M.KUMARASAMY
COLLEGE OF ENGINEERING
NAAC Accredited Autonomous Institution
Approved by AICTE & Affiliated to Anna University
ISO 9001:2015 & ISO 14001:2015 Certified Institution
Thalavapalayam, Karur – 639 113.

A Minor Project Report

On

MONITORING TEMPERATURE AND HUMIDITY USING AUGMENTED REALITY

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

of

BACHELOR OF ENGINEERING

in

COMPUTER SCIENCE AND ENGINEERING

Under the guidance of

Ms. G. PAVITHRA Assistant Professor/CSE

Submitted By

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SHARMI. K	**(20BCS4085)**
SRINITHI. B	**(20BCS4089)**
YOGI. N	**(20BCS4107)**

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

M.KUMARASAMY COLLEGE OF ENGINEERING

(Autonomous)

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NOV 2022

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(Autonomous Institution affiliated to AnnaUniversity, Chennai)

KARUR – 639113

BONAFIDE CERTIFICATE

Certified that this minor project report **"MONITORING TEMPERATURE AND HUMIDITY USING AUGMENTED REALITY"** is the bonafide work of **"NAVEENA. M (20BCS4068), SHARMI. K (20BCS4085), SRINITHI. B (20BCS4089), YOGI. N (20BCS4107)"** who carried out the project work during the academic year 2022-2023 under my supervision.

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- Create a diverse, fully-engaged, learner-centric campus environment to provide quality education to the students
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PEO 1: Graduates will have successful career in software industries and R&D divisions through continuous learning.

PEO 2: Graduates will provide effective solutions for real world problems in the key domain of computer science and engineering and engage in lifelong learning.

PEO 3: Graduates will excel in their profession by being ethically and socially responsible.

PROGRAM OUTCOMES (POs)

Engineering students will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

- **PSO1: Professional Skills:** Ability to apply the knowledge of computing techniques to design and develop computerized solutions for the problems.
- **PSO2: Successful career:** Ability to utilize the computing skills and ethical values in creating a successful career.

ABSTRACT

Monitoring Temperature and Humidity using AR(Augmented Reality) adds digital elements to the camera of your smartphone, creating the illusion that holographic content is a part of a physical world around you . The main objective of this project is to provide the users with the enhanced version of the environmental data which include temperature , humidity etc . With the help of Augmented Reality visualization is done and this has the ability to greatly help the users to experience the environmental data in real time and also provide an friendly environment for user. To offer on-screen information about the environmental data which include temperature , humidity etc. Hence, this project was proposed with new features that can detect, notify, record and control the humidity and temperature instantaneously in order to have stable, controllable atmospheric conditions.

ABSTRACT WITH PO AND PSO MAPPING

ABSTRACT	POs MAPPED	PSOs MAPPED
ABSTRACT Monitoring Temperature and Humidity using AR(Augmented Reality) adds digital elements to the camera of your smartphone, creating the illusion that holographic content is a part of a physical world around you .The main objective of this project is to provide the users with the enhanced version of the environmental data which include temperature, humidity ,etc. With the help of Augmented Reality visualization is done and this has the ability to greatly help the users to experience the environmental data in real time and also provide an friendly environment for user. Hence, this project was proposed with new features that can detect, notify, record and control the humidity and temperature instantaneously in order to have stable, controllable atmospheric conditions. .	**PO1(3)** **PO2(3)** **PO3(2)** **PO4(2)** **PO5(2)** **PO6(1)** **PO7(3)** **PO8(2)** **PO9(3)** **PO10(3)** **PO11(2)** **PO12(2)**	**PSO1(3)** **PSO2(2)**

Note: 1- Low, 2-Medium, 3- High

SUPERVISOR **HEAD OF THE DEPARTMENT**

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LIST OF ACRONYMS / ABBREVIATIONS

AR	Augmented Reality
VR	Virtual Reality
SDK	Software Developer Kit

CHAPTER 1

INTRODUCTION

Internet of Things (IOT) can be used to control any electronic equipment in homes and industries. Moreover, it can read a data from any sensor and analyze it graphically from anywhere in the world. It can read temperature and humidity data from DHT11(Digital Humidity and Temperature)sensor and upload it to a Blynk app using Arduino and ESP8266. Augmented Reality has a good visualization for the virtual content. So Augmented Reality is used to visualize the temperature and humidity values. That happens simultaneously, so users don't sense delays. This ensures real-time interaction with the AR software.

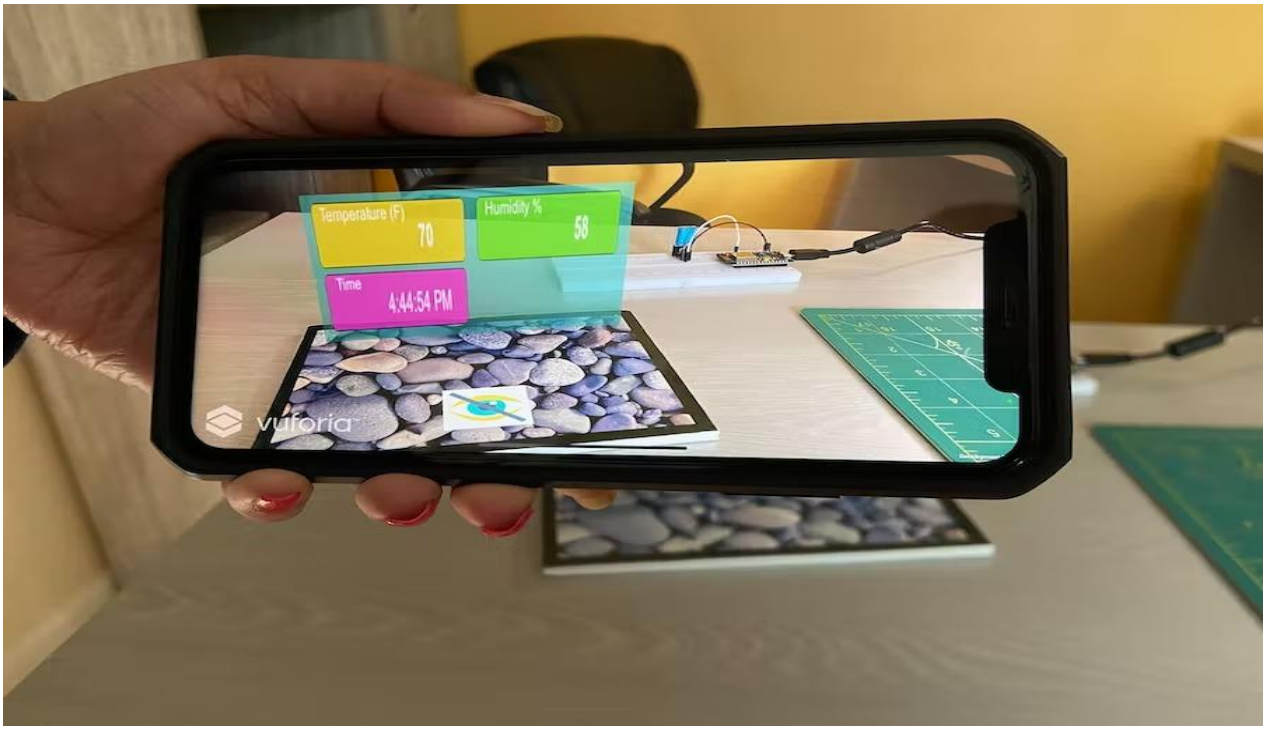


Figure: 1.1 Augmented Reality with Internet of Things(IoT)

1.1 OVERVIEW

Monitoring Temperature and Humidity using AR(Augmented Reality) is a new technology that involves the overlay of computer graphics on the real world . Wireless communication had significant impact on daily life . The benefits of wireless communication technology are apparently with low cost, convenience, ease of installation and high portability. One of the important applications is to monitor the temperature and humidity of surroundings without restricting the movement of user . In this project with the help of Augmented Reality visualization is done and this has the ability to greatly help the users to experience the environmental data in real time and also provide an friendly environment for user. To offer on-screen information about the environmental data which include temperature , humidity , pressure , time etc. Hence, this project was proposed with new features that can detect, notify, record and control the humidity and temperature instantaneously in order to have stable, controllable atmospheric conditions.

1.2 DOMAIN INTRODUCTION

Augmented reality is the technology that expands our physical world by adding layers of digital information onto it. This application is implemented using marker based AR. It uses hidden images as markers. Once camera spots this marker, the app triggers the augmented reality elements. It superimposes information on to the real world. Through this system the user can gain better information about the environmental data.

Modern Generation is going to dependable on computer. Augmented Reality(AR) adds digital elements to the camera of your smartphone , creating the illusion that holographic content is a part of a physical world around you . The main objective of this project is to provide the users with the enhanced version of the environmental data . This will be helpful for the persons to check the temperature and humidity around their surroundings without the need of internet . In this project by using AR in a poster , it can engage the viewer with the topic and further their understanding through visuals and audio on a digital interface . Here the poster are created by Unity Hub tool . People visiting a poster can download an app onto their smartphone to further engage with the poster . With this , Vuforia Engine is a Software Development kit is also used for creatingAR.

Vuforia Engine is the most widely used platform for AR development, with support for leading phones, tablets, and eyewear. Developers can easily add advanced computer vision functionality to Android, iOS, and UWP apps, to create AR experiences that realistically interact with objects and the environment.

Internet of Things(IoT):

The term IoT refers to the collective network of connected devices and the technology that facilitates communication between devices and the cloud, as well as between the devices themselves. Connecting everyday things embedded with electronics, software, and sensors to internet enabling to collect and exchange data without human interaction called as the Internet of Things (IoT). When objects and machines can be sensed and controlled remotely by across a network, a tighter integration between physical world and computers are enabled. This allows enablement of advanced applications.

IoT systems allow users to achieve deeper automation, analysis, and integration within a system . IoT utilizes existing and emerging technology for sensing , networking , and robotics. IoT exploits recent advances in software, falling hardware prices, and modern attitudes towards technology . Here Arduino , Blynk are used . Using a Arduino data acquisition board has the following advantages is open source , is easily programmed , can be used on any operating system and low cost. Arduino boards can be programmed easily using the Integrated Development Environment (IDE). This environment is for writing programs that can be loaded on the board . Arduino is found in several variants depending on the sizes and capabilities. The board used for this work is Arduino ESP2866 .

1.3 OBJECTIVE

A temperature monitoring system controls and regulates the temperature of a particular environment. A temperature monitoring system has become an essential part of healthcare, hospitals, clinics, food business, and other industries in recent years . The main objective of this project is to design an IoT (Internet of Things) to monitor temperature and humidity from environment . Temperature sensors and humidity sensors measure environmental conditions and are processed by a microcontroller . Data from the sensors and status from the actuators are sent to the server and can be monitored via a smartphone. The data collected can be analyzed for various purposes . AR is defined as the use of technology that overlays digitally generated information over what the user sees in the real world . People visiting a poster can download an app onto their smartphone to further engage with the presenter's poster

1.4 PROBLEM STATEMENT

Using of AR Foundations as a Software Development Kit in is not effective for the whole implementation as it does not has any features like Importing images, Inserting video set .

- When it comes to Vuforia vs AR Foundation for creating posters in AR the answer is clear that Vuforia is the solution we use.
- AR Foundation is a great platform but it's best for games and other lightweight solutions and won't have the tools required for visualizing the environmental data .

CHAPTER 2

LITERATURE SURVEY

1) Seman, M. T. A., M. N. Abdullah, and M. K. Ishak. "Monitoring temperature, humidity and controlling system in industrial fixed room storage based on IoT." *Journal of Engineering Science and Technology* 15, no. 6 (2020): 3588-3600.

Humidity and temperature monitors have wide industrial applications in many areas such as automobile industry, food processing and evaluation of plastic encapsulations in IC packaging. The value of temperature and humidity changes can be seen through graph and gauge in Blynk software application. The relative humidity level will be decrease as the temperature increase. Humidifier triggered when the reading of temperature and humidity is less than 20% and more than 80%. Through the mobile application, it can review and read the previous readings and histories from the temperature and humidity sensor.

2) Huang, Zhiguo, Zhixin Huang, Xihe Cui, and Shengli Han. "Intelligent network temperature and humidity measuring system based on USB interface." *TELKOMNIKA Indonesian Journal of Electrical Engineering* 12, no. 5 (2014): 3805-3810.

To achieve a functional system in terms of hardware and software, to measure temperature and humidity. The paper aims to achieve the following goals: achieving a functional system in terms of hardware and software that allows measuring and monitoring temperature, humidity and the time; using a development board for the communication with the sensor and clock; implementation a program that allows requirements.

3) Veas, Eduardo, Raphaël Grasset, Ioan Ferencik, Thomas Grünewald, and Dieter Schmalstieg. "Mobile augmented reality for environmental monitoring." *Personal and ubiquitous computing* 17, no. 7 (2013): 1515-1531.

On the visualization side, we are currently working with a head-mounted display that includes orientation tracking to provide a greater level of immersion to the users. In terms of interaction other forms of interaction will be added to the prototype such as a digital compass, a virtual reality glove and the controller. Finally we plan to do user extensive studies to test the feasibility of SensAR application.

4) Shah, Honey, Jyotika Gurnani, and Sachin Gajjar. "Design and Development of AR-PlaSys: Augmented Reality Based Plant Monitoring System." In *2020 IEEE 17th India Council International Conference (INDICON)*, pp. 1-5. IEEE, 2020.

AR-PlaSys is designed by merging Augmented Reality (AR) and the Internet of Things (IoT). A proficient observing framework is required for easy and long-term plant monitoring in industries such as nurseries and at domestic level. AR-PlaSys is an innovative and viable solution for the same. The humidity and temperature data from plant is collected by a DHT11 sensor and uploaded to Particle Photon cloud. The screen to be augmented is built in Unity 3D which is a real-time 3D development platform and is connected to the Particle Cloud. An android application file (APK) is developed which can be installed in all android cell phones. This system is unique, compact, cost and energy-efficient which can be deployed for domestic and industrial purposes.

CHAPTER 3

FEASIBILITY STUDY

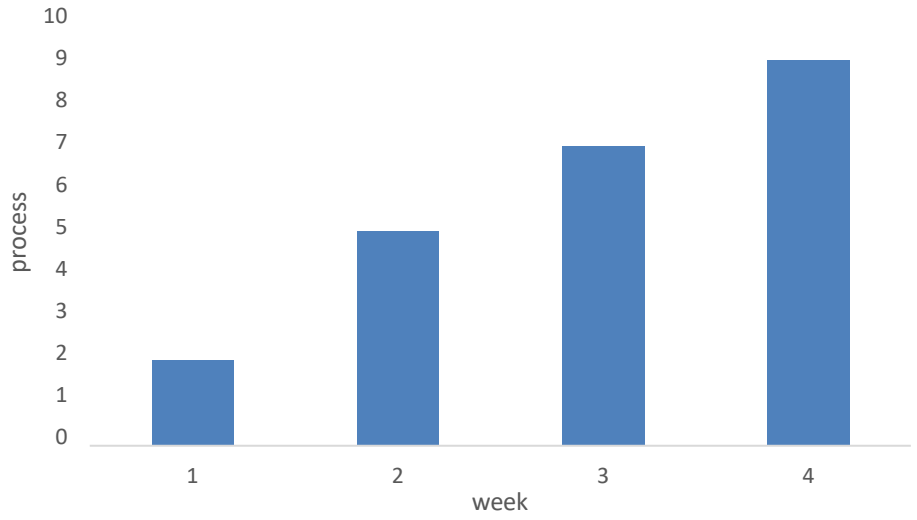


Figure 3.1 Feasibility Study for Monitoring Temperature and Humidity using AR

1. Idea: We have planned to design Augmented Reality by using Vuforia Engine
2. Economic Feasibility: There is very important aspect to be consider while developing of project. We decided the technology based on minimum possible cost factor.
    - All software used in this are freecost
    - Overall we have estimated that by using this project the user can experience a real time experience with lesscost.

3. Technical Feasibility: This Agumented Reality has been used for both visualization and simulation use-cases, improving the communication of information and, as a result, facilitating good experience for the user.
4. Documentation: The documentation is completed after getting approval of supervisor.

CHAPTER 4

PROJECT METHODOLOGY

4.1 BLOCK DIAGRAM OF AR

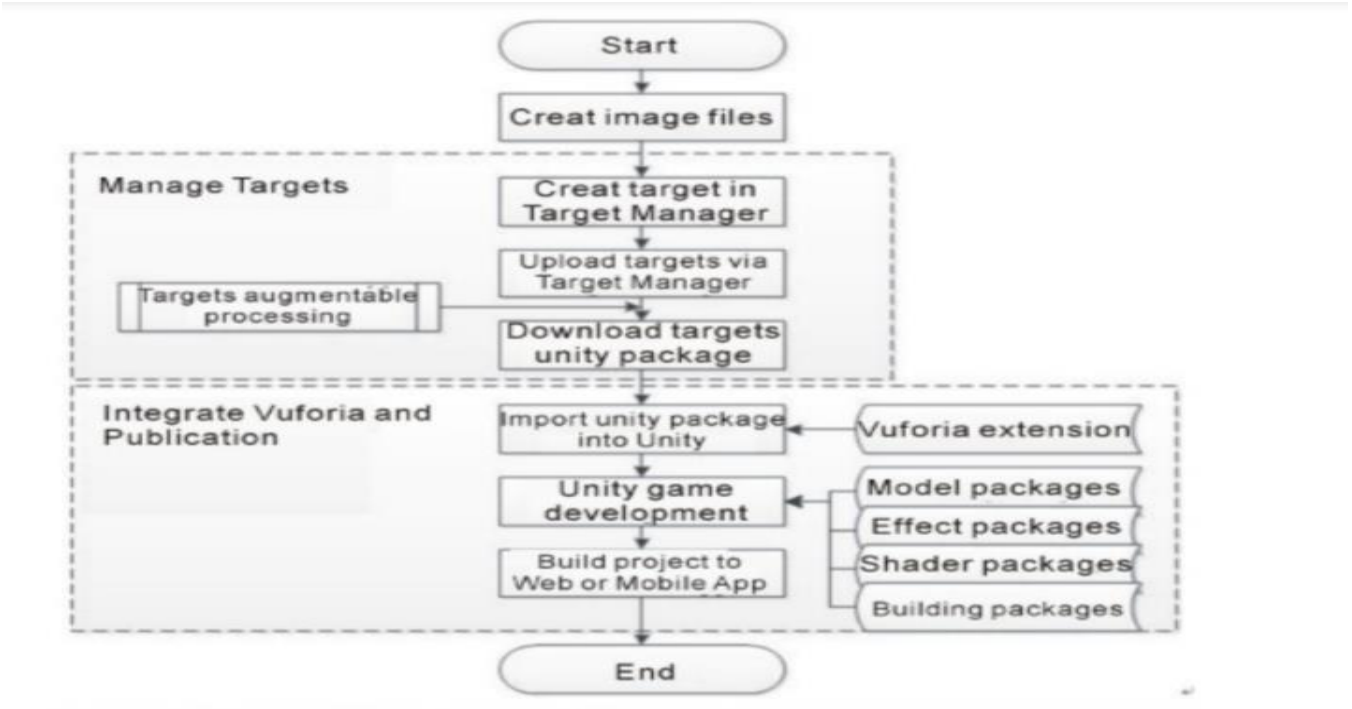


Figure: 4.1 Block diagram of Augmented Reality

This block diagram contains the details about Augmented Reality It also contain the details about installation , working process , how helpful for the user to experience the real world in an virtual Reality.

4.2 RESULTS AND DISCUSSION

Simulation of hardware:

- ❖ Connect the DHT11 sensor to the ESP8266 microcontroller
- ❖ Connect the positive side to D4, negative side to ground pin
- ❖ Connect the setup to desktop using USB cable

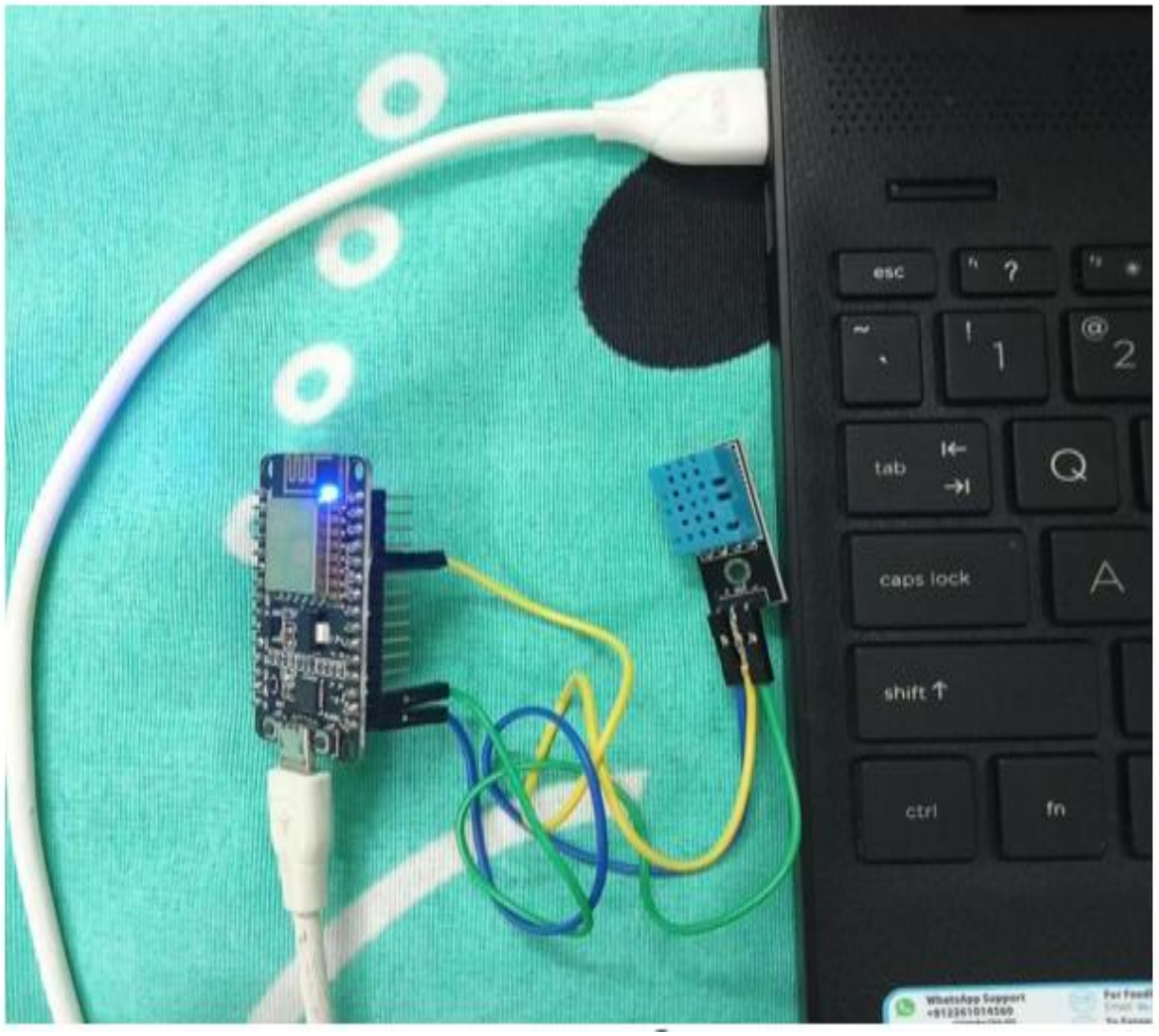


Figure 5.1 Connection between DHT11 sensor and ESP8266

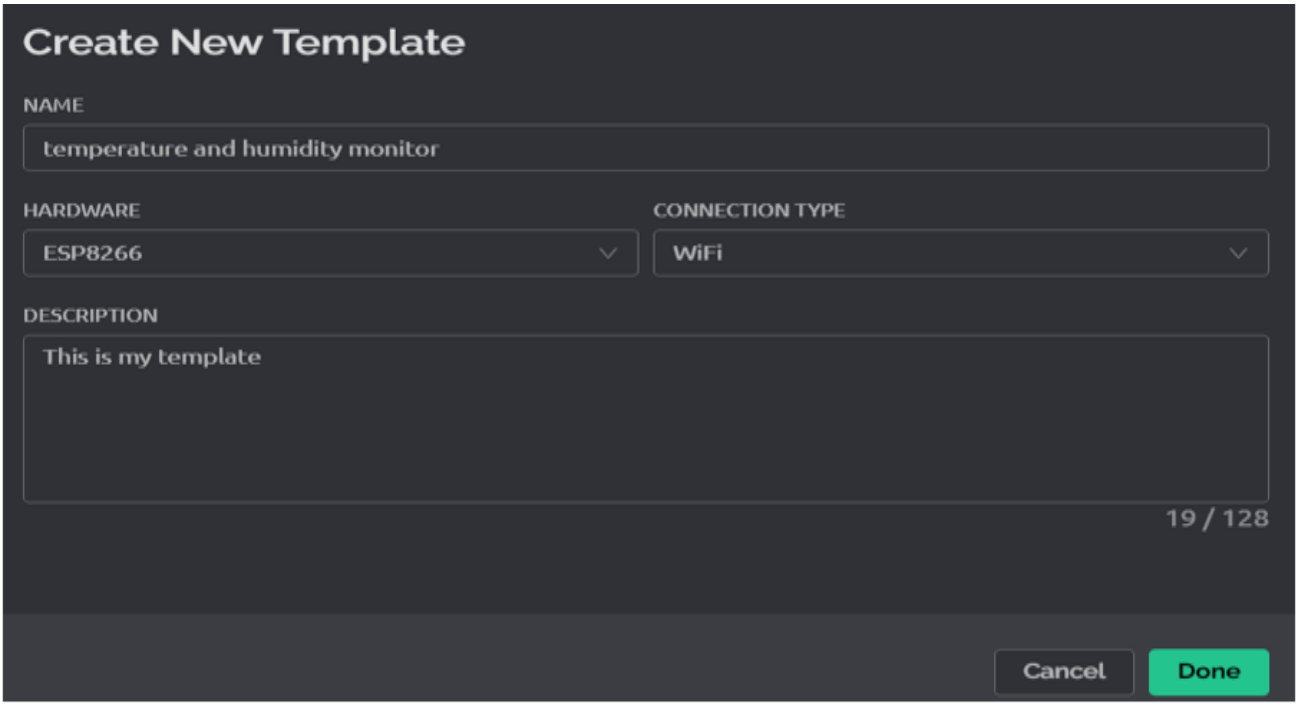


Figure 5.2 Create login in blynk app and create new template

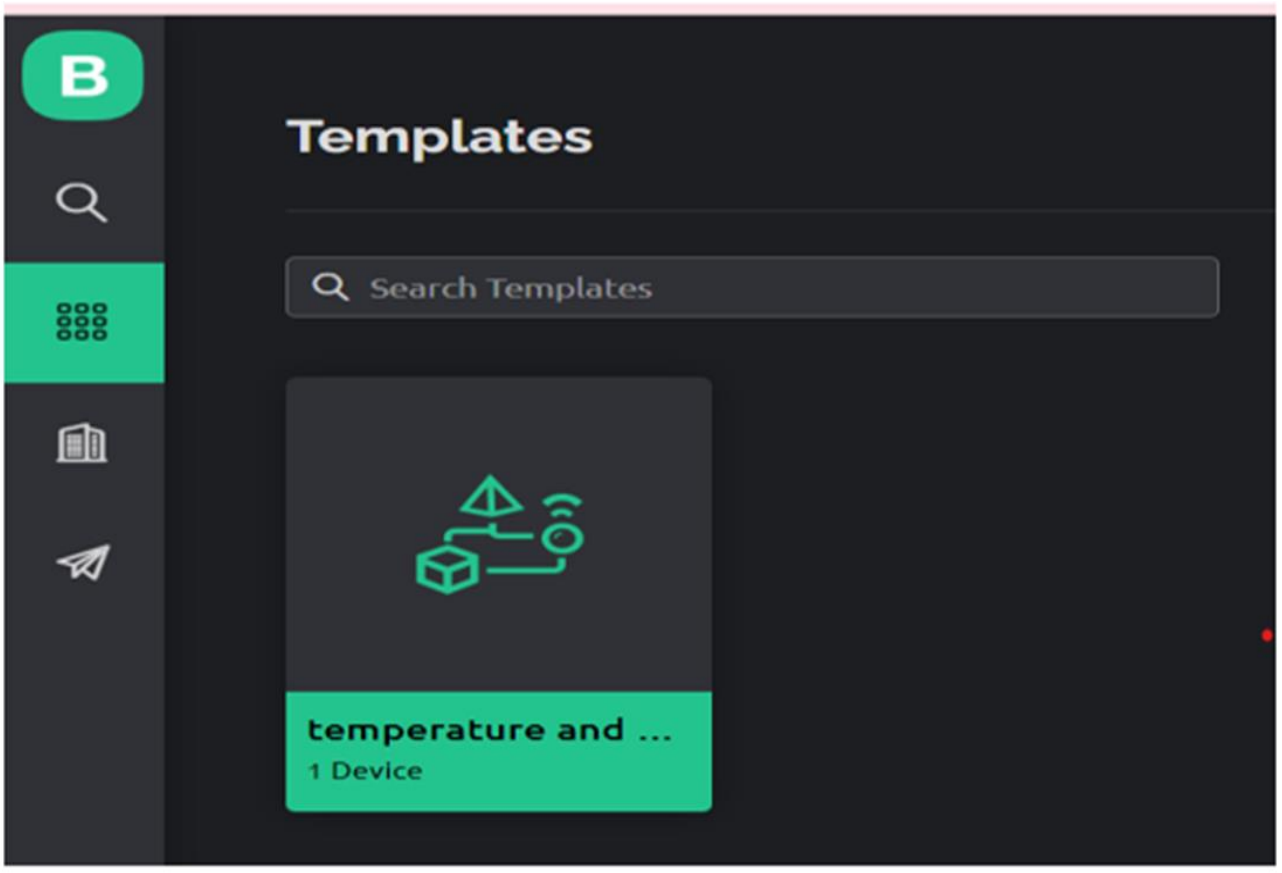


Figure 5.3 Name the template as Temperature and Humidity

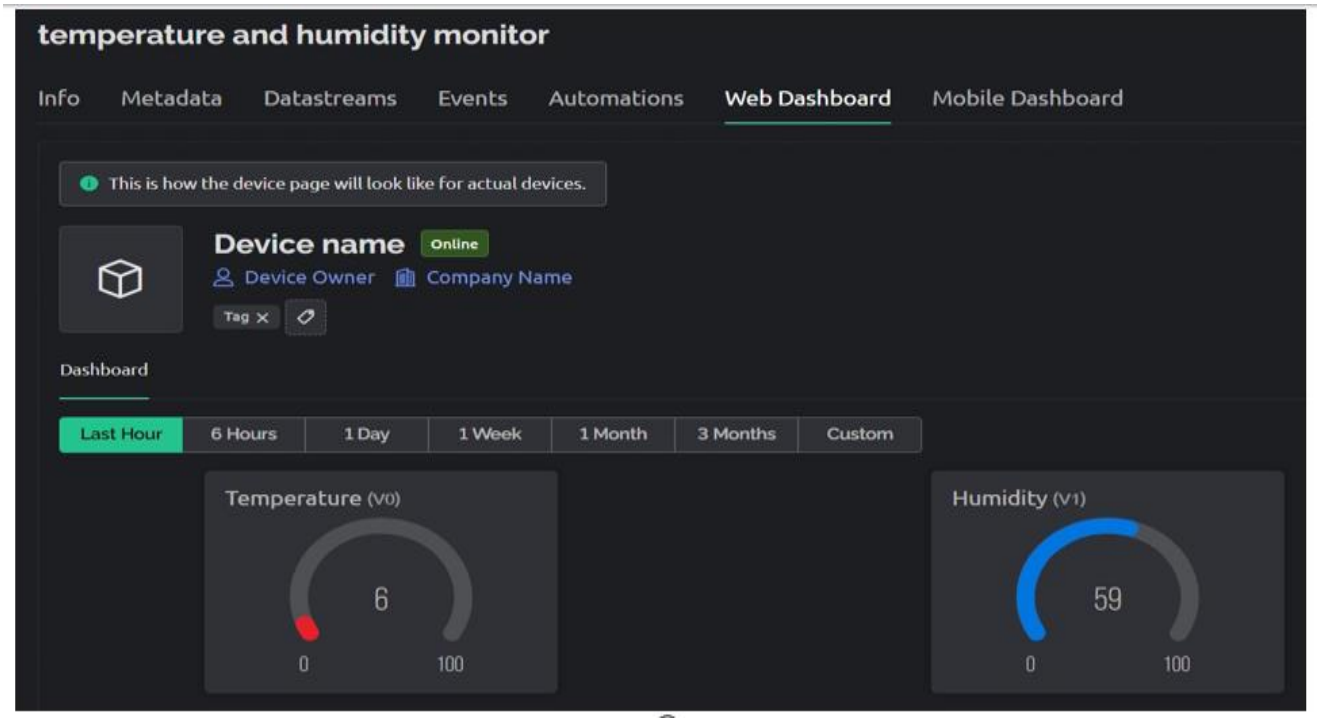


Figure 5.4 Select the widgets required for the data used for displaying

Installation of Arduino IDE:

- Download Arduino IDE Software
- Launch Arduino IDE
- Create a new project. Select the Arduino board
- Select the serial port and Upload the program to the board

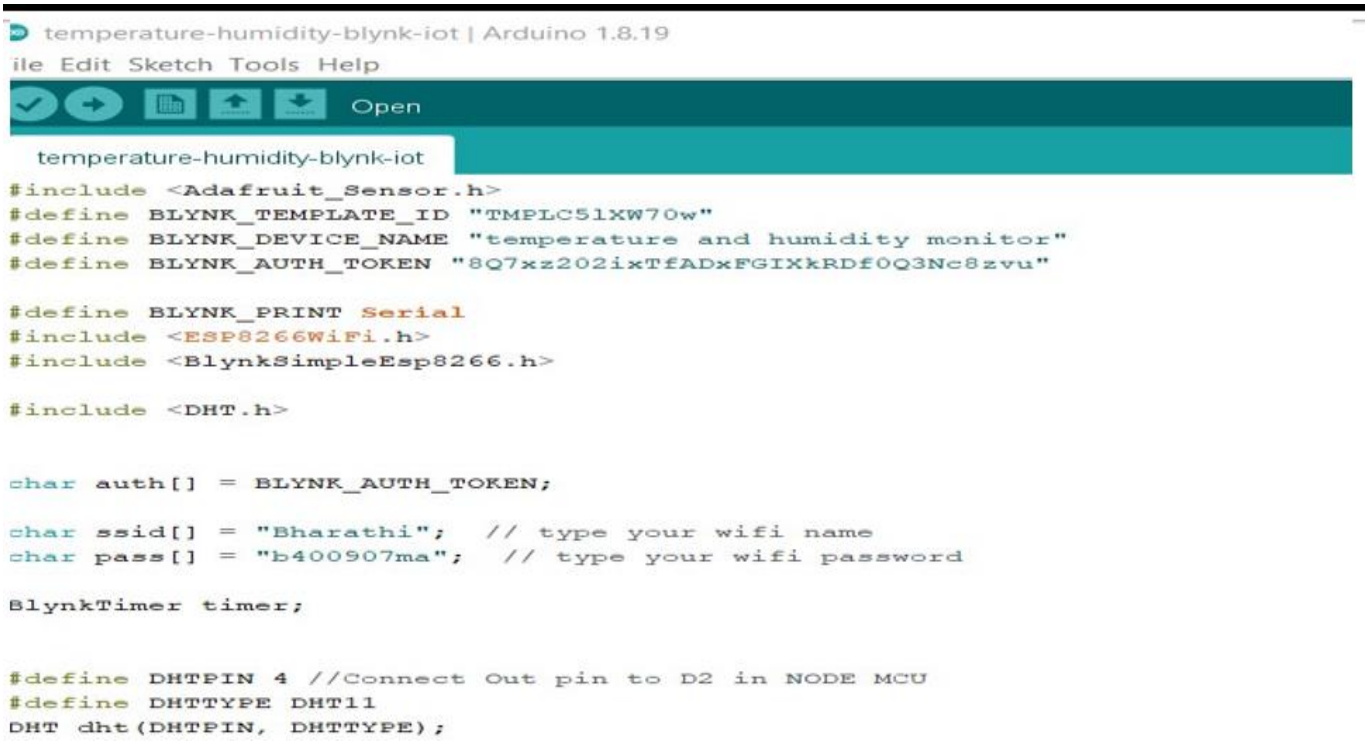


Figure 5.5 Paste the authentication token provided by blynk app and link both Arduino and Blynk app.

Figure 5.6 coding part

Visualization of Temperature and Humidity:

- Install the Unity Hub and setup the plane to fix the target image
- Insert the C# code and import the image
- Built and run the code which is used for the visualization
- Download the APK in the connected device and scan the target image through the camera
- Now the real time value of temperature and humidity will be visualized and displayed on the camera of the user smartphone

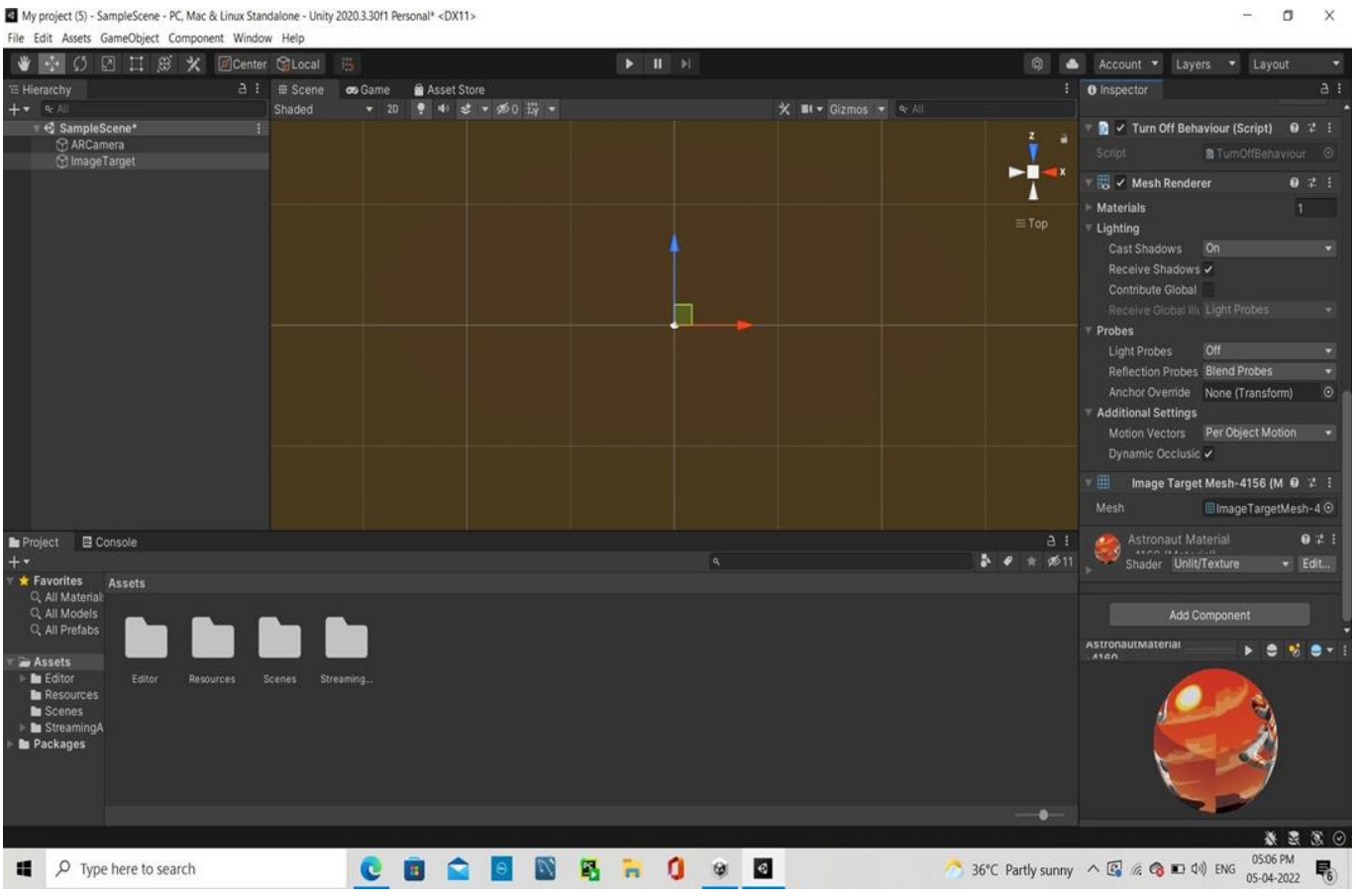


Figure 5.7 coding part

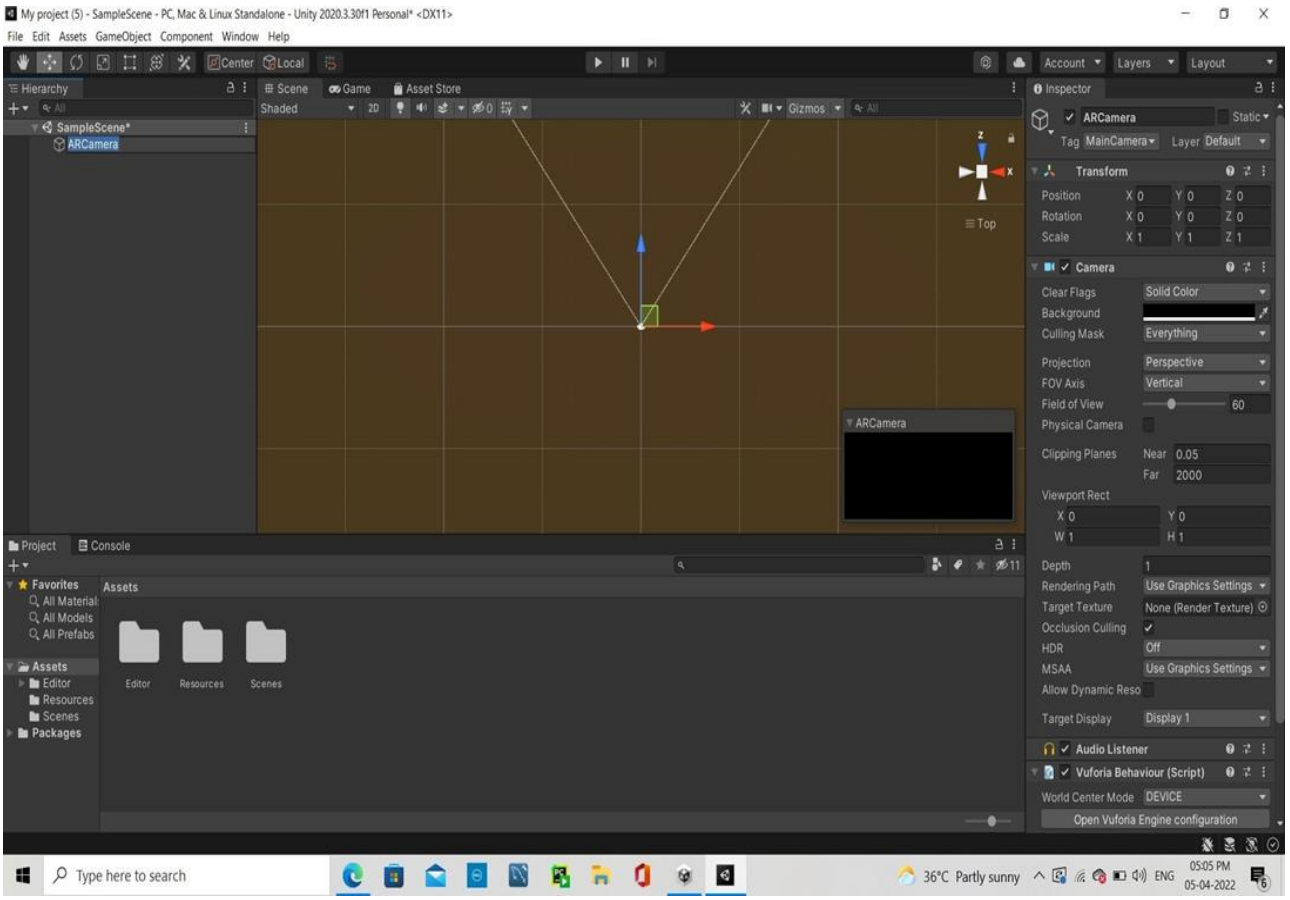


Figure 5.8 Unity Hub

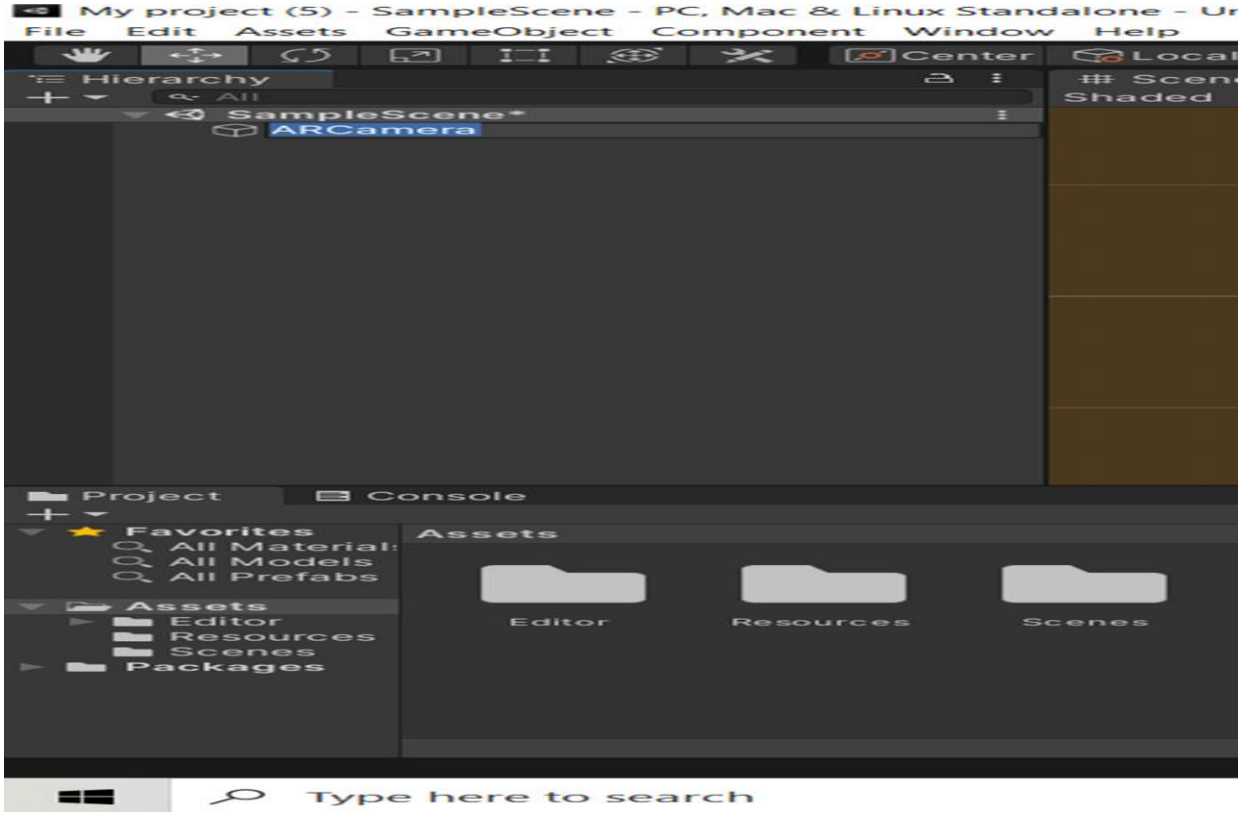


Figure 5.9 AR camera

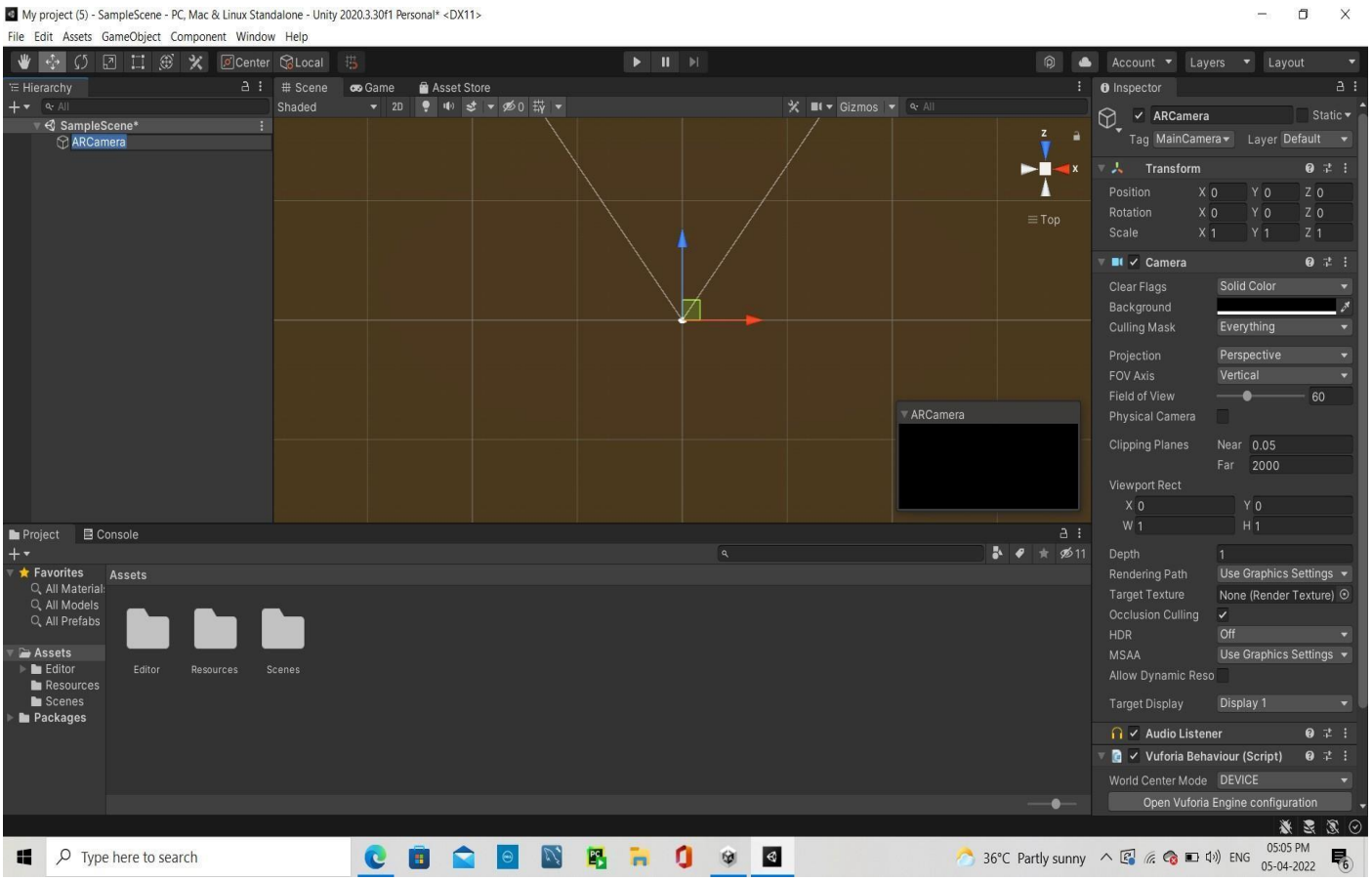


Figure 5.10 Fix the Axis

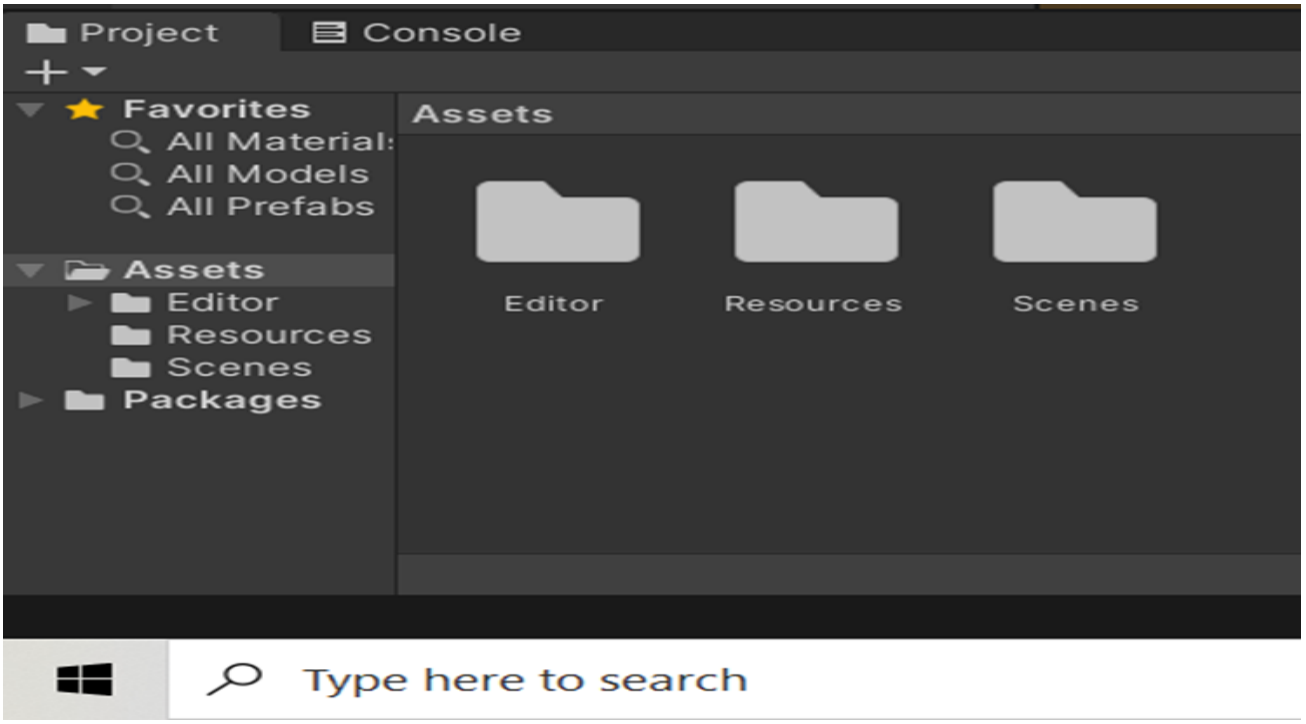


Figure 5.11 Assets

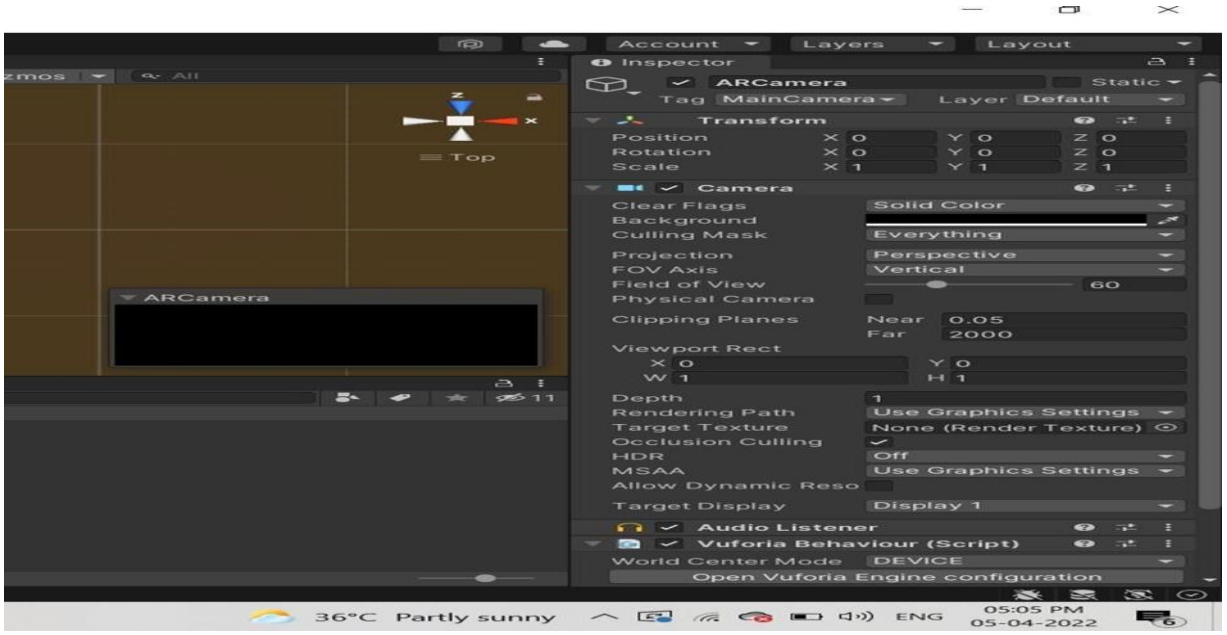


Figure 5.12 Insert the Image Target

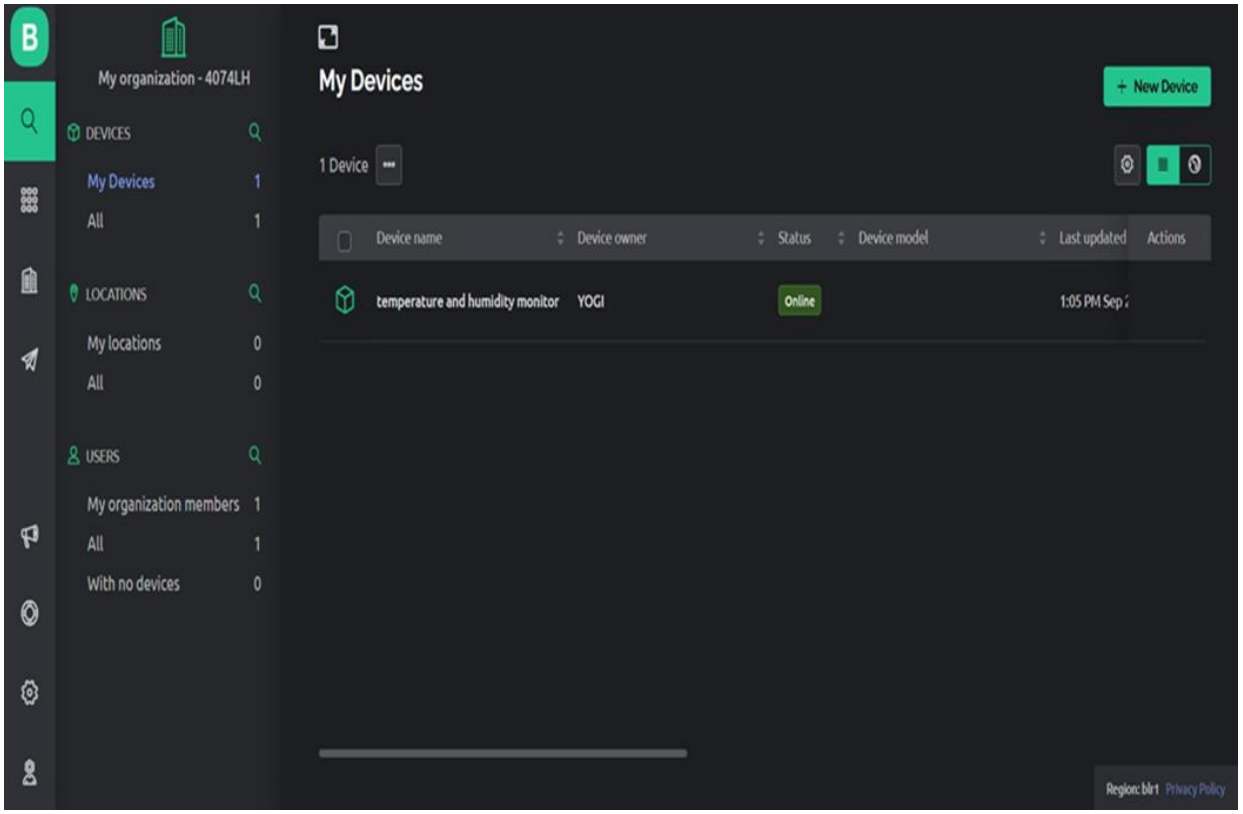


Figure 5.13 When the code is inserted in ESP8266 the status will become online

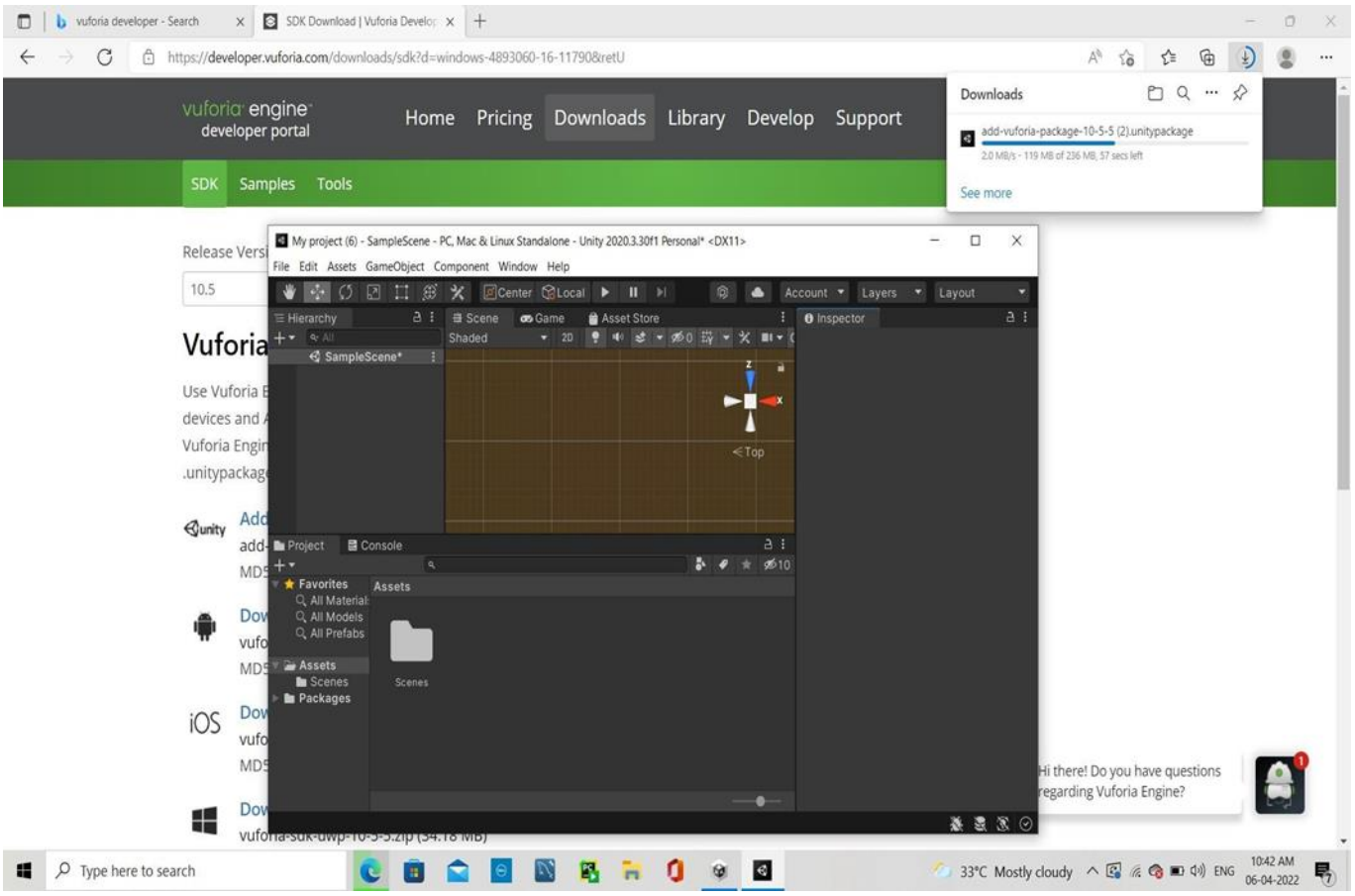


Figure 5.14 View of both Portal

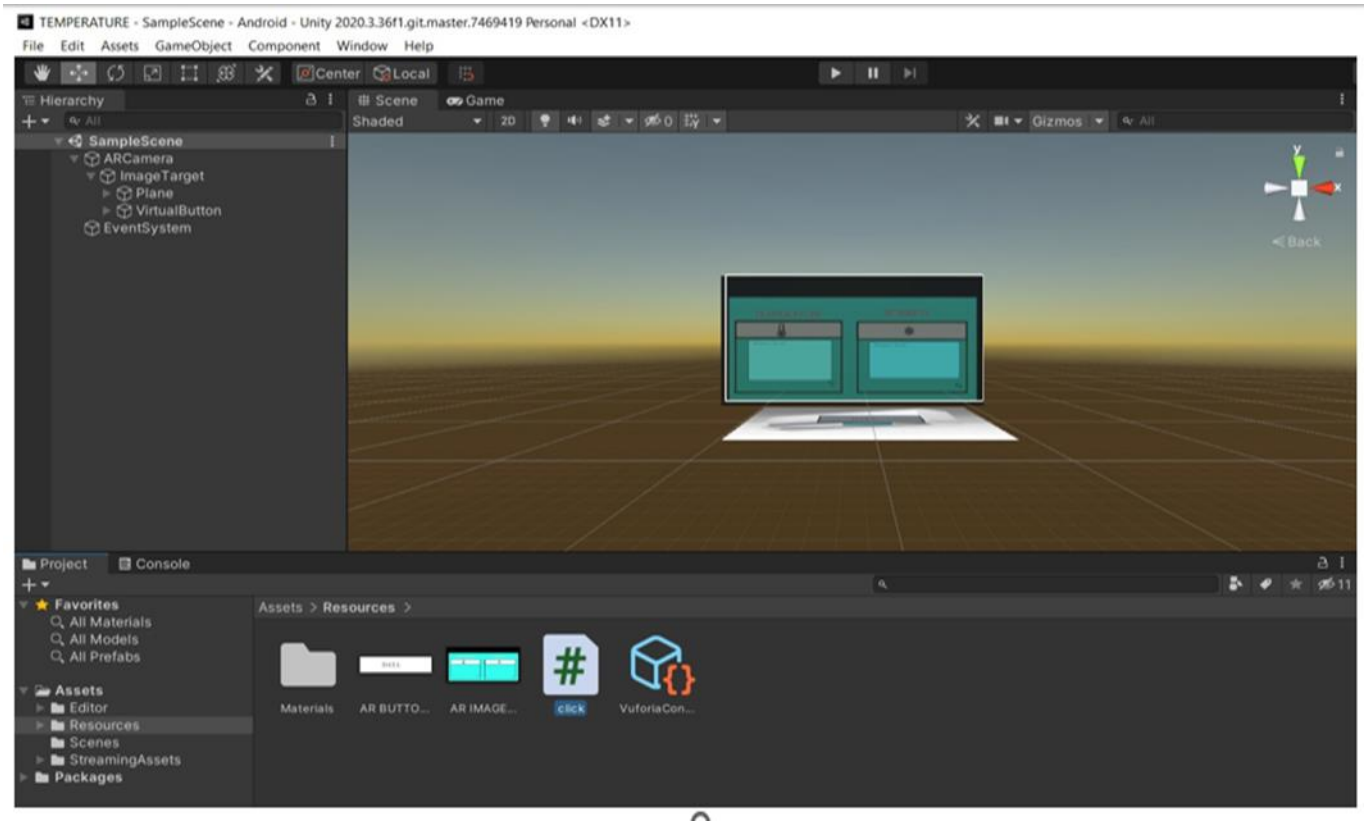
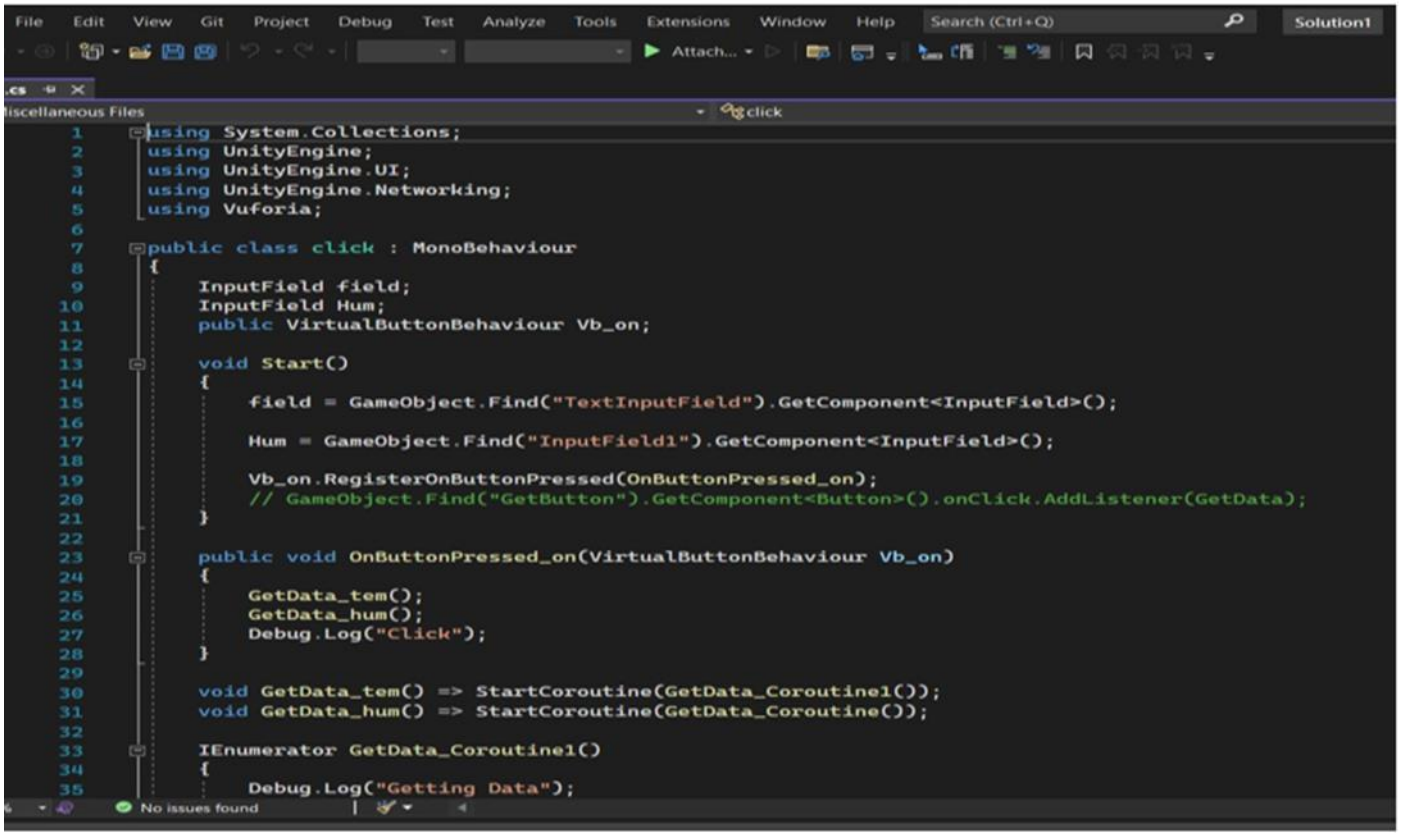
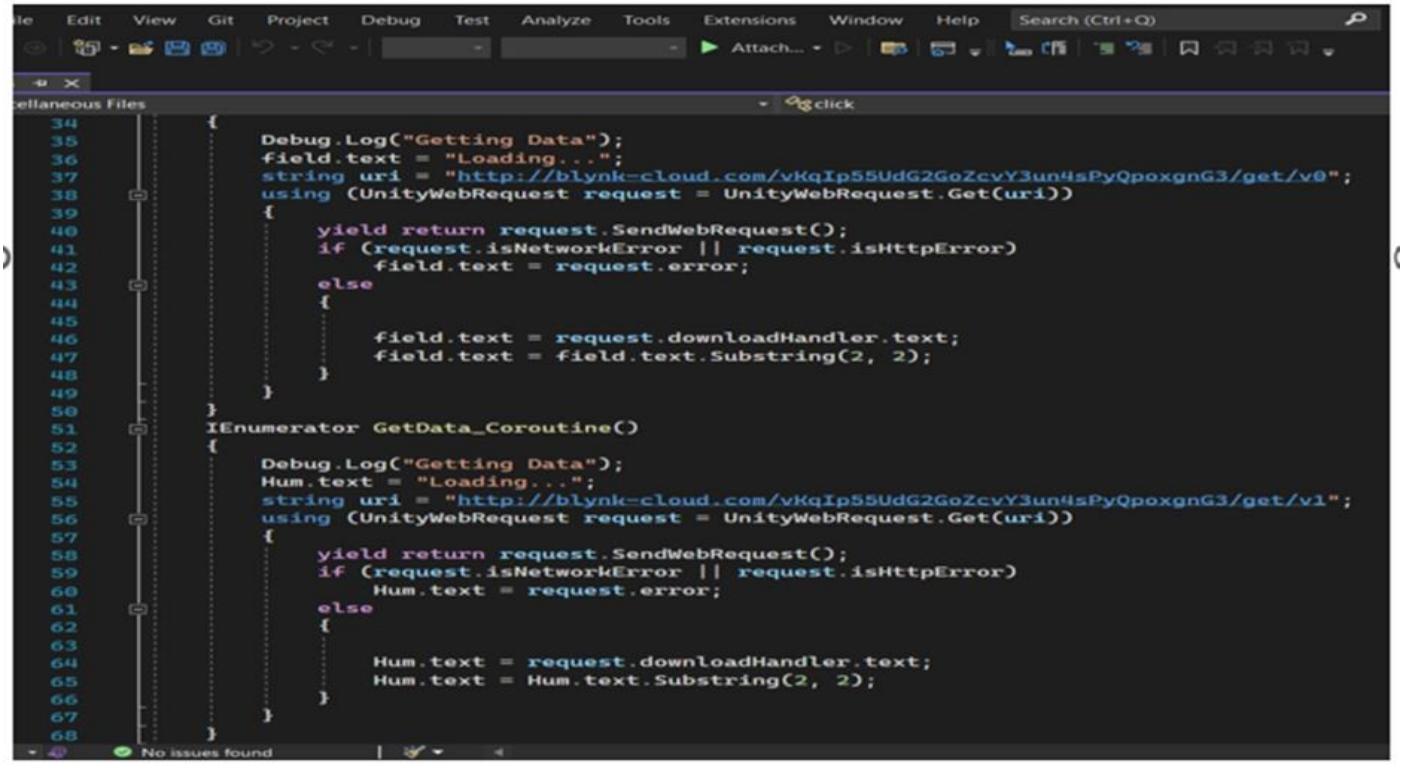


Figure 5.15 Fix the Image



```
using System.Collections;
using UnityEngine;
using UnityEngine.UI;
using UnityEngine.Networking;
using Vuforia;

public class click : MonoBehaviour
{
    InputField field;
    InputField Hum;
    public VirtualButtonBehaviour Vb_on;

    void Start()
    {
        field = GameObject.Find("TextInputField").GetComponent<InputField>();

        Hum = GameObject.Find("InputField1").GetComponent<InputField>();

        Vb_on.RegisterOnButtonPressed(OnButtonPressed_on);
        // GameObject.Find("GetButton").GetComponent<Button>().onClick.AddListener(GetData);
    }

    public void OnButtonPressed_on(VirtualButtonBehaviour Vb_on)
    {
        GetData_tem();
        GetData_hum();
        Debug.Log("Click");
    }

    void GetData_tem() => StartCoroutine(GetData_Coroutine1());
    void GetData_hum() => StartCoroutine(GetData_Coroutine());

    IEnumerator GetData_Coroutine1()
    {
        Debug.Log("Getting Data");
```

Figure 5.16 C# code for data visualization in Augmented Reality



```
    {
        Debug.Log("Getting Data");
        field.text = "Loading...";
        string uri = "http://blynk-cloud.com/vKqIp55UdG2GoZcvY3un4sPyQpoxgnG3/get/v0";
        using (UnityWebRequest request = UnityWebRequest.Get(uri))
        {
            yield return request.SendWebRequest();
            if (request.isNetworkError || request.isHttpError)
                field.text = request.error;
            else
            {

                field.text = request.downloadHandler.text;
                field.text = field.text.Substring(2, 2);
            }
        }
    }
    IEnumerator GetData_Coroutine()
    {
        Debug.Log("Getting Data");
        Hum.text = "Loading...";
        string uri = "http://blynk-cloud.com/vKqIp55UdG2GoZcvY3un4sPyQpoxgnG3/get/v1";
        using (UnityWebRequest request = UnityWebRequest.Get(uri))
        {
            yield return request.SendWebRequest();
            if (request.isNetworkError || request.isHttpError)
                Hum.text = request.error;
            else
            {

                Hum.text = request.downloadHandler.text;
                Hum.text = Hum.text.Substring(2, 2);
            }
        }
    }
```

Figure 5.17 Code for data visualization , add authentication token in v0 and v1

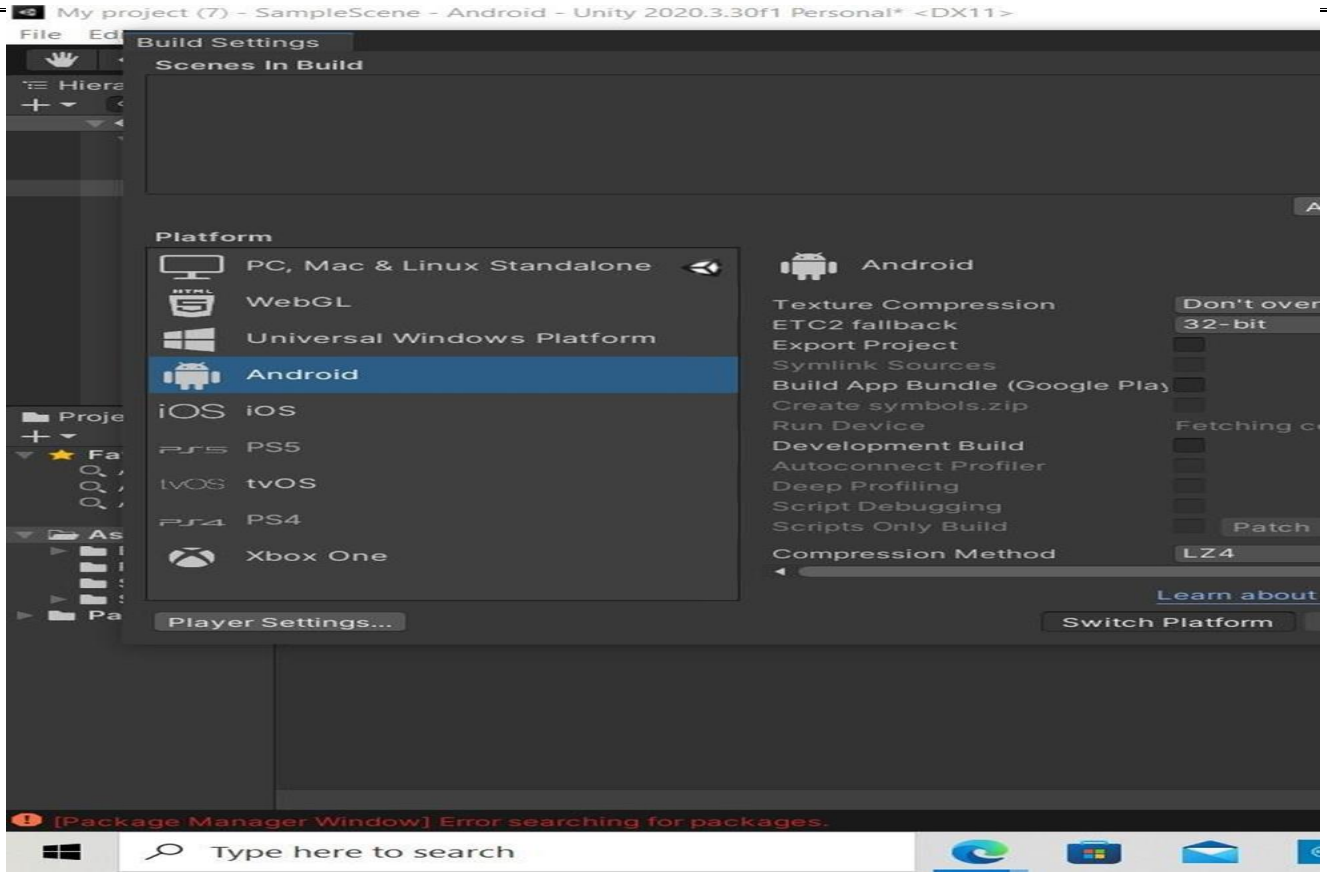


Figure 5.18 Build the settings.

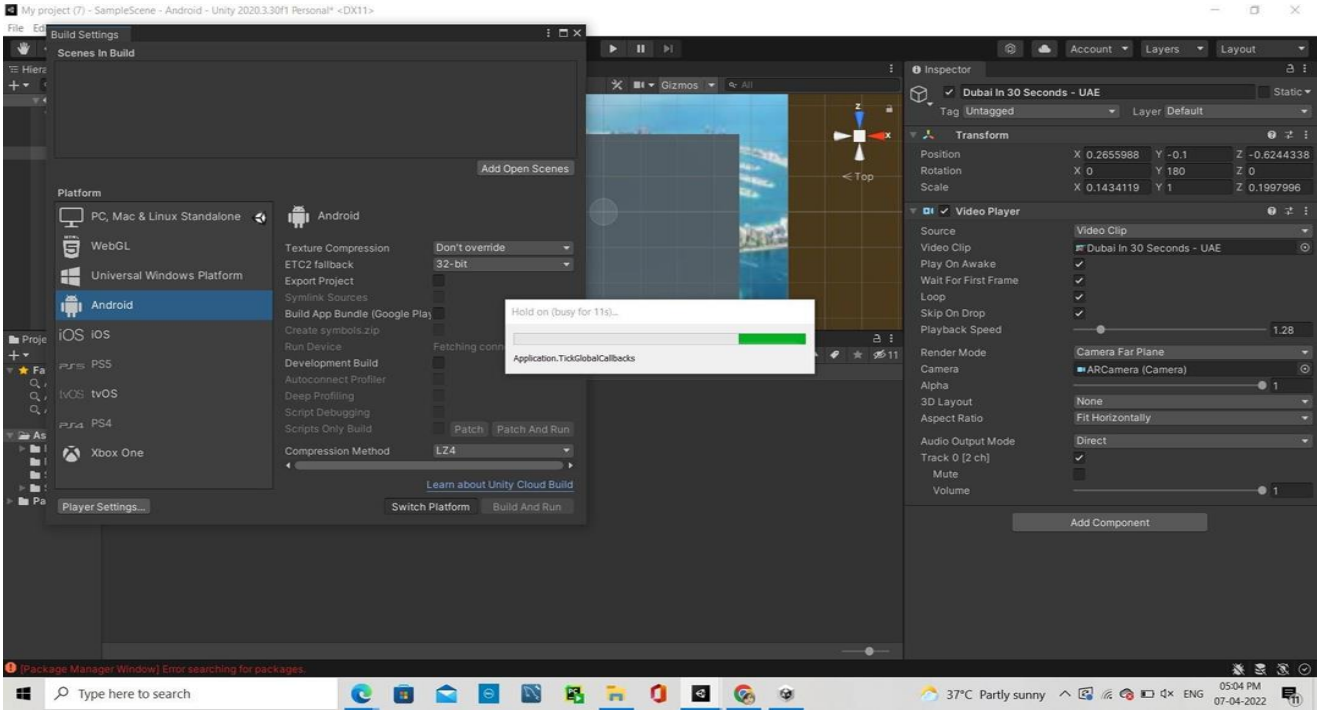


Figure 5.19 Run the Image target

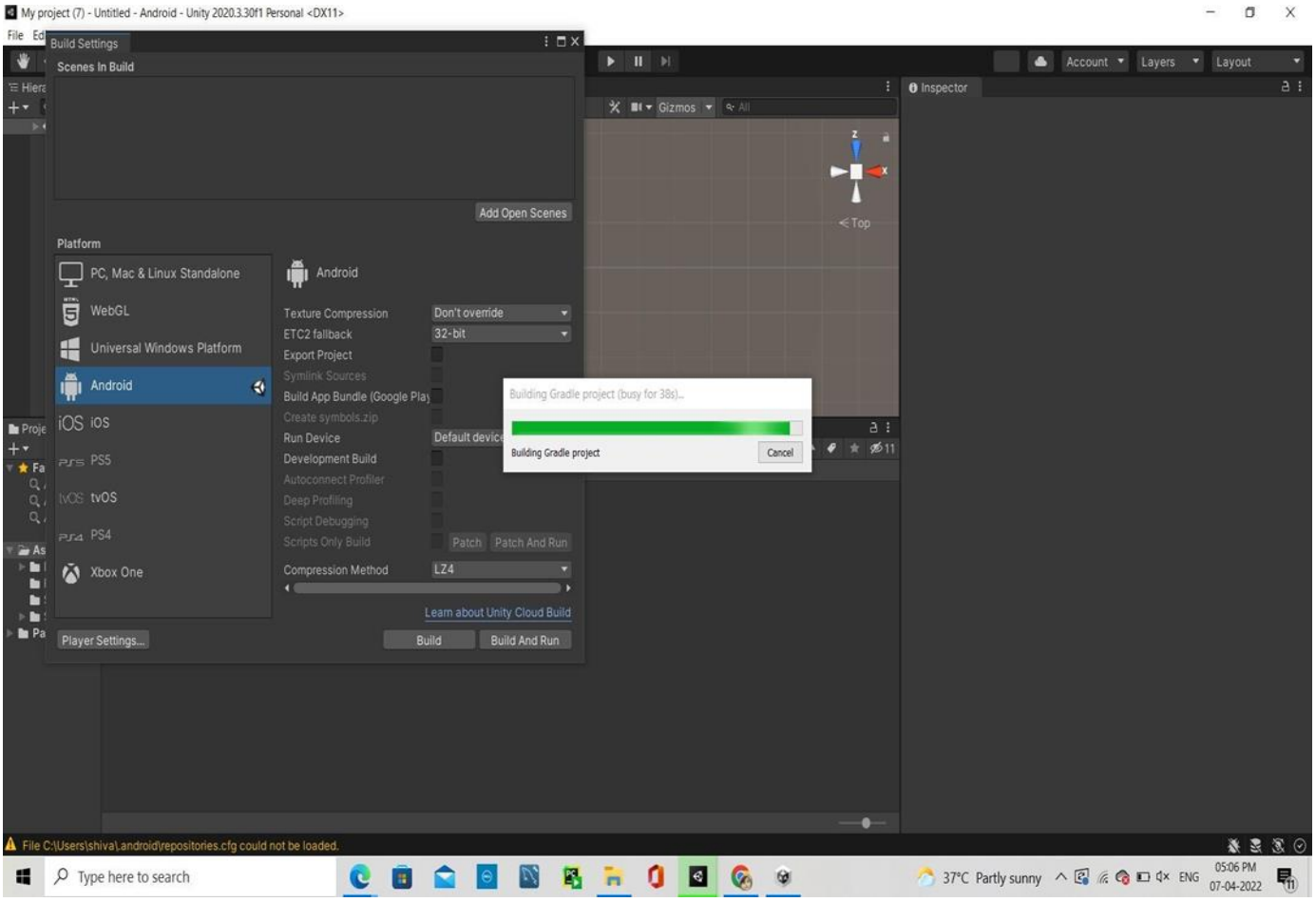


Figure 5.20 Running Process

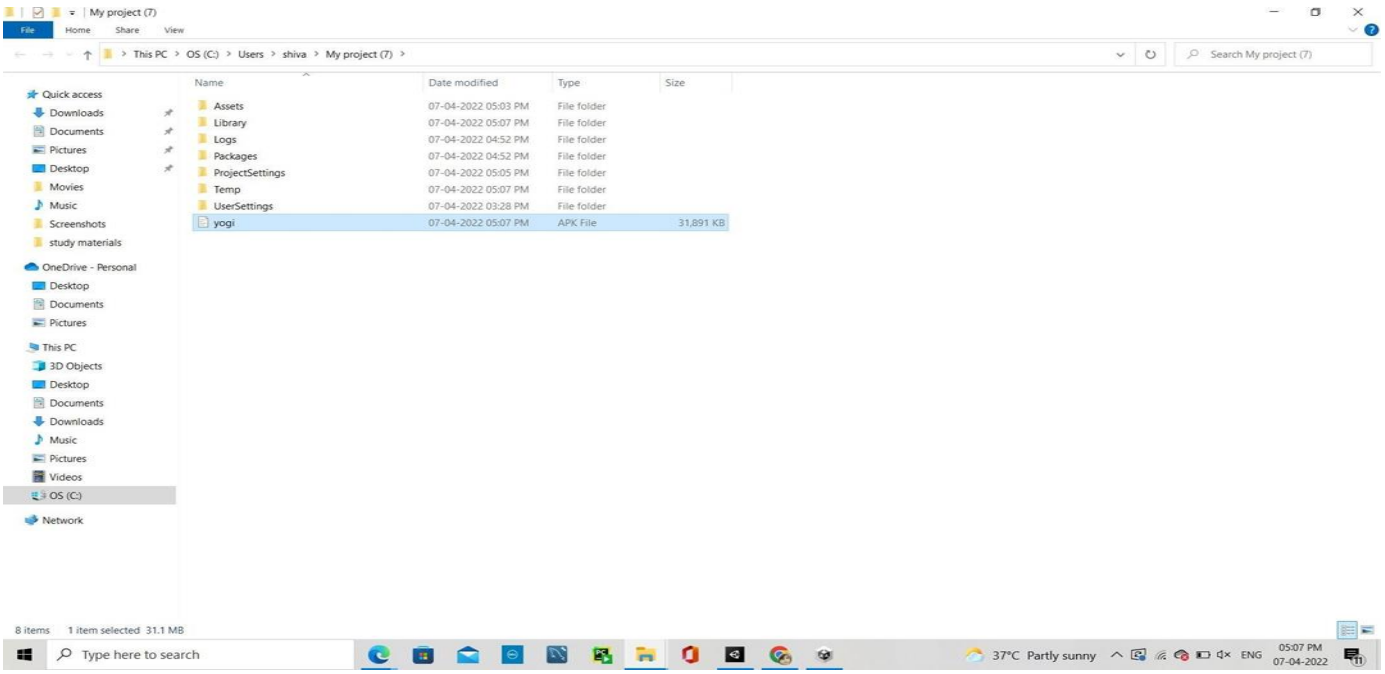


Figure 5.21 APK generated

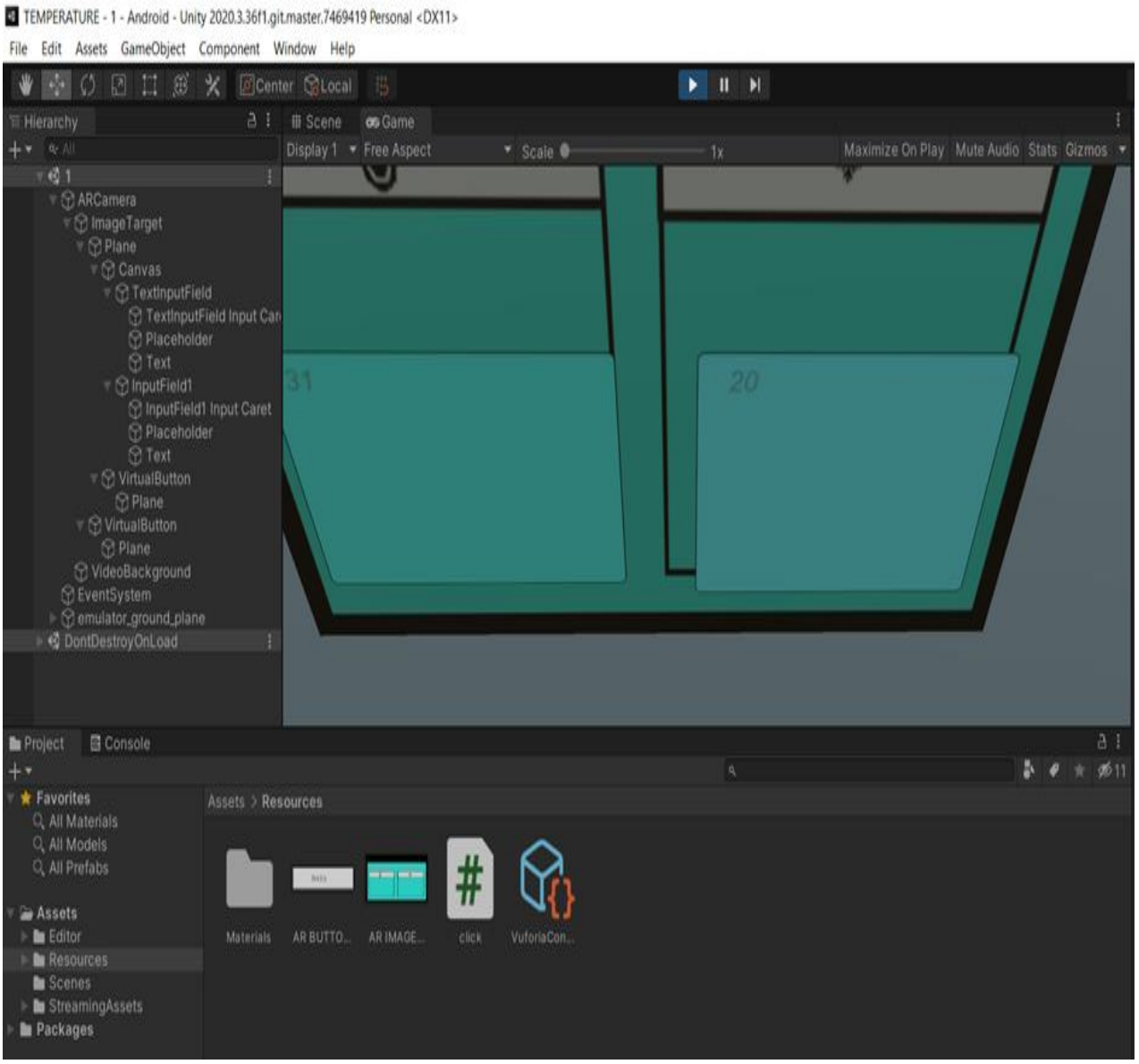


Figure 5.22 Temperature and Humidity monitor using Blynk app and Augmented Reality

CHAPTER 5

CONCLUSION

- In this project, the IOT devices are connected with the WIFI which have shortest range, in future our Project can be improved by the range of the connection where the IOT devices are connected in cloud .
- In future this will be implemented in home automation , smart cities , healthcare centres .
- The “Augmented Reality” can enhance the learning process, learning motivation and effectiveness. Despite the positive results, more research is necessary .
- In future ,we will add Virtual Reality in addition to give better experience for the users in the real world .

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