1.INTRODUCTION:

In this project we will learn How to design Touch-Based Door Lock System Using Arduino & Touch Sensor TTP223**.** Door Lock System using Arduino & TTP223 Capacitive Touch Sensor Switch is a simple project for switching circuit, i.e. switching the servo motor on/off with the help of simple touch. The door can be locked or unlocked just by simply touching. We are using Touch Sensor TTP223 as a switch and LCD to display the status of door lock and LED to indicate on/off status as well.

The application area of this project is home and office where a simple touch can open and close the door**.** Interfacing touch sensor TTP223 with Arduino acts as a switch for unlocking the door.

A capacitive touch sensor module based on the dedicated TTP223 touch sensor IC. The module provides a single integrated touch sensing area of 11 x 10.5mm with a sensor range of ~5mm. An on-board LED will give a visual indication of when the sensor is triggered. When triggered the module's output will switch from its idle low state to high (default operation). Solder jumpers allow for reconfiguring its mode of operation to be either active low or toggle output.

1.1. OBJECTIVE:

The main objective of this project is Arduino Based Smart door locking system is designed to prevent unauthorized access, trespassing and intrusion. Banks, corporate offices, financial organization, jewelry shops, and government organization are some of the common targets where unauthorized access, trespassing and intrusion take place. Using Arduino to create a simple and smart door locking system.

2. REQUIREMENT ANALYSIS

2.1 Methodology

The TTP223 is a touch-based capacitive sensor module that can be used to build a touch-based door lock system using an Arduino. Following steps were used to develop the reconciliation system.

Step 1: Identify the program scope, goals and objectives.
Understand how the firms and households and design touch-based door lock system.

Step 2: Study the existing program database tables.
There are many ways to design touch-based door lock system. For example, earlier we use key and lock and in some cases locks can be broken ,so touch based door lock came to picture which is very effective.

Step 3: Setup the hardware components.

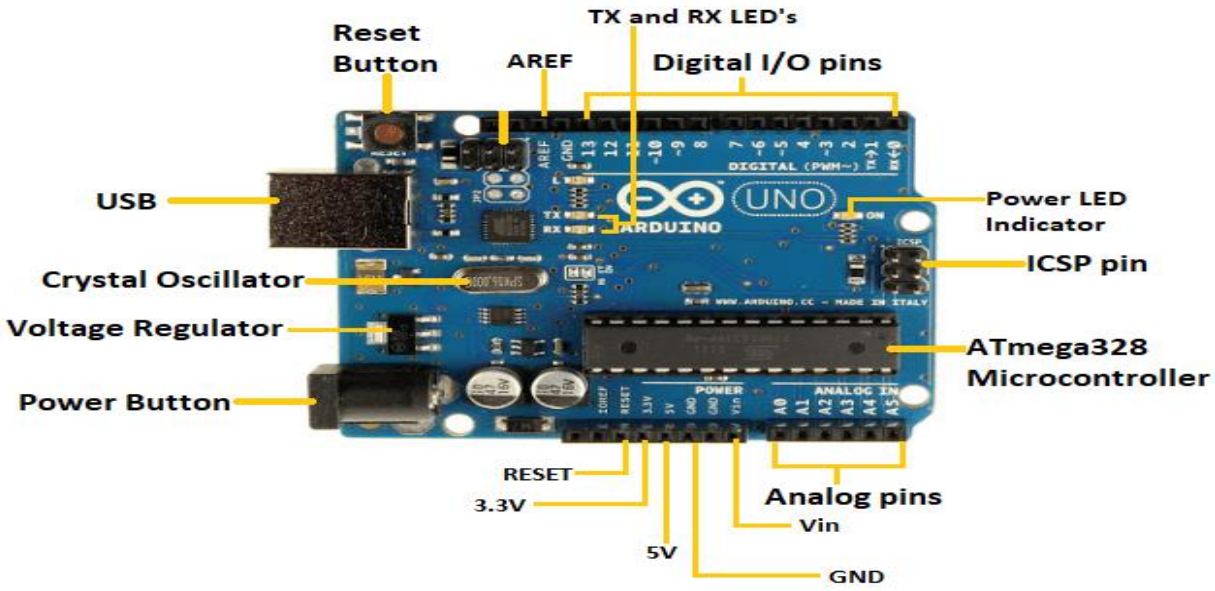
As in the initial concept, the touch based of a door lock system was needed to retrieve to the web page. An Capacitive Touch Sensor is used to sense the thumb impression from the finger to capacitive touch sensor.

Step 4: Connect the hardware to a webpage.

As the final stage, the hardware components were connected to a web page. The web page is developed by using HTML, CSS.

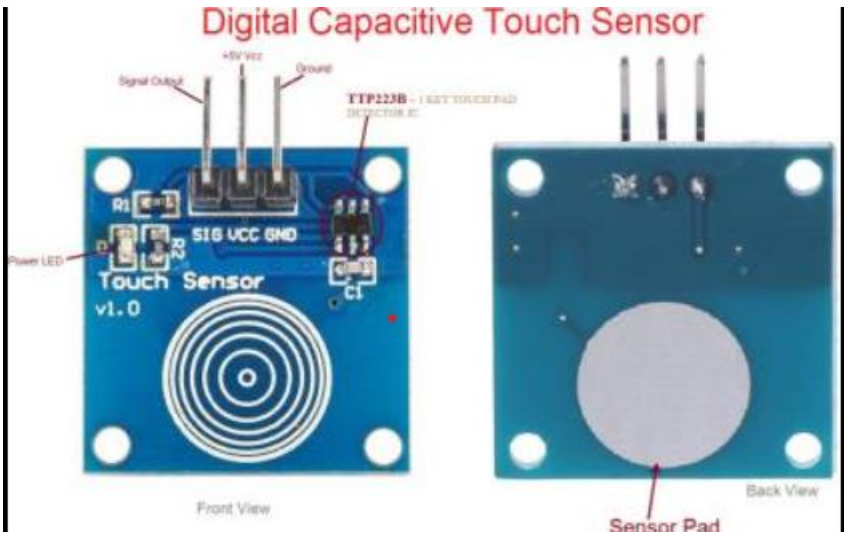
3. HARDWARE AND SOFTWARE REQUIREMENTS SPECIFICATIONS

3.1.1 Arduino Uno Board



Arduino Uno is an open-source microcontroller board based on the ATmega328P microcontroller chip. It is one of the most popular and widely used Arduino boards, known for its simplicity and ease of use. The board has 14 digital input/output (I/O) pins, six analog input pins, and a 16 MHz quartz crystal oscillator. It also has a USB interface for serial communication and programming.

3.1.1 TTP223 Capacitive Touch Sensor



TTP223 is 1 Key Touch pad detector IC, and it is suitable to detect capacitive element

variations. It consumes very low power and the operating voltage is only between 2.0V~5.5V. The response time max about 60mS at fast mode, 220mS at low power mode @VDD=3V. Sensitivity can adjust by the capacitance(0~50pF) outside.
The TTP223 is a touch sensor module that can be used to detect human touch on a conductive surface, such as a metal or foil pad. It uses the capacitive sensing technique to detect changes in the electrical capacitance of the pad, which occur when a finger or other conductive object touches the pad.

3.1.3 Jumper Wires :

A wire is a single, usually cylindrical, flexible strand or rod of metal. Wires are used to bear mechanical loads or electricity and telecommunications signals. A jump wire is an electrical wire or group of them in a cable with a connector or pin at each end. Wires are used to connect components to each other on the breadboard or other prototypes, internally or with other equipment or components, without soldering. Jumper wires typically comes in three versions: male-to male, male-to-female and female-to-female. The difference between each is in the end point of the wire. Male ends have a pin protruding and can plug into things, while female ends do not and are used to plug things into. Male-to-male jumper wires are the most common and what you likely will use most often. When connecting two ports on a breadboard, a male-to-male wire is required.

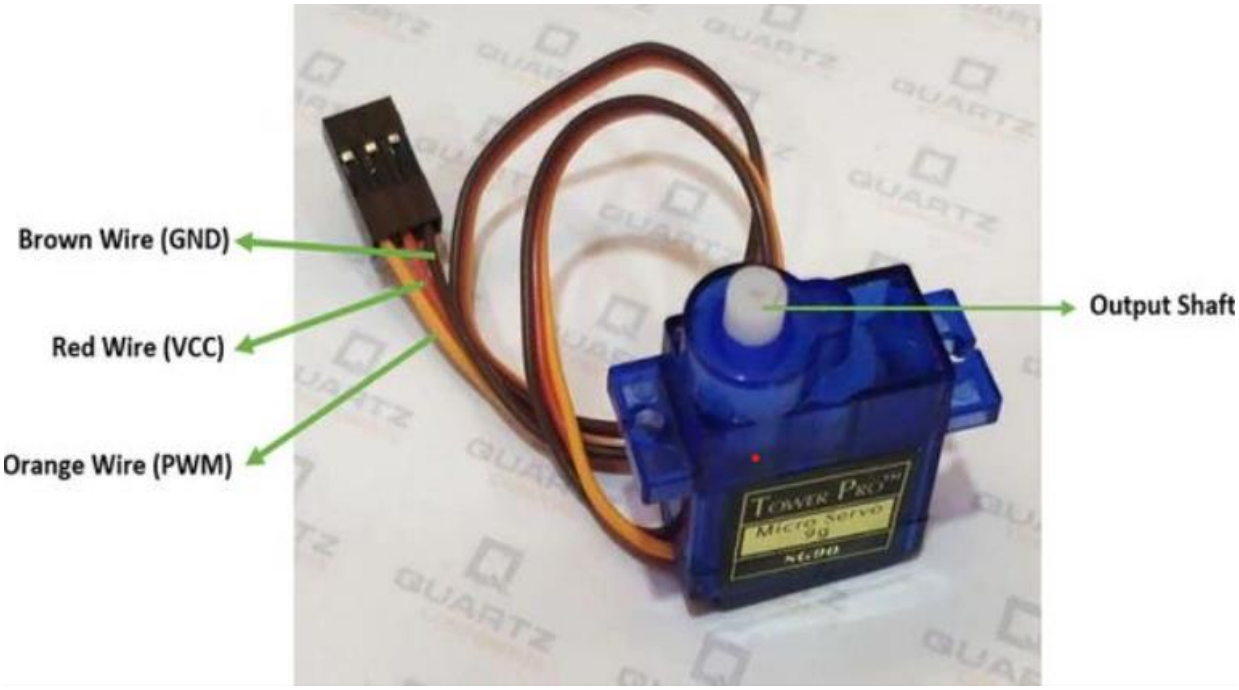
3.1.4 16x2 LCD Display:

A 16x2 LCD display is a type of alphanumeric display that can display up to 16 characters per line and 2 lines of text. It is a popular and widely used display in various applications, including electronic devices, appliances, and embedded systems.

The 16x2 LCD display consists of a display controller chip, such as the HD44780, and a display module that includes a backlit liquid crystal display (LCD) panel and a driver circuit. The display is capable of displaying a range of characters, symbols, and graphics, and can be controlled using a microcontroller or other external device.

3.1.5 SG90 Servo Motor :

The SG90 servo motor is a commonly used micro servo motor that is popular among hobbyists, makers, and roboticists. It is a small, low-cost motor that is capable of precise control of angular position, making it ideal for use in small-scale robotics projects.
The SG90 servo motor is a versatile and reliable motor that is well-suited for a wide range of small-scale robotics applications. It is also compatible with a wide range of microcontrollers and development boards, making it easy to integrate into your projects.


Brown Wire (GND)
Red Wire (VCC)
Orange Wire (PWM)
Output Shaft
TOWER PRO
Micro Servo
9g

3.2 Software Requirements:

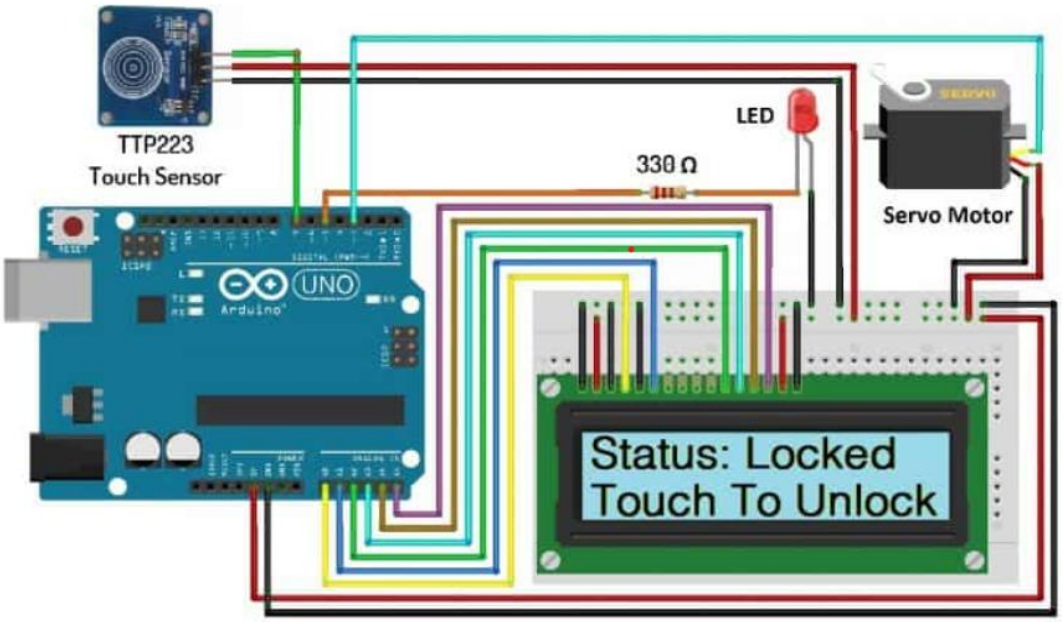
3.2.1 Arduino IDE:

Arduino is an open-source computer hardware, open-source software and microcontroller-based device building kit and interactive objects that can sense and control physical devices. arduino designs and manufactures software.The project is focused on the design of the microcontrollers. The board contains a combination of digital and analogue input / output (I / O) pins, which can connect to specific expansion boards (termed shields). The plates have serial communication interfaces for loading programs from personal computers, including Universal Serial Bus (USB) in the UNO model .

The Arduino project provides the built-in development environment (IDE) for the programming of microcontrolling systems to allow code writing and uploading to the board. It runs on Mac OS X, Linux and Windows. The code is written in Java, which is based on open source software and processing.

4. ANALYSIS AND DESIGN

4.1 Circuit Diagram



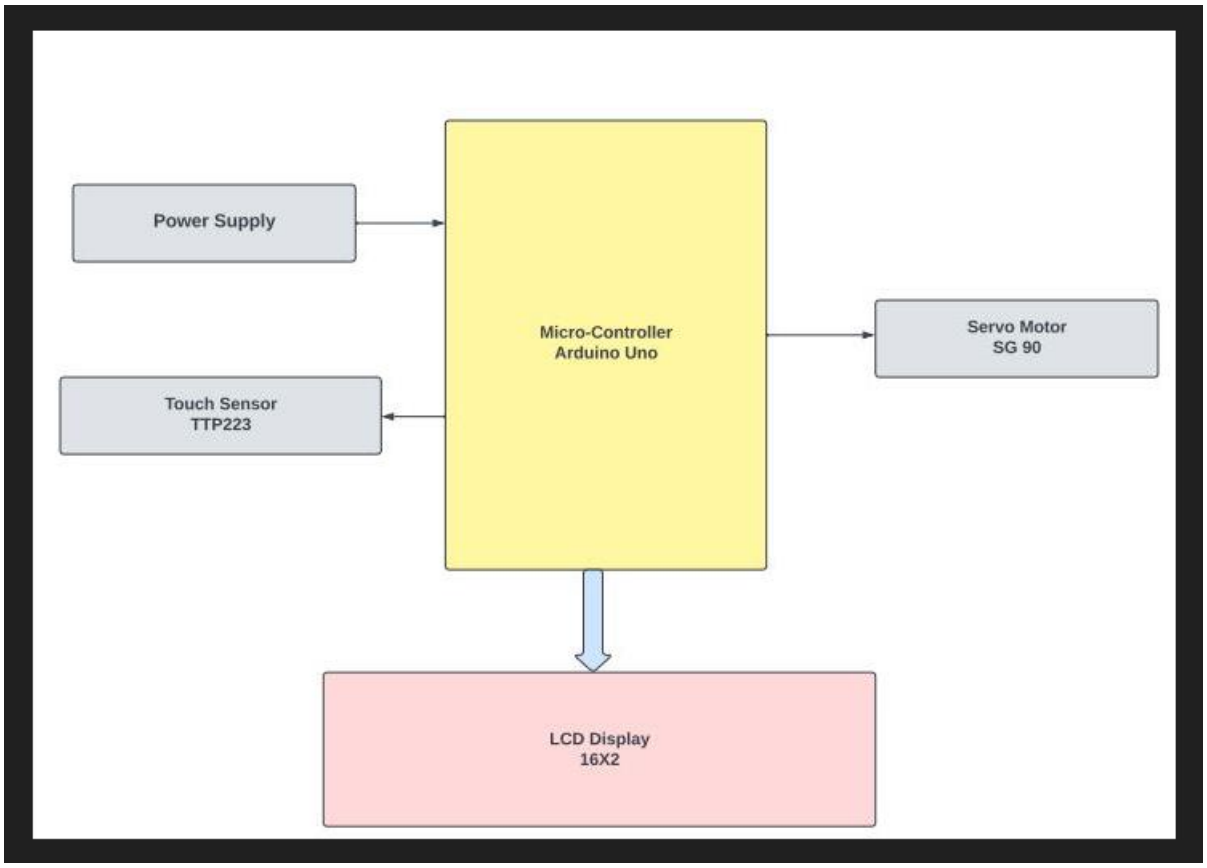
Capacitive screens do not use the pressure of your finger to create a change in the flow of electricity. Instead, they work with anything that holds an electrical charge – including human skin.

When a finger hits the screen a tiny electrical charge is transferred to the finger to complete the circuit, creating a voltage drop on that point of the screen. The software processes the location of this voltage drop and orders the ensuing action.

4.1.1 Connections

- Connect the signal pin of TTP223 Touch Sensor to Arduino Digital Pin 7.
- Connect servo motor signal pin to Arduino Digital Pin 3.
- Connect the LED to Arduino Digital Pin 5 via a 330-ohm resistor.
- Connect the LCD to analog pin A0, A1, A2, A3, A4, A5 of Arduino as shown in the figure.

4.2 Block diagram



Power supply: This provides power to the microcontroller, touch sensor, and motor or solenoid.

Microcontroller: This is the brain of the system that receives input from the touch sensor and sends output to the motor or solenoid to lock or unlock the door.

Touch sensor: This is the input device that detects when a user touches it, indicating that they want to lock or unlock the door.

Motor : This is the output device that physically locks or unlocks the door when the microcontroller sends a signal to it.

LCD Display: The display is capable of displaying a range of characters, symbols, and graphics, and can be controlled using a microcontroller or other external device.

5. IMPLEMENTATION

5.1 Sample code

```
#include<LiquidCrystal.h>
#include<Servo.h>
LiquidCrystal lcd(A0,A1,A2,A3,A4,A5);
  const int servoPin = 3; // Servo pin
  const int touchPin = 7; // Pushtouch pin
  int ledPin = 5;
  int touchState = 0;
  int directionState = 0;
  Servo myservo;
  int pos = 0;

void setup() {
    lcd.begin(16,2);
    lcd.print(" Touch Based");
    lcd.setCursor(0, 1);
    lcd.print("Door Lock System");
    myservo.attach(3);
    pinMode(touchPin, INPUT);
    pinMode(ledPin, OUTPUT);
  }

void loop(){
  touchState = digitalRead(touchPin);
  if (directionState == 0){
    if (touchState == HIGH) {
      directionState = 1;
      for(pos = 0; pos < 180; pos += 1)
      digitalWrite(ledPin,1);
      lcd.clear();
      lcd.print("Status: Unlocked");
      lcd.setCursor(0, 1);
      lcd.print("Touch to Lock");
      {
        myservo.write(pos);
        delay(15); // waits 15ms to reach the position
      }
```

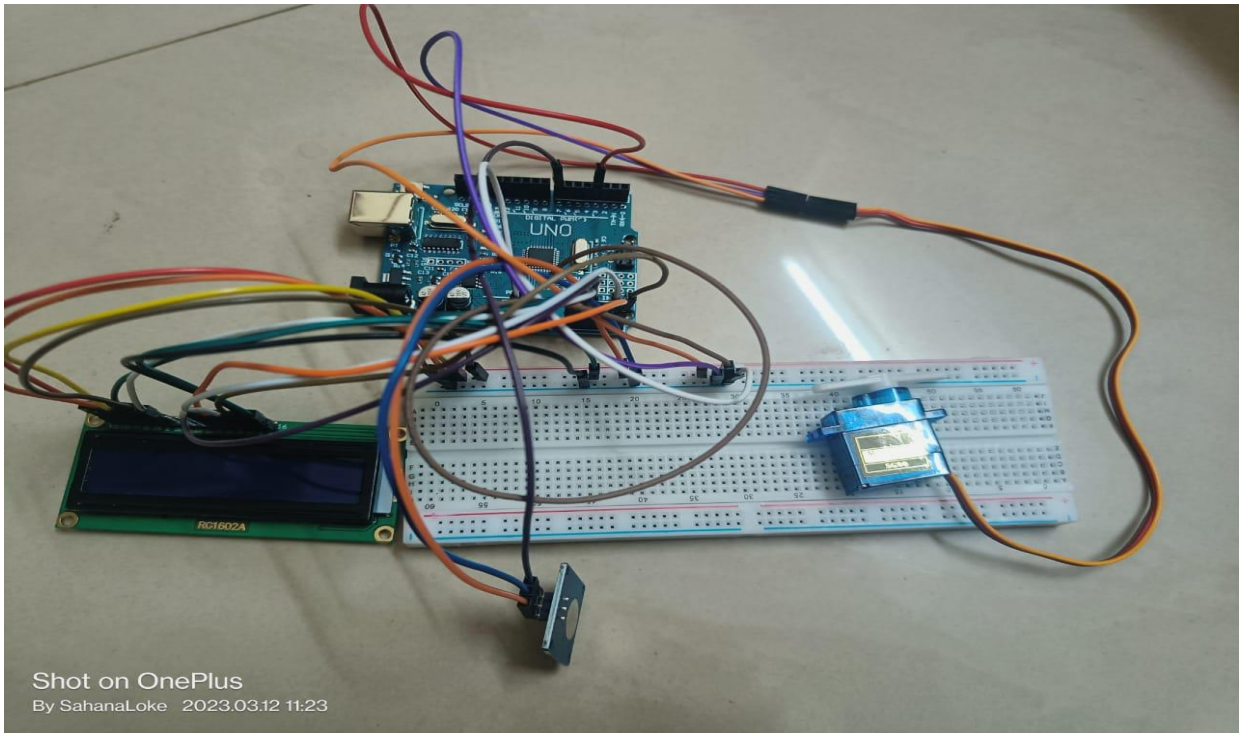
```
    }

  } else if (directionState == 1) {
    if (touchState == HIGH) {
      directionState = 0;

    for (pos = 180; pos>=1; pos -=1)
      digitalWrite(ledPin,0);
      lcd.clear();
      lcd.print("Status: Locked");
      lcd.setCursor(0, 1);
      lcd.print("Touch to Unlock");
      {
        myservo.write(pos);
        delay(15);
      }
    }
  }
}
```

6. SCREENSHOOT

6.1 Model




Status: Unlocked
Touch to Lock
RG1602A
Shot on OnePlus
By SahanaLoke 2023.03.12 11:34

7. TESTING

The Internet of Things popularly known as IoT is the network that consists of devices, vehicles, buildings or any other connected electronic devices. This interconnection facilitates collection and exchange data. The 4 common components of an IoT system are

- **Sensor**
- **Application**
- **Network**
- **Backend (Data Center)**

IOT is a connection of identifiable embedded devices with the existing Internet infrastructure. In simple words, we can say that IOT is an era of "Smart", connected products that communicate and transfer a large amount of data and upload it to cloud. IOT testing is a type of testing to check IOT devices. Today there is increasing need to deliver better and faster services. There is a huge demand to access, create, use and share data from any device. The thrust is to provide greater insight and control, over various interconnected IOT devices. Hence, IOT testing framework is important.

Types of Testing in IOT

Testing for IoT devices broadly revolves around Security, Analytics, Device, Networks, Processors, Operating Systems, Platforms and Standards.

Usability Testing:

There are so many devices of different shape and form factors are used by the users. Moreover, the perception also varies from one user to other. That's why checking usability of the system is very important in IoT testing.

Compatibility Testing:

There are lots of devices which can be connected though IOT system. These devices have varied software and hardware configuration. Therefore, the possible combination are huge. As a result, checking the compatibility in IOT system is important.

Reliability and Scalability Testing:

Reliability and Scalability is important for building an IOT test environment which involves simulation of sensors by utilizing virtualization tools and technologies.

Data Integrity Testing:

It's important to check the Data integrity in IOT testing as it involves large amount of data and its application.

Security testing:

In the IOT environment, there are many users are accessing a massive amount of data. Thus, it is important to validate user via authentication, have data privacy controls as part of security testing.

Performance Testing:

Performance testing is important to create strategic approach for developing and implementing an IOT testing plan.

8. CONCLUSION

Based on the information provided, a touch-based door lock system using Arduino and TTP223 seems like a viable solution for a simple and cost-effective access control system.

The TTP223 capacitive touch sensor module is a popular choice for touch-based projects due to its low cost and easy integration with microcontrollers like the Arduino. The sensor can detect a touch even through non-conductive materials such as glass or plastic, making it suitable for use as a touch-based door lock.

Using an Arduino microcontroller to control the TTP223 sensor, you can program the system to unlock the door when a valid touch is detected. You can also add additional features, such as a keypad or RFID reader, for added security.

However, it is important to consider the potential limitations of this type of system. For example, capacitive touch sensors can be sensitive to environmental factors such as humidity, which can affect their accuracy. Additionally, the system may not be suitable for high-security applications that require more robust authentication methods.

Overall, a touch-based door lock system using Arduino and TTP223 can be a cost-effective and practical solution for simple access control applications, but careful consideration should be given to its limitations and potential security risks.

9.BIBLIOGRAPHY

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