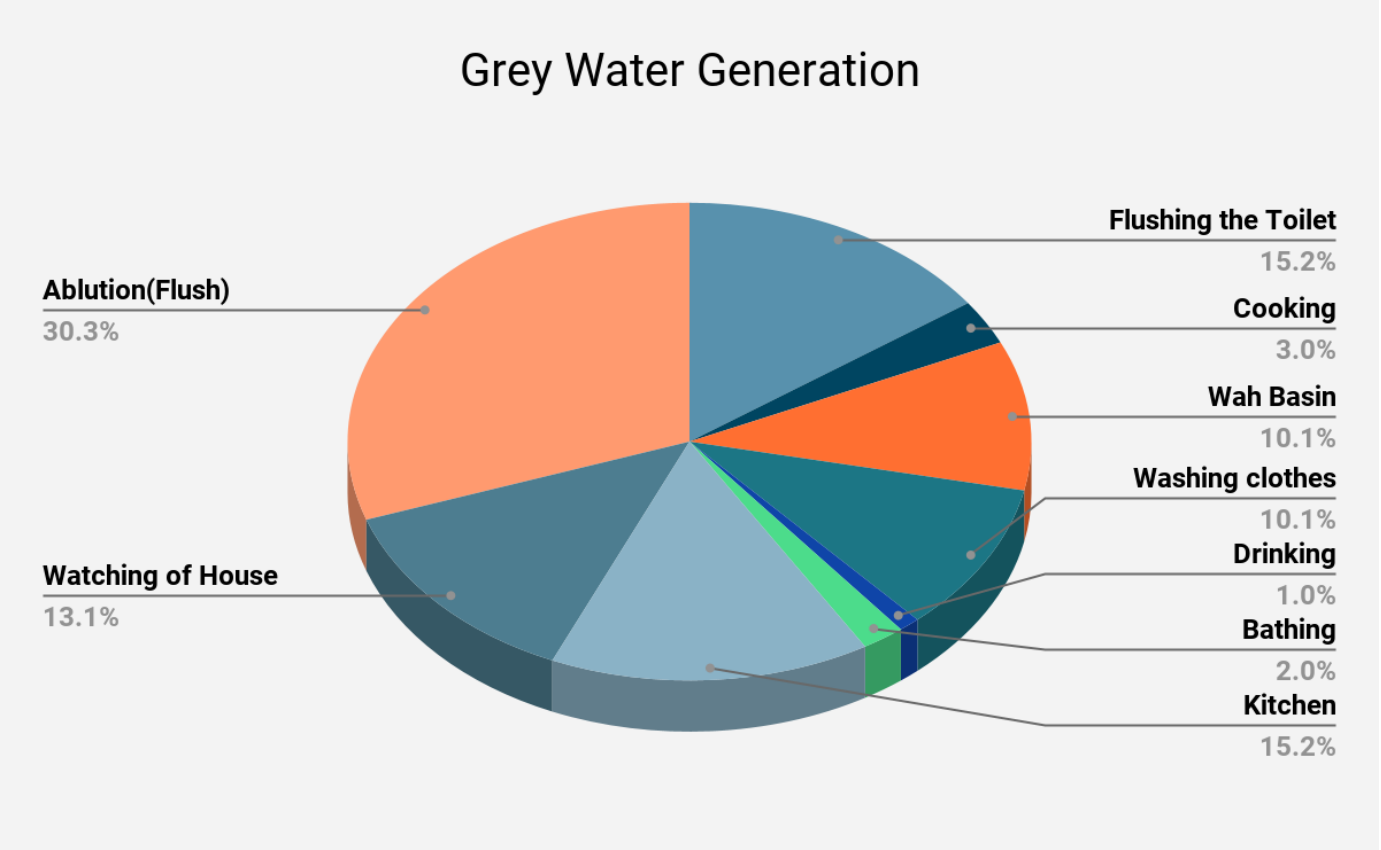
Simple code to understand the working of the project:

User -> Smart Sink: Uses sink
Smart Sink -> pH Sensor: Detects pH of water
pH Sensor -> Smart Sink: Sends pH value
Smart Sink -> 3 Pumps: Activates pumps based on pH value
alt pH value <= 6.5
Smart Sink -> Pump 1: Activates Pump 1 for acidic water
else pH value > 6.5
Smart Sink -> Pump 2: Activates Pump 2 for alkaline water
end
Pump 2 -> Container: Stores alkaline water
Container -> Sonar Sensor: Detects water level
Sonar Sensor -> HC-05: Sends water level data
HC-05 -> User's Phone: Sends water level data to app
alt Water level is low
Smart Sink -> Pump 3: Activates Pump 3 to water plants
else Water level is sufficient
User's Phone -> Smart Sink: No action taken
end
Smart Sink -> Soil Moisture Sensor: Detects soil moisture level
Soil Moisture Sensor -> Smart Sink: Sends moisture level data
alt Soil moisture is low
Smart Sink -> Pump 3: Activates Pump 3 to water plants
else Soil moisture is sufficient
User's Phone -> Smart Sink: No action taken
end

2.2. Flow Diagram:



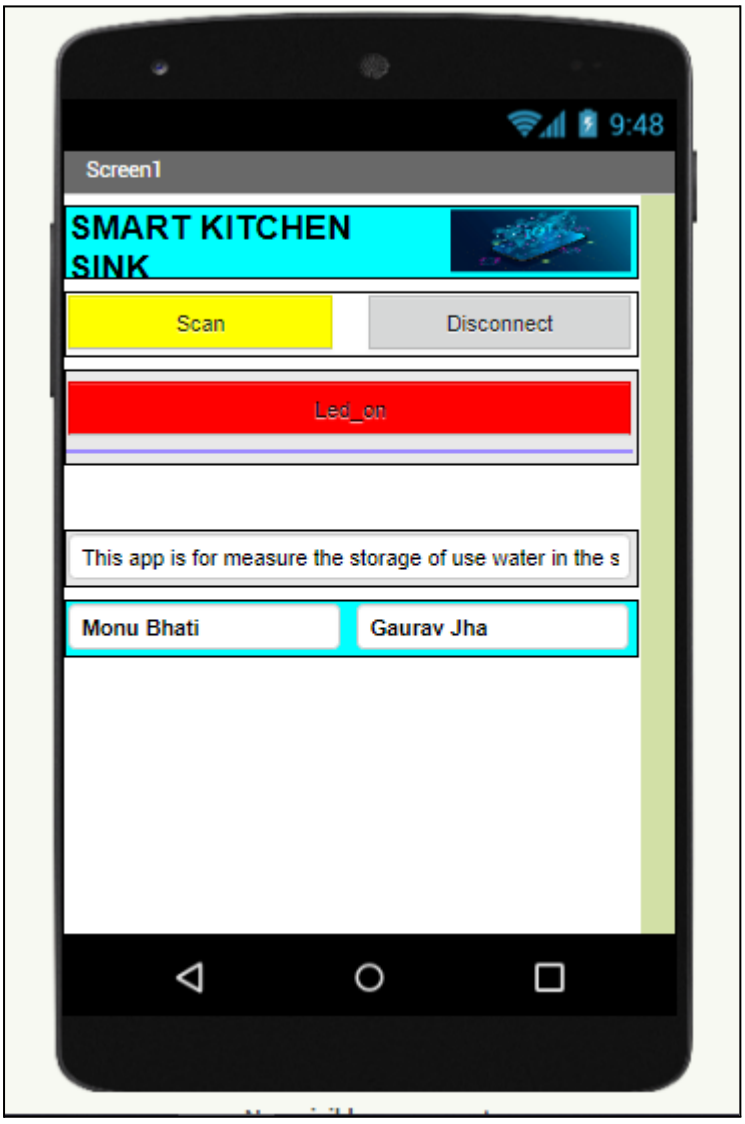
2.3. Pie Diagram(Grey Water Generation):



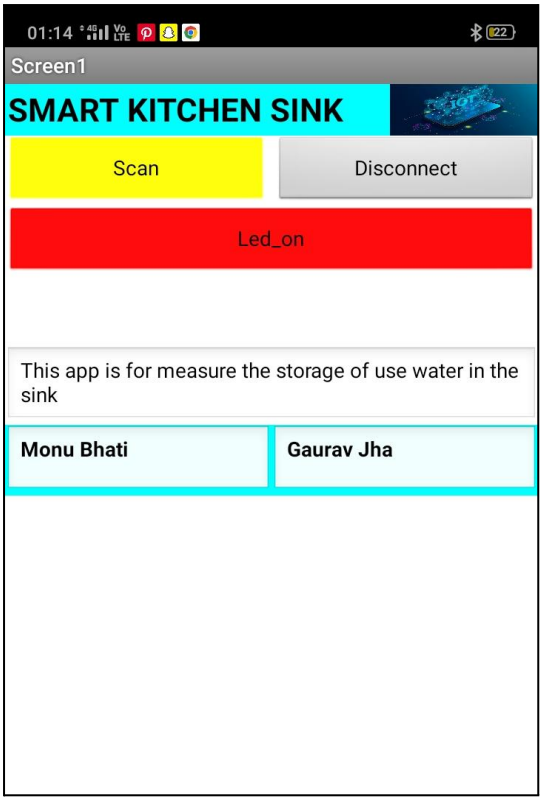
Chapter 3 - IMPLEMENTATION

3.1. Screenshots of the Application(Smart kitchen Sink):

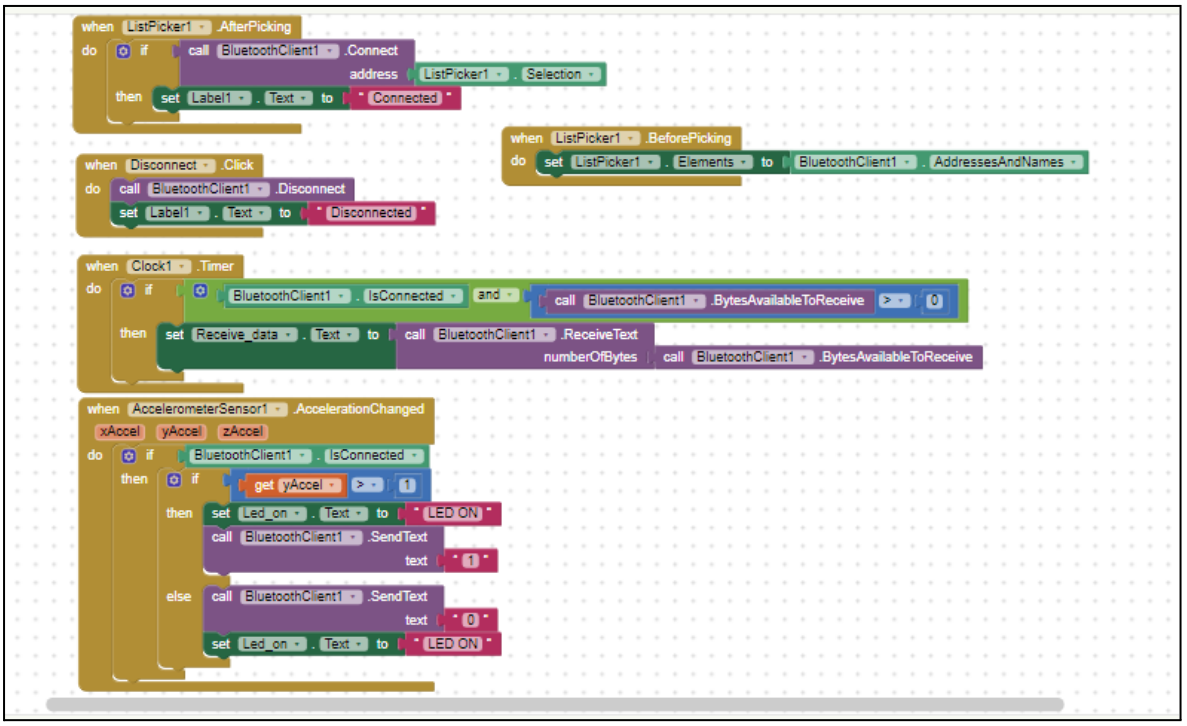
3.1.1. Main Application UI:



3.1.2. Android Interface:



3.1.3. Blocks Code:



3.2. All Codes:

3.2.1. Arduino Code(Main):

Code for ph sensone

```
const int analogInPin = A0; // Analog input pin that the pH sensor is attached to
const int led1Pin = 2; // Digital output pin for LED1
const int led2Pin = 3; // Digital output pin for LED2
float sensorValue = 0; // Variable to store the sensor value
float pH = 0; // Variable to store the calculated pH value

void setup() {
  pinMode(led1Pin, OUTPUT); // Set LED1 pin as output
  pinMode(led2Pin, OUTPUT); // Set LED2 pin as output
  Serial.begin(9600); // Start serial communication at 9600 bps
}

void loop() {
  // Read the sensor value
  sensorValue = analogRead(analogInPin);

  // Convert the sensor value to pH using the formula for the pH sensor you're using
  // For example, if you're using a SEN0161 pH sensor, you would use the following formula:
  pH = 7 - (sensorValue * 5 / 1024.0);

  // Print the pH value to the serial monitor
  Serial.print("pH: ");
  Serial.println(pH);

  // Control the LEDs based on the pH value
  if (pH >= 5.5) {
    digitalWrite(led1Pin, HIGH); // Turn on LED1
    delay(100); // Wait for 0.1 second
    digitalWrite(led1Pin, LOW); // Turn off LED1
```

```
   delay(100); // Wait for 0.1 second
  } else {
   digitalWrite(led2Pin, HIGH); // Turn on LED2
   delay(100); // Wait for 0.1 second
   digitalWrite(led2Pin, LOW); // Turn off LED2
   delay(100); // Wait for 0.1 second
  }

  delay(1000); // Wait for 1 second before taking another reading
}
```

3.2.2. Pairing Bluetooth module HC-05 with app

```
// Create object named bt of the class SoftwareSerial
// SoftwareSerial bt(2,3); // (Rx,Tx)

void setup()
{
        bt.begin(9600); //Define baud rate for software serial communication
        Serial.begin(9600);  // Define baud rate for serial communication
}
void loop()\
{
   if (bt.available()) //If data is available on serial port
   {
        Serial.write(bt.read());      //Print character received on to the serial monitor
   }
}
```

Code for soil Moisture**:**

```
int soilMoisturePin = A0; // Analog pin for soil moisture sensor

void setup() {
  Serial.begin(9600); // Initialize serial communication
}

void loop() {
  int soilMoistureValue = analogRead(soilMoisturePin); // Read analog value from sensor
  float soilMoisturePercent = map(soilMoistureValue, 0, 1023, 0, 100); // Convert analog value to
percentage
  Serial.print("Soil Moisture: ");
  Serial.print(soilMoisturePercent);
  Serial.println("%");
  delay(1000); // Delay for one second before taking next reading
}
```

Chapter 4 - CONCLUSION/REPORT

4.1 Conclusion:

- We have successfully designed and built a smart sink that is equipped with a pH sensor and a solenoid valve.
- This Smart sink is able to automatically detect the pH level of the water in the sink and sort it into either an acidic or alkaline container for safe disposal.
- Through the use of a microcontroller, we were able to control the pH sensor and solenoid valve and ensure that they were working together accurately and efficiently.
- We also faced challenges along the way, such as calibrating the pH sensor and installing the solenoid valve in a tight space, but we were able to overcome these challenges through careful planning and creative problem-solving.
- The results of our tests show that the smart sink is able to accurately detect and sort the water according to its pH level.
- This represents a significant advance in the field of household waste management, and we believe that our smart sink has the potential to greatly reduce the environmental impact of acidic and alkaline liquids.

4.2 Results:

- The smart sink project was successful in designing and building a system that uses a pH sensor and solenoid valve to sort and manage water based on its pH level.
- The system was controlled by an Arduino microcontroller and was able to accurately detect and sort water into either an acidic or alkaline container for safe disposal.
- Challenges faced included calibrating the pH sensor, installing the solenoid valve in a tight space, and finding a reliable power source for the pump and control mechanism.

4.3 Advantages and Dis-advantages:

4.3.1. Advantage:

- Efficient water management: A smart sink can help to efficiently manage water usage by detecting and sorting water based on its pH level. This can help to reduce water waste and promote sustainable water management practices.

- Cost savings: By reducing water waste and promoting efficient water management practices, a smart sink can lead to cost savings on water bills.
- Convenience: The use of smart technology in a sink can reduce the need for manual intervention and make water management more convenient and time-saving.
- Environmental impact: A smart sink can help to reduce the environmental impact of acidic and alkaline liquids by properly sorting and disposing of them. This can promote sustainable waste management practices and contribute to a healthier environment.
- Versatility: The smart sink can be used in a variety of settings, such as households, commercial buildings, agriculture, education, and research. It has the potential to serve multiple purposes and applications.

4.3.2. Disadvantages:

- Compatibility: The smart sink may not be compatible with certain plumbing systems or fixtures, which can limit its effectiveness in certain settings.
- Dependence on technology: The smart sink may be dependent on technology, such as microcontrollers or sensors, which can be sometimes vulnerable to malfunctions, errors.

4.4 Future Enhancement:

- Integration with other IoT devices: The smart sink can be integrated with other IoT devices such as smart water metres, weather stations, and water purifiers to create a comprehensive water management system.

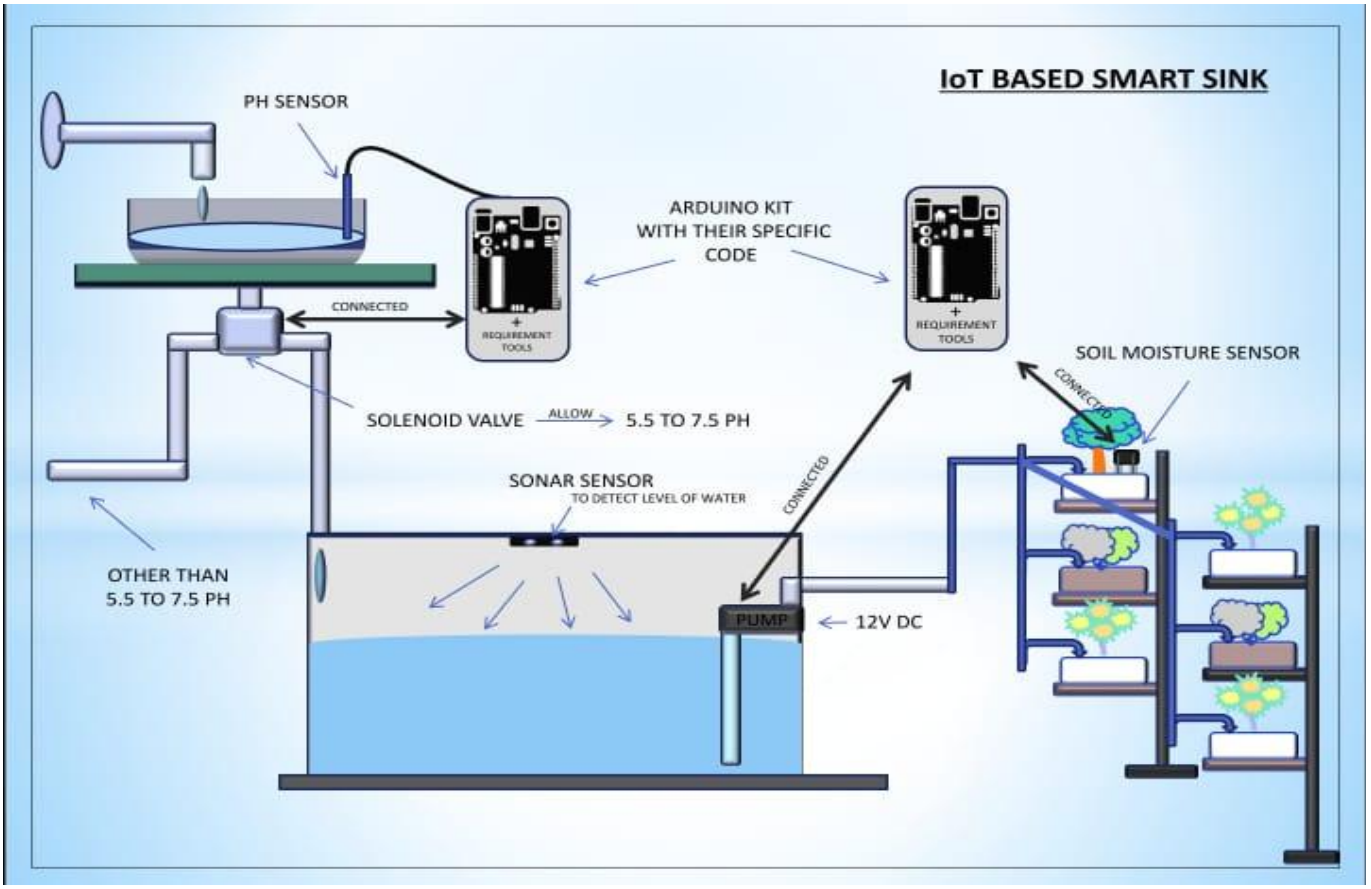
- Machine learning algorithms: The system can be equipped with machine learning algorithms that can predict water usage patterns and optimise the system for maximum efficiency.

- Enhanced filtration system: The sink can be fitted with an enhanced filtration system to remove contaminants and pollutants from the water before releasing it for irrigation or other purposes.

- Wireless connectivity: The system can be made wireless, eliminating the need for cables and making it easier to install in various settings.

- Integration with other smart home systems: The smart sink can be integrated with other smart home systems, such as a smart irrigation system or a smart water heater, to create a more comprehensive water management system for the home.

Chapter 5 - IMAGE/DIAGRAM OF THE PROJECT



Link of the video of the project

https://drive.google.com/file/d/1onmt2F276QJTl3e_mGPEc36ymGv2zSsH/view?usp=drivesdk

https://drive.google.com/file/d/1on5S9j-IIbCEJC0WWsiemfLT9N3YJAfl/view?usp=drivesdk