IOT OFFICE ASSISTANT SYSTEM

BY

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A REPORT

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UNIVERSITI TUNKU ABDUL RAHMAN

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Finally, I must say thanks to my parents and my family for their love, support, and continuous encouragement throughout the course.

ABSTRACT

This project is an IoT solution project which designed for academic purposes only. The methodology, concept, design skills for hardware and software will be provided through this project. This will be illustrated through the construction of an IoT office assistant system. Since the Raspberry Pi is suitable for the hardware implementation, therefore, it is implemented in the project. The Raspberry Pi is used as a CPU that can control and monitor the whole system. The tool used in this project is Eagle Software, it is used to design the layout of the PCB so that all the hardware components can be integrated on PCB. Besides, two Raspberry Pi is used in the project. One of the Raspberry Pi is used to collect data from the sensors while another Raspberry Pi is used for display information. The data such as the sensor's reading value are stored using Firebase Real-Time Database for the system. Moreover, the system of this project can be divided into hardware and software part. The hardware part is included PCB design and uses Raspberry Pi integrated with components such as sensors and LCD while the software part is the system function design which uses Python programming language and Flutter for mobile application development. The mobile application is used for lecturer to configure the system and monitor the office. Finally, an IoT solution for the office assistant system is developed to help the lecturer in monitoring the office.

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Ω	Ohm (resistance)
v	Voltage (Volt)

LIST OF ABBREVIATIONS

ADC	Analog to Digital Converter
CPU	Central Processing Unit
GB	Gigabytes
GPIO	General Purpose Input Output
GUI	Graphical User Interface
IOS	IPhone Operating System
IoT	Internet of Things
LCD	Liquid Crystal Display
LDR	Light Dependent Resistor
OS	Operating System
PCB	Printed Circuit Board
RAM	Random Access Memory
SDK	Software Development Kit
VNC	Virtual Network Computing

Chapter 1
Introduction

1.1 Problem Statement and Motivation

As human beings, we would not know what is happening currently inside our office and we spend most of the time inside our office. Most of the time, the room condition can be visible by our human eyes or feel it by our body, but the human would not know the exact details such as temperature, intensity, and condition of the air of his/her office whether it is suitable for them to study or work inside the office. An uncomfortable office would make the human feel tired, sleepy, and not able to focus and the worst case is that it would cause us to fall sick. For instance, studying or working in a high-level humidity office will cause the human to fall sick easily. The excess moisture also can result in mold and dust mites. This is very dangerous for those people who suffer from allergies and asthma.

The goal of the thesis is to propose an office assistant system with IoT which able to help the lecturer to monitor his/her office condition. Although there are many types of systems that able to monitor office conditions, some systems are required an input source such as a voice or a gesture from the user. The user may need to speak something or do a gesture to run the program. However, this project does not require the user to speak or do a gesture. This project is using sensors to monitor the user's room and it is fully automated. This project will develop a website and mobile application for the lecturer to monitor his/her office no matter how far away from the office, lecturer can monitor the office through a website or mobile application.

1.2 Objectives

The objectives of this project are:

1. Develop an IoT solution which able to assist the lecturer in monitoring the office.
2. Display the sensor's reading that is collected on the LCD of the Raspberry Pi and the mobile application.
3. The lecturer can leave a message using the mobile application and show it on the LCD of Raspberry Pi.
4. When the sensor's reading reaches a certain threshold, the lecturer can get the notifications through the mobile application.

1.3 Project Scope and Direction

The project scope is developing a mobile application using Flutter which is a Dart programming language. The mobile application is used for the lecturer to configure the system and monitor his/her office. Besides, Python programming language is used for system function design and GUI design which can suit the LCD screen for display purposes. The PCB is required to ensure the system has a cleaner look than a breadboard. Moreover, an IoT-based system is required to be built and the system is designed for the lecturer room only. Hence, this project would develop a system that is able for the lecturer to monitor his/her room's ambient and secure the room.

1.4 Contributions

Although most office assistant systems are using voice or a gesture, but with the utilization of sensors, room safety would be assured. This is because any incident may happen inside the room, so the sensors will play an important role in sending data to the control unit and informing the user that the room condition such as leaking of toxic gas inside the room or humidity is high, especially during summer. The contribution of the project is to inform or alert the user to take action such as opening a window to exchange the air or leaving the room before he/she feels uncomfortable, falls sick, or even puts themselves in danger.

1.5 Report Organization

This report is divided into 7 chapters. The first chapter is the project introduction. The second chapter is the literature review on several IoT projects and evaluate its strengths and weakness. The third chapter is system methodology which includes the system design diagram and system architecture diagram. The fourth chapter is mainly about the system design. The fifth chapter is the system implementation which includes the project setup and configuration such as hardware and software. The sixth chapter is including the evaluation on the system and test case. The seventh chapter is the conclusion of the system and its future improvements that could be done.

Chapter 2

Literature Review

2.1 Previous Works on IoT-Based Monitoring Systems

2.1.1 Smart Office Monitoring System

In [1] proposed a research paper that developed a smart office monitoring system using IoT which aims to save energy and promote the satisfaction of the employees. The hardware component and sensors involved in the proposed system are fingerprint sensors, a servo motor, an ESP32 microcontroller, a passive infrared motion sensor, an MQ2 gas sensor, an LDR sensor, a DHT11 temperature-humidity sensor, and a 5*v* 4-channel relay. Besides, the proposed system is using Blynk to build a mobile application for real-time monitoring purposes. The mobile application can support Android and IOS smartphones. All information such as sensor data can be monitored through Blynk mobile application, and the application is also able to control the system such as switching on and off the light and fan of the system.

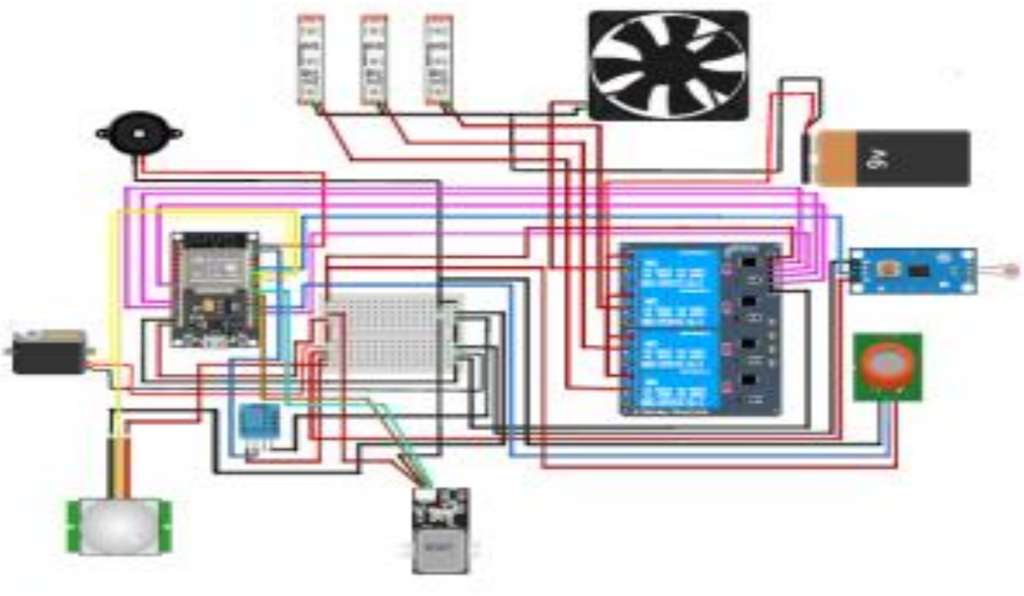

Figure 2.1.1: Circuit diagram of the proposed system in [1].

2.1.2 IoT Based Electronic Monitoring System Using Raspberry Pi

Besides, [2] proposed a research paper that developed the monitoring system without a wired connection and can be implemented with a wider range. Therefore, the system does not have any wiring problems. The system required a Raspberry Pi, Relay circuit, Wi-Fi connection, keyboard, mouse, and some other interfacing devices such as a tablet, smartphone, and so on. The proposed system also develops a web page just for the local network only to monitor all the home appliances whether it is ON or OFF status. The system is also able to control the home appliances through the web page by the respected relay to turn the appliances ON or OFF.

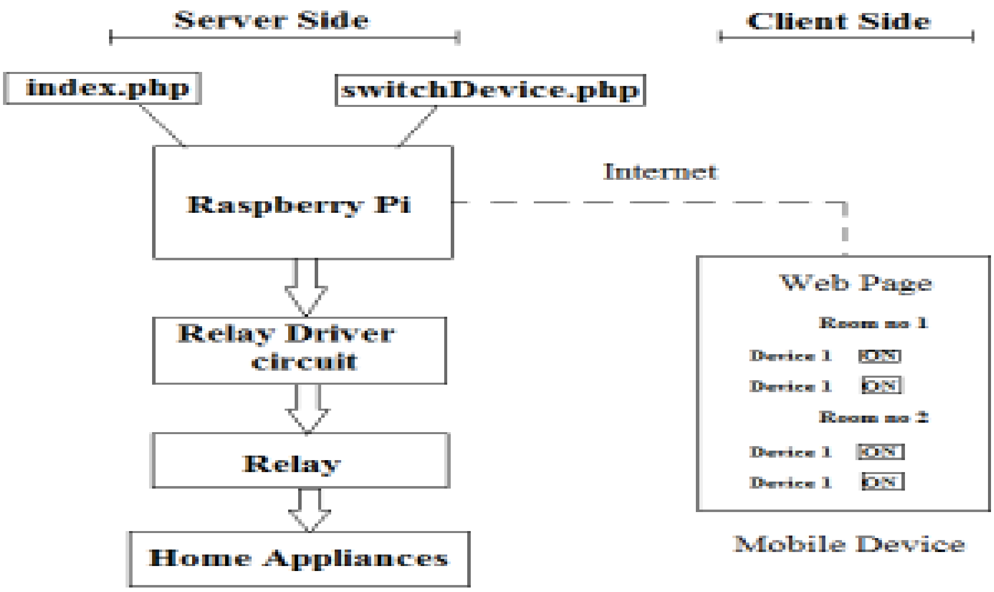

Figure 2.1.2: Overview of the proposed system in [2].

2.1.3 Cloud-Based Fault Prediction Using IoT in Office Automation

Furthermore, [3] proposed a research paper that which the system is used for the improvisation of the health of employees. The proposed system is to perform all tasks automatically and securely interact with the appliances. The system will start checking the health of appliances when the office appliances are switched on to prevent any abnormal values. The machine learning algorithm is used to predict inevitable faults based on the analysis of the existing dataset. The user will receive an alert message when any abnormal functioning of the appliances is predicted in the machine learning algorithm. Moreover, the system can predict the fault at an early stage so that it can prevent damage to the appliance. The power consumption of the office appliance can be monitored by the user. The system required an ATmega8 Microcontroller, and it can place on many small boards due to its compact size.

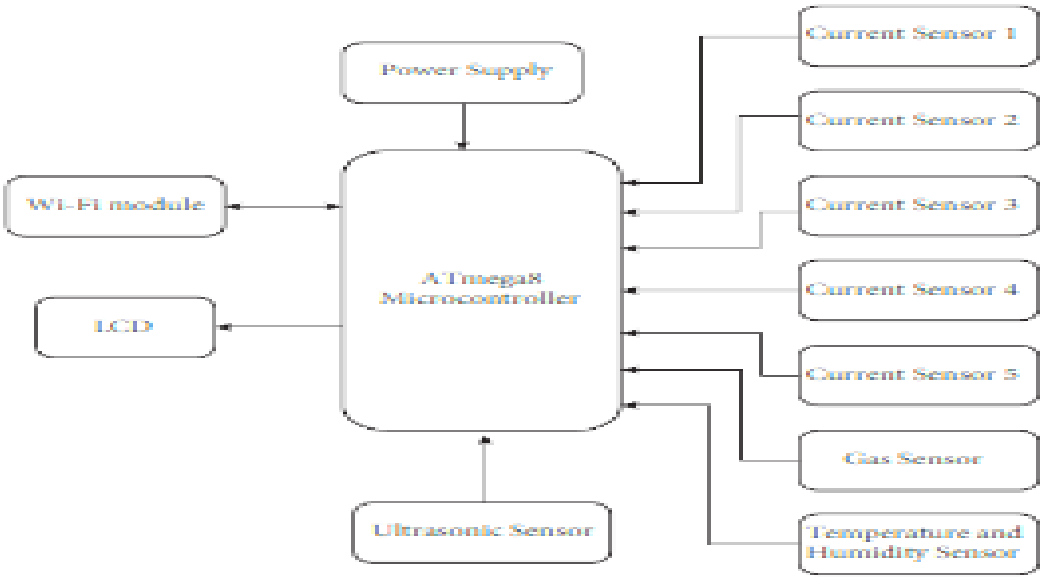

Figure 2.1.3: Block diagram of the proposed system in [3].

2.1.4 Smart Office System Using Based Security System

In addition, [4] proposed a research paper that which the system is developed using the waterfall method to create a prototype of the smart home system. The system was able to monitor the inside and outside of the office. The inside of the office can be controlled and monitored through the Internet while the outside of the office only will operate during the night. During the night, an autonomous robot will run automatically following the predetermined line so that able to control the security of the office. The system has used a camera that is integrated with Raspberry Pi on the autonomous robot. Besides, the system also used the microcontroller Arduino Mega 2560 and Arduino Uno R3. The Arduino Uno R3 is served as a control to follow the predetermined line.

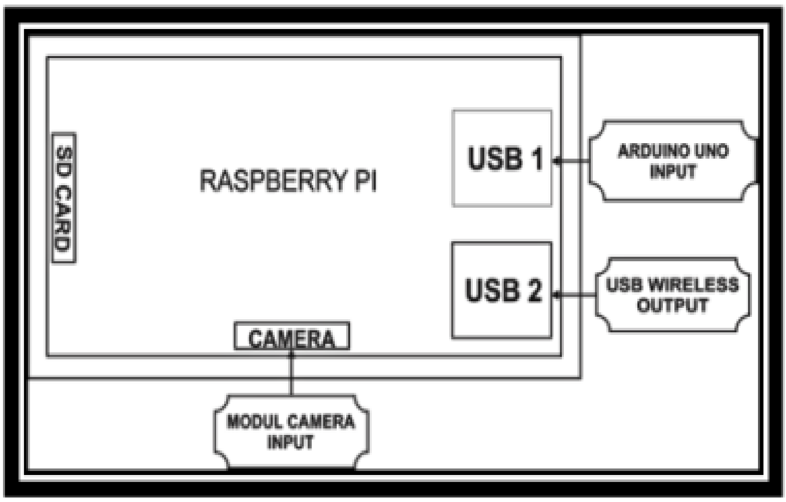

Figure 2.1.4: Block diagram of an autonomous robot in [4].

2.2 Strengths and Weakness of Previous Work

The strength in [1] is the proposed system can monitor the office through the Blynk mobile application which is called Blynk IoT and the application is available in PlayStore and AppStore. The Blynk IoT has a simple user interface that is easy to use for the beginner to build an IoT project. However, the user interface in Blynk had been limited. The shape of the widget and the way to display data are not able to be changed.

Figure 2.2.1: Blynk mobile application of the system in [1].

Besides, the strength of the proposed system in [2] is the user can monitor the home appliances through the web page only by using Raspberry Pi's local IP address. However, the user is not able to monitor home appliances if the user is not in the same local area network as the Raspberry Pi.

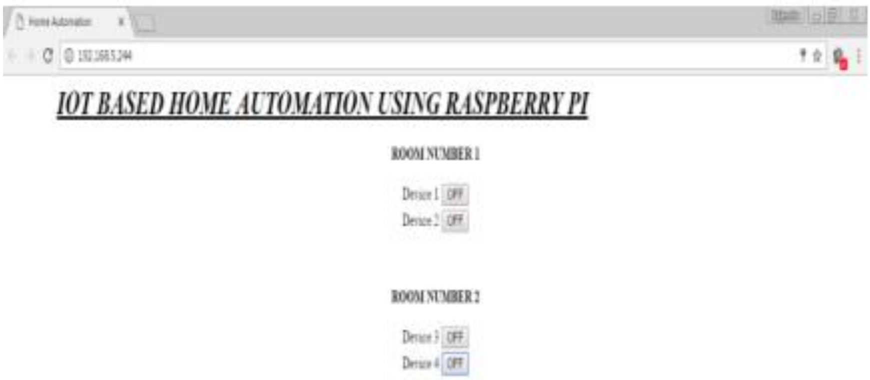

Figure 2.2.2: Web page of the system in [2].

Furthermore, the system in [3] can detect any abnormal functioning and status of the device in the office by applying a machine learning algorithm. However, the proposed system must initialize all devices and sensors first and the data fetched from all devices is pre-processed using machine learning. If there are new devices added to the office, the whole system needs to retrain again the model.

In addition, the proposed system in [4] can ensure the office is secure during night time by detecting movements and humans passing through the autonomous robot. However, the autonomous robot is only powered up by a 9*v* battery and it is required to operate for the whole night. The system in [4] should increase its battery size to ensure the system can operate for a longer time.

Chapter 3

System Methodology/Approach

3.1 System Design/Architecture Diagram

3.1.1 Hardware Block Diagram and Description

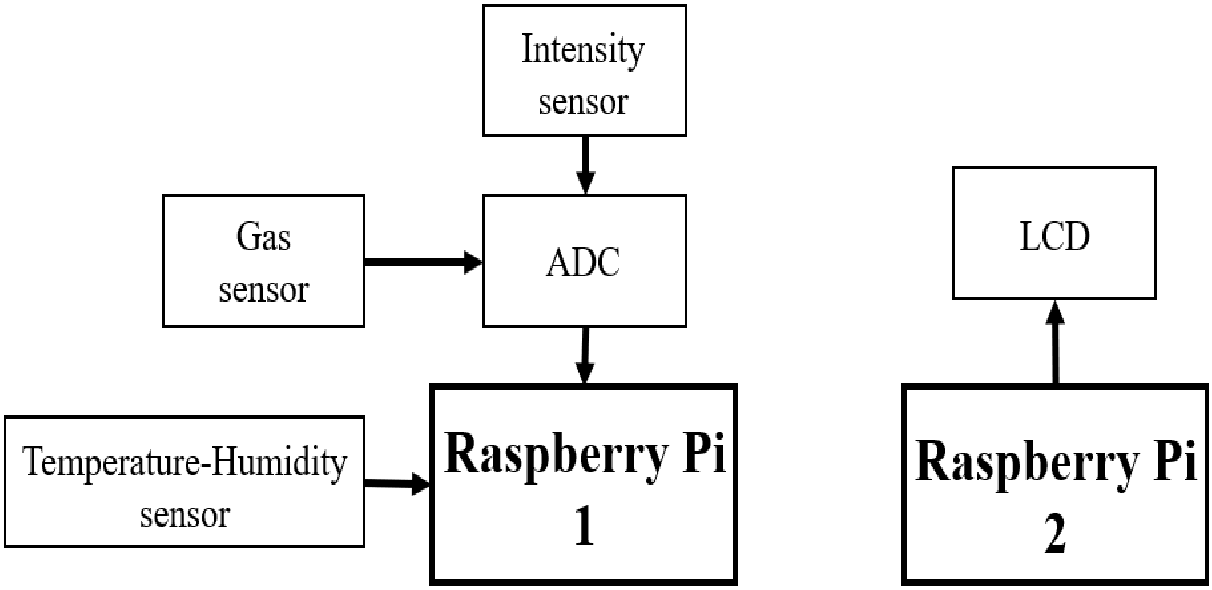

Figure 3.1.1: Hardware Block Diagram.

<u>Intensity sensor – Light Dependent Resistor (LDR)</u>

- Detect light level and send an analog signal to ADC.
- The analog signal is converted to digital and sent to Raspberry Pi 1.

<u>Gas sensor – MQ5</u>

- Detect air quality.
- The output signal is analog/digital, and the analog signal is used for more accurate results then send ADC for conversion and send to Raspberry Pi 1.

<u>Temperature-Humidity sensor – DHT11</u>

- Detect temperature and humidity in one sensor.
- The output signal is digital and then send to Raspberry Pi 1.

<u>LCD – 3.5-inch</u>

- Display GUI with sensor reading.
- Display user status such as in or not in the room.

Raspberry Pi 1 - Raspberry Pi 3 Model B+

- Receive sensor reading then process it.
- Send processed data to Firebase Real-Time database.

Raspberry Pi 2 - Raspberry Pi 3 Model B+

- Read data such as the sensor's reading and lecturer's status from Firebase real-time database.
- Process the collected data and display it on LCD.

3.1.2 Software Block Diagram and Description

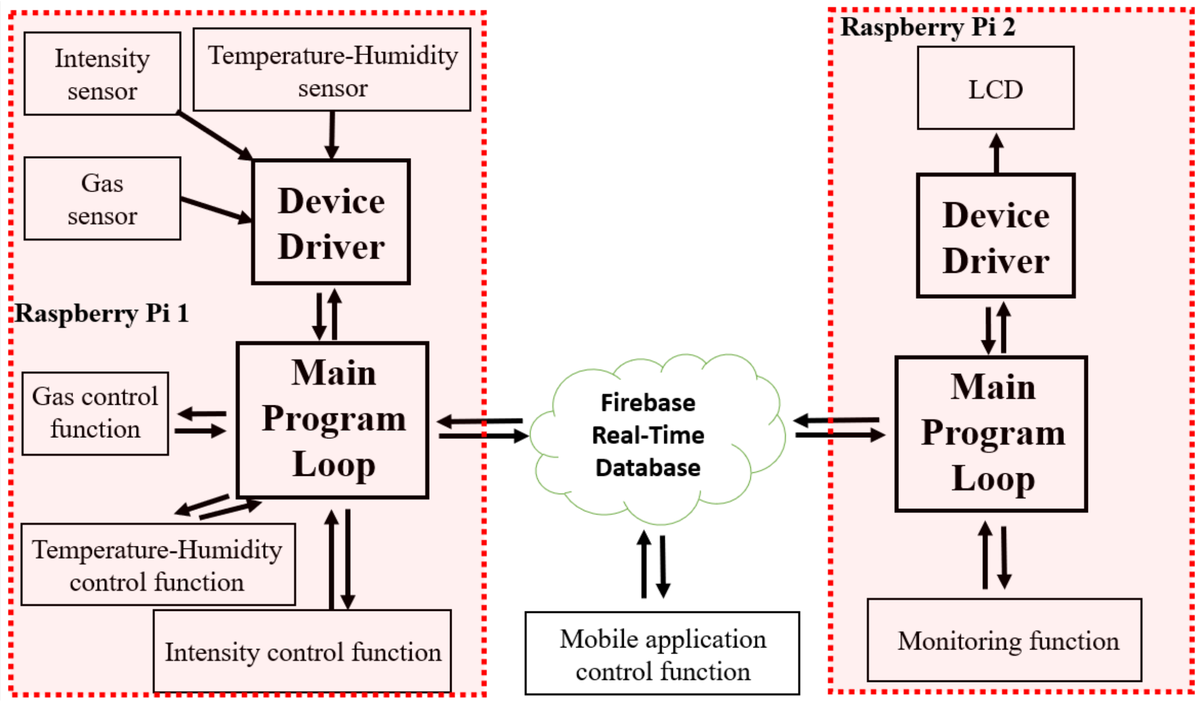

Figure 3.1.2: Software Block Diagram.

In Raspberry Pi 1, when the Device Driver received signals from the sensor (intensity, gas, temperature-humidity sensor), it will pass the signals to the Main Program Loop to select the correct control function. After the signals have been processed in the respective control function, they will pass back to Main Program Loop and then the data will upload to the Firebase. In the second Raspberry Pi, the Main Program Loop will always listen to the value change in the Firebase Real-Time database. The monitoring function is to output the data changed on the LCD. The mobile application control function is used for the lecturer to configure the system and monitor his/her office by using his/her smartphone. The mobile applications can directly get the sensor's reading without looking at the LCD screen.

3.1.3 Use Case Diagram and Description

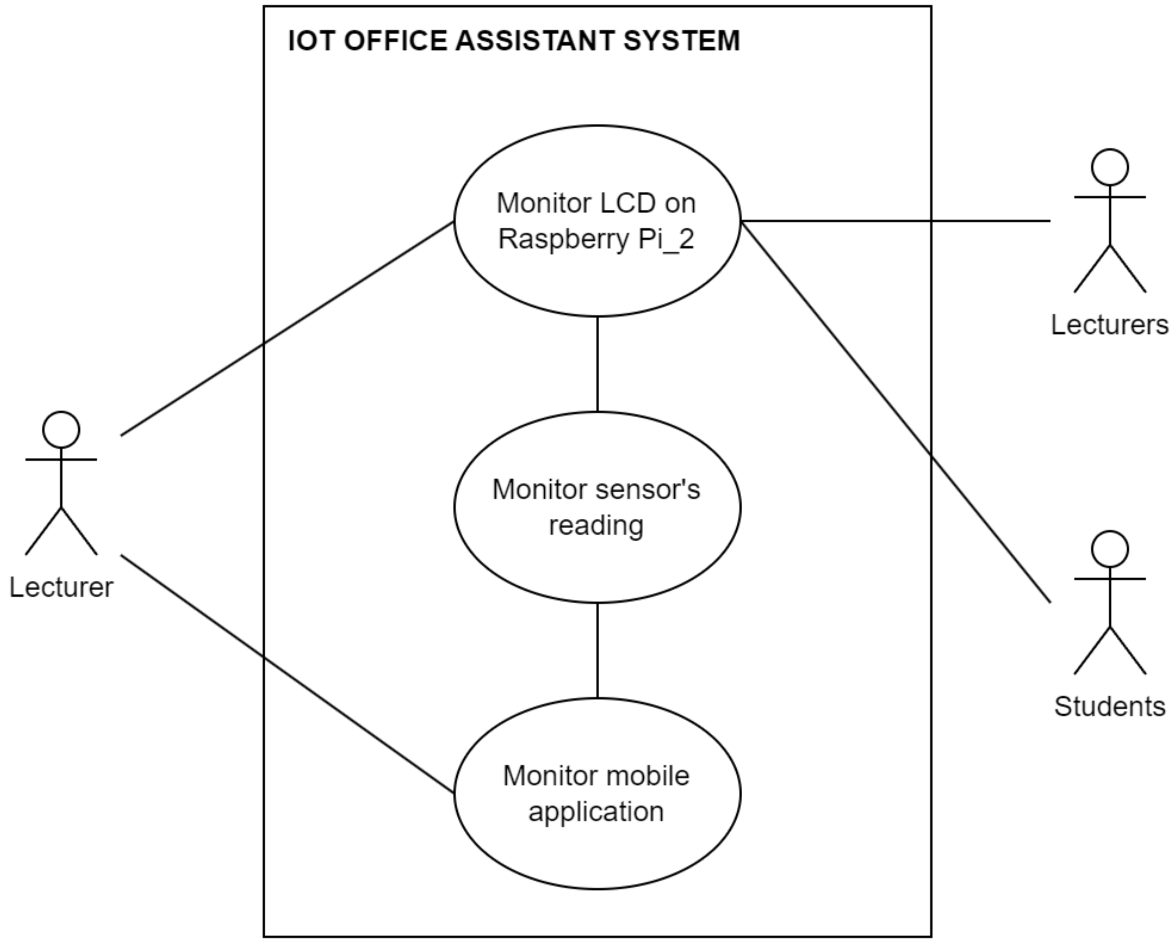

Figure 3.1.3: Use Case Diagram of the system.

Based on Figure 3.1.3, the lecturer on the left-hand side is the user which able to monitor the sensor’s reading through LCD on Raspberry Pi_2 and his/her mobile application. The lecturers and students on the right-hand side only can monitor the LCD on Raspberry Pi_2. Hence, they only can know the room ambient and the user’s status through the LCD on Raspberry Pi_2.

3.1.4 Activity Diagram

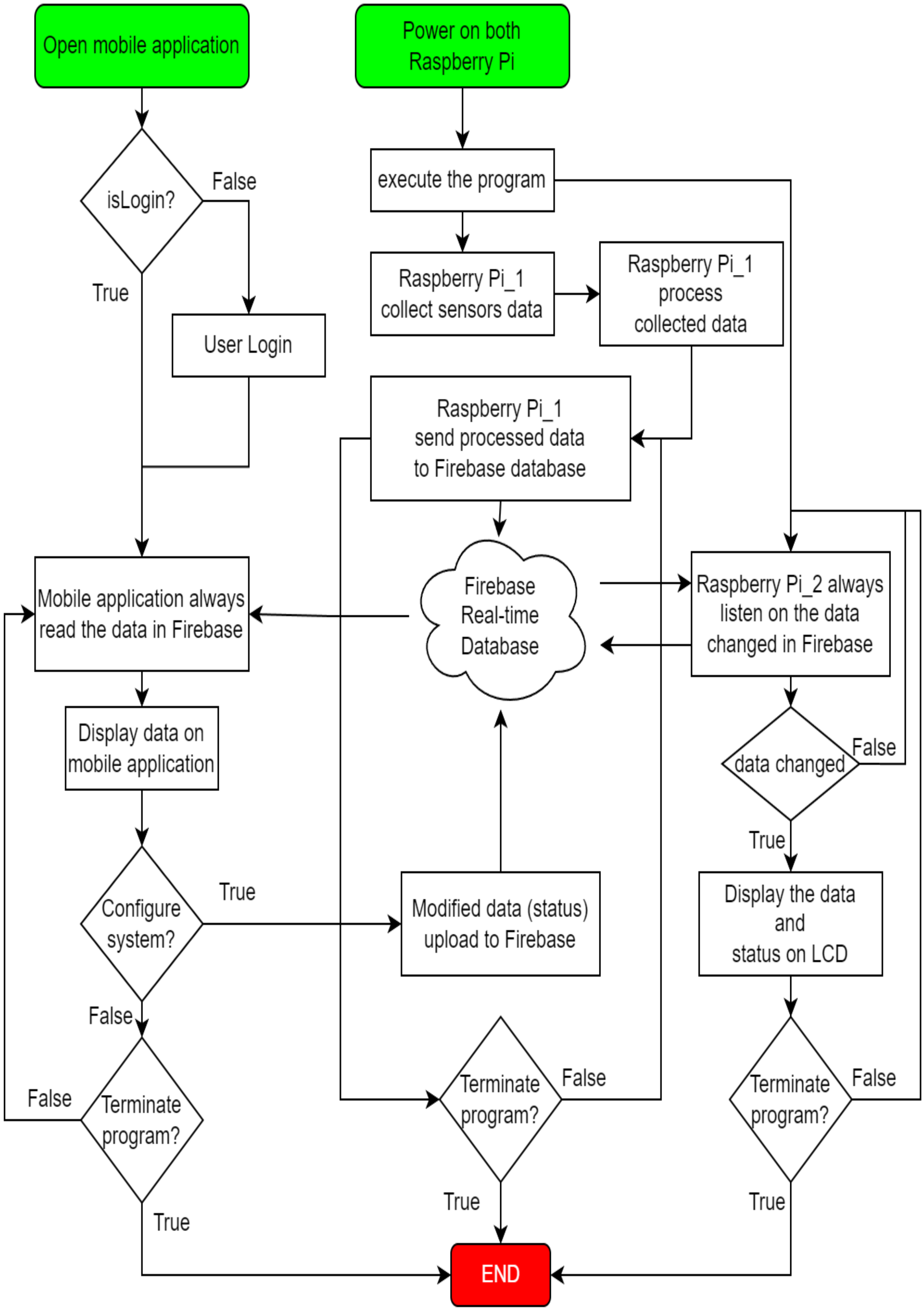

Figure 3.1.4: Activity Diagram of the System.

When the user power on both Raspberry Pi and execute the program, the program will work as shown in Figure 3.1.4. The Raspberry Pi_1 works as a data collector and processes the data, then upload it to the Firebase while Raspberry Pi_2 works as the listener to the Firebase Real-Time database, any data changed on Firebase Real-Time database, it will display on the GUI on the LCD of Raspberry Pi_2. The mobile application also always reads data from the Firebase Real-Time database and any data changes such as the sensor’s reading will display on the mobile application in real-time. Besides, the mobile application is also used to change the status of the lecturer. When the status changed, it will directly display on the GUI on the LCD of Raspberry Pi_2.

Chapter 4

System Design

4.1 System Block Diagram

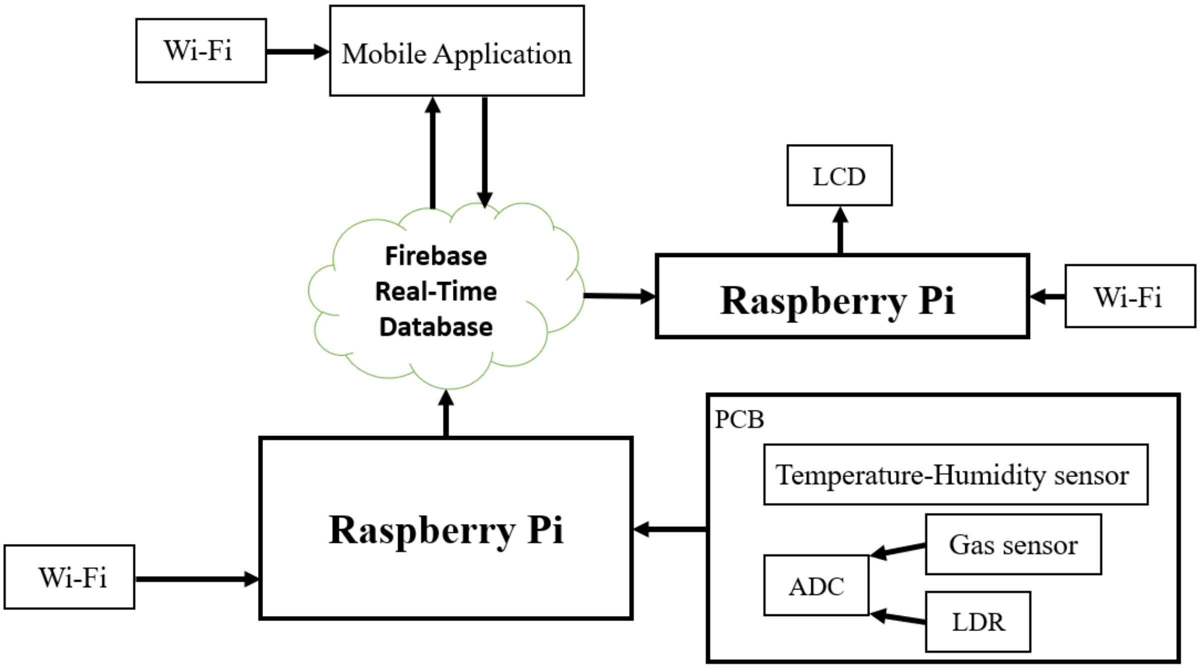

Figure 4.1: Block Diagram of the System.

In the system block diagram, all components were integrated as shown in Figure 4.1. The components such as both Raspberry Pi and mobile applications required an internet connection such as Wi-Fi to work perfectly. The lecturer can choose either to refer to the LCD on Raspberry Pi or his/her smartphone through the mobile application that has been developed. All sensors were soldered on the PCD and the PCD is connected to the GPIO pins of the Raspberry Pi. All data transmissions are using Firebase Real-Time Database.

4.2 System Components Specifications

4.2.1 Hardware

In this project, the hardware involved were Raspberry Pi, LCD screen, PCB, sensors, and resistor.

Description	Specification	Output Signal Type
Raspberry Pi	Raspberry Pi 3 Model B+	-
LCD screen	3.5-inch	-
Gas sensor	MQ5	Analog/Digital
Temperature and Humidity sensor	DHT11	Digital
Intensity sensor	LDR	Analog
ADC	ADS1115	Digital
Resistor	10kΩ	-
PCB	-	-

Table 4.2.1: Specification of hardware.

Raspberry Pi 3 B+ is used as a central part of this project. The reason for choosing a 3.5-inch LCD screen is because there is much information needed to be displayed. The MQ5 sensor is used to detect the air quality inside the room. The DHT11 is chosen because it is cheap which can lower the budget of the project and it also provides two data by using one sensor rather than using two sensors to get two data. LDR is used as an intensity sensor, the intensity level can be determined by monitoring the changing resistor value in LDR. ADC is needed for LDR because Raspberry Pi's GPIO only accepted digital input.

4.2.2 Software

In this project, the code editor involved were Geany and Visual Studio Code. Besides, the Eagle software is used to design PCB.

Description		Programming language involved	Purpose
Geany		Python	GUI and system function design
Visual Studio Code	Flutter	Dart	Mobile application development
Eagle Software		-	Design PCB
VNC viewer		-	Remote access Raspberry Pi

Table 4.2.2: Software involved.

In this project, Geany would be used to design the GUI and the system function by using Python programming language. Geany is a code editor which is pre-installed in Raspberry Pi OS and Python is one of the programming languages which is supported by Raspberry Pi. Hence, Geany has been selected for this project. Besides, Flutter has been selected to develop a mobile application for the lecturer to configure the system and monitor the office through his/her smartphone. The reason for selecting Flutter in mobile development is that Flutter has a better performance compared to React Native. Flutter uses Dart programming language which has its rendering engine while React Native uses JavaScript which relies on the underlying platform's rendering engine. Moreover, the mobile application developed using Flutter can support Android and IOS devices. The Visual Studio Code is used for development in Flutter. Furthermore, PCB is play an important role in this project. The purpose of the PCB is to solve the messy wiring issues of the breadboard and integrated all sensors into a small board. The VNC viewer is used to remote access the Raspberry Pi so that the work will be much easier in terms of does not require connecting to a monitor.

4.3 Circuit and Components Design

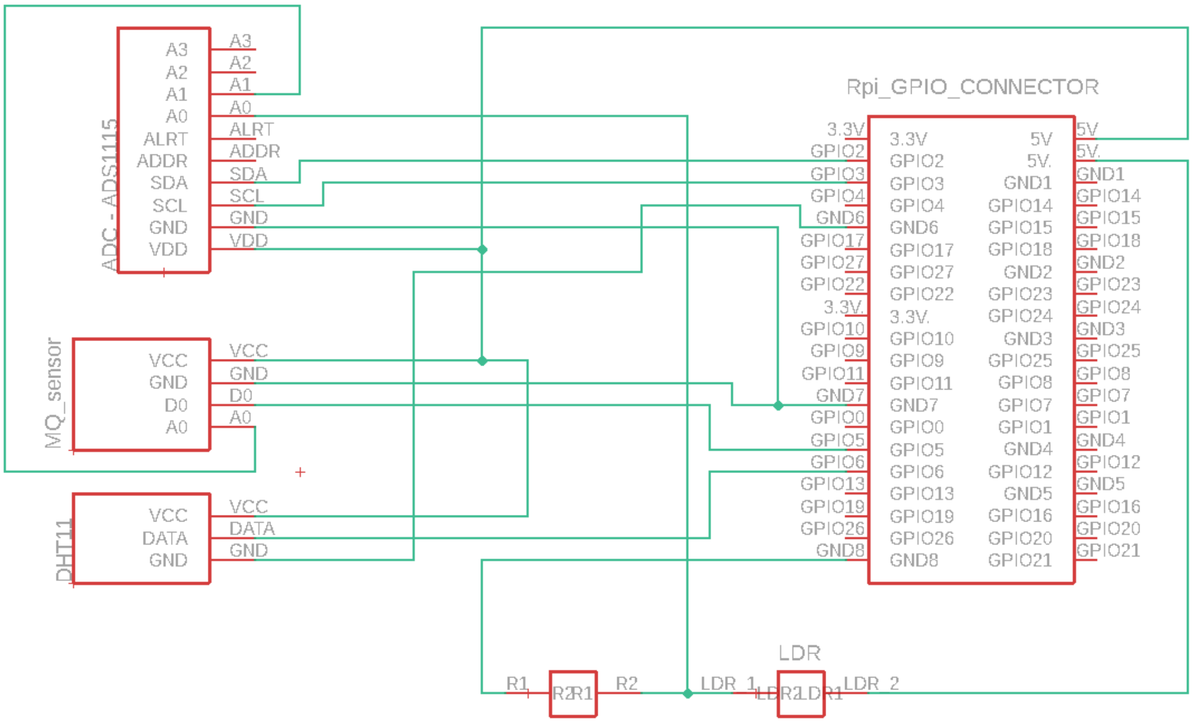

Figure 4.3.1: PCB Schematic Diagram.

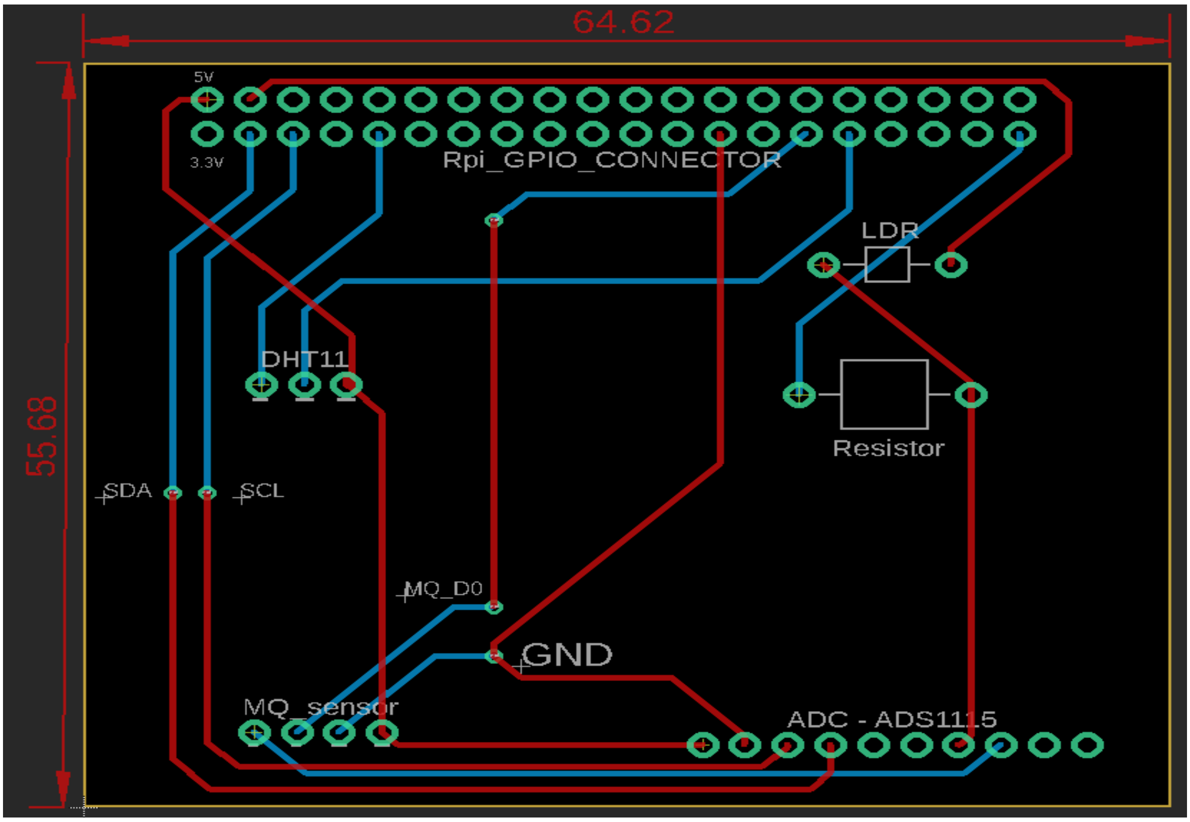

Figure 4.3.2: PCB Layout.

The schematic diagram and board layout of the PCB are created and designed using Eagle Software. The PCB schematic is required before designing the board layout of the PCB. The purpose of the schematic diagram is to reduce the chances of making mistakes when connecting the components. Most of the connections are used the GPIO which faces towards the middle of the board. The purpose of this kind of design is to reduce the copper wire of the board crashing each other and it will be easier to fabricate the board. The dimension of the PCB is 64.62mm x 55.68mm. The PCB is placed on the Raspberry Pi as shown in Figure 4.3.3.

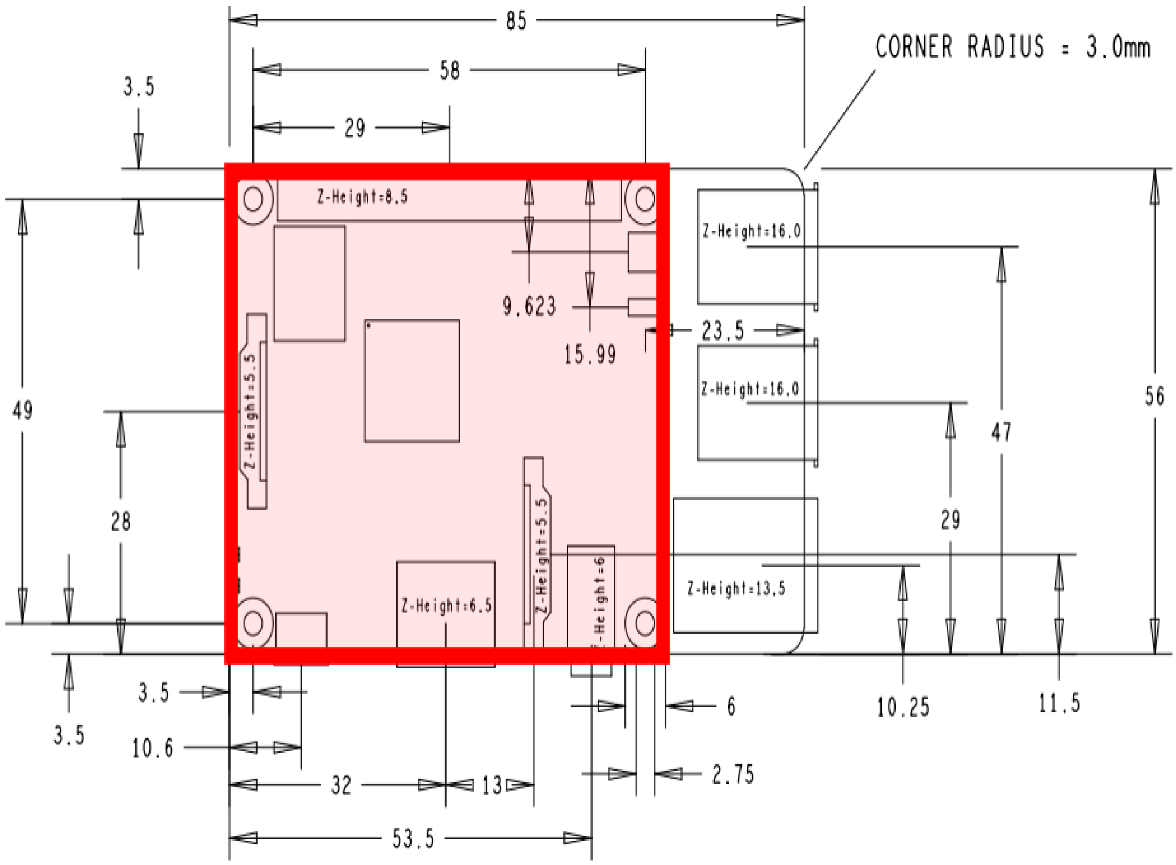

Figure 4.3.3: PCB position on the Raspberry Pi Model 3 B+.

4.4 System Components Interaction Operations

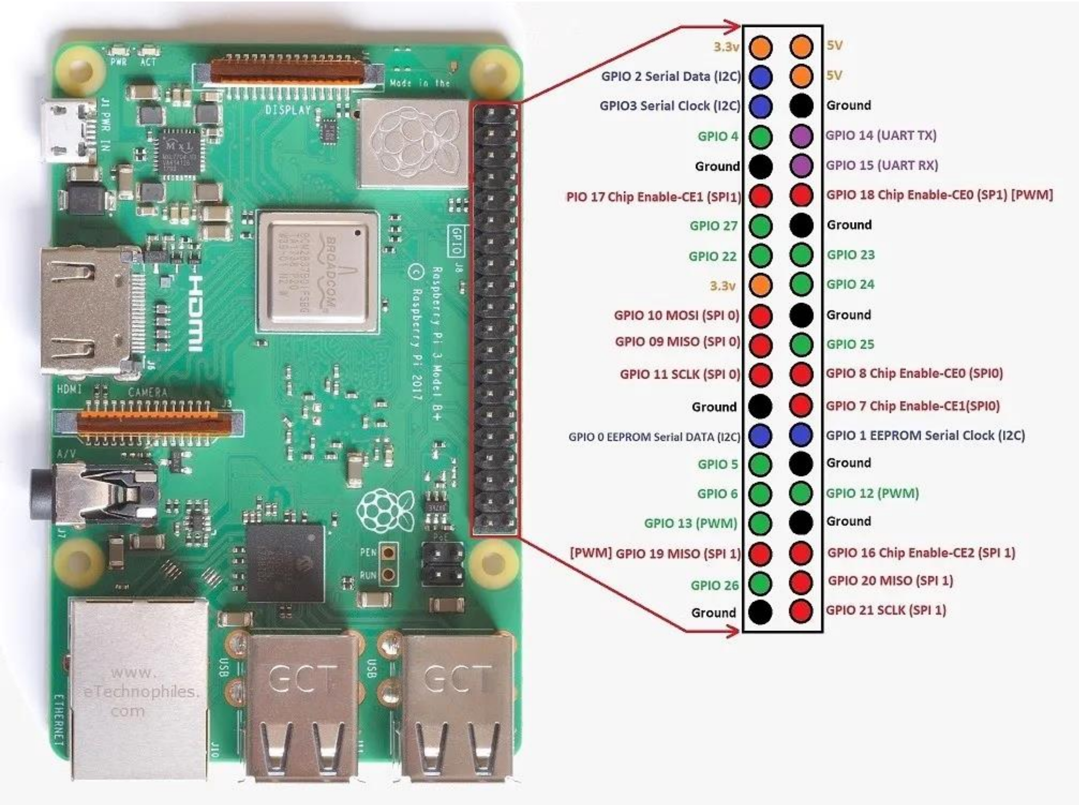

Figure 4.4.1: Raspberry Pi 3B+ GPIO Diagram.

Based on the circuit diagram in Figure 4.3.1, the pin used is shown in Table 4.4.1.

Pin used	Components Used
GPIO 2 Serial Data (I2C)	ADC
GPIO 3 Serial Clock (I2C)	
GPIO 5	MQ-5 digital output
GPIO 6	DHT11
5v	All components is power up by 5v
Ground	All components is connected to Ground

Table 4.4.1: Pin and Components used.

Chapter 5

System Implementation

5.1 Hardware Setup

The hardware setup involved in this project is to integrate all sensors using a breadboard for components testing to ensure all components are functioning, then soldering all sensors on the PCB.

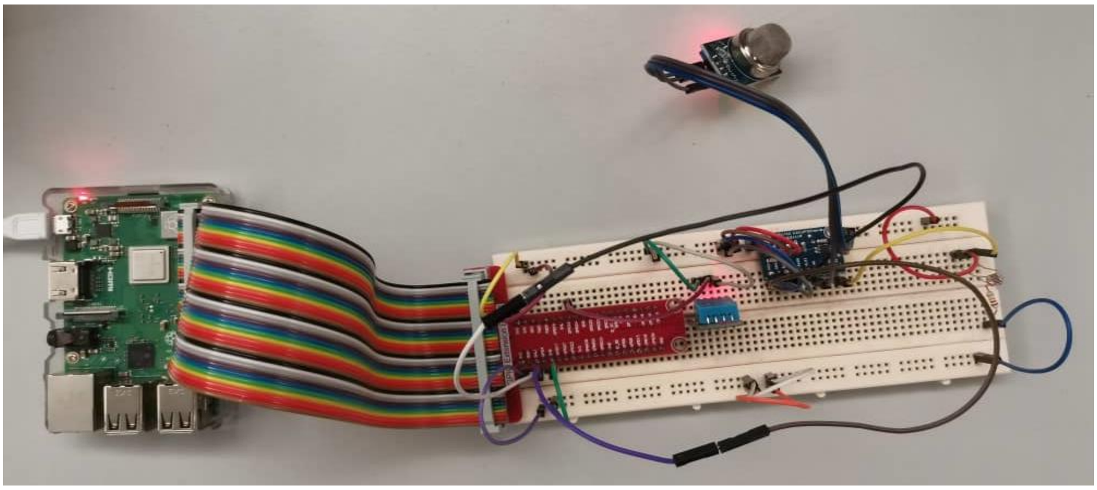

Figure 5.1.1: Sensors before integrated into the PCB.

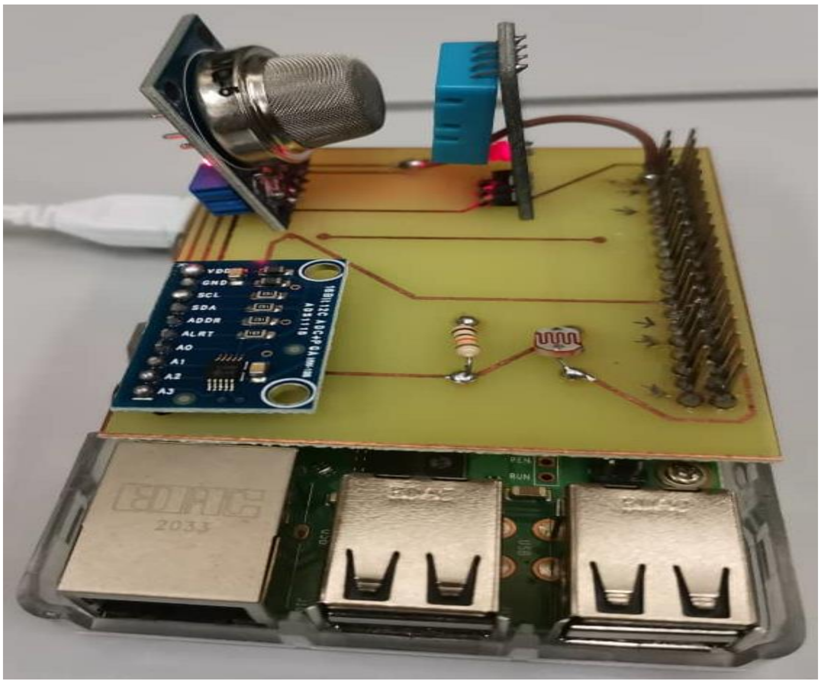

Figure 5.1.2: Sensors after integrated into the PCB.

The PCB is fabricated and used to integrate all the sensors and reduce the mess for the physical view of the circuit.

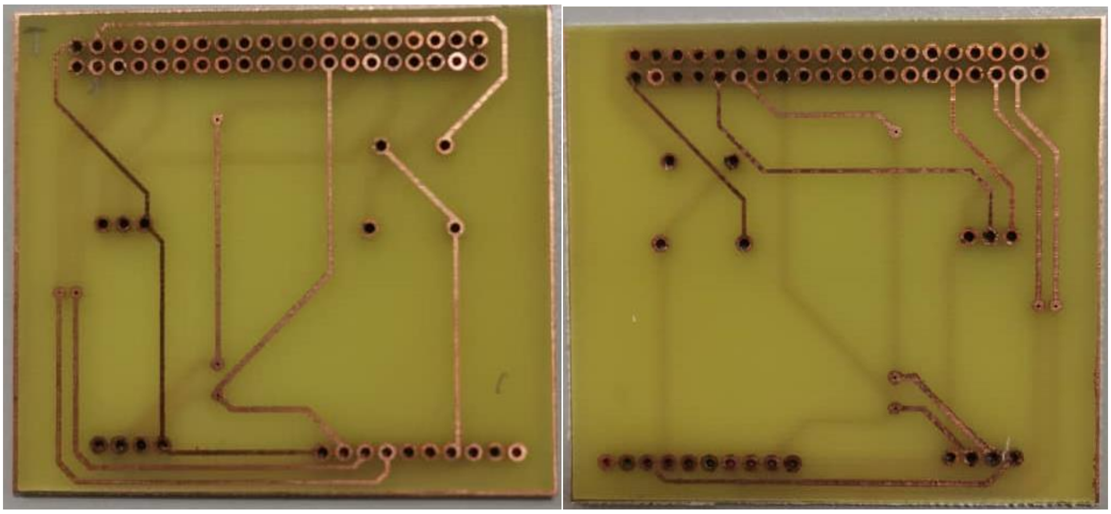

Figure 5.1.3: The PCB before being integrated with the sensors.

The left-hand side is the top layer view of the PCB while the right-hand side is the bottom layer view of the PCB.

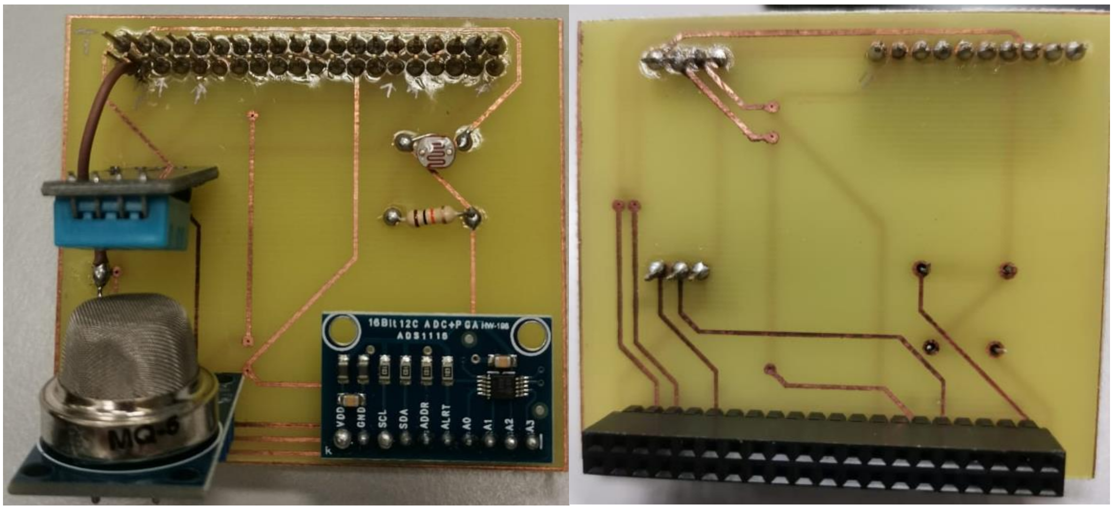

Figure 5.1.4: The PCB integrated with the sensors.

The left-hand side is the top layer view of the PCB while the right-hand side is the bottom layer view of the PCB. After soldering all the components on the PCB, the whole system looks cleaner than before, and the system's physical size also becomes smaller. Hence, the system is easy to be carried compared to the component on the breadboard.

5.2 Software Setup

5.2.1 Raspberry Pi OS

Before starting to develop this system, it is required to install/fetch the Raspberry Pi OS into the microSD card for the Raspberry Pi, the steps are shown below:

1. Download the Raspbian disc image file (Version: 2020-Raspbian-Buster)
2. Unzip the disc image file.
3. Format the microSD card to ensure the disc image able to write into the microSD card properly.
4. Then, fetch/write the image file into the microSD card by using the Win32 Disk Imager.
5. After successfully writing the image into the microSD card, plug the microSD card into Raspberry Pi and boot up.

5.2.2 VNC viewer

The remote access technique is used to make the work easier such as it does not require to use monitor plug-in the Raspberry Pi.

1. Configure the Raspberry Pi for remote access by enabling the VNC in Raspberry Pi using the command: *sudo raspi-config*
    a. Get the IP address of the Raspberry Pi using the command: *ifconfig*
    b. By default, the Raspberry Pi is using static IP address.

    OR

    a. Create a VNC account and log in using cloud remote access so that no need to worry about the changes in the IP address.

5.2.3 Flutter Version Management (FVM)

The FVM is a simple command-line interface (CLI) that manages Flutter SDK versions. In other words, we can switch to the Flutter SDK version more easily. The full installation guideline is available at: https://fvm.app/docs/getting_started/installation

5.2.4 Visual Studio Code

Install/Update the latest version of the Visual Studio Code. The Visual Studio Code is used as a code editor for the development of the Flutter mobile application.

5.2.5 Android Studio

For debugging using the Android Studio emulator will improve the speed of debugging. This is because the operating system will build the mobile application using an emulator faster compared to the real device. It helps to save a lot of time waiting for the application build when every time debugging the application.

5.3 Setting and Configuration

The steps to start creating a Flutter project template:

1. Open Visual Studio Code's terminal or command prompt and change to your project directory.
2. Execute the command: fvm flutter create <*your-project-name*>

   For example: fvm flutter create myoffice

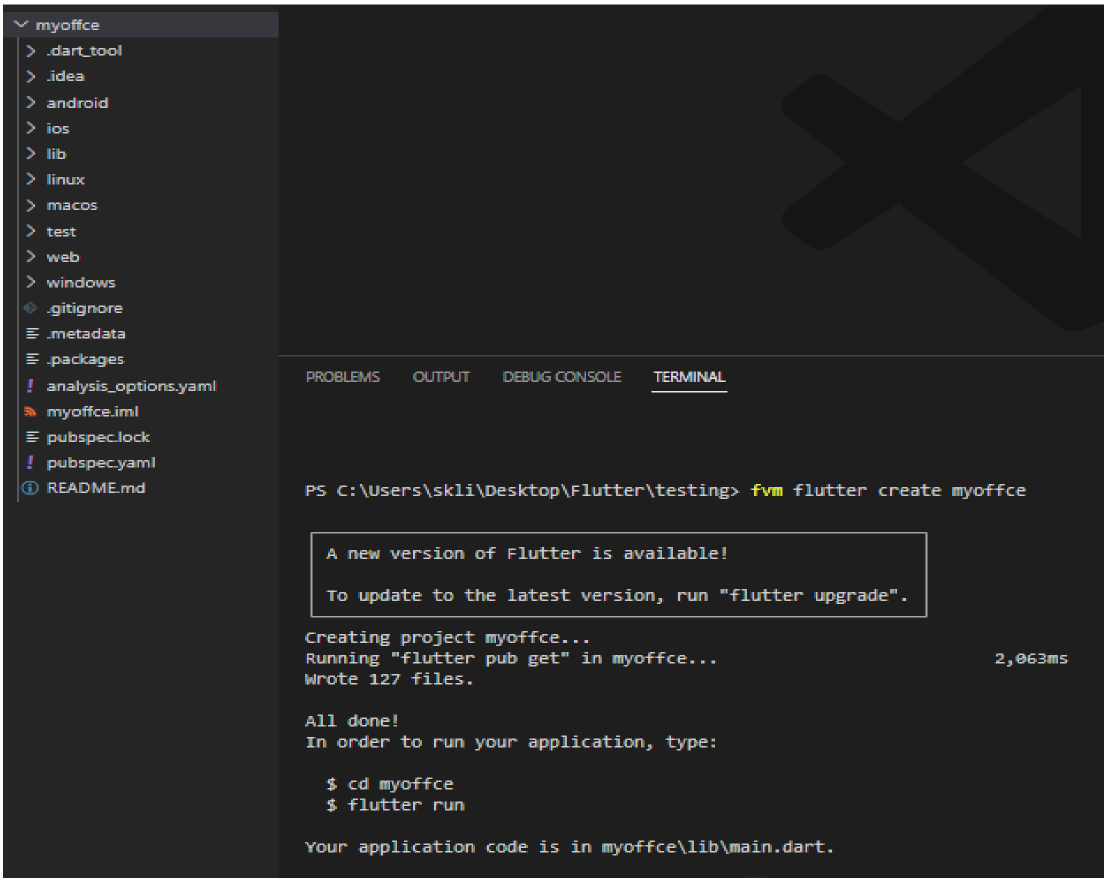

Figure 5.3.1: A Sample of Creating a New Flutter Project.

3. Select your Flutter SDK version using the command: fvm use <*version*>

   For example: fvm use 3.3.7

   Note: Remember run as administrator.

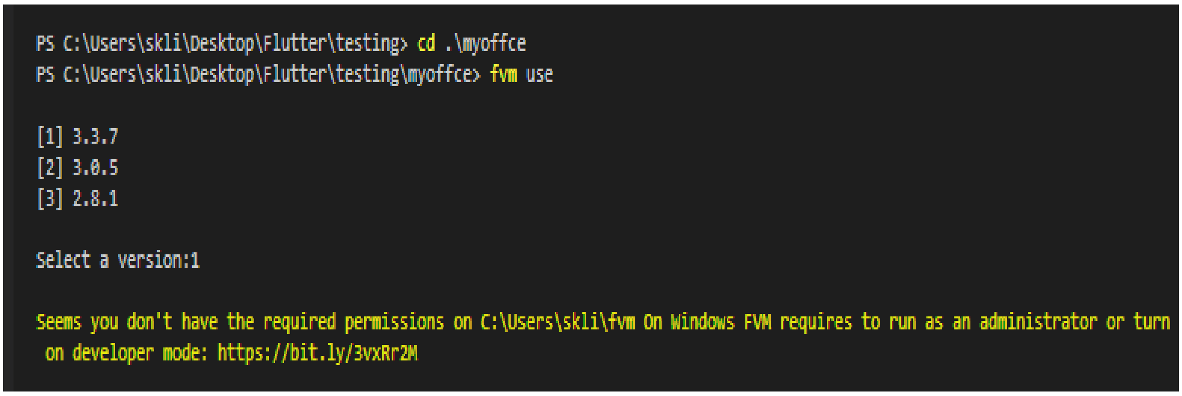

Figure 5.3.2: Select the Flutter SDK version.

4. Start to write code and build the mobile application in the lib folder.

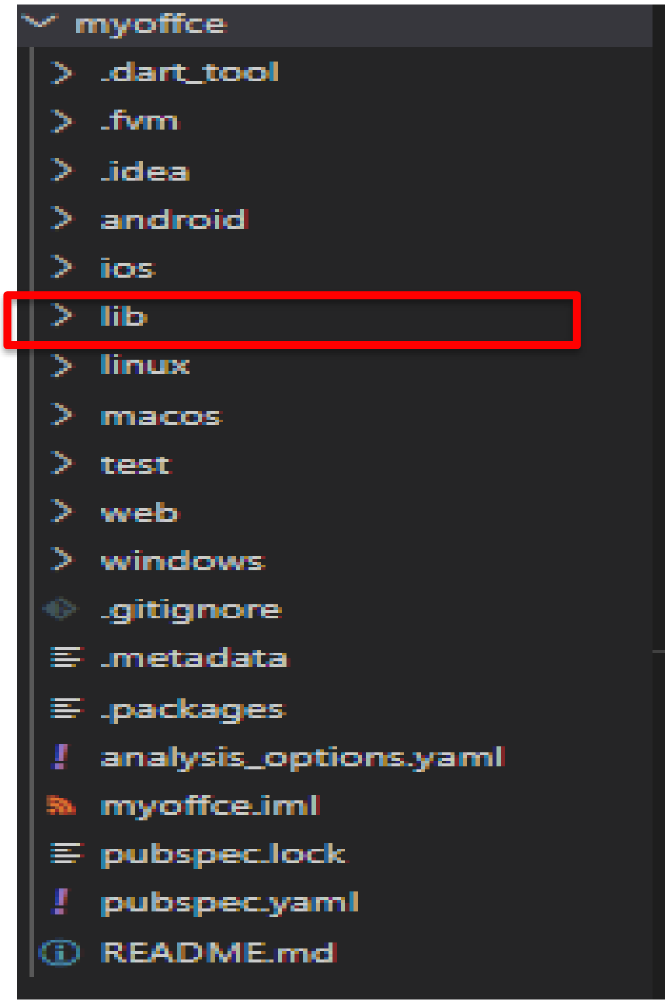

Figure 5.3.3: lib folder of Flutter project.

5. To debug the project in Visual Studio Code using the F5 key, there are two ways:
   i. Using Android Studio emulator, recommended computer with minimum 16GB RAM.

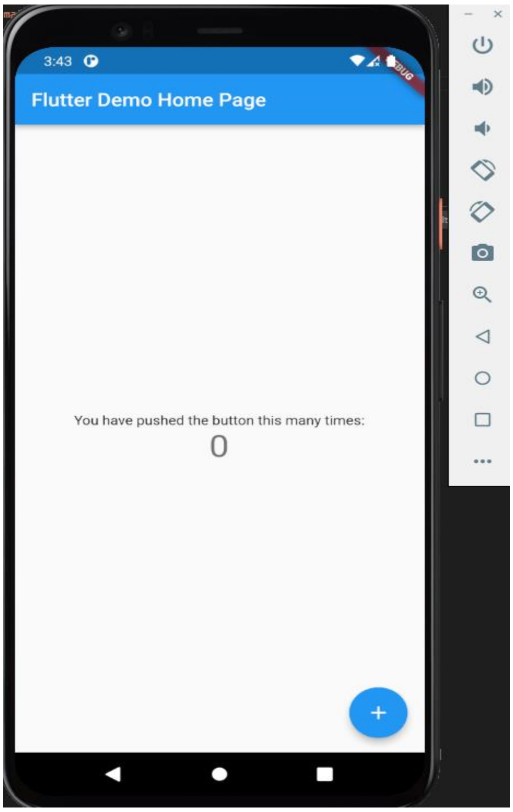

Figure 5.3.4: Default Flutter Application.

   ii. Using a real Android device, recommend a computer with a minimum of 8GB RAM.
      1) Make sure your device is in developer mode, each device's brand has its way to turn on the developer mode.
      2) Connect your device using a cable (recommended) or wireless.
      3) Select transfer file options on your device
      4) Verify your device is connected by looking at the bottom right corner of Visual Studio Code.

Figure 5.3.5: Sample Connected Device.

5.4 System Operation

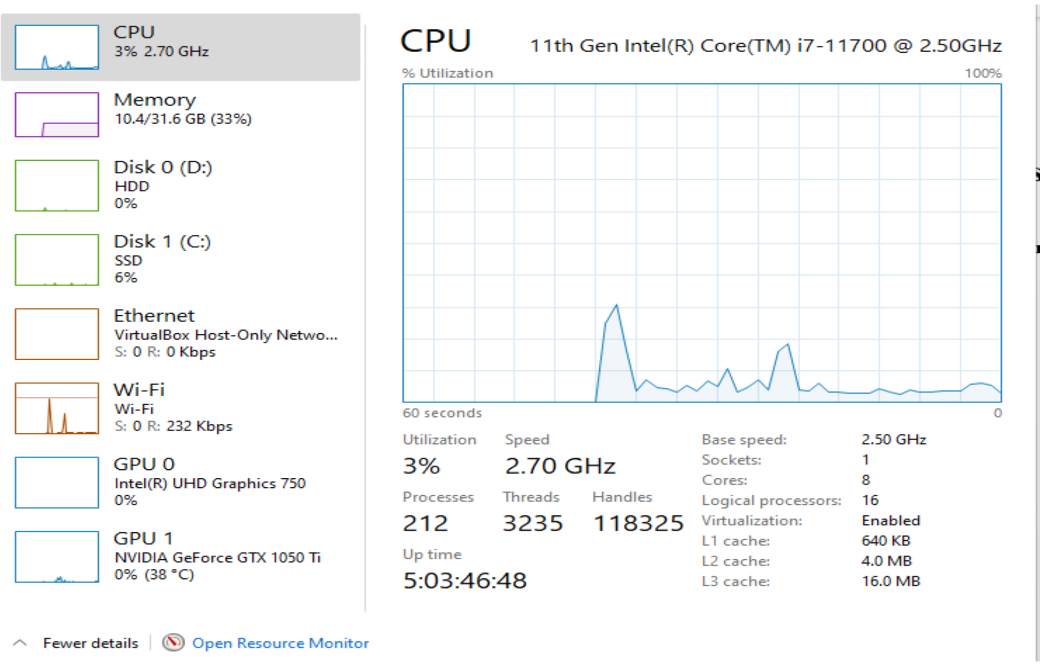

Figure 5.4.1: System Operation for Mobile Application Development.

The system operation shown in Figure 5.4.1 is the system used to develop the "My Office" mobile application.

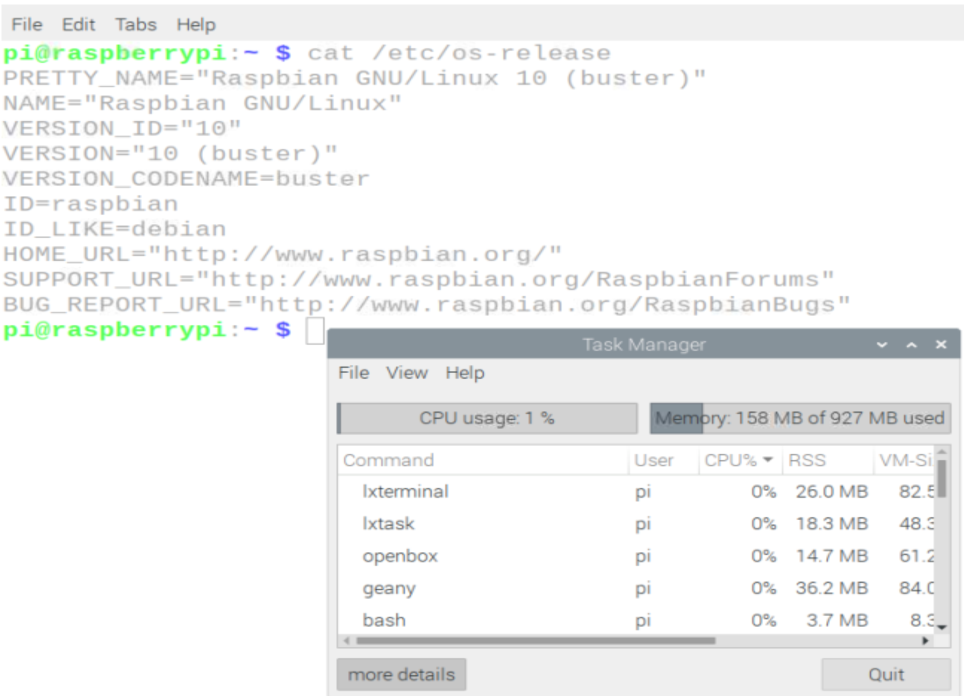

Figure 5.4.2: System Operation for System Functionality and GUI.

The system operation shown in Figure 5.4.2 is the Raspbian OS on both Raspberry Pi which is used to develop system functionality and GUI.

5.5 Implementation Issues and Challenges

There are a lot of issues and challenges faced in completing this project. It is recommended to don't update the Android Studio to the latest version. As many issues will occur when using the latest version of Android Studio in Flutter mobile application development. It will waste a lot of time in finding out the problems or reasons after updating to the latest version and there are fewer resources such as documentation to read on the latest version issue. Besides, the PCB fabrication has some problems and causes the PCB to have some faults. Therefore, it required self-modify by adding wire as shown in Figure 5.5.1.

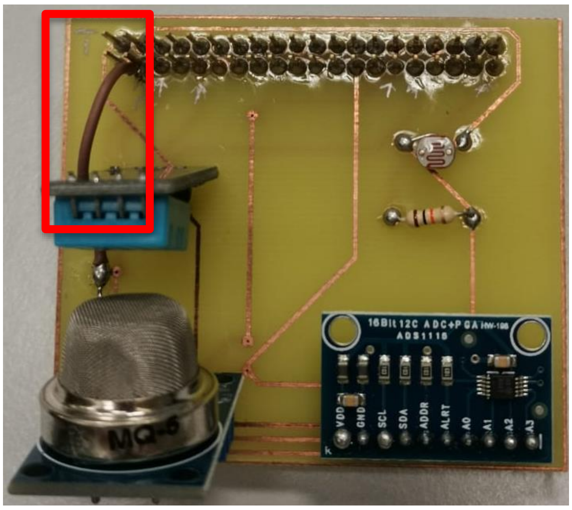

Figure 5.5.1: Self-modified part on the PCB.

5.6 Concluding Remark

However, the Flutter community is very huge. The problems that occur will have a solution and be resolved within a week or even a few days because there is a huge amount of Flutter developers in the world. They always keep updating the problems faced with solutions.

Chapter 6

System Evaluation And Discussion

6.1 System Testing and Performance Metrics

System testing plays an important role in every development project. The system testing of this project is expected to pass all the test cases. Besides, the system should minimize the bugs or even no bugs in the system so that to have a better user experience on the system. Hence, the test case is required to create to test the system functionality/performance including the hardware side and software side.

6.2 Testing Setup and Result

6.2.1 Hardware testing with test case

Component: LCD			
Test Case	Expected Outcome	Actual Outcome	Result
LCD screen functionality	LCD can display without any faults.	LCD can display without any faults as Figure 6.2.1.	Pass

Table 6.2.1: LCD Test Case (Hardware).

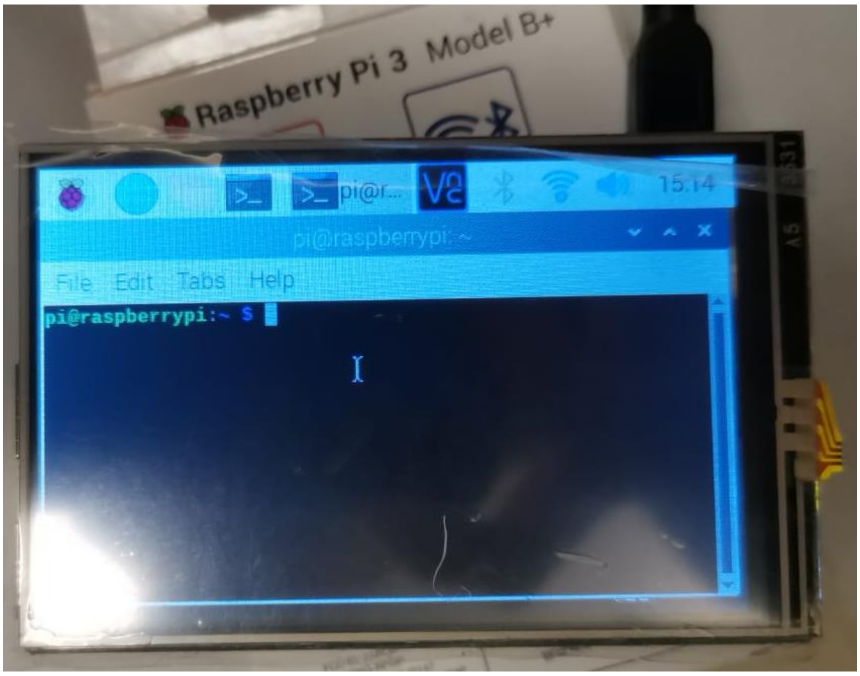

Figure 6.2.1: LCD Actual Output.

The LCD is working after the installation of the package for the LCD. The package is stored in the folder called LCD_show_v6_1_3. For interchange between 3.5inch LCD and monitor, it can make it by the following command:

- To 3.5-inch LCD
  - sudo ./LCD35_v
- To monitor
  - sudo ./LCD_hdmi

The command is used to execute the program to change the screen display either on a 3.5-inch LCD or monitor.

Component: DHT11			
Test Case	Expected Outcome	Actual Outcome	Result
DHT11 functionality	DHT11 can get the reading.	DHT11 can get the reading as Figure 6.2.2.	Pass

Table 6.2.2: DHT11 Test Case.

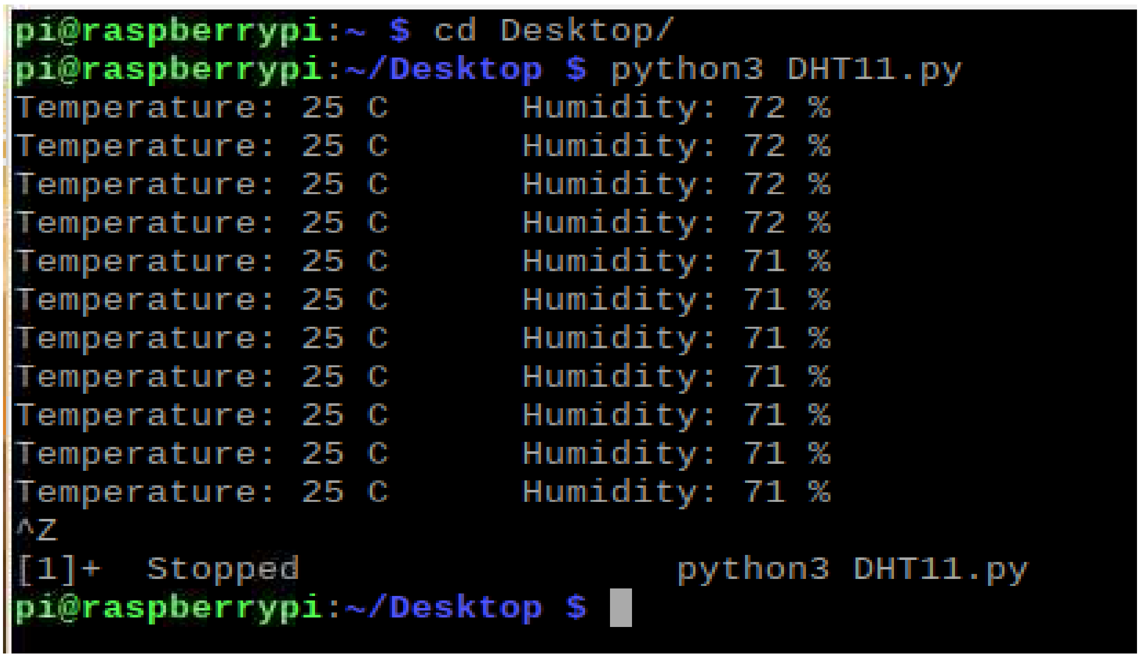

Figure 6.2.2: DHT11 Actual Output.

Component: ADC with MQ-5 and LDR			
Test Case	Expected Outcome	Actual Outcome	Result
MQ-5 functionality	MQ-5 can get the reading.	MQ-5 can get the reading as Figure 6.2.3.	Pass
LDR functionality	LDR can get the reading.	LDR can get the reading as Figure 6.2.3.	Pass

Table 6.2.3: ADC Test Case.

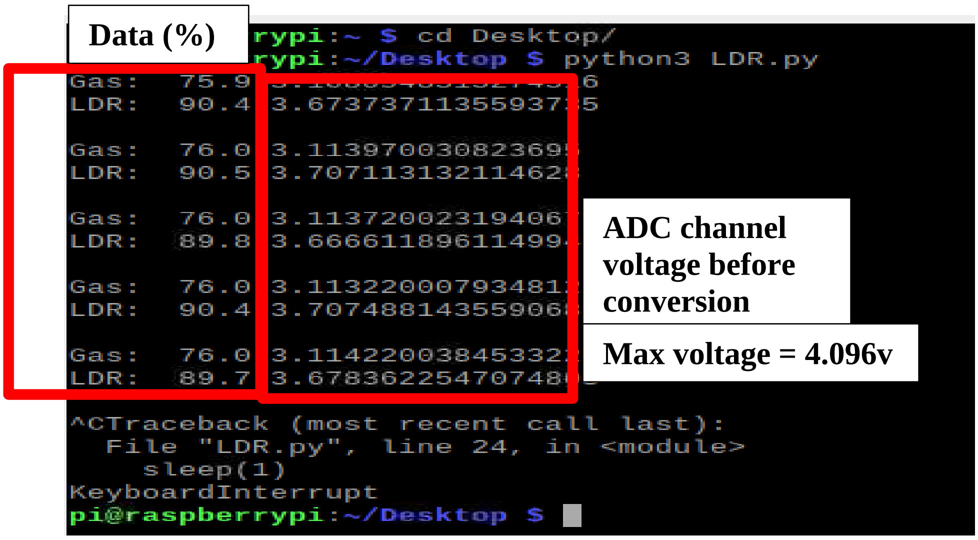

Figure 6.2.3: MQ-5 and LDR Actual Output.

A small program is created and executed to test the library install for the ADC able to work and get the conversion value of LDR and gas sensor. If the ADC can get the sensor's value, this means that the sensor is functioning.

The maximum digital value of the ADC channel is 15 bits (0 - 32767).

LDR Equation: $ADC_{A0(digital)LDR} Value * \frac{100}{32767}$ **(Range of LDR: 0% - 100%)**

MQ5 Equation: $ADC_{A1(digial)_{MQ5}} Value * \frac{100}{32767}$ **(Range of MQ5: 0% - 100%)**

6.2.2 Software testing with test case

Component: Mobile application “My Office”			
Test Case	Expected Outcome	Actual Outcome	Result
Log in	User can log in.	User can log in.	Pass
Sensor’s reading	All sensor reading is responses in Real-Time and is the same as the LCD on Raspberry Pi.	All sensor reading is responses in Real-Time and is the same as the LCD on Raspberry Pi as Figure 6.2.4.	Pass
	Monitor recorded data in the graph by selecting the date on the mobile application.	Monitor recorded data in the graph by selecting the date on the mobile application as Figure 6.2.4.	Pass
Push notifications	When the sensor’s reading reaches a certain threshold, it will push notifications.	When the sensor’s reading reaches a certain threshold, it will push notifications as Figure 6.2.5.	Pass
Run in Background	The mobile application can push notifications even the application is closed.	The mobile application can push notifications even the application is closed.	Pass
Update the status of the lecturer	The lecturer can change his/her status through mobile application.	The lecturer can change his/her status through mobile application.	Pass
Log out	User can log out.	User can log out.	Pass
Change password	User can change his/her password.	User can change his/her password.	Pass

Table 6.2.4: Mobile Application “My Office” Test Case.

Figure 6.2.4: Sensor's Reading Actual Output.

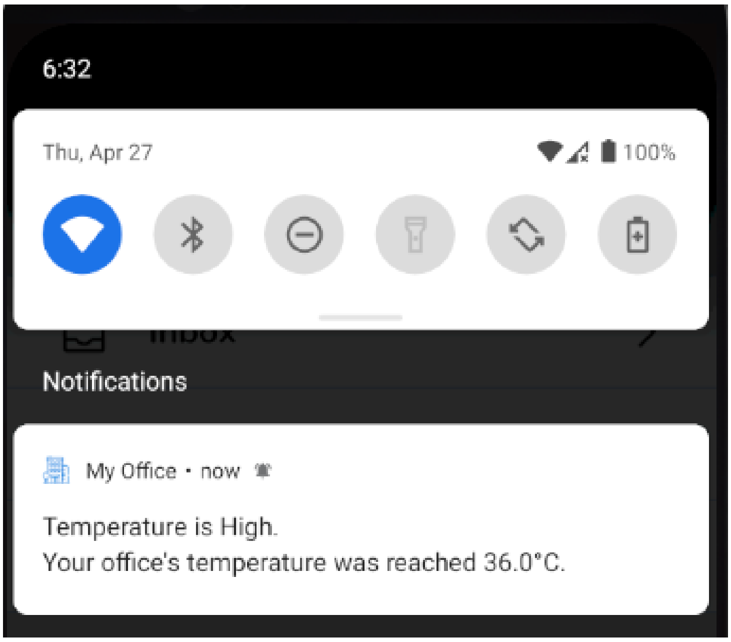

Figure 6.2.5: Push Notification Actual Output.

Component: LCD on Raspberry Pi			
Test Case	Expected Outcome	Actual Outcome	Result
Sensor’s reading	All sensor reading is responses in Real-Time and is the same as the mobile application.	All sensor reading is responses in Real-Time and is the same as the mobile application.	Pass
Lecturer’s status	Lecturer can change his/her status through the mobile application and display on the LCD in Real-Time.	Lecturer can change his/her status through the mobile application and display on the LCD in Real-Time.	Pass

Table 6.2.5: LCD Test Case (Software).

6.3 Project Challenges

Firstly, the mobile application has the functionality of “Run in background” which allows the user to monitor his/her office even if the mobile application is closed. This functionality required the knowledge on understanding the device behaviour (Android or IOS) such as its version and its OS used. Besides, the Firebase Real-Time database is used in this project which has a limited quota. Therefore, it is required to keep monitoring the quota used for this project. Furthermore, it is quite challenging when debugging the project. This is because it is required to always switch the programming languages (Python and Dart) to fix the bugs that have been found. Both programming languages have different on its syntax and coding methods. Moreover, it is required to spend time understanding each of the Dart packages (library) used. The reason is because some of the documentation is outdated, or the guideline provided is not clear.

6.4 Objectives Evaluation

The system can:

1. Display the sensor's reading that is collected on the LCD of the Raspberry Pi and the mobile application.
2. The lecturer can leave a message using the mobile application and show it on the LCD of Raspberry Pi.
3. When the sensor's reading reaches a certain threshold, the lecturer can get the notifications through the mobile application.

Hence, the objective of this project is achieved which is to develop an IoT solution which able to assist the lecturer in monitoring the office.

6.5 Concluding Remark

Although many challenges were faced in completing this system, all the challenges have been handled well. Besides, the objectives are achieved, and all the test cases including hardware and software are passed. Hence, the system is completed.

Chapter 7
Conclusion And Recommendation

7.1 Conclusion

This project is developed to help the lecturer to monitor his/her room ambient when he/she is inside or outside the room. The purpose of developing this system is to make sure the lecturer is working in a safe office. In other words, workplace safety is guaranteed for the lecturer is very important to ensure the lecturer does not fall sick and can concentrate on the job of delivering knowledge to the students. Besides, the system is fully automated, and the lecturer does not require to give any instructions to run the system. Moreover, this project developed a mobile application for the lecturer to monitor the office and change his/her status when he/she is leaving the room. The lecturer can use his/her smartphone to monitor the office and configure the system. The mobile application can support Android and IOS users. Hence, it will not cause any problems for Android fans and IOS fans. Furthermore, the user is also able to receive an alert notification from the system if the room is not safe to stay in or work in whether the user is inside or outside the room. This alert notification is automatically generated when the room ambient reaches a certain condition.

7.2 Recommendation

Although this project is completed, but every project is not perfect. Therefore, this project can be further improved in the future. For example, create a more user-friendly or better user experience for the mobile application. Besides, the GUI on the LCD also can be further improved. Moreover, the system can add a buzzer so that when the sensor's reading reaches the threshold, it will alert the lecturer through the buzzer if the lecturer's smartphone is in silent mode. This project also can be improved by using one Raspberry Pi only instead of two Raspberry Pi which helps to reduce the cost of the system.

REFERENCES

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[3] M. Uppal, D. Gupta, S. Juneja, G. Dhiman and S. Kautish. “Cloud-Based Fault Prediction Using IoT in Office Automation for Improvisation of Health of Employees.” researchgate.net. https://www.researchgate.net/publication/355905226_Cloud-Based_Fault_Prediction_Using_IoT_in_Office_Automation_for_Improvisation_of_Health_of_Employees (accessed Apr. 25, 2023).

[4] T. F. Prasetyo, D. Zaliluddin and M. Iqbal. “Prototype of smart office system using based security system.” iopscience.iop.org. https://iopscience.iop.org/article/10.1088/1742-6596/1013/1/012189/pdf (accessed Apr. 25, 2023).

APPENDIX

A.1.1 MQ5 Data Sheet

HANWEI ELECTRONICS CO.,LTD MQ-5 http://www.hwsensor.com

TECHNICAL DATA MQ-5 GAS SENSOR

FEATURES

* High sensitivity to LPG, natural gas , town gas
* Small sensitivity to alcohol, smoke.
* Fast response . * Stable and long life * Simple drive circuit

APPLICATION

They are used in gas leakage detecting equipments in family and industry, are suitable for detecting of LPG, natural gas , town gas, avoid the noise of alcohol and cooking fumes and cigarette smoke.

SPECIFICATIONS

A. Standard work condition

Symbol	Parameter name	Technical condition	Remarks
Vc	Circuit voltage	5V±0.1	AC OR DC
V_H	Heating voltage	5V±0.1	ACOR DC
P_L	Load resistance	20KΩ	
R_H	Heater resistance	31±10%	Room Tem
P_H	Heating consumption	less than 800mw	

B. Environment condition

Symbol	Parameter name	Technical condition	Remarks
Tao	Using Tem	-10℃-50℃	
Tas	Storage Tem	-20℃-70℃	
R_H	Related humidity	less than 95%Rh	
O_2	Oxygen concentration	21%(standard condition)Oxygen concentration can affect sensitivity	minimum value is over 2%

C. Sensitivity characteristic

Symbol	Parameter name	Technical parameter	Remarks
Rs	Sensing Resistance	10KΩ - 60KΩ (5000ppm methane)	Detecting concentration scope: 200-10000ppm LPG,LNG Natural gas, iso-butane, propane Town gas
α (5000ppm/1000 ppm CH_4)	Concentration slope rate	≤0.6	
Standard detecting condition	Temp: 20℃±2℃ Vc:5V±0.1 Humidity: 65%±5% Vh: 5V±0.1		
Preheat time	Over 24 hour		

D. Strucyure and configuration, basic measuring circuit

	Parts	Materials
1	Gas sensing layer	SnO_2
2	Electrode	Au
3	Electrode line	Pt
4	Heater coil	Ni-Cr alloy
5	Tubular ceramic	Al_2O_3
6	Anti-explosion network	Stainless steel gauze (SUS316 100-mesh)
7	Clamp ring	Copper plating Ni
8	Resin base	Bakelite
9	Tube Pin	Copper plating Ni

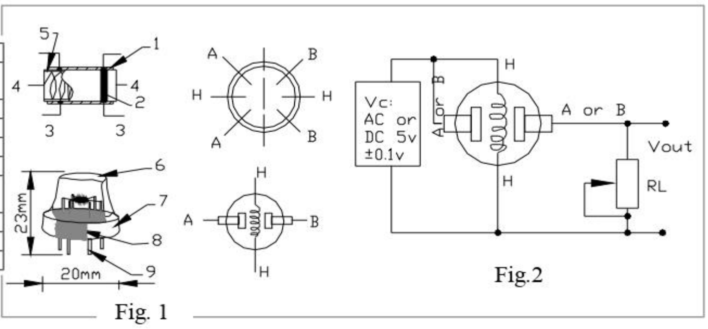
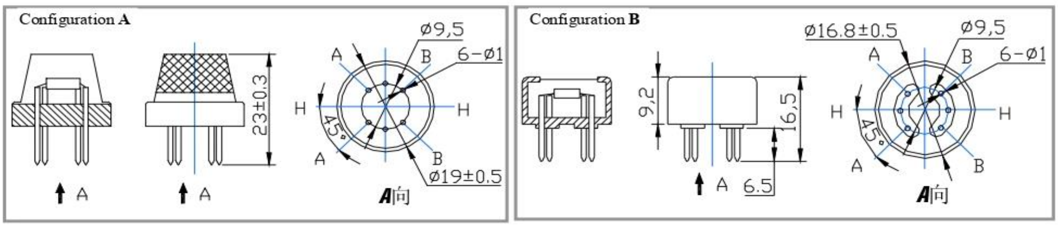


Fig. 1 Fig.2



Structure and configuration of MQ-5 gas sensor is shown as Fig. 1 (Configuration A or B), sensor composed by

TEL: 86-371- 67169070 67169080 FAX: 86-371-67169090 E-mail: sales@hwsensor.com micro AL_2O_3 ceramic tube, Tin Dioxide (SnO_2) sensitive layer, measuring electrode and heater are fixed into a crust made by plastic and stainless steel net. The heater provides necessary work conditions for work of sensitive components. The enveloped MQ-5 have 6 pin ,4 of them are used to fetch signals, and other 2 are used for providing heating current.

Electric parameter measurement circuit is shown as Fig.2

E. Sensitivity characteristic curve

Fig.2 sensitivity characteristics of the MQ-5

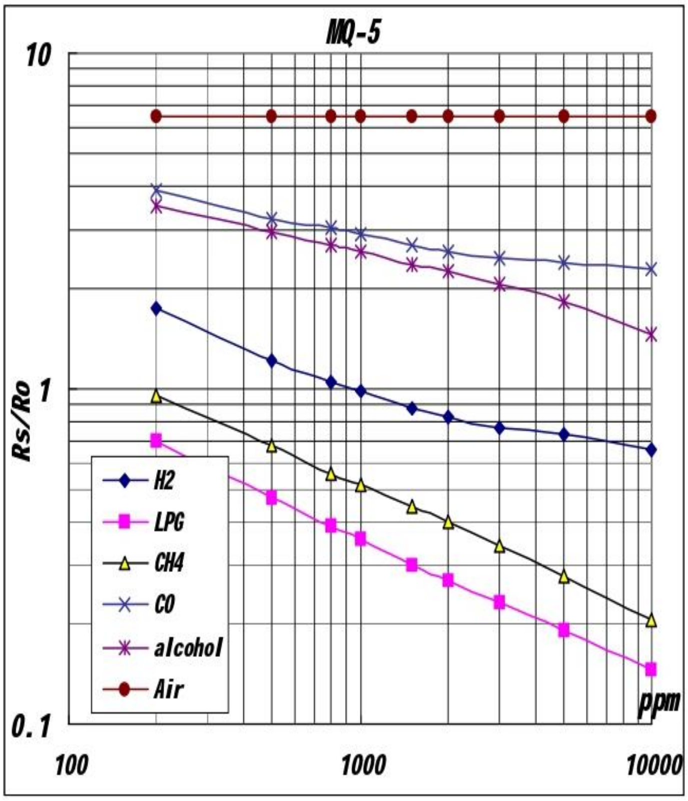


Fig.3 is shows the typical sensitivity characteristics of the MQ-5 for several gases.

in their: Temp: 20℃、

Humidity: 65%、

O_2 concentration 21%

RL=20kΩ

Ro: sensor resistance at 1000ppm of H_2 in the clean air.

Rs:sensor resistance at various concentrations of gases.

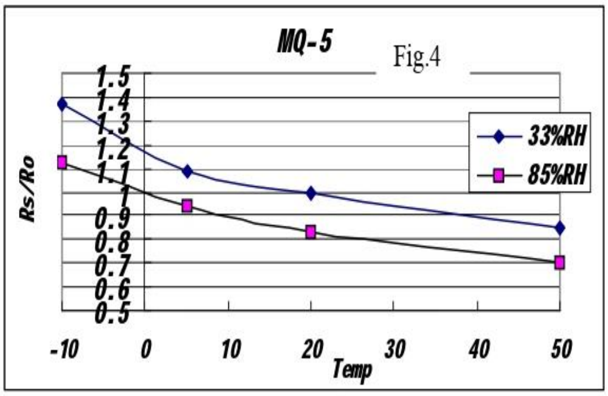


Fig.4 is shows the typical dependence of the MQ-5 on temperature and humidity.

Ro: sensor resistance at 1000ppm of H_2 in air at 33%RH and 20 degree.

Rs: sensor resistance at different temperatures and humidities.

SENSITVITY ADJUSTMENT

Resistance value of MQ-5 is difference to various kinds and various concentration gases. So, When using this components, sensitivity adjustment is very necessary. we recommend that you calibrate the detector for 1000ppm H_2 or LPG concentration in air and use value of Load resistance (R_L) about 20 KΩ (10KΩ to 47KΩ).

When accurately measuring, the proper alarm point for the gas detector should be determined after considering the temperature and humidity influence.

A.1.2 LDR Data Sheet

Data pack F *Issued March 1997* **232-3816**

Data Sheet

Light dependent resistors

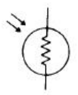
NORP12 RS stock number 651-507
NSL19-M51 RS stock number 596-141

Two cadmium sulphide (cdS) photoconductive cells with spectral responses similar to that of the human eye. The cell resistance falls with increasing light intensity. Applications include smoke detection, automatic lighting control, batch counting and burglar alarm systems.

Guide to source illuminations

Light source	Illumination (Lux)
Moonlight	0.1
60W bulb at 1m	50
1W MES bulb at 0.1m	100
Fluorescent lighting	500
Bright sunlight	30,000

Circuit symbol



Light memory characteristics

Light dependent resistors have a particular property in that they remember the lighting conditions in which they have been stored. This memory effect can be minimised by storing the LDRs in light prior to use. Light storage reduces equilibrium time to reach steady resistance values.

NORP12 (RS stock no. 651-507)

Absolute maximum ratings

Voltage, ac or dc peak	320V
Current	75mA
Power dissipation at 30°C	250mW
Operating temperature range	-60°C to +75°C

Electrical characteristics

T_A = 25°C. 2854°K tungsten light source

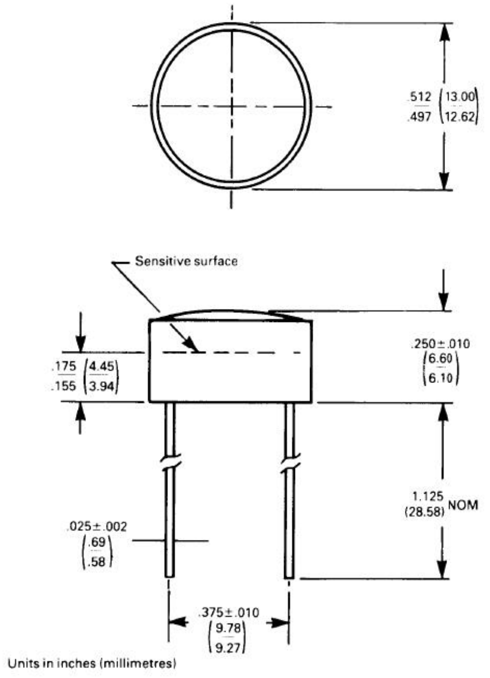
Parameter	Conditions	Min.	Typ.	Max.	Units
Cell resistance	1000 lux 10 lux	- -	400 9	- -	Ω kΩ
Dark resistance	-	1.0	-	-	MΩ
Dark capacitance	-	-	3.5	-	pF
Rise time 1	1000 lux 10 lux	- -	2.8 18	- -	ms ms
Fall time 2	1000 lux 10 lux	- -	48 120	- -	ms ms

1. Dark to 110% R_L
2. To 10 × R_L
R_L = photocell resistance under given illumination.

Features

- Wide spectral response
- Low cost
- Wide ambient temperature range.

Dimensions



232-3816

Absolute maximum ratings

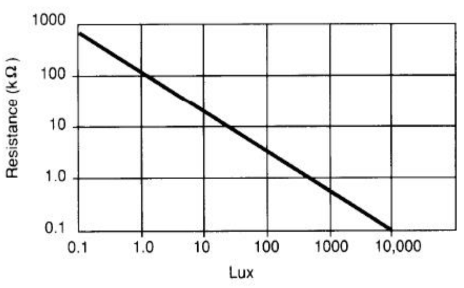
Voltage, ac or dc peak ____ 100V
Current ____ 5mA
Power dissipation at 25°C ____ 50mW*
Operating temperature range ____ -25°C +75°C

*Derate linearly from 50mW at 25°C to 0W at 75°C.

Electrical characteristics

Parameter	Conditions	Min.	Typ.	Max.	Units
Cell resistance	10 lux 100 lux	20 -	- 5	100 -	kΩ kΩ
Dark resistance	10 lux after 10 sec	20	-	-	MΩ
Spectral response	-	-	550	-	nm
Rise time	10ftc	-	45	-	ms
Fall time	10ftc	-	55	-	ms

Figure 4 Resistance as a function illumination



Dimensions

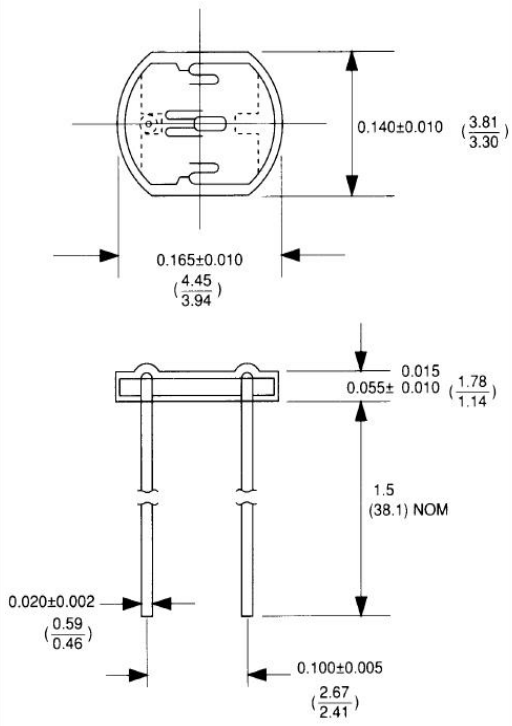
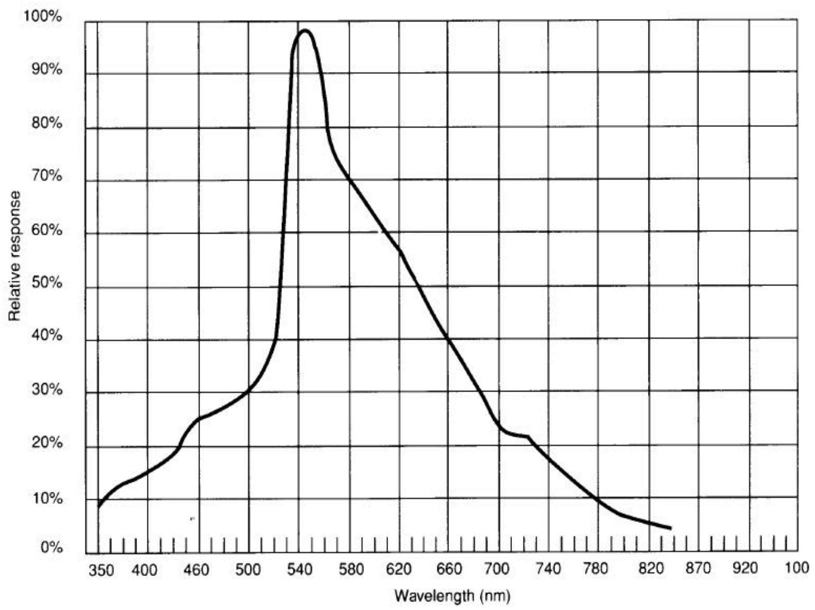
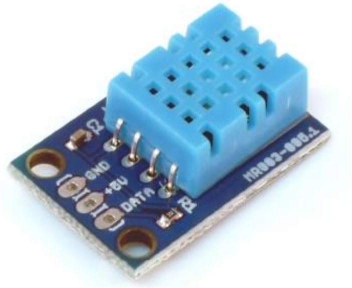


Figure 5 Spectral response



A.1.3 DHT11 Data Sheet



Name: **DHT11 Humidity and Temperature Digital Sensor**
Code: **MR003-005.1**

This board is a breakout board for the DHT11 sensor and gives a digital output that is proportional to temperature and humidity measured by the sensor. Technology used to produce the DHT11 sensor grants high reliability, excellent long-term stability and very fast response time.

Each DHT11 element is accurately calibrated in the laboratory. Calibration coefficient is stored in the internal OTP memory and this value is used by the sensor's internal signal detecting process.

The single-wire serial interface makes the integration of this sensor in digital system quick and easy.

Sensor physical interfacing is realized through a 0.1" pitch 3-pin connector: +5V, GND and DATA. First two pins are power supply and ground and they are used to power the sensor, the third one is the sensor digital output signal.

Its small physical size (1.05"x0.7") and its very light weight (just 0.1oz) make this board an ideal choice to implementing small robots and ambient monitoring systems.

CONNECTIONS

DATA	Serial data output
GND	Ground
+5V	Power supply (+5V)

Tab.1 – Connections

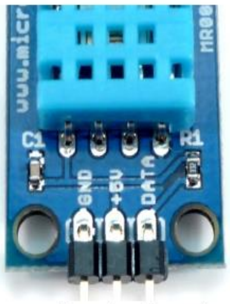


Fig. 1 - Signals

CHARACTERISTICS

Supply voltage	+5V
Supply current (running)	0.5mA typ. (2.5mA max.)
Supply current (stand-by)	100uA typ. (150uA max.)
Temperature range	0 / +50°C ±2°C
Humidity range	20-90%RH ±5%RH
Interface	Digital
Dimensions	1.05" x 0.7" (connectors excluded)
Weight	0.1 oz (2.7g)

Tab.2 - Characteristics

SENSOR UTILIZATION

The single-wire bus needs a 5Kohm pull-up resistor and the connection with the system is realized as showed in Fig.2.

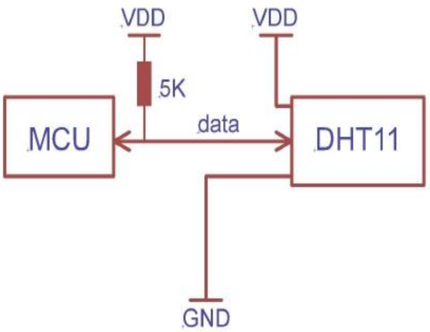


Fig. 2 - System

A.1.4 ADS1115 Data Sheet

TEXAS INSTRUMENTS

ADS1113
ADS1114
ADS1115

www.ti.com SBAS444B – MAY 2009 – REVISED OCTOBER 2009

Ultra-Small, Low-Power, 16-Bit Analog-to-Digital Converter with Internal Reference

Check for Samples: ADS1113 ADS1114 ADS1115

FEATURES

- **ULTRA-SMALL QFN PACKAGE: 2mm × 1,5mm × 0,4mm**
- **WIDE SUPPLY RANGE: 2.0V to 5.5V**
- **LOW CURRENT CONSUMPTION: Continuous Mode: Only 150µA Single-Shot Mode: Auto Shut-Down**
- **PROGRAMMABLE DATA RATE: 8SPS to 860SPS**
- **INTERNAL LOW-DRIFT VOLTAGE REFERENCE**
- **INTERNAL OSCILLATOR**
- **INTERNAL PGA**
- **I²C™ INTERFACE: Pin-Selectable Addresses**
- **FOUR SINGLE-ENDED OR TWO DIFFERENTIAL INPUTS (ADS1115)**
- **PROGRAMMABLE COMPARATOR (ADS1114 and ADS1115)**

APPLICATIONS

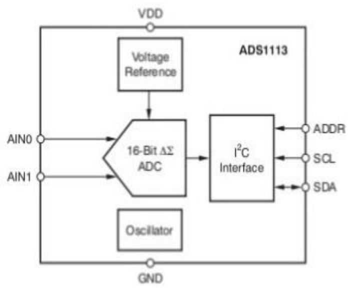
- **PORTABLE INSTRUMENTATION**
- **CONSUMER GOODS**
- **BATTERY MONITORING**
- **TEMPERATURE MEASUREMENT**
- **FACTORY AUTOMATION AND PROCESS CONTROLS**

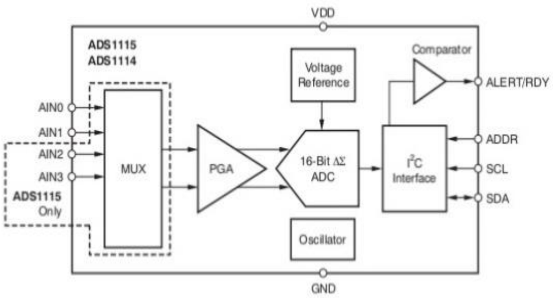
DESCRIPTION

The ADS1113, ADS1114, and ADS1115 are precision analog-to-digital converters (ADCs) with 16 bits of resolution offered in an ultra-small, leadless QFN-10 package or an MSOP-10 package. The ADS1113/4/5 are designed with precision, power, and ease of implementation in mind. The ADS1113/4/5 feature an onboard reference and oscillator. Data are transferred via an I²C-compatible serial interface; four I²C slave addresses can be selected. The ADS1113/4/5 operate from a single power supply ranging from 2.0V to 5.5V.

The ADS1113/4/5 can perform conversions at rates up to 860 samples per second (SPS). An onboard PGA is available on the ADS1114 and ADS1115 that offers input ranges from the supply to as low as ±256mV, allowing both large and small signals to be measured with high resolution. The ADS1115 also features an input multiplexer (MUX) that provides two differential or four single-ended inputs.

The ADS1113/4/5 operate either in continuous conversion mode or a single-shot mode that automatically powers down after a conversion and greatly reduces current consumption during idle periods. The ADS1113/4/5 are specified from –40°C to +125°C.





Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

ORDERING INFORMATION

For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at www.ti.com.

ABSOLUTE MAXIMUM RATINGS(1)

	ADS1113, ADS1114, ADS1115	UNIT
VDD to GND	–0.3 to +5.5	V
Analog input current	100, momentary	mA
Analog input current	10, continuous	mA
Analog input voltage to GND	–0.3 to VDD + 0.3	V
SDA, SCL, ADDR, ALERT/RDY voltage to GND	–0.5 to +5.5	V
Maximum junction temperature	+150	°C
Storage temperature range	–60 to +150	°C

(1) Stresses above those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. Exposure to absolute maximum conditions for extended periods may affect device reliability.

PRODUCT FAMILY

DEVICE	PACKAGE DESIGNATOR MSOP/QFN	RESOLUTION (Bits)	MAXIMUM SAMPLE RATE (SPS)	COMPARATOR	PGA	INPUT CHANNELS (Differential/ Single-Ended)
ADS1113	BROI/N6J	16	860	No	No	1/1
ADS1114	BRNI/N5J	16	860	Yes	Yes	1/1
ADS1115	BOGI/N4J	16	860	Yes	Yes	2/4
ADS1013	BRMI/N9J	12	3300	No	No	1/1
ADS1014	BRQI/N8J	12	3300	Yes	Yes	1/1
ADS1015	BRPI/N7J	12	3300	Yes	Yes	2/4

ELECTRICAL CHARACTERISTICS

All specifications at –40°C to +125°C, VDD = 3.3V, and Full-Scale (FS) = ±2.048V, unless otherwise noted.
Typical values are at +25°C.

PARAMETER	TEST CONDITIONS	ADS1113, ADS1114, ADS1115 MIN	TYP	MAX	UNIT
ANALOG INPUT					
Full-scale input voltage(1)	V_{IN} = (AIN_P) – (AIN_N)		±4.096/PGA		V
Analog input voltage	AIN_P or AIN_N to GND	GND		VDD	V
Differential input impedance			See Table 2		
Common-mode input impedance	FS = ±6.144V(1)		10		MΩ
	FS = ±4.096V(1), ±2.048V		6		MΩ
	FS = ±1.024V		3		MΩ
	FS = ±0.512V, ±0.256V		100		MΩ
SYSTEM PERFORMANCE					
Resolution	No missing codes	16			Bits
Data rate (DR)			8, 16, 32, 64, 128, 250, 475, 860		SPS
Data rate variation	All data rates	–10		10	%
Output noise			See Typical Characteristics		
Integral nonlinearity	DR = 8SPS, FS = ±2.048V, best fit(2)			1	LSB
Offset error	FS = ±2.048V, differential inputs		±1	±3	LSB
	FS = ±2.048V, single-ended inputs		±3		LSB
Offset drift	FS = ±2.048V		0.005		LSB/°C
Offset power-supply rejection	FS = ±2.048V		1		LSB/V
Gain error(3)	FS = ±2.048V at 25°C		0.01	0.15	%
Gain drift(3)	FS = ±0.256V		7		ppm/°C
	FS = ±2.048V		5	40	ppm/°C
	FS = ±6.144V(1)		5		ppm/°C
Gain power-supply rejection			80		ppm/V
PGA gain match(3)	Match between any two PGA gains		0.02	0.1	%
Gain match	Match between any two inputs		0.05	0.1	%
Offset match	Match between any two inputs		3		LSB
Common-mode rejection	At dc and FS = ±0.256V		105		dB
	At dc and FS = ±2.048V		100		dB
	At dc and FS = ±6.144V(1)		90		dB
	f_{CM} = 60Hz, DR = 8SPS		105		dB
	f_{CM} = 50Hz, DR = 8SPS		105		dB
DIGITAL INPUT/OUTPUT					
Logic level					
V_{IH}		0.7VDD		5.5	V
V_{IL}		GND – 0.5		0.3VDD	V
V_{OL}	I_{OL} = 3mA	GND	0.15	0.4	V
Input leakage					
I_H	V_{IH} = 5.5V			10	µA
I_L	V_{IL} = GND	10			µA

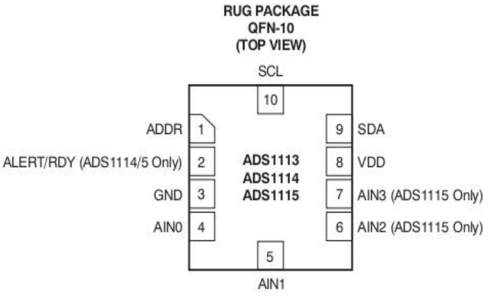
(1) This parameter expresses the full-scale range of the ADC scaling. In no event should more than VDD + 0.3V be applied to this device.
(2) 99% of full-scale.
(3) Includes all errors from onboard PGA and reference.

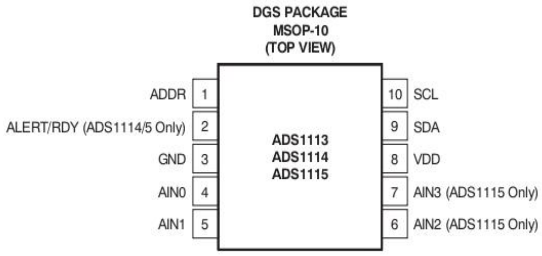
ELECTRICAL CHARACTERISTICS (continued)

All specifications at –40°C to +125°C, VDD = 3.3V, and Full-Scale (FS) = ±2.048V, unless otherwise noted.
Typical values are at +25°C.

PARAMETER	TEST CONDITIONS	ADS1113, ADS1114, ADS1115 MIN	TYP	MAX	UNIT
POWER-SUPPLY REQUIREMENTS					
Power-supply voltage		2		5.5	V
Supply current	Power-down current at 25°C		0.5	2	μA
	Power-down current up to 125°C			5	μA
	Operating current at 25°C		150	200	μA
	Operating current up to 125°C			300	μA
Power dissipation	VDD = 5.0V		0.9		mW
	VDD = 3.3V		0.5		mW
	VDD = 2.0V		0.3		mW
TEMPERATURE					
Storage temperature		–60		+150	°C
Specified temperature		–40		+125	°C

PIN CONFIGURATIONS





PIN DESCRIPTIONS

PIN #	DEVICE ADS1113	ADS1114	ADS1115	ANALOG/ DIGITAL INPUT/ OUTPUT	DESCRIPTION
1	ADDR	ADDR	ADDR	Digital Input	I^2C slave address select
2	NC (1)	ALERT/RDY	ALERT/RDY	Digital Output	Digital comparator output or conversion ready (NC for ADS1113)
3	GND	GND	GND	Analog	Ground
4	AIN0	AIN0	AIN0	Analog Input	Differential channel 1: Positive input or single-ended channel 1 input
5	AIN1	AIN1	AIN1	Analog Input	Differential channel 1: Negative input or single-ended channel 2 input
6	NC	NC	AIN2	Analog Input	Differential channel 2: Positive input or single-ended channel 3 input (NC for ADS1113/4)
7	NC	NC	AIN3	Analog Input	Differential channel 2: Negative input or single-ended channel 4 input (NC for ADS1113/4)
8	VDD	VDD	VDD	Analog	Power supply: 2.0V to 5.5V
9	SDA	SDA	SDA	Digital I/O	Serial data: Transmits and receives data
10	SCL	SCL	SCL	Digital Input	Serial clock input: Clocks data on SDA

(1) NC pins may be left floating or tied to ground.

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3T3	**Study week no.: 1**
Student Name & ID: See King Li, 19ACB03614	
Supervisor: Teoh Shen Khang	
Project Title: IoT Office Assistant System	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

The mobile application setup such as mobile application's name and design the application logo. Write down the pages that required to build. Login page is completed.

2. WORK TO BE DONE

Continue the mobile development.

3. PROBLEMS ENCOUNTERED

So far so good.

4. SELF EVALUATION OF THE PROGRESS

So far so good.

TEOH
Supervisor's signature

King
Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3T3	**Study week no.: 2**
Student Name & ID: See King Li, 19ACB03614	
Supervisor: Teoh Shen Khang	
Project Title: IoT Office Assistant System	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

Dashboard widget with bottom navigator and app bar is completed and ready to integrate to the pages (Home, Status, Statistics, Settings).

2. WORK TO BE DONE

Create Home page, Status page, Statistics page, and Settings page.

3. PROBLEMS ENCOUNTERED

So far so good.

4. SELF EVALUATION OF THE PROGRESS

So far so good.

TEOH

Supervisor's signature

King

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3T3	**Study week no.: 3**
Student Name & ID: See King Li, 19ACB03614	
Supervisor: Teoh Shen Khang	
Project Title: IoT Office Assistant System	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

Home page, Status page and Statistics page are completed, and dummy data is used for testing.

2. WORK TO BE DONE

Research on Firebase Real-Time database and use ii for Raspberry Pi to upload data and mobile application listen to the data changes.

3. PROBLEMS ENCOUNTERED

So far so good.

4. SELF EVALUATION OF THE PROGRESS

So far so good.

TEOH

Supervisor's signature

King

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3T3	**Study week no.: 4**
Student Name & ID: See King Li, 19ACB03614	
Supervisor: Teoh Shen Khang	
Project Title: IoT Office Assistant System	

1. WORK DONE [Please write the details of the work done in the last fortnight.] Setup Firebase Real-Time database on Raspberry Pi and mobile application.
2. WORK TO BE DONE Raspberry Pi processes the data then upload to Firebase.
3. PROBLEMS ENCOUNTERED So far so good.
4. SELF EVALUATION OF THE PROGRESS So far so good.

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Supervisor's signature

King
Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3T3	**Study week no.: 5**
Student Name & ID: See King Li, 19ACB03614	
Supervisor: Teoh Shen Khang	
Project Title: IoT Office Assistant System	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

Add a lots of logic for data processing before upload to Firebase on Raspberry Pi. Mobile application can read the data on Firebase.

2. WORK TO BE DONE

Setting page for mobile application.

3. PROBLEMS ENCOUNTERED

So far so good.

4. SELF EVALUATION OF THE PROGRESS

So far so good.

TEOH

Supervisor's signature

King

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3T3	**Study week no.: 6**
Student Name & ID: See King Li, 19ACB03614	
Supervisor: Teoh Shen Khang	
Project Title: IoT Office Assistant System	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

User interface for setting page is completed.

2. WORK TO BE DONE

Continue development for setting page.

3. PROBLEMS ENCOUNTERED

So far so good.

4. SELF EVALUATION OF THE PROGRESS

So far so good.

TEOH

Supervisor's signature

King

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT
(Project II)

Trimester, Year: Y3T3	**Study week no.: 7**
Student Name & ID: See King Li, 19ACB03614	
Supervisor: Teoh Shen Khang	
Project Title: IoT Office Assistant System	

1. WORK DONE
[Please write the details of the work done in the last fortnight.]

Push notification is completed and its work perfectly.

2. WORK TO BE DONE

Continue development for setting page.

3. PROBLEMS ENCOUNTERED

So far so good.

4. SELF EVALUATION OF THE PROGRESS

So far so good.

TEOH
Supervisor's signature

King
Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3T3	**Study week no.: 8**
Student Name & ID: See King Li, 19ACB03614	
Supervisor: Teoh Shen Khang	
Project Title: IoT Office Assistant System	

1. WORK DONE
[Please write the details of the work done in the last fortnight.]

Select the suitable Dart package (library) to use for the mobile application to run in background.

2. WORK TO BE DONE

Continue development for setting page.

3. PROBLEMS ENCOUNTERED

So far so good.

4. SELF EVALUATION OF THE PROGRESS

So far so good.

TEOH
Supervisor's signature

King
Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3T3	**Study week no.: 9**
Student Name & ID: See King Li, 19ACB03614	
Supervisor: Teoh Shen Khang	
Project Title: IoT Office Assistant System	

1. WORK DONE
[Please write the details of the work done in the last fortnight.]

Debugging the background service.

2. WORK TO BE DONE

Continue development for setting page.

3. PROBLEMS ENCOUNTERED

So far so good.

4. SELF EVALUATION OF THE PROGRESS

So far so good.

TEOH
Supervisor's signature

King
Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3T3	**Study week no.: 10**
Student Name & ID: See King Li, 19ACB03614	
Supervisor: Teoh Shen Khang	
Project Title: IoT Office Assistant System	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

Mobile application is completed.

2. WORK TO BE DONE

Mobile application page by page testing.

3. PROBLEMS ENCOUNTERED

So far so good.

4. SELF EVALUATION OF THE PROGRESS

So far so good.

TEOH

Supervisor's signature

King

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3T3	**Study week no.: 11**
Student Name & ID: See King Li, 19ACB03614	
Supervisor: Teoh Shen Khang	
Project Title: IoT Office Assistant System	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

Test case for mobile application all passed.

2. WORK TO BE DONE

GUI on LCD.

3. PROBLEMS ENCOUNTERED

So far so good.

4. SELF EVALUATION OF THE PROGRESS

So far so good.

TEOH

Supervisor's signature

King

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

Trimester, Year: Y3T3	**Study week no.: 12**
Student Name & ID: See King Li, 19ACB03614	
Supervisor: Teoh Shen Khang	
Project Title: IoT Office Assistant System	

1. WORK DONE

[Please write the details of the work done in the last fortnight.]

Complete chapter 1,2,3, 4 and 5 in report.

2. WORK TO BE DONE

Continue for GUI development on LCD.

3. PROBLEMS ENCOUNTERED

So far so good.

4. SELF EVALUATION OF THE PROGRESS

So far so good.

TEOH

Supervisor's signature

King

Student's signature

FINAL YEAR PROJECT WEEKLY REPORT

(Project II)

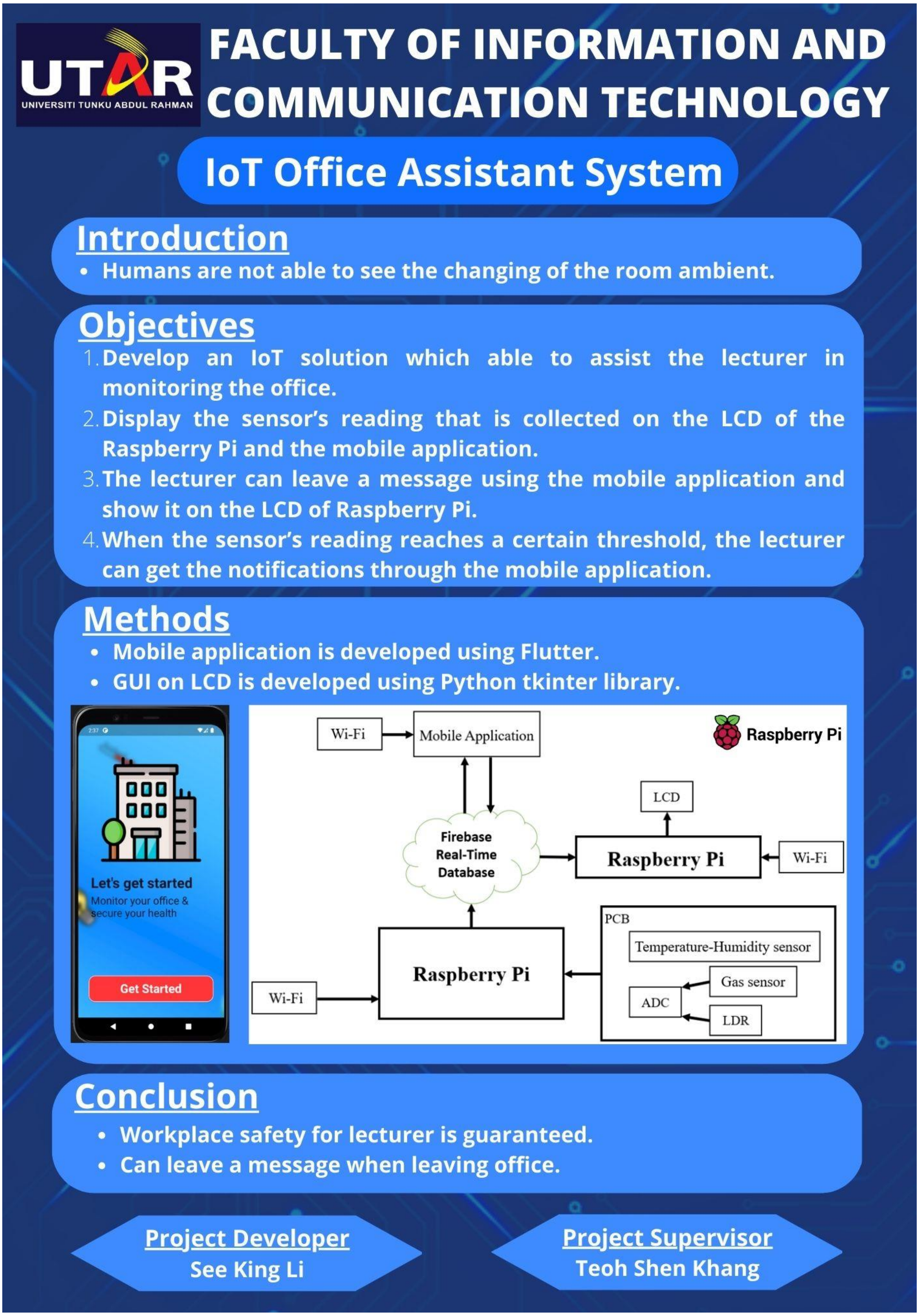
Trimester, Year: Y3T3	**Study week no.: 13**
Student Name & ID: See King Li, 19ACB03614	
Supervisor: Teoh Shen Khang	
Project Title: IoT Office Assistant System	

1. WORK DONE [Please write the details of the work done in the last fortnight.] The report and GUI is completed, all components is tested and passed all test case.
2. WORK TO BE DONE -
3. PROBLEMS ENCOUNTERED So far so good.
4. SELF EVALUATION OF THE PROGRESS So far so good.

TEOH
Supervisor's signature

King
Student's signature

POSTER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UNIVERSITI TUNKU ABDUL RAHMAN
FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
IoT Office Assistant System
Introduction
• Humans are not able to see the changing of the room ambient.
Objectives
1. Develop an IoT solution which able to assist the lecturer in monitoring the office.
2. Display the sensor's reading that is collected on the LCD of the Raspberry Pi and the mobile application.
3. The lecturer can leave a message using the mobile application and show it on the LCD of Raspberry Pi.
4. When the sensor's reading reaches a certain threshold, the lecturer can get the notifications through the mobile application.
Methods
• Mobile application is developed using Flutter.
• GUI on LCD is developed using Python tkinter library.
Let's get started
Monitor your office & secure your health
Get Started
Wi-Fi
Mobile Application
Raspberry Pi
LCD
Firebase Real-Time Database
Raspberry Pi
Wi-Fi
PCB
Temperature-Humidity sensor
Gas sensor
ADC
LDR
Raspberry Pi
Wi-Fi
Conclusion
• Workplace safety for lecturer is guaranteed.
• Can leave a message when leaving office.
Project Developer
See King Li
Project Supervisor
Teoh Shen Khang

PLAGIARISM CHECK RESULT

IOT OFFICE ASSISTANT SYSTEM By King Li SEE

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Full Name(s) of Candidate(s)	SEE KING LI
ID Number(s)	19ACB03614
Programme / Course	Bachelor of Information Technology (Honours) Computer Engineering
Title of Final Year Project	IOT OFFICE ASSISTANT SYSTEM

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Based on the above results, I hereby declare that I am satisfied with the originality of the Final Year Project Report submitted by my student(s) as named above.

TEOH
Signature of Supervisor

Name: Teoh Shen Khang

Date: 27 April 2023

Signature of Co-Supervisor

Name: ______________________

Date: ______________________

UNIVERSITI TUNKU ABDUL RAHMAN

FACULTY OF INFORMATION & COMMUNICATION TECHNOLOGY (KAMPAR CAMPUS)

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Student Name	SEE KING LI
Supervisor Name	TEOH SHEN KHANG

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I, the author, have checked and confirmed all the items listed in the table are included in my report.

King

____

(Signature of Student)
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