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IOT Based Monitoring System in Smart Agriculture

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Abstract

We all know that smart agriculture using IoT is an emerging concept which plays crucial role. Through IoT (Internet of Things), we can communicate and interact with others over the Internet, and they can be remotely monitored and controlled. According to Ministry of Agriculture and Farmers Welfare (India), 52.1% of the population estimated directly or indirectly employed in agriculture. The aim of this paper is to propose a smart IoT based agriculture continuously assisting farmer in getting live data for efficient environment monitoring which will activate them to do smart farming and to improve the product quality.

Keywords: *Agriculture, DHT11, IOT, LM35, TI CC3200, UBIDOTS (Web Server)*

INTRODUCTION

Internet of Things (IOT) plays an important role in smart agriculture. Smart farming is a growing concept. The sensors are capable of providing information about their agriculture fields. Such as humidity, temperature and moisture of specific field. By monitoring environmental factors we are capable to improve the yield of the efficient crops [1]. The feature of this project includes:

Monitoring temperature and humidity in agricultural field through sensors and by using it we are able to detect disease of crops with the help of CC3200 single chip. Also we can access information on the cloud computing which is gathered through sensors [2].

LITERATURE SURVEY

India ranked in the world's five largest producers of over 80% of agricultural production. As increased demand for food due to population and income growth agricultural technologies helps to increase global crop yields up to 67%. To accept the climate change on the agriculture and to increase the production of sustainable field to feed the planet [3].

Today's agriculture routinely uses technologies and electronic devices such as robots, temperature and moisture sensors, aerial images, and GPS technology. Because of advanced devices [4'5], precision agriculture and robotic systems, businesses becomes more profitable, efficient, safer, and more environmental friendly [6].

PROPOSED SYSTEM MODEL

The main component of our project is CC3200 launch pad which is high performance single chip microcontroller with built-in Wi-Fi. It has on board chip antenna and also it has on board accelerometer and temperature sensor.

In our project, we have connected soil moisture sensor, temperature and humidity sensor, DHT11 and rain sensor, as this project is based on IOT, the collected data from sensor will get on mobile or PC which has been uploaded on cloud.

Rain sensor works on the principal of resistance. Rain sensor module allows to measure moisture via analog output pins and it provides a digital output when a

threshold of moisture exceeds. It includes the electronics module and a printed circuit board that "collects" the rain drops. As rain drops are collected on the circuit board, they create paths of parallel resistance that are measured via the op amp. The sensor is resistive dipole that shows less resistance when wet and more resistance when dry. When there is no rain drop on board it increases resistance so we gets high voltage according to V=IR. When rain drop present it reduces the resistance because water is a conductor of electricity and presence of water connects nickel lines in parallel so reduces resistance and reduces voltage drop across it [6].

Block Diagram of System

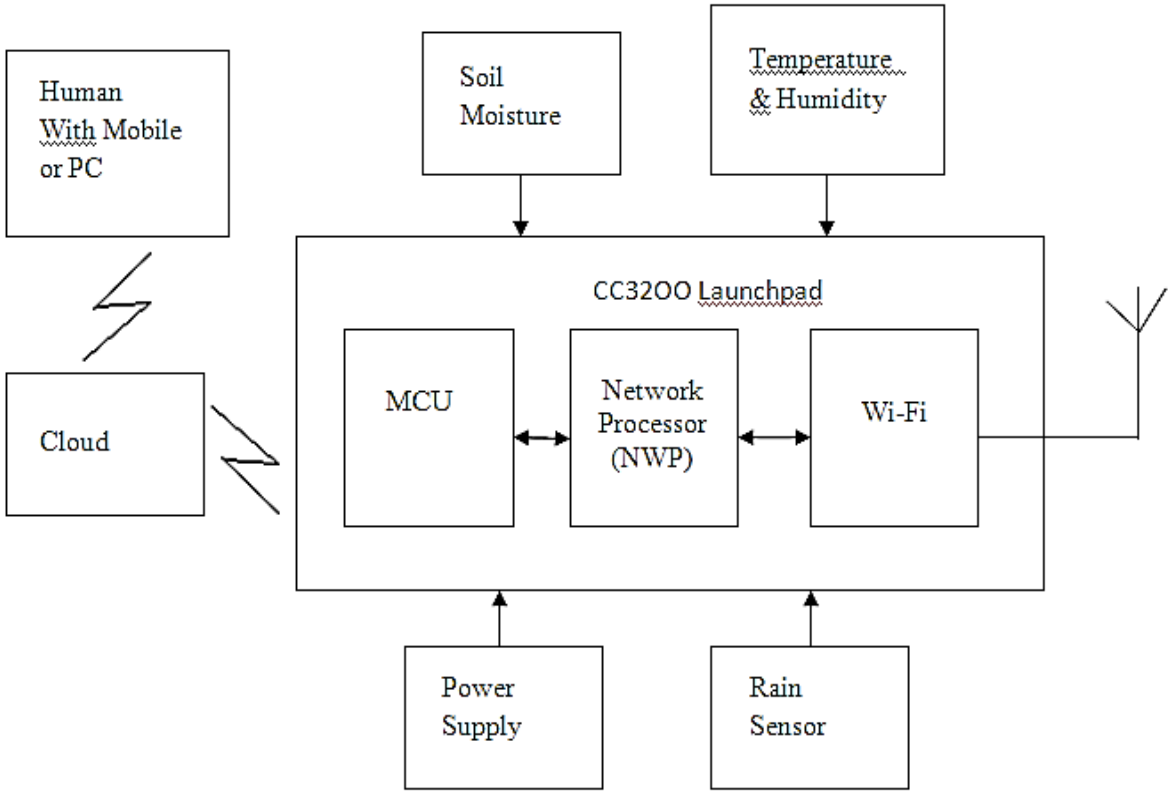


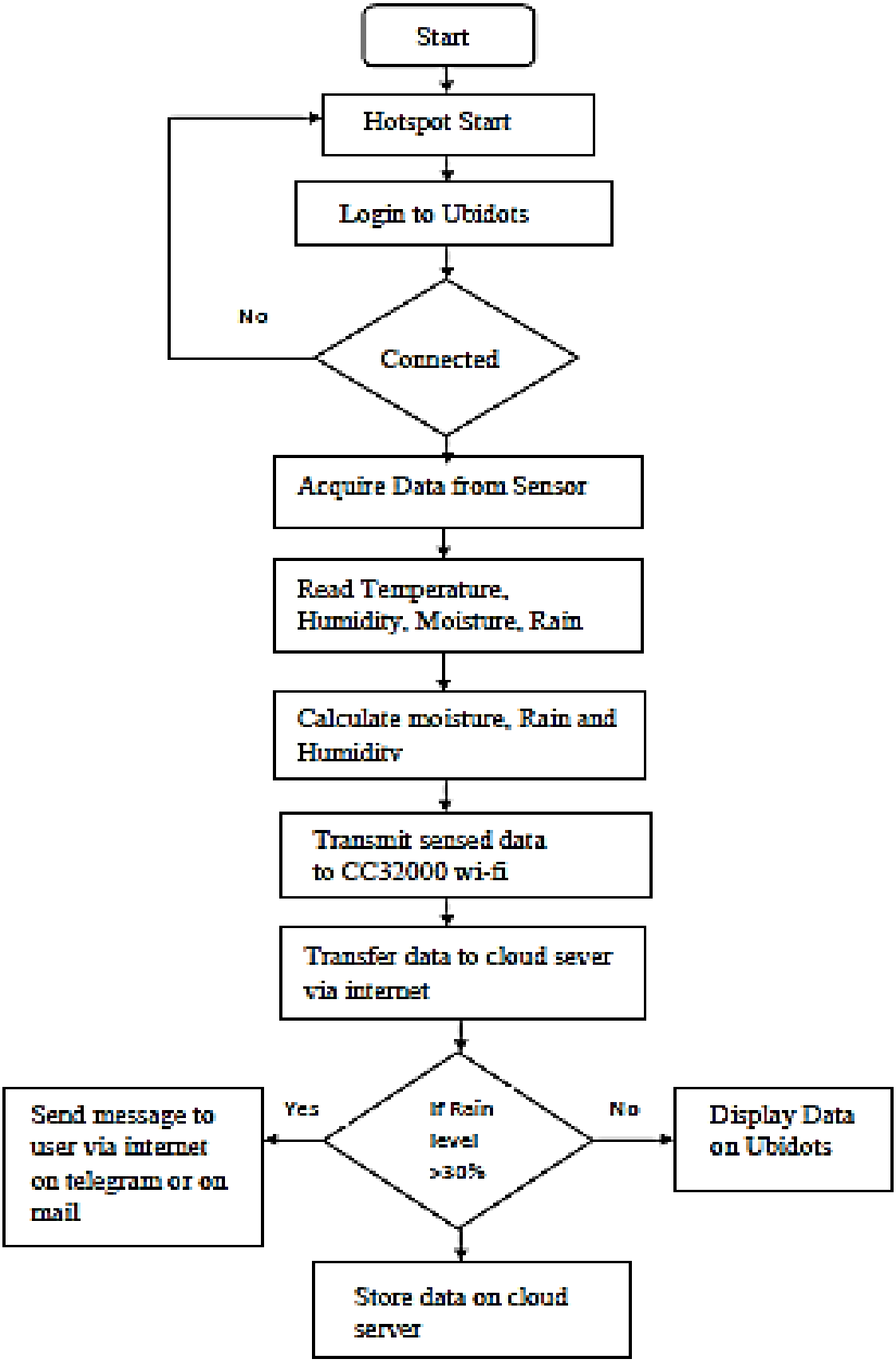
Figure 1: *Block Diagram of System*

Soil moisture is basically the content of water present in the soil. This can be measured using a soil moisture sensor which consists of two conducting probes. It can measure the moisture content in the soil based on the change in resistance between the two conducting plates. The resistance between the two conducting plates varies in an inverse manner with the amount of moisture present in the soil.

DHT11 is made up of two different parts i.e. capacitive humidity sensor and a thermistor. It has an internal small chip used for analog to digital conversions and to provide digital output. We can read this digital output easily through any of the micro-controller. In order to measure temperature DHT11 uses a thermistor also known as NTC (Negative Temperature Coefficient) temperature sensor.

We are using UBIDOTS for cloud data retrieving. The collected data from sensor gets automatically uploaded on cloud and by using specific ID we can get data on any mobile or PC, in various form such as mail, telegram and SMS.

Flow chart:



SYSTEM DESIGN

Description of CC3200 Launchpad

CC3200 is the main block of this proposed system. It is the first high performance Wi-Fi wireless microcontroller. It consists of three main units which are: microcontroller, network processor and Wi-Fi unit on same die. It is portable device, which uses low power for battery-operated device. It also gives secure and fast connection.

The JTAG headers are provided on the board to separate the CC3200 device from the FTDI JTAG emulator which is mounted on the same die. This CC3200 board features an accelerometer and a temperature sensor. These are connected to the I2C bus and can be differentiated using the jumpers which provided. The power supply can be provided by using the on-board micro USB connector. It provides 3.3 V for the CC3200 and the rest of the board to operate on that voltage.

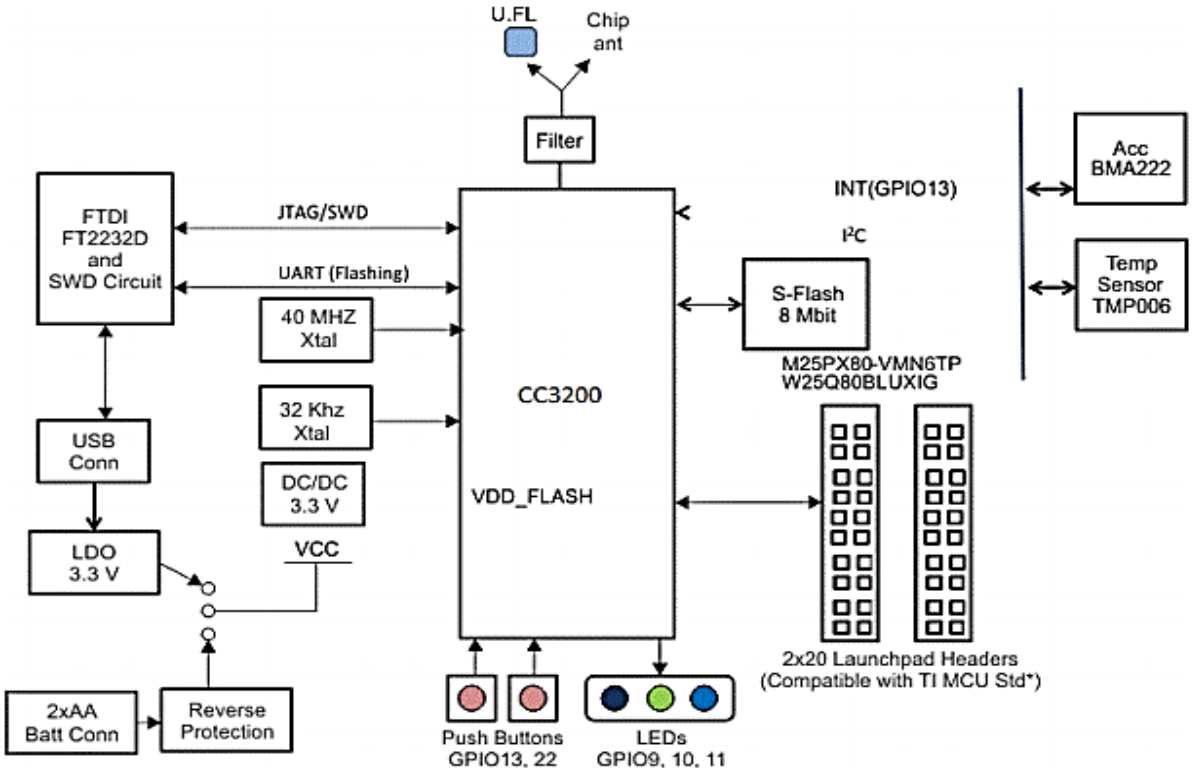


Figure 2: Caption missing

Power Modes

CC3200 has power modes based on following three aspects. Power mode of microcontroller subsystem is controlled by MCU application. Power mode of NWP maintained automatically and chip level power mode is controlled by the combination of MCU and NWP mode.

Table 1: *CC3200 power modes.*

MCU POWER MODES	Networking Sub systems		
	Disabled	LPDS	Active
Hibermate	Hibemate	N/A	N/A
LPDS	LPDS	LPDS	Active
Sleep	Active	Active	Active
Active	Active	Active	Active

Soil Moisture Sensor

This sensor can be used to test the moisture of soil, when the soil is having water shortage, the module [4] output is at high level, and else the output is at low level. Module triple output mode, digital output is simple, analog output more accurate, serial output with exact readings.

Features of Soil Moisture Sensor

- Sensitivity can adjust.
- This Sensor has fixed bolt hole, convenient installation.
- Threshold level can be configured.
- Analog output more Accurate, serial output with exact readings.

Rain Sensor Module

Figure 3: *Rain sensor module.*

The rain sensor module can be used a switch when raindrop falls through the raining board and also for measuring rainfall intensity. The module features, a rain board and the control board that is separate for more convenience, power indicator LED and an adjustable sensitivity though a potentiometer.

The analog output is used in detection of drops in the amount of rainfall. Connected to 5V power supply, the LED will turn on when induction board has no rain drop, and DO output is high. When dropping a little amount water, DO output is low, the switch indicator will turn on. Brush off the water droplets, and when restored to the initial state, outputs high level.

Specifications of Rain Sensor

- Output waveform of comparator is good, driving ability, over 15mA
- Potentiometer adjust the sensitivity
- Working voltage 5V

DHT11 Humidity and Temperature Sensor

The DHT11 is a basic sensor which is of ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and depends on that it gives out a digital signal on the data pin. It ensures high reliability and excellent long-term stability. This sensor includes a resistive-type humidity

measurement component which connects to a high performance 8-bit microcontroller and an NTC temperature measurement component.

Specificaion of DHT11

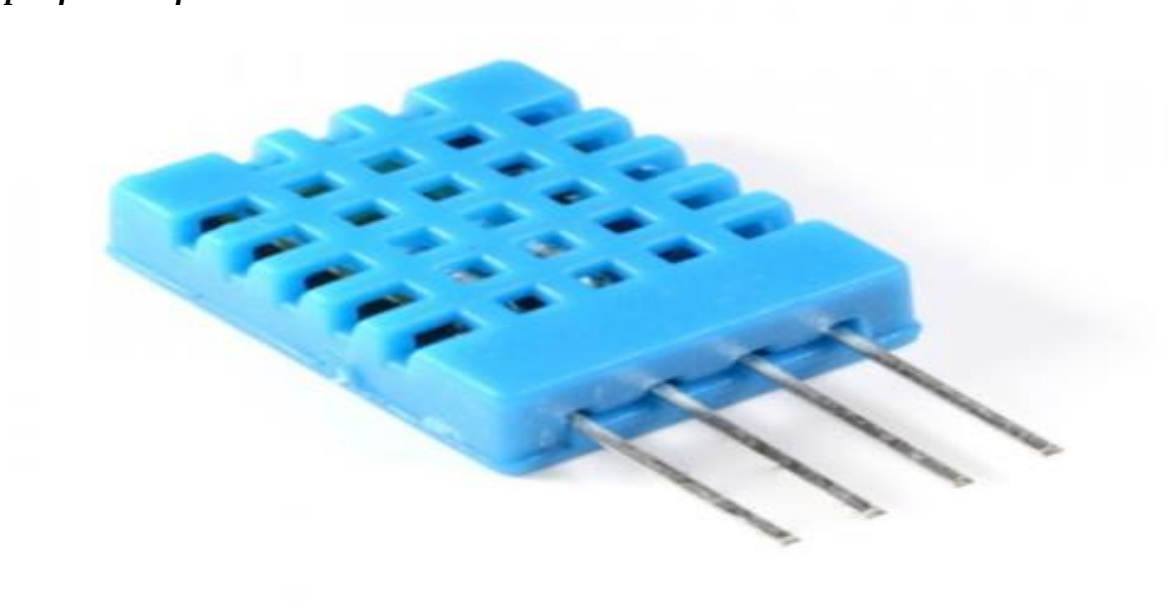


Table 2: *Specifications*

Item	Measurement Range	Humidity Accuracy	Temperature Accuracy	Resolution	Package
DHT11	20-90%RH 0-50 ℃	±5%RH	±2℃	1	4 Pin Single Row

RESULT

On PC

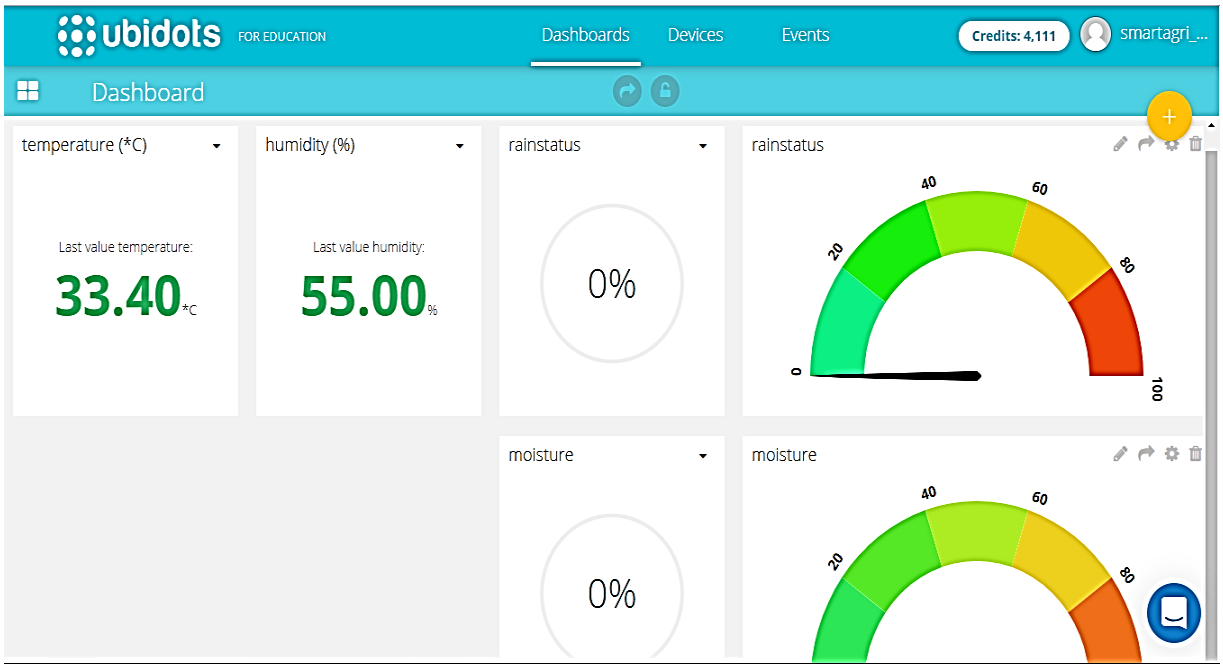


Figure 5: *View on PC*

On Mobile Phone

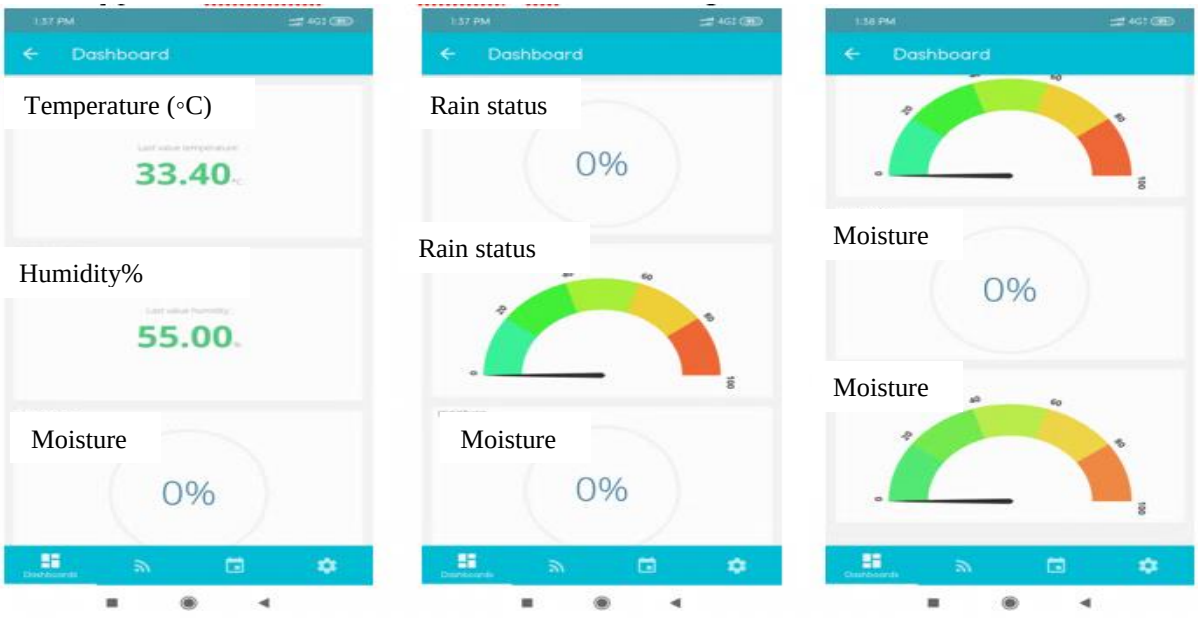


Figure 6: *View on mobile phones.*

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