IOT BASED POUNDER

A Project Report

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

BACHELOR OF SCIENCE

(INFORMATION TECHNOLOGY)

By

Kundu Tanishq, Amitkumar Naidu & Aditya Vishwakarma

Roll Number- 3016, 3054 & 3050

Under the Guidance of Mrs. PRACHI SURVE

DEPARTMENT OF INFORMATION TECHNOLOGY

RAMNIRANJAN JHUNJHUNWALA COLLEGE (AUTONOMOUS)

(Affiliated to University of Mumbai)

GHATKOPAR (W), MUMBAI – 400086

MAHARASHTRA 2022-23

A Project Report

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

Degree of

BACHELOR OF SCIENCE

(INFORMATION TECHNOLOGY)

By

Kundu Tanishq, Amitkumar Naidu & Aditya Vishwakarma

Roll Number- 3016, 3054 & 3050

Under the Guidance of Mrs. PRACHI SURVE

DEPARTMENT OF INFORMATION TECHNOLOGY

RAMNIRANJAN JHUNJHUNWALA COLLEGE (AUTONOMOUS)

(Affiliated to University of Mumbai)

GHATKOPAR (W), MUMBAI – 400086

MAHARASHTRA 2022-23

Hindi Vidya Prachar Samiti's

RAMNIRANJAN JHUNJHUNWALA COLLEGE

Ghatkopar (W), Mumbai-400 086

Certificate

This is to certify that the project entitled, "**IoT Based Pounder**", is Bonafide work of **Kundu Tanishq, Amitkumar Naidu & Aditya Vishwakarma** bearing **Roll No:. 3016, 3054 & 3050** **Kundu Tanishq, Amitkumar Naidu & Aditya Vishwakarma** submitted in partial fulfillments of the requirement for the degree of **BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY** from University of Mumbai.

Internal Guide **Co-coordinator**

External Examiner

College Seal **Date**

ABSTRACT

The IoT Based Pounder is a seesaw lever model used for pounding or crushing any desired product.

The prototype is designed with Mechanism where two buckets attached to its ends along with a pounder. In the beginning, One of the buckets is filled with water, which causes the seesaw to tip in its direction. Accelerometer connected in the prototype causes the bucket filled with water to start pumping water on the opposite end. Water flows from the filled bucket into the empty bucket as the seesaw continues to tip, sensors in the prototype will continue to detect change in the position of the seesaw and the pump to make water ascend and descend. This phenomenon is repeated constantly and helps to maintain the balance of the seesaw. Hammers are placed at the bottom of each bucket, such that when the bucket is filled with water, it falls in full force with gravity and the material below will be smashed.

With the IoT Based Pounder model, which uses the seesaw mechanism and IoT technology, this project saves human efforts and works with minimum energy making it energy-efficient.

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 POUNDER** 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. PRACHI SURVE** 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 POUNDER**" 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 other than me.

This is to certify that the undersigned is currently undertaking a project during their fourth semester of studies. The project is being pursued as a requirement for the completion of their academic program and is intended to demonstrate their mastery of the concepts and skills learned in their coursework.

Tanishq Kundu, Amitkumar Naidu & Aditya Vishwakarma

INDEX

Chapter 1 - INTRODUCTION

1.1. Objectives

Our project aims to address the energy efficiency issues that are commonly found in existing automated crushing and pounding machines. By integrating IoT sensors and devices into the machine, we can monitor and control the energy consumption of the machine, ensuring that it operates at maximum efficiency. This will not only benefit the environment but also reduce the operating costs for businesses that rely on these machines.

Furthermore, our IoT-based pounder will be designed to be easy to use and maintain, with a user-friendly interface and intuitive controls. This will allow operators to monitor the performance of the machine in real-time and make any necessary adjustments to ensure that it operates smoothly and efficiently. By leveraging the power of IoT technology, we hope to make significant contributions to the field of automation while also promoting sustainability and efficiency.

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

- Small-scale grain processing: It can be used by small-scale farmers to efficiently grind grains for use in food production or animal feed.

- Pharmaceuticals: In Pharmaceuticals Industries it can be used to grind various ingredients for the production of tablets, capsules, and other pharmaceutical products.

- Wood pounding machines: For furniture makers, this machine is going to be a great choice to pound or flatten wood into sheets or planks, using a seesaw mechanism to apply pressure to the wood, etc.

- Construction: This machine can also be used in construction areas as a rock crusher for crushing large rocks.

- Mining areas: It can also be used in mining areas since the minerals that come out from the ground are not purified. First, they are crushed into small rocks, then they go into further processing. It can be used to crush/pound the minerals.

1.4. Feasibility of the Project

- The feasibility of an IoT-based pounder depends on various factors, including the intended application, target audience, cost, and technological requirements.
- In terms of the technology required, an IoT-based pounder would need sensors to detect the position of the seesaw, a pump to move the water from one bucket to the other, and hammers to crush the material at the bottom of the buckets.
- These components would need to be connected through an IoT platform to allow for remote monitoring and control.
- If designed and implemented correctly, an IoT-based pounder could provide various benefits, such as reducing human effort and making the pounding process more energy-efficient.
- However, it is essential to consider the cost of developing and maintaining such a system, as well as any safety concerns that may arise from its use.

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. Smart Pounder:

A mobile application developed with the name "Smart Pounder" by an MIT app inventor to control the pounder.

1.5.2. Hardware components(Parts):

1. Arduino Uno:
2. Relay (2-Channels)
3. Bluetooth module (HC-05)

4. Jumper wires
5. Mobile(Accelerometer/Gyroscope, Bluetooth & Application)
6. Lever
7. Buckets
8. Pumps(165v)
9. Hammers

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.

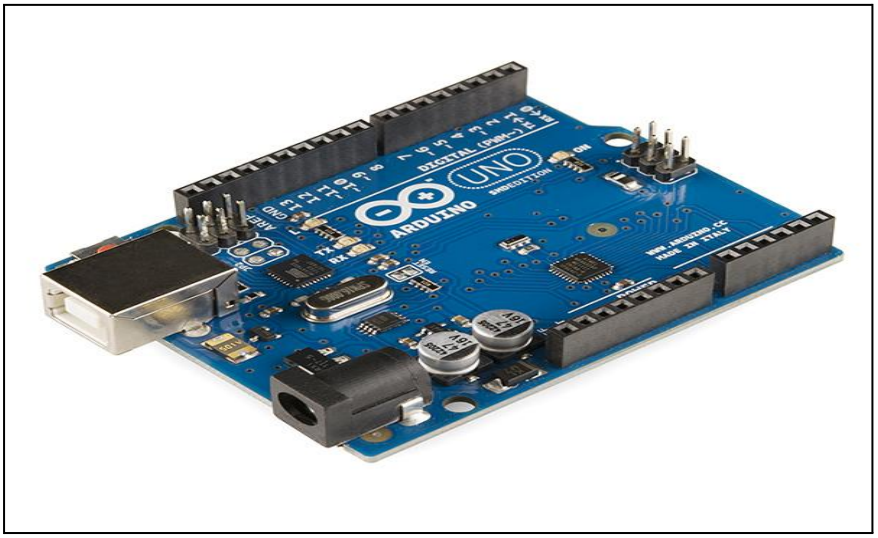
3. Power Pins:

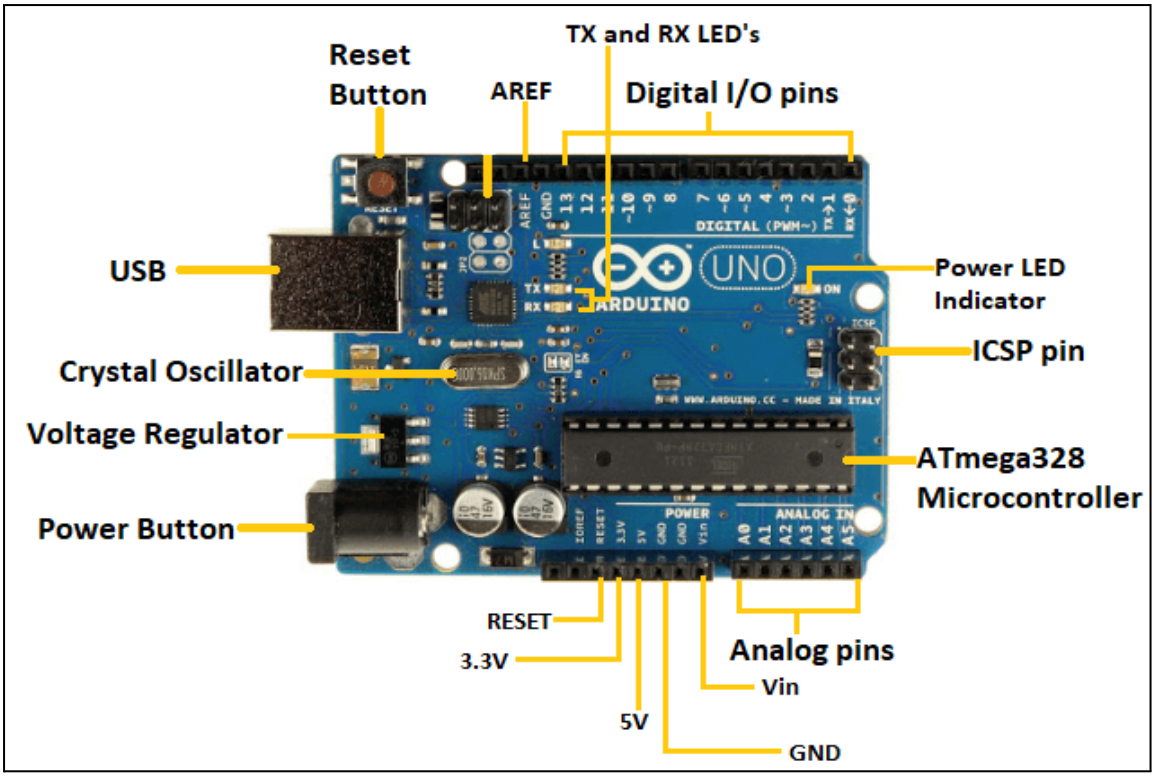
There are several power pins on the board, including the VIN pin, which is used to power the board with an external power supply. The 5V pin and 3.3V pin are used to supply power to external components connected to the board. The GND pins are used for ground connections.

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. 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:

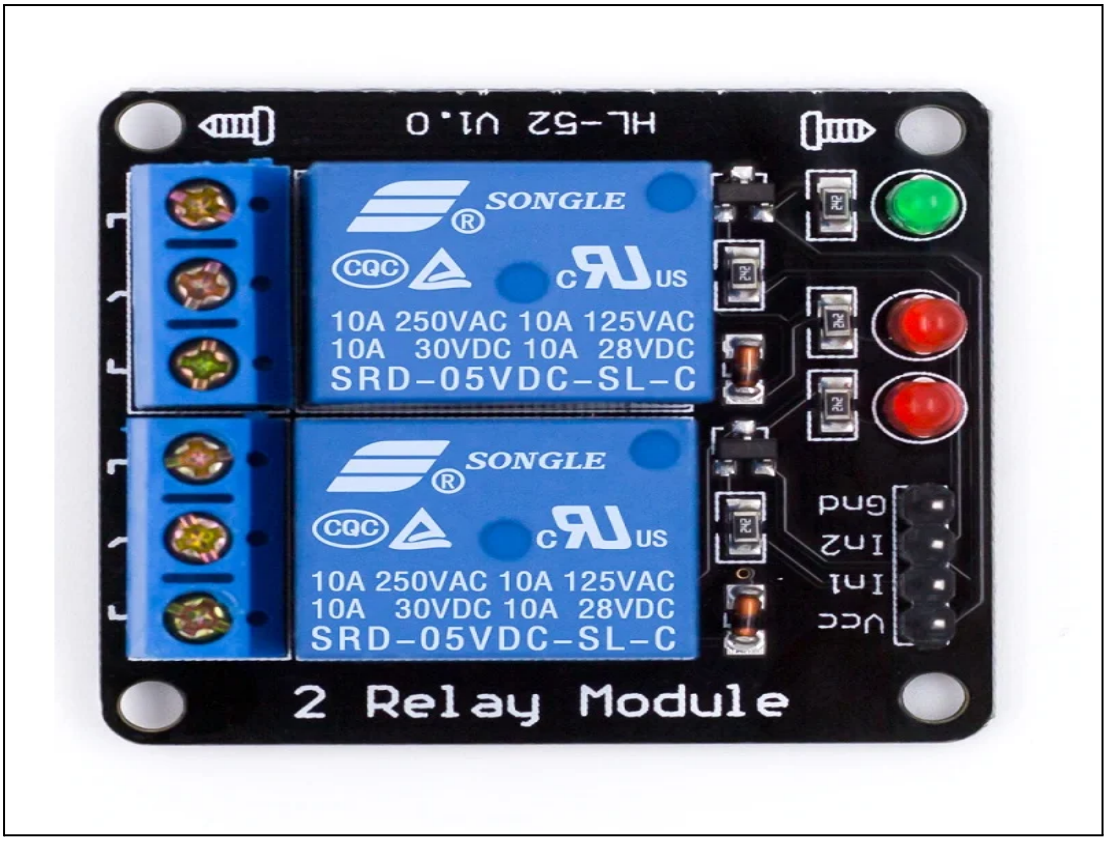
Input:

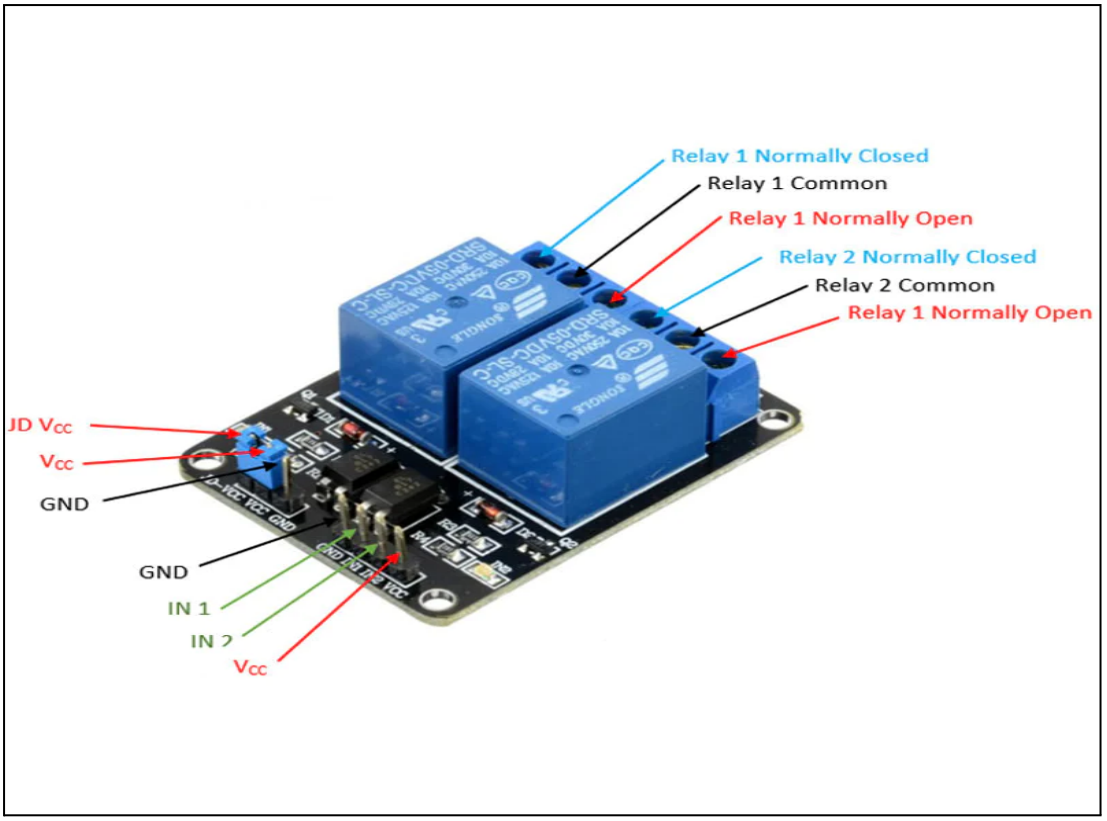
- The module is controlled using two digital input pins from a microcontroller or other digital circuit.
- The inputs are optically isolated, meaning that they are electrically isolated from the output side of the relay to protect the microcontroller from voltage spikes or other electrical noise.
- The 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.

Image:


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

3. 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.

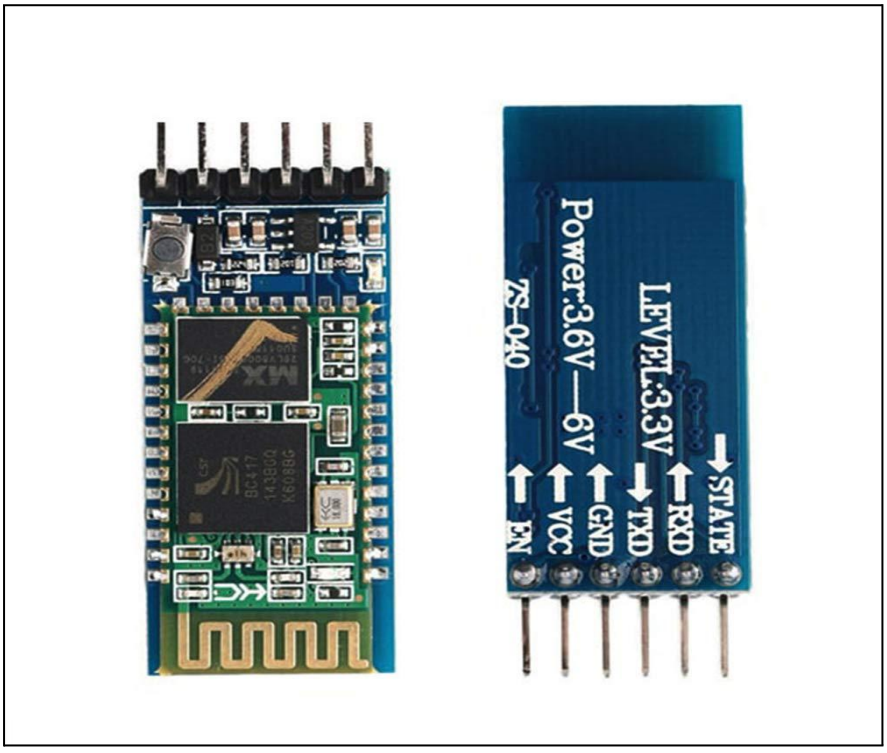
HC-05 module has two modes:

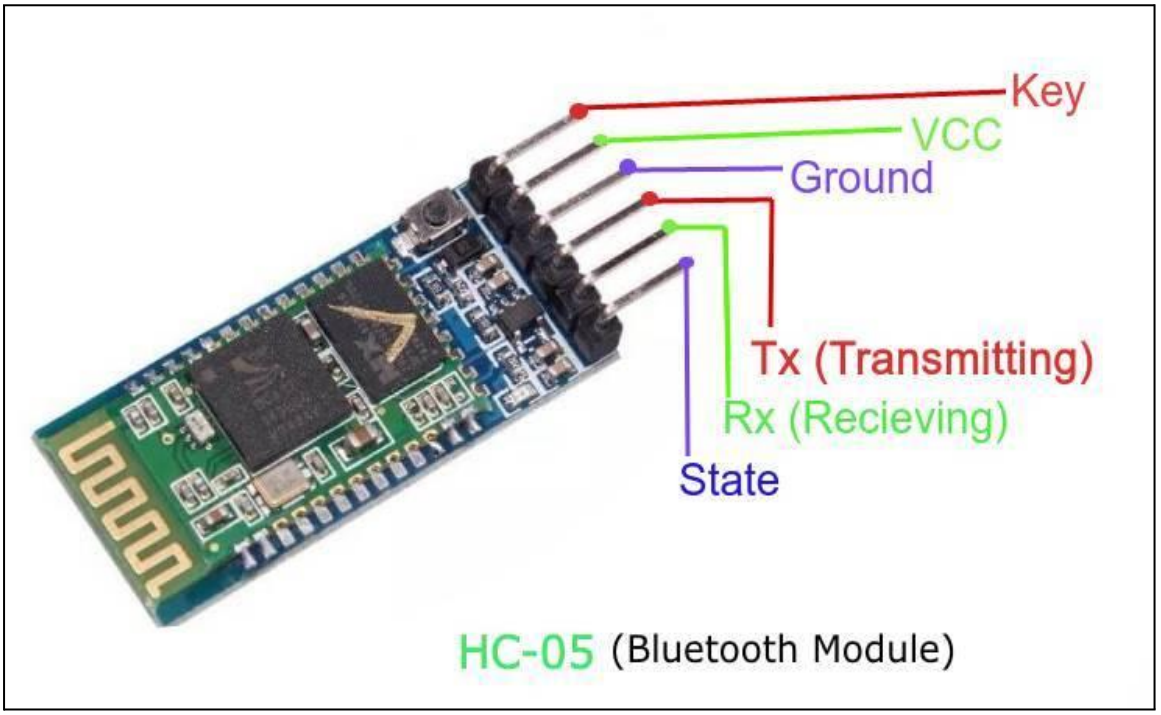
1. Data mode: Exchange of data between devices.
2. Command mode: It uses AT commands which are used to change settings of HC-05. To send these commands to the module serial (USART) port is used.

- 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.

Image:





4. Jumper wires:

Introduction:

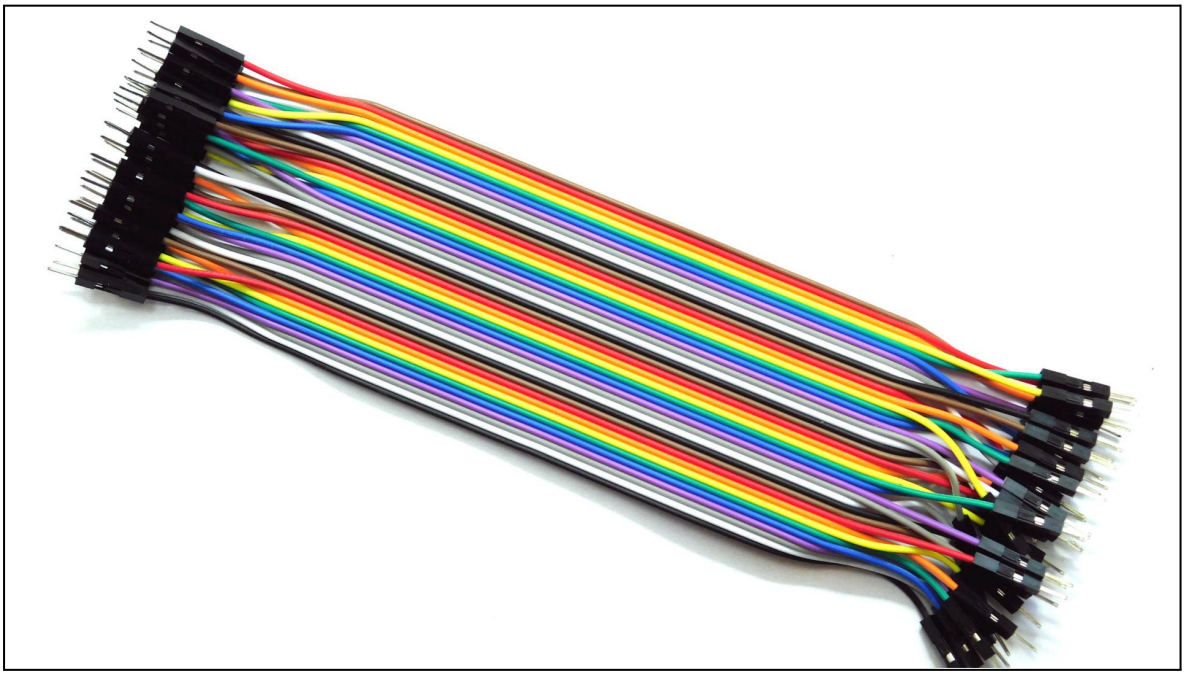
- Jumper wires are electrical cables that are employed to establish transient connections between two locations on a circuit board or other electronic device.
- They can be used to quickly and simply create connections without the use of soldering or other long-term attachment techniques.
- They are 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:



5. **Mobile(Accelerometer):**

Introduction:

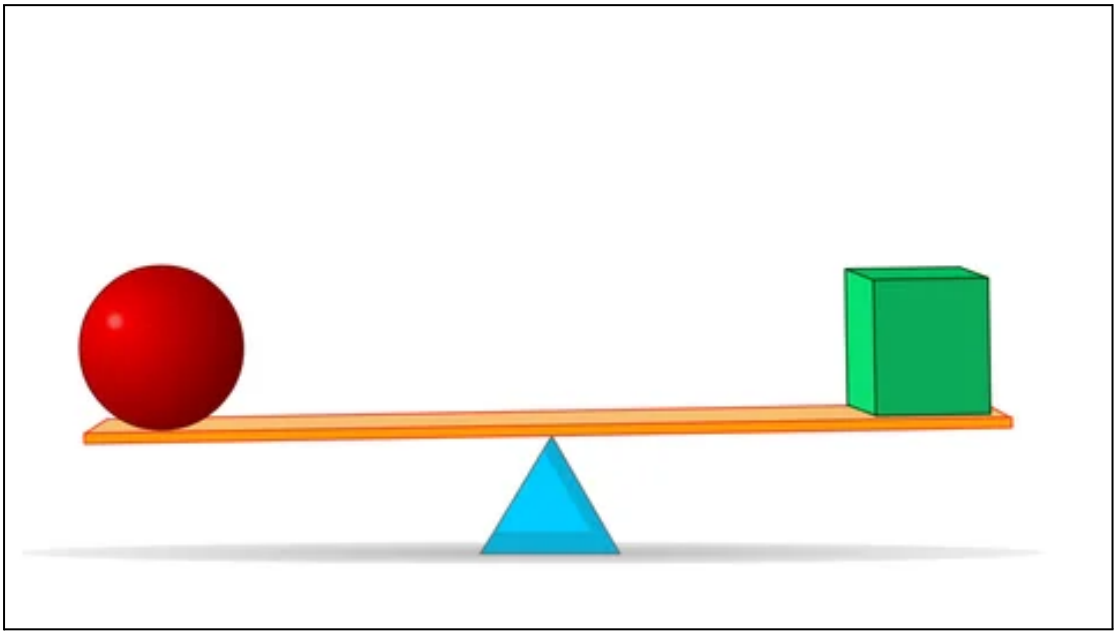
The mobile is used to take advantage of the accelerometer and gyroscope that are already integrated into the mobile device and also to use the application we have developed called "Smart Pounder" that we have created to control the machine.

6. **Lever:**

Introduction:

- A lever is a simple machine consisting of a rigid object, such as a bar or a plank, that pivots around a fixed point called a fulcrum.
- It is used to apply a force to an object in order to move it or lift it up.
- The three main parts of a lever are the effort arm, the load arm, and the fulcrum.
- The effort arm is the part of the lever where the force is applied, the load arm is the part of the lever that moves the load, and the fulcrum is the fixed point around which the lever rotates.
- Levers are used in many different applications, such as in construction, engineering, and even in the human body (such as when we use our arms to lift objects).

Image:



7. **Pumps:**

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. **Hammers:**

Introduction:

- Hammers are handheld tools that are used for striking and driving nails, breaking objects, and shaping or bending metal.
- They typically consist of a handle and a weighted head, which can be made from materials such as iron, steel, brass, or rubber.
- Ball peen hammers are used for shaping metal and feature a rounded head on one end and a flat surface on the other.
- Sledgehammers are used for heavy-duty tasks such as breaking concrete and feature a large, heavy head and long handle.
- Mallets are typically made of rubber or wood and are used for striking materials that could be damaged by metal hammers.

- Dead blow hammers are designed to reduce recoil and provide a more controlled strike, making them ideal for precision work.
- Hammers are available in various sizes and weights to suit different applications.

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

❖ Methodology

- It starts with the power supply being given to both the pump and the Arduino, as well as Bluetooth being connected to the Arduino from the mobile phone.

- As the power supply is given to both the pump and the Arduino, we can use it to send and receive data between the Arduino and our mobile phone via Bluetooth.

- Once the Bluetooth connection is established, we can use it to send and receive data between the Arduino and our mobile phone.

- An Arduino-connected pump will be controlled by a mobile application, and the status of the system can also be monitored.

- A program will be written to determine the orientation of the phone using the accelerometer, since the accelerometer detects tilt in the lever.

- Accelerometers measure orientation of phones, since the accelerometer detects tilt in the lever, as well as movement and position changes.

- When the phone is tilted in a particular direction, the program will send a message to the Arduino i.e. to instruct the pump to initiate the flow of water in the opposite direction.

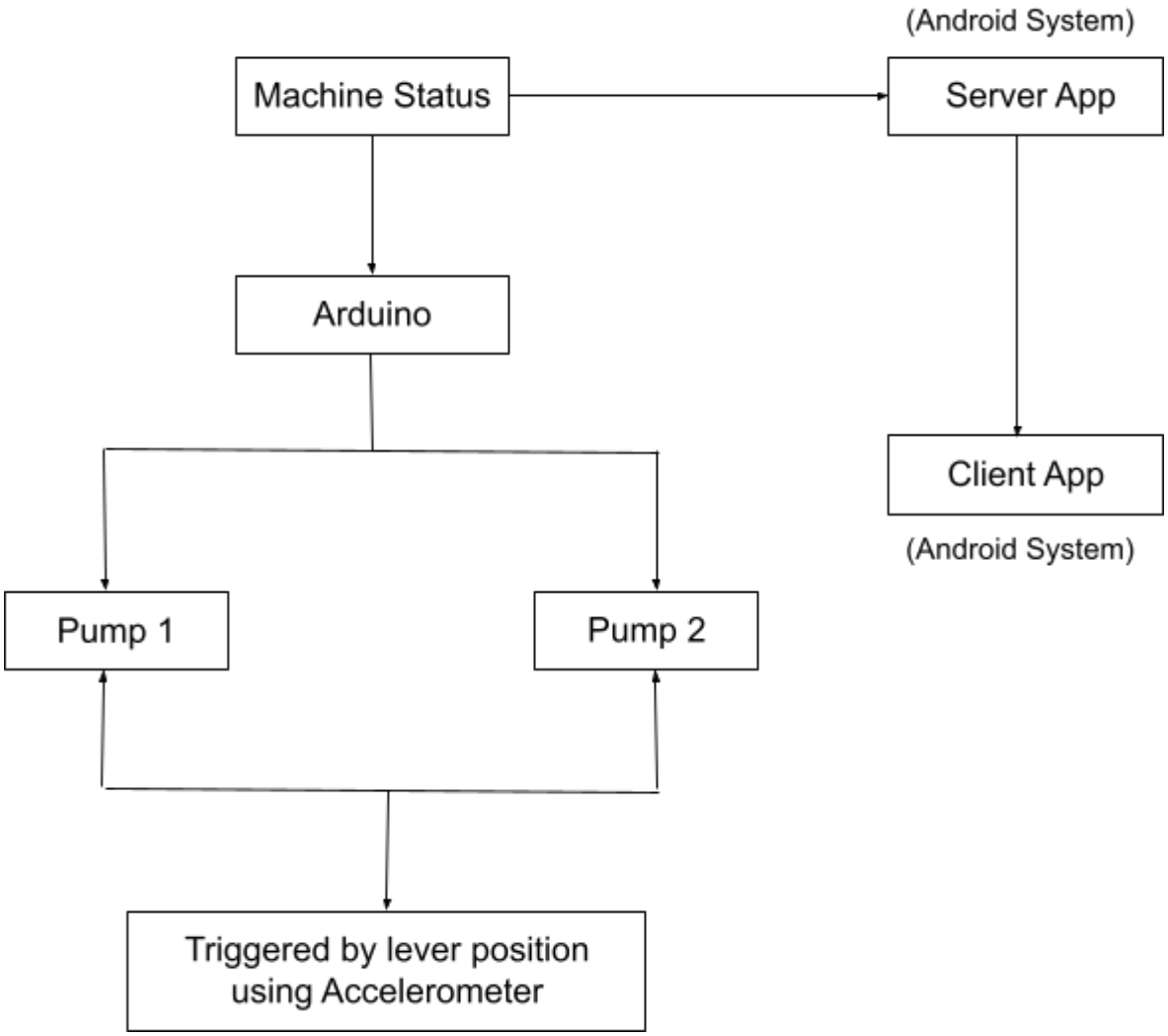
- When water flows in the opposite direction, the bucket begins to fill up and becomes heavier, it starts falling down with the influence of gravity in full force on top of material.

- A hammer is also placed at the bottom of each bucket so that Water in the bucket, combined with the hammers attached to it, will generate a lot of force that will shatter materials placed below.

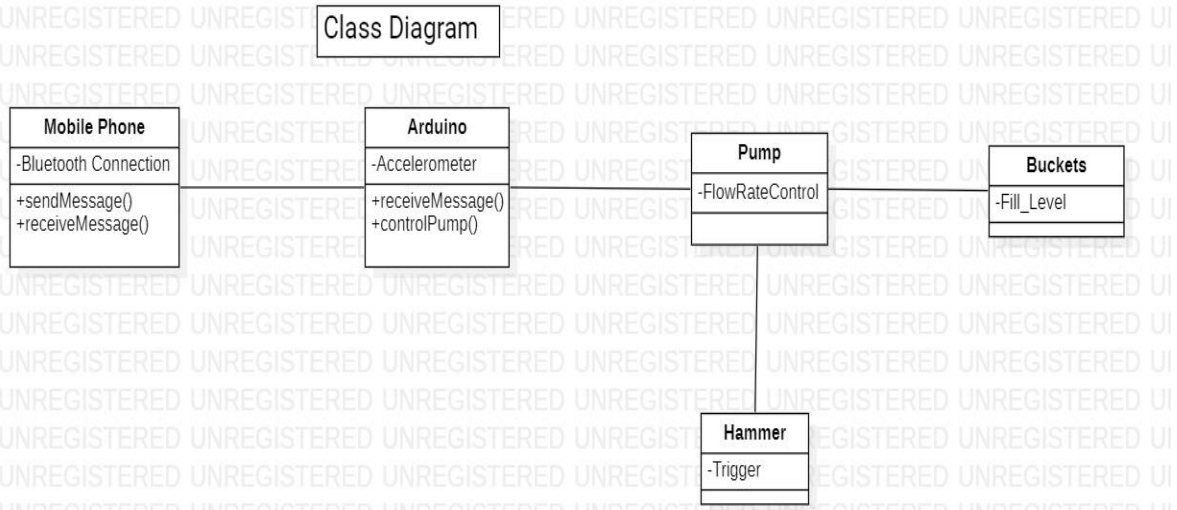
- Water will flow into the opposite bucket as soon as the hammer on one side strikes the ground. This phenomenon is repeated continuously.

- In order to pound the materials, this phenomenon is repeated continuously.

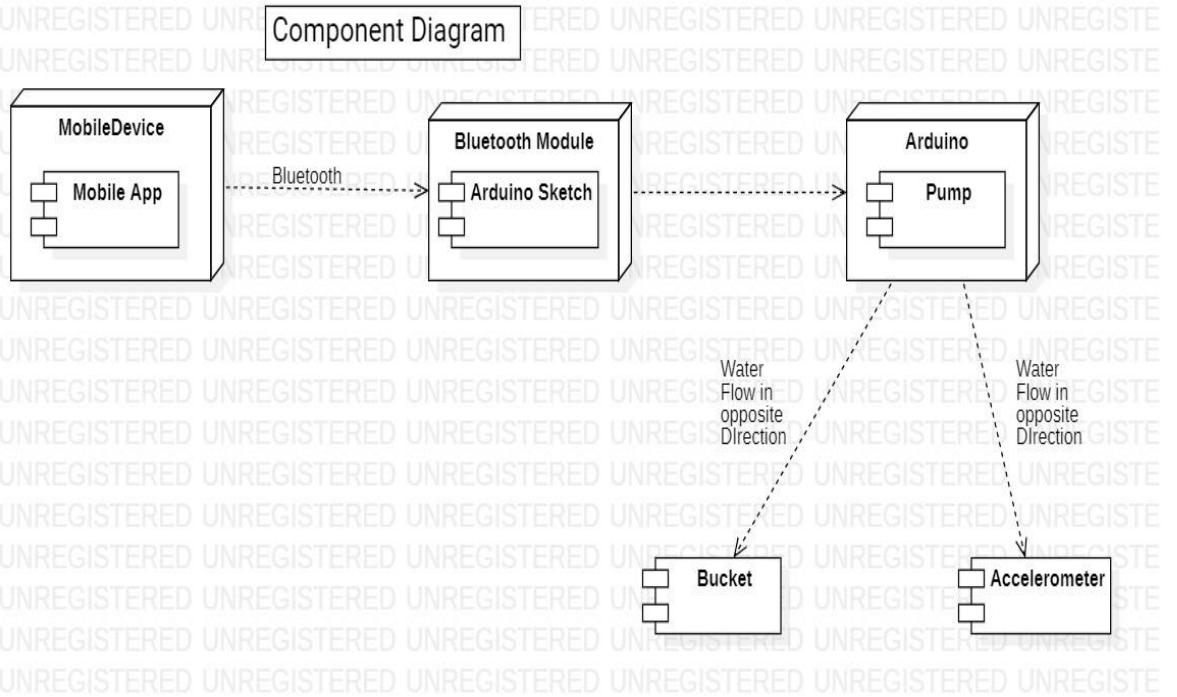
❖ **Flow Diagram**



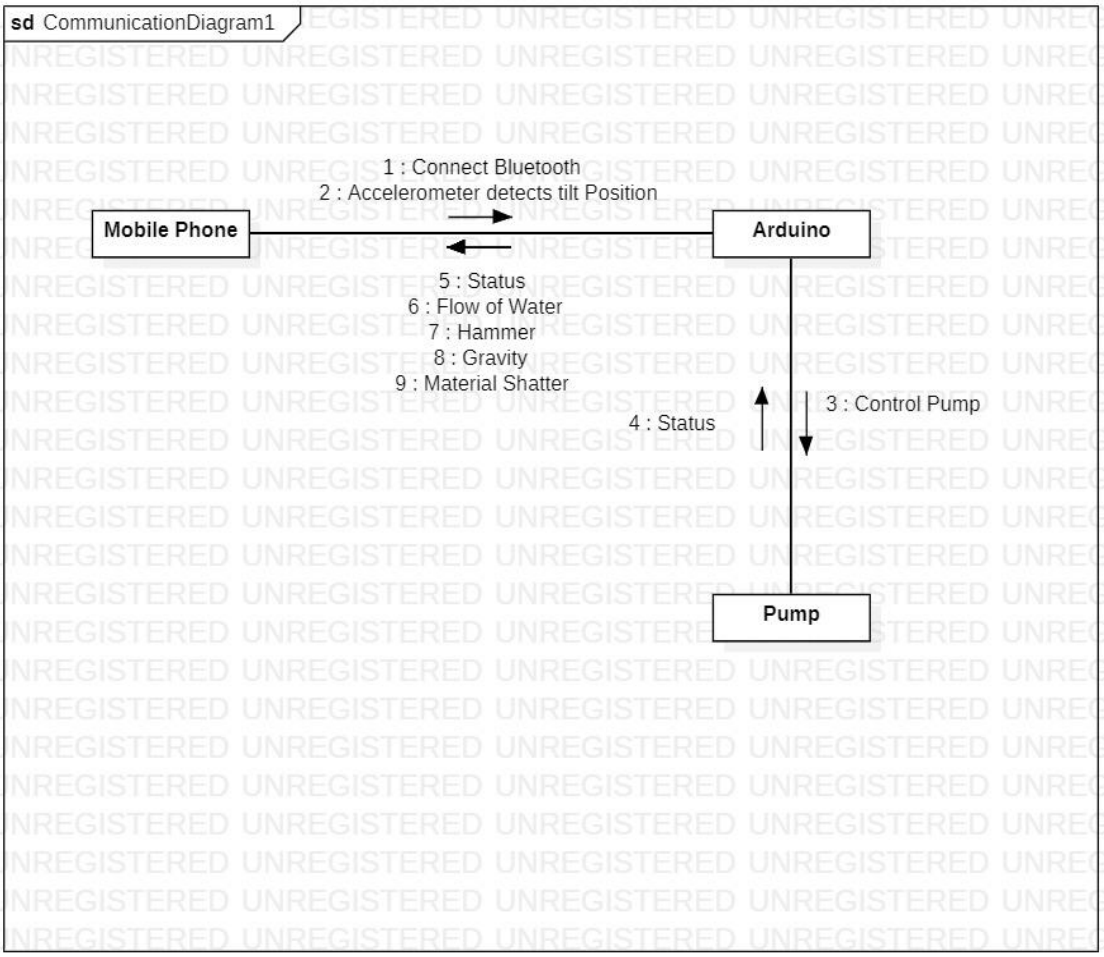
❖ **Class Diagram**



❖ **Component Diagram**



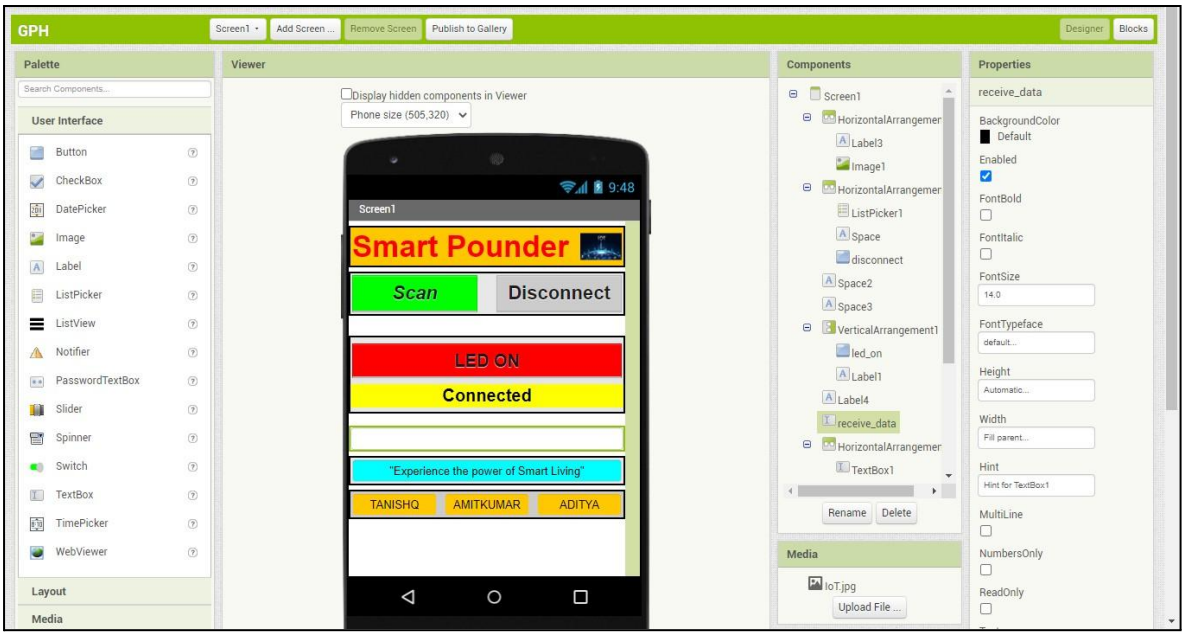
❖ **Collaboration Diagram**



Chapter 3 - IMPLEMENTATION

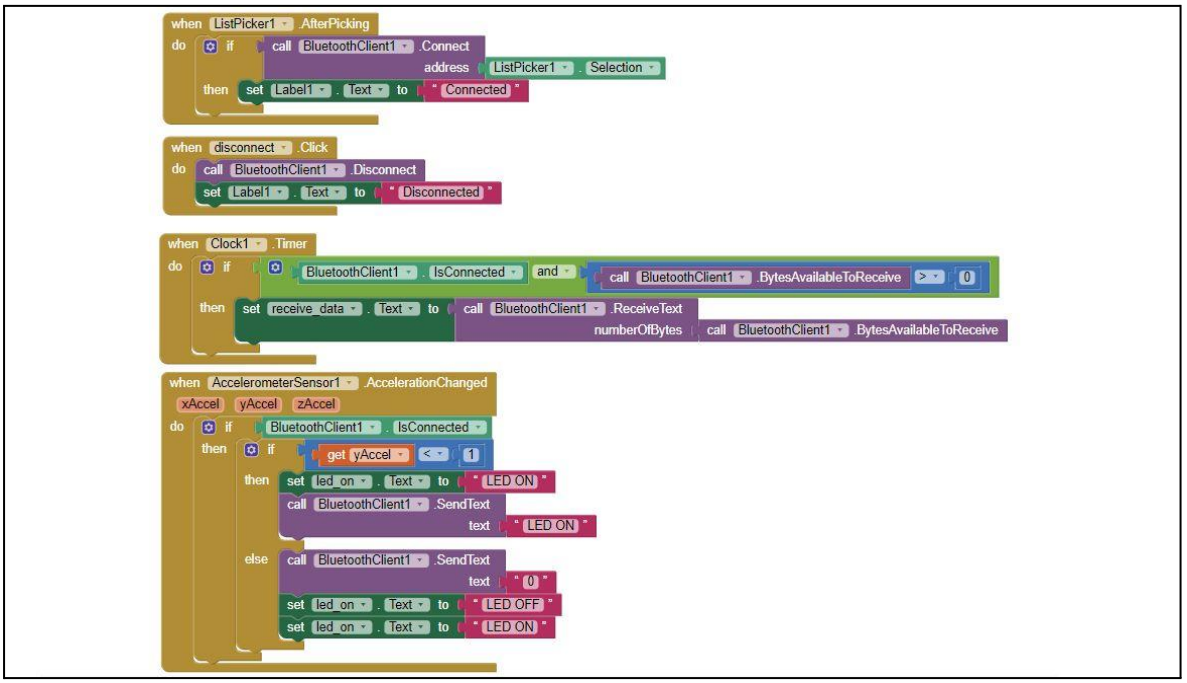
3.1. Screenshots of the Application(Smart Pounder):

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):

```
char data = 0;        // Variable for storing received data
void setup()
{
 Serial.begin(9600);              // Sets the baud for serial data transmission
 pinMode(13, OUTPUT);             // Sets digital pin 13 as output pin
 pinMode(12, OUTPUT);             // Sets digital pin 12 as output pin
}
void loop()
{
 if(Serial.available() > 0)       // Send data only when  you receive data
  {
       data = Serial.read();     // Read the incoming data and stores it into variable data
```

```
      Serial.print(data);                  // Print value inside data in Serial monitor

      Serial.print("\n");           //New line

      if(data == '1')                    // Checks whether value of data is equal to 1
      {
       digitalWrite(13, HIGH);         // If value is 1 then Relay 1 turns ON
       digitalWrite(12, LOW);          // If value is 1 then Relay 2  turns ON
      }
       if(data == '0')                 // Checks whether value of data is equal to 0
      {
       digitalWrite(13, LOW);          // If value is 1 then Relay 1 turns ON
       digitalWrite(12, HIGH);          // If value is 1 then Relay 2 turns OFF
      }
    }
}
```

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
  }
}
```

Chapter 4 - CONCLUSION/REPORT

4.1 Conclusion:

- The IoT Based Pounder is a model that uses a seesaw mechanism and IoT technology to save human effort with minimal energy consumption.
- Additionally, the use of IoT technology allows the Pounder to be controlled and monitored remotely, making it even more convenient to use.
- Overall, the Pounder is an innovative and energy-efficient solution for a wide range of applications.

4.2 Results:

In order to obtain the desired results, it is crucial for this model to be implemented on a large scale for effective crushing of the materials using the least amount of energy. It could potentially reduce the need for manual labour.

4.3 Advantages and Dis-advantages:

4.3.1. Advantage:

- The IoT based pounding machines can crush things in a very effective way, thanks to their advanced technology. By leveraging sensors and analytics, the machines can optimise the crushing process, delivering consistent and high-quality results. This efficiency can help to save time, money, and resources, making it a valuable investment for various industries.

- The IoT technology used in the machine allows for remote control from anywhere in the world, making it a convenient and user-friendly option. This feature enables users to monitor and control the pounding process from their fingertips, ensuring that the process is running smoothly and without interruption.

- The energy efficiency of the IoT-based pounding machines is significantly higher than traditional pounding machines. This higher efficiency means that the machines consume less

energy, resulting in a lower cost of operation. This cost-effectiveness can help to save money in the long run, making it an attractive option for businesses and individuals alike.

- The IoT-based pounding machines can be customised to meet specific needs and requirements. With advanced analytics and sensors, the machines can be adjusted to optimise performance and efficiency for specific applications. This customization can help to improve the quality and consistency of the pounding process, resulting in better overall outcomes.

4.3.2. Disadvantages:

- While automation and advanced technology can bring many benefits, there is a concern that it may lead to fewer job opportunities for people in the long run. As machines become more advanced and efficient, they may replace certain jobs that were previously performed by humans. However, it's important to note that new job opportunities may also arise as technology advances, creating new roles that require specific skills and expertise.

- Using 12v pumps may have a higher risk of damage compared to pumps with higher wattages. This is because the pumps may not have enough power to handle certain tasks, resulting in wear and tear on the components. It's important to choose pumps with the appropriate wattage and capacity for the specific application to ensure they operate at optimum efficiency and avoid damage.

4.4 Future Enhancement:

- With advancements in technology, pumps with higher wattages will become more readily available in the future, providing greater power and efficiency to meet the requirements of various applications.

- Using solar energy to power up pumps can be a sustainable alternative to electricity. Solar panels can be installed to generate renewable energy, which can then be used to power the pumps, reducing reliance on fossil fuels and minimising the carbon footprint.

- Installing buzzers or small incandescent lamps (zero-watt bulbs) can be an effective way to check the efficiency of the pumps. These devices can be wired to the pumps, providing an audible or visual indication of the pump's operation, ensuring that it is working at optimum efficiency.

- Customising the hammers of the Pounder can enhance its performance for specific applications. Depending on the product or material to be crushed, the hammers can be changed or modified to deliver optimal results. This customization can improve the efficiency of the Pounder, making it a more versatile and useful tool for various industries.

Chapter 5 - IMAGE OF THE PROJECT