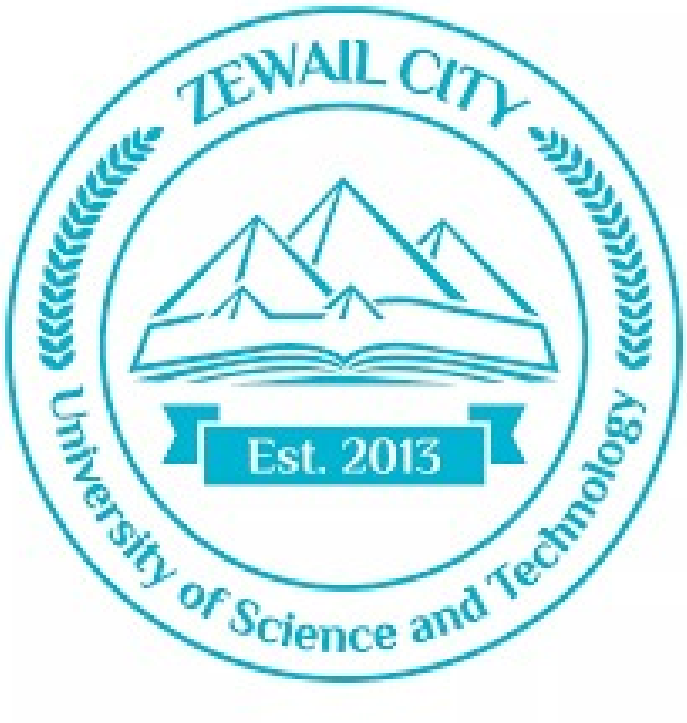

University of Science and Technology in Zewail City

CIE 405

IOT Smart Plant Monitoring and Irrigation System

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Stage 2 Report

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Contents

1 Introduction

Figure 1: Plant Monitoring

Water scarcity is a global issue with far-reaching implications for agriculture and food production. Inefficient water resource management is a significant factor hampering agricultural productivity. To tackle this pressing concern, the adoption of intelligent irrigation systems is on the rise. These systems utilize sensors to constantly monitor environmental conditions and adjust irrigation accordingly. Our project aims to introduce a smart irrigation system that integrates a water pump, DHT11 sensor, Soil Moisture Sensor Module, and a mobile application developed using App inventor. This system will automate the irrigation process by precisely sprinkling water onto the land based on the levels of moisture, temperature, and humidity. Additionally, real-time data will be transmitted to the mobile application, empowering farmers to actively monitor environmental conditions and implement appropriate corrective measures.

2 Functional Block Diagram

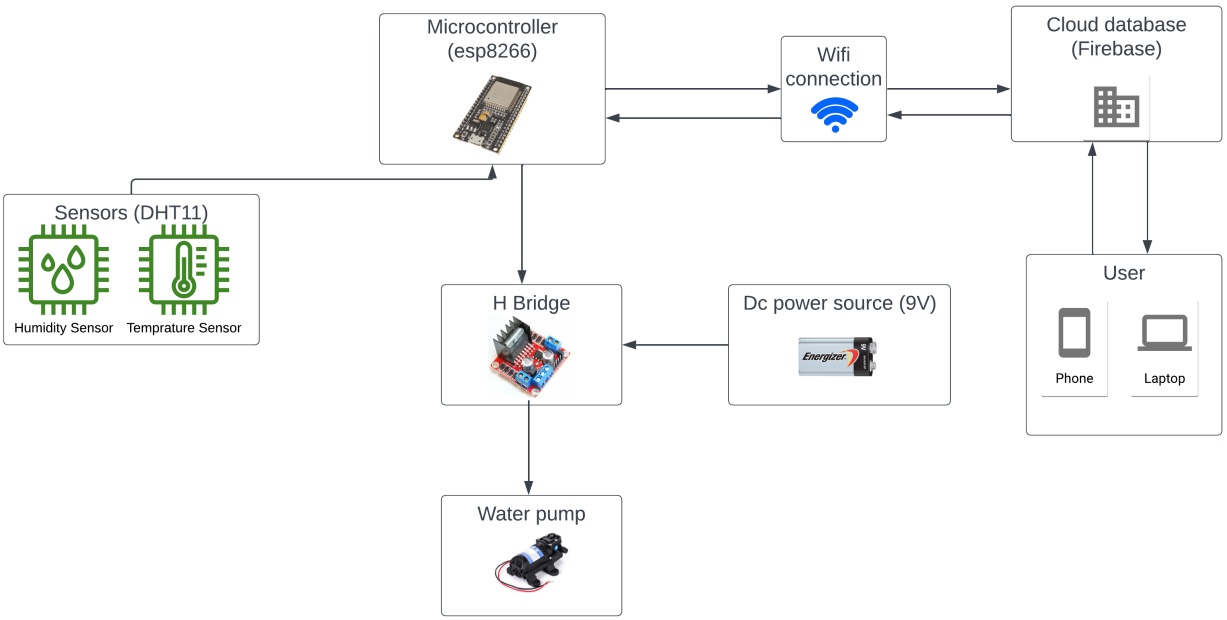

Figure 2: Functional Block Diagram

1. DHT11 Sensor: The DHT11 sensor is a reliable and low-cost humidity and temperature sensor that provides high accuracy and long-term stability. It generates calibrated digital output and can be interfaced with any microcontroller such as Arduino, Raspberry Pi, or MIT App Inventor to obtain instantaneous results.

2. Soil Moisture Sensor Module: The soil moisture sensor module is used to measure the volumetric water content in the soil. It will be used to determine the moisture level in the soil and trigger the irrigation system when the moisture level falls below a predefined threshold.

3. Air Quality Sensor: The air quality sensor is a component that detects and measures various pollutants and gases present in the air. It will be integrated into the smart irrigation system to monitor the

quality of air surrounding the agricultural area. This data can provide insights into the environmental conditions and help farmers make informed decisions regarding irrigation and crop health.

4. Lidar Sensor: The lidar sensor, which stands for Light Detection and Ranging, is a remote sensing technology that uses laser light to measure distances and create detailed 3D maps of the surrounding area. In the context of the smart irrigation system, the lidar sensor can be employed to gather topographic information, identify slope variations, and map the terrain's characteristics. This data is crucial for determining water runoff, drainage patterns, and optimal irrigation strategies.

5. Water Level Sensor: The water level sensor is a device designed to measure the water level in a reservoir, tank, or irrigation source. It provides real-time information about the water availability, allowing the smart irrigation system to adjust irrigation schedules and optimize water usage based on the actual water levels. This sensor ensures that water resources are utilized efficiently and prevents over or under-watering of crops.

6. 9V Power Adaptor: The 9V power adaptor is used to generate 9 volts of power to operate the system.

7. MIT App Inventor: MIT App Inventor is a visual block-based programming language used to develop mobile applications for Android devices. It will be used to develop the mobile application that will communicate with the irrigation system.

8. H-Bridge: The H-Bridge is a motor control circuit that allows the system to control the motor that drives the water pump. It will be used to turn the motor on or off based on the moisture level in the soil.

3 Schematic Diagram

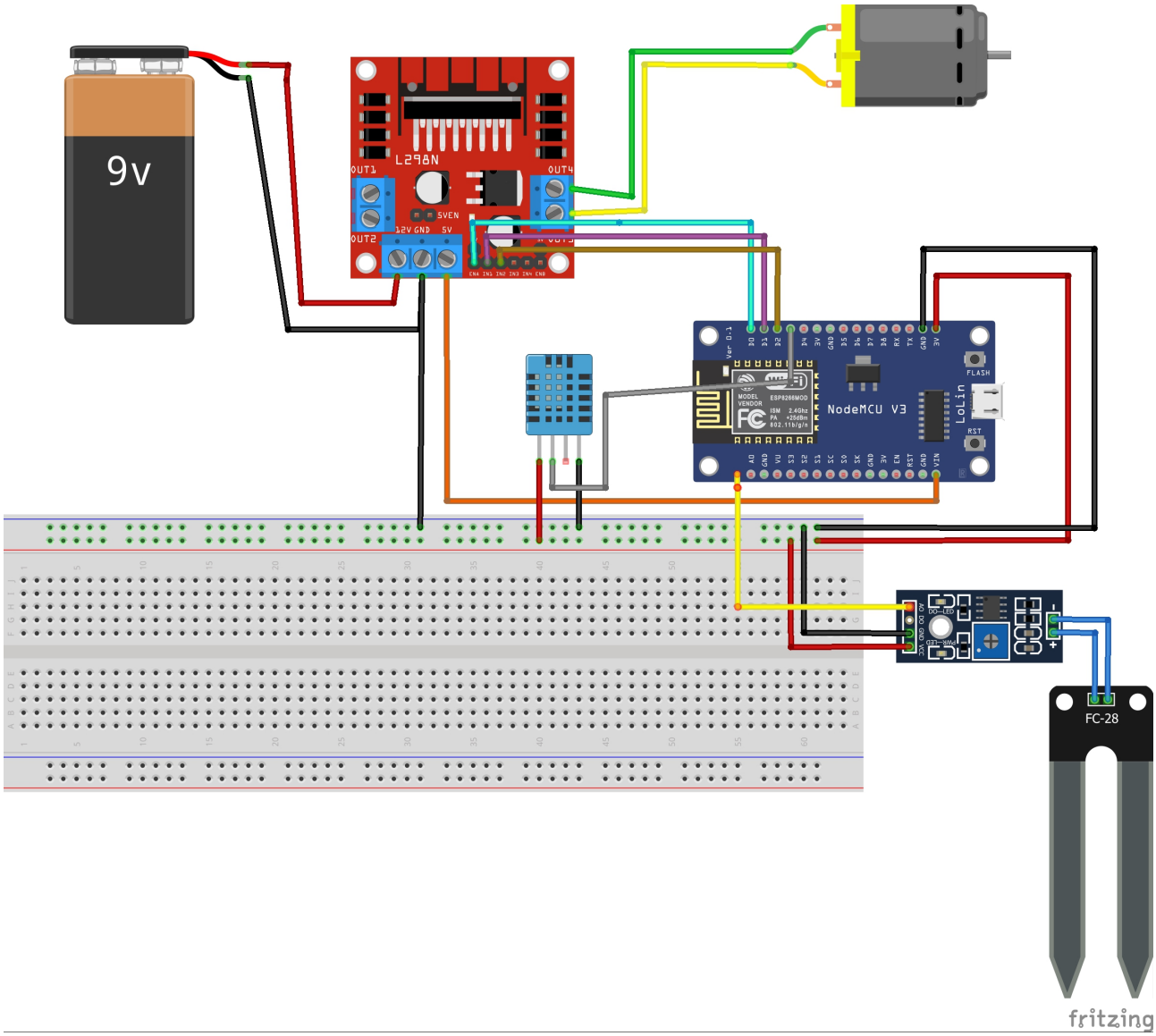

Figure 3: Old Schematic Diagram

After we have added the three new sensors it became as follows

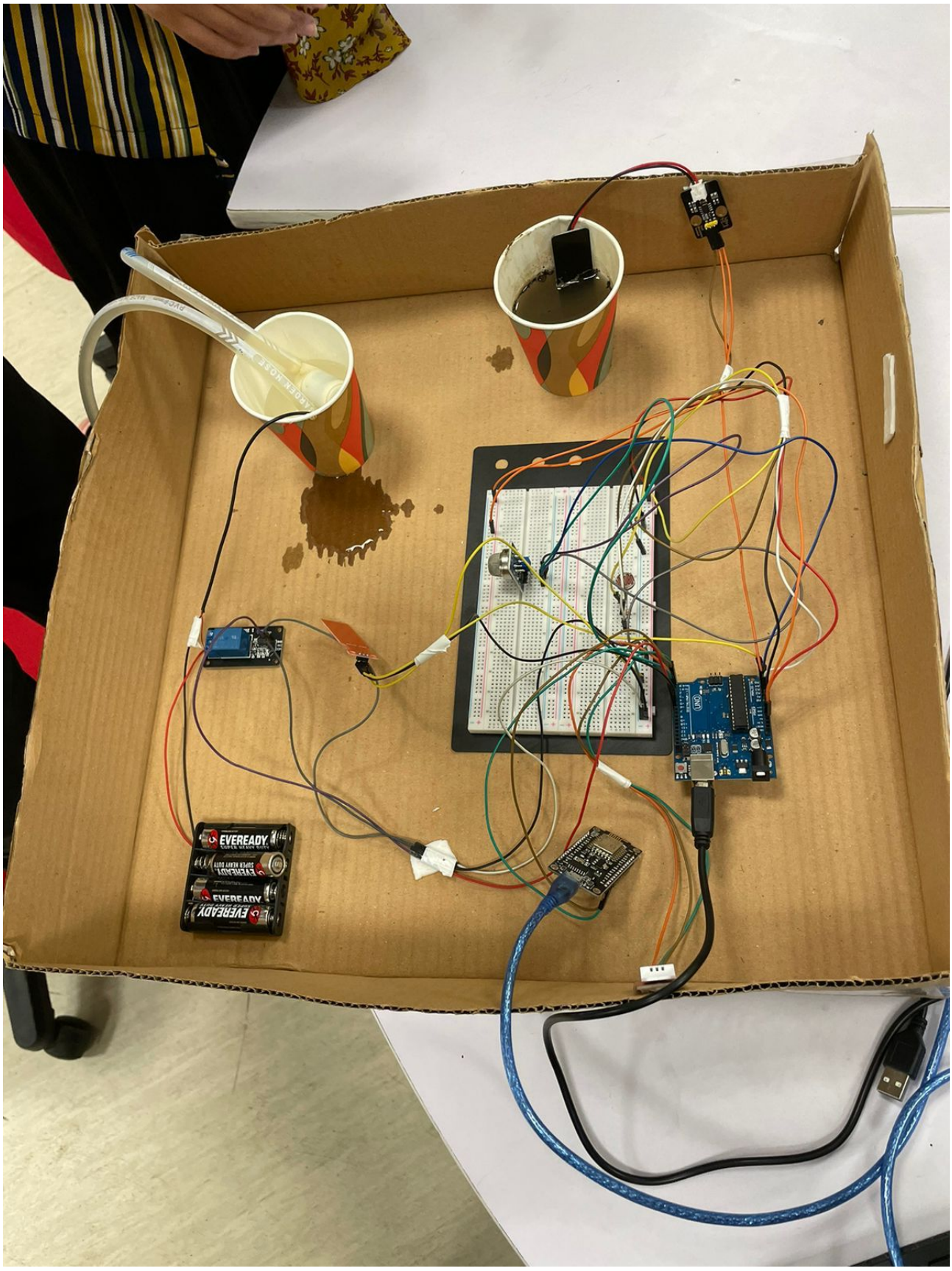

Figure 4: Old Schematic Diagram

4 Components and Prices

In this section we will introduce a detailed list of the used components, their usage, and their price. Note that we have added additional three sensors which are a light sensor, air quality sensor, and water level sensor

4.0.1 DHT11 Pins

Here are the pin labels for the DHT11 sensor

Figure 5: DHT11 Sensor

4.1 Breadboard

Will be used to gather all the components needed in one place without the need to use a soldering iron.
Price: 45 EGP

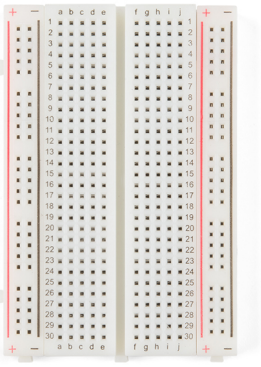

Figure 6: Breadboard

4.2 NODEMCU ESP8266

This WIFI module Will be used to connect to the Firebase.
Price: 170 EGP

Figure 7: ESP8266

4.3 Relay Module (optional)

Is needed to control the flow of the water pump.
Price: 40 EGP

Figure 8: Relay Module

4.4 Water Pump

Will be used to control the in-out water flow.
Price: 90 EGP

Figure 9: Water Pump

4.5 Soil Moisture Sensor

Will be used to measure the volumetric water content in soil. .
Price: 75 EGP

Figure 10: Soil Sensor

4.6 9 volt battery

To power the components on, it will work as our main power supply.
Price: 35 EGP

Figure 11: Battery

4.7 Connecting Jumpers

To connect the components on the breadboard.
Price: 35 EGP

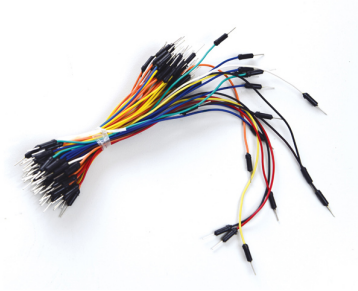

Figure 12: Connecting jumpers

4.8 Temperature and Humidity Sensor

Will be used to get instantaneous measurement of temperature and humidity.
Price: 50 EGP

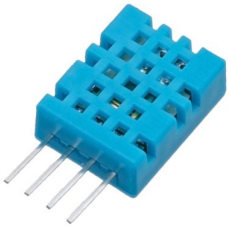

Figure 13: DHT11 Sensor

4.9 Air Quality Sensor

at detects and measures various pollutants and gases present in the air.
Price: 70 EGP

Figure 14: Air quality Sensor

4.10 Light detector

Light Detection and Ranging.
Price: 70 EGP

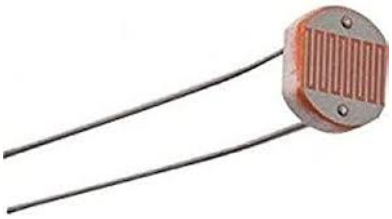

Figure 15: Light Sensor

4.11 Water level sensor

Measure the water level in a reservoir, tank, or irrigation source.
Price: 100 EGP

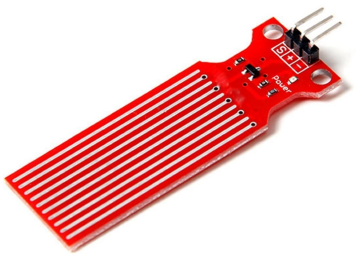

Figure 16: Light Sensor

4.12 Dual H-Bridge

Will be used as control motor.
Price: 85 EGP

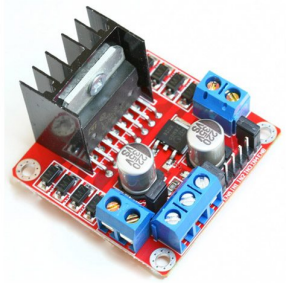

Figure 17: Dual H-Bridge

4.13 220 Ohm Resistor

Will be used to control the current and voltage.
Price: 0.75 EGP

Figure 18: 220 Ohm Resistor

5 Mobile application

We designed one with the MIT app inventor to see the current moment and different states of all sensors, we let the firebase the connection between the application and mobile app. We enabled the control of the motor as well from the application.

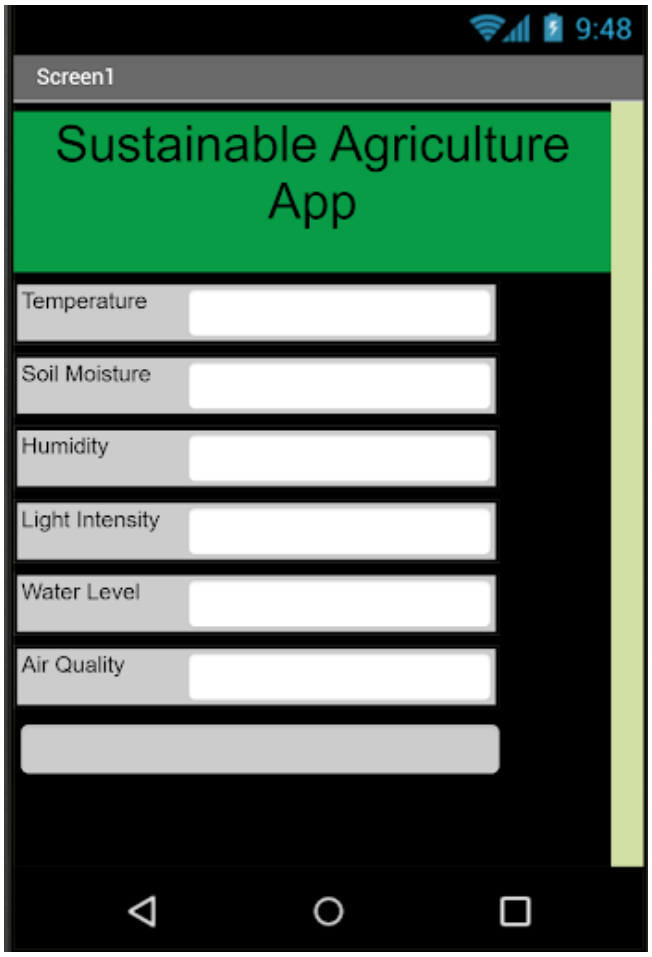

Figure 19: Mobile applicatoin

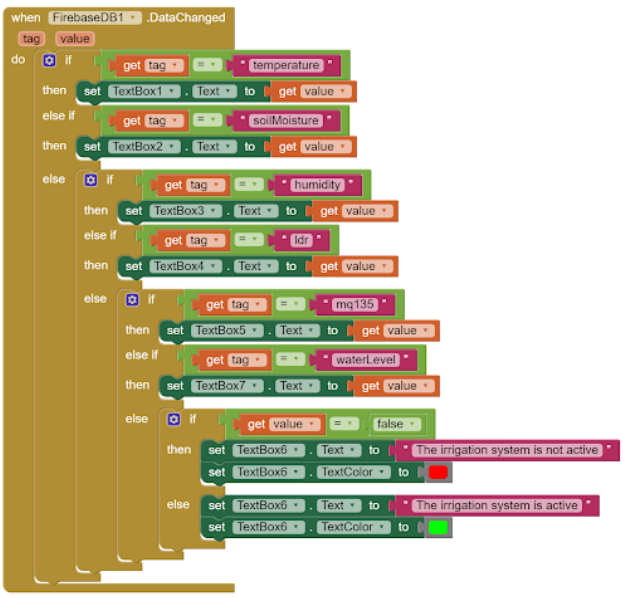

Figure 20: App inventor

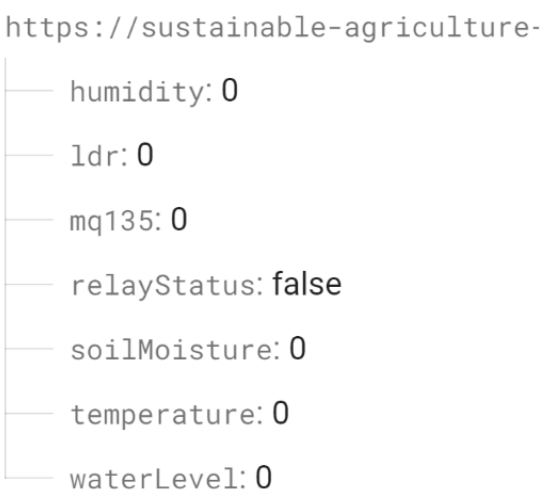

Figure 21: Firebase