IOT BUILDER TRAINER
MODEL-IOTBLD200

This trainer has been designed with a view to provide practical and experimental knowledge of Internet of Things (IOT) with Sensors with hardware and software programing.

IOT means Internet of Things, where things are objects, animals, people or Car, AC, Fan, TV, Fridge, Washing machine, Lights etc. IOT is a technology to sense and measure different data and parameters of different things as above and then to control and monitor them automatically as per our requirement. The things are provided with unique ID and their data is transferred on Internet. The things talk with each other with M2M - Machine to Machine communication.

SPECIFICATIONS

This Trainer consists of 2 Boards as below.

IOT Base Receiver

IOT Node Transmitter

1. IOT Base Receiver

Hardware

A. Microcontroller

1. Raspberry Microcontroller Board Pi 3.0 B+
2. Processor : Cortex-A53 (ARMv8) 64-bit Soc @ 1.4GHz,
3. Memory : 1 GB RAM
4. SD Card : 32GB SD Card External
5. Operating System : Open Source Linux porting
6. Programming Languages : C, C++ and Python Programming
7. Coding : Qt IDE based GUI development
8. Communication

   Ethernet : Gigabit Ethernet Rj45

   Wifi : 802.11 b/g Wireless LAN (Wifi) Dual-Band 2.4/5.0 GHz, 3G

   Bluetooth : Bluetooth 5.0

   Communication Protocols : I2C interface

   SPI interface

   RS485 interface
9. USB Interface : USB HID and CDC Interface - USB 2.0 – 2 Ports
10. Display and Audio : HDMI Output Interface port
11. Color TFT LCD : 1.77 Inch
12. Power : 5V, 2A DC

B. Other Parts

1. A to D Converter - ADC : 8 Nos.

   Voltage inputs : 1 Channel Resistance Input

   1 Channel 4-20mA Input

   6 Analog Voltage inputs,

   4 digital outputs

   I2C Channel – 1 No.
2. Stepper Motor with Driver PCB : 1 No
3. DC Motor with Driver PCB : 1 No
4. RS232 Serial to USB Converter Interface Module - USB and TIL interface
5. RS485 Interface Module : 1 No
6. 4-20mA Interface Module : 1 No
7. Camera Module : CAM Camera

8. Relay Module : 2 Channel
9. Audio Buzzer : 5V, 3 Pins
10. LCD Display : 20 X 4
11. Push Switch Interface : 2 Nos.
12. LED Interface : 8 Nos
13. Bluetooth Module : 1 No
14. IoT Node - Wireless 2.4GHz Zigbee Module
    with USB Port as an End Device, Coordinator and Router with 6 Sensors Input Node
15. IoT Node : Wireless 2.4GHz Wifi Module – ESP32
16. GSM IoT Gateway :
    Quad-Band 850/900/1800/1900 MHz with GPRS multi-slot class
    2G Modem with USB interface and GPRS enabled. Modem can be controlled via AT Commands. The user can make voice call, SMS and send data through Embedded TCP/UDP and HTIP protocol for loT Gateway
17. 2 mm interconnection Sockets and connectors with external module interface
18. Each Sensor Node packed in IP65 box with 6 Analog Voltage inputs, 4 digital outputs and I2C Channel
19. Solar Panel : 6 Watts
20. DC Battery : 3.7V, 4400mAH
21. Solar Charger : USB

C. Server, Software and Programming

1. Cloud/ Server configurations
   It has features of Local server Configuration, Database Management and Web Based application with learning of Html, jQuery, JavaScript and Php applications for local server.
2. Remote parameter update (Over The Air - OTA)
   Over the air (OTA) Node configuration
   GUI based parameter configuration
   GUI Base loT application development.
3. Online Cloud/ Server (Optional) :
   We will provide online server along with database, Email, Configuration with one website for one year.

2. IOT Node Transmitter

Hardware

A. Microcontroller

1. Arduino Uno Microcontroller as Wireless Sensor Node with

Analog Inputs	: 6 Nos
Digital Outputs	: 4 Nos.

B. Sensors

1. Temperature Sensor – MAX6375

Linear Temperature Slope	: 10mV/°C
Temp. Range (°C)	: -40 to +150-4°C/+6°C Accuracy from -40°C to +150°C
Operates from	: 2.3V to 5.SV

2. Humidity Sensor - DHT22

Accuracy (Best Fit Straight Line)	: ±3.0 %RH
Operates Voltage	: 3.3V
Range	: 0 to 100% RH
Output Signal	: Analog voltage

3. Soil / Water Temperature Sensor – RTD100

Soil/Water Temp. Range (°C)	: 0 to 100
Accuracy	: ±2°C
Size	: 6 inch
Operating Voltage	: 3.3 to 5.0 V

4. Leaf Wetness Sensor

Grid-like

Resistance-type sensor

Moisture on vegetation	: From 0 (dry) to 15 (wet).

5. Soil Moisture Sensor

Operating Voltage	: 3.3 to 5.0 V
Range	: 0 to 100% (Need Calibration)
Output Signal	: Analog voltage

6. Dust Sensor – PM2.5-PM10

Dust Sensor Operating Voltage	: 5 V
Sensitivity	: 1.65 V/ 100µg/m3
Output Signal	: Analog voltage

C. Other Parts

1. LCD Display : 20 X 4
2. IoT Node : Wireless 2.4GHz Zigbee Module
3. IoT Node : Wireless 2.4GHz Wifi Module – ESP32
4. Push Switch : 1 No.
5. LED and Resistor : 1 No. Each

D. Accessories:

1. 2 mm interconnection Sockets : On Board
2. 2 mm Banana Jumper Cable : 50 Nos
3. 2mm Banana Jack to Single pin jumpers : 4 Nos
4. USB to Mini USB Cable for Zigbee : 2 Nos
5. USB to Micro USB Cable for ESP32 : 2 Nos
6. USB to Square USB Cable for Arduino : 1 Nos
7. COM1 Cable - Male to Female for GSM : 1 No
8. COM1 Male to USB Cable for RS232 : 1 No
9. Ethernet Cable for Raspberry : 1 No
10. HDMI to Micro HDMI Cable for Raspberry : 1 No
11. VGA 15 pin Male to HDMI Converter : 1 No
12. 4 Port USB 3.0 Hub : 1 No
13. 5V, 3A DC USB-C Adaptor for Raspberry : 1 No
14. 9V, 1A Adaptor for Arduino : 2 No
15. 9V, 1A Adaptor for GSM : 1 No
16. DIN connector Cable : 2 No.
17. SD Memory Card with Codes for All Experiments : 32 GB - 1 No
18. Online Cloud/Server Services : Free for 1 Year
19. 16 GB Pen Derive : 1No
    with Software, Library, Drivers, Codes, Soft Copy of Manual & Mobile App
20. Printed Practical Manual : 1 No
21. E-Books for IOT Subjects : 10 Nos
22. Mp4 Video Class for IOT and AI Subjects : 100 Nos
23. Power Supply : 230V AC, 50 Hz
24. Operating Conditions : 0-40 °C, 85% RH

EXPERIMENTS

A. Theory Experiments

Arduino Micro Controller

1. To understand theory and working of Arduino Operating software.
2. To understand Pin and Connection Diagram of Arduino.
3. To understand USB Interface for Arduino
4. To understand that how to connect 20 x 4 LCD Display to Arduino
5. To understand Libraries and Algorithms used for Arduino

Raspberry Micro Controller

6. To understand theory and working of Raspberry
7. To understand Operating System for Raspberry
8. To understand Communication Protocols - UART, I2C, SPI, RS232 and RS485.
9. To understand Libraries and Algorithms used for Raspberry
10. To understand USB Interface for Raspberry PI
11. To understand Ethernet Cable Interface for Raspberry PI
12. To understand micro SD Card Interface for Raspberry PI
13. To understand that how to connect 1.77" Color TFT LCD to Raspberry PI.
14. To understand that how to connect 20 x 4 LCD Display to Raspberry PI
15. To understand what is OTA and how to deploy OTA software update on Raspberry Pi
16. To understand theory of I2C Channel
17. To understand theory of Port Forwarding with Static IP
18. To understand theory and working of GSM Module
19. To understand theory and working of Zigbee Module
20. To understand theory and working of ESP32
21. To understand theory of Air Humidity Sensor DHT22
22. To understand theory of Temperature Sensor MAX6375
23. To understand theory of Air Quality Sensor- PM2.5-PM10
24. To understand theory of Soil Moisture Sensor
25. To understand theory of Ambient Light Sensor - LDR
26. To understand theory of Soil/Water temperature Sensor RTD100
27. To understand theory of PIR Sensor
28. To understand theory of Leaf Wetness Sensor
29. To understand theory of Carbon Dioxide CO2 Sensor
30. To understand theory of Oxygen O2 Sensor

B. Practical Experiments

31. To determine Air Humidity using DHT22
32. To determine Air Temperature using Temperature Sensor – MAX6375
33. To measure Air Quality using Dust Sensor – PM2.5-PM10
34. To measure Soil Moisture using Soil Moisture Sensor
35. To measure Soil / Water Temperature using RTD 100
36. To measure wetness of Leaf using Leaf Wetness Sensor
37. To measure CO2 PPM value using CO2 sensor
38. To measure Oxygen range using O2 sensor
39. To detect motion using PIR sensor
40. To detect the presence of Ambient Light using Photo Sensor LDR
41. To control Stepper Motor using Motor Driver
42. To control DC Motor using Motor Driver
43. To record and play Video using Raspberry Pi Camera
44. To control 2 Channel Relay
45. To use Audio Buzzer for output signal alarm experiment
46. To convert Analog voltage into Digital Voltage using ADC - ADS1115S
47. To demonstrate Push Button functionally by toggling LED
48. To charge Battery using Solar Panel
49. To demonstrate 4-20mA input Module
50. To demonstrate RS232 Protocol
51. To demonstrate RS485 Protocol
52. To demonstrate GSM Protocol
53. To demonstrate Ethernet Protocol
54. To demonstrate MQTT Protocol
55. To demonstrate CoAP Protocol
56. To demonstrate HTTP Protocol
57. To demonstrate FTP Protocol

C. Server, Cloud Configuration, IOT Gateway, Nodes and Mobile App Experiments

58. To send Sensors data using Zigbee from IOT Node to IOT Receiver
59. To send Sensors data using Wifi ESP32 from IOT Node to IOT Receiver
60. To send Sensors data by SMS to Mobile using GSM IOT Gateway
61. To send and display Sensors Data in a server Web Page using HTTP, Java and PHP Code
62. To send Sensors data to website webpage and store them into MySQL Server
63. To receive and show Sensors data on Android based Mobile App

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