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 - Raspberry

Hardware

A. Microcontroller

1. Raspberry Microcontroller Board Pi 4.0
2. Processor : Cortex-A53 (ARMv8) 64-bit Soc @ 1.4GHz,
3. Memory : 1 GB RAM
4. Memory SD Card : 32GB Micro SD Card External – Push / Pull type
5. Operating System : Open Source Linux and Windows
6. Programming Languages : C, C++ and Python Programming
7. Coding : Qt IDE based GUI development
8. Communication

   Ethernet : 10/100/1000 Mhz Gigabit Ethernet Rj45

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

   Bluetooth : Bluetooth 5.0

   Zigbee : 2.4 GHz

   Communication Protocols : I2C interface
   SPI interface
   RS485 interface
   2.4 GHz Zigbee
9. USB PC Interface : 4 Nos.
10. Audio : 3.5 mm Audio Output Jack
11. Video : HDMI and Composite RCA
12. Camera Module : 15 pin MIPI Camera Serial Input
13. Color TFT LCD : 1.77 Inch
14. Power : 5V, 2A DC

B. Other Parts

1. ADC – Analog Inputs : 8 Nos.
   : 1 Channel Resistance Input
   1 Channel 4-20mA Input
   6 Analog Voltage inputs,
   4 Digital outputs for Relays
   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
    IoT Node : Wireless 2.4GHz Wifi Module – ESP32
15. 2 mm interconnection Sockets and connectors with external module interface
16. Wireless Sensor Node : 2 Nos packed in IP65 box
17. Solar Panel : 6 Watts
18. Solar Charger : USB
19. DC Battery : 3.7V, 4400mAH
20. Sensor : 1 No with each node
21. 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.

    Explore physical and application layers protocols like RS232, RS485, GSM, Ethernet and MQTT, CoAP, HTTP, FTP.

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, Java and PhP and mySQL.

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 :

   We will provide online server along with database, Email, Configuration with one website for one year.

2. IOT Node Transmitter - Arduino

Hardware

A. Microcontroller

Arduino Uno Microcontroller as Wireless Sensor Node with

Analog Inputs	: 6 Nos
Digital Outputs	: 4 Nos.

B. Sensors

1. Temperature and Humidity Sensor – DHT11

Supply	: +5V DC
Temp. Range (°C)	: 0 to +100°C
Operating Humidity Range	: 0 to 100% RH
Output Signal	: Analog voltage
Heater Voltage	: 5V

2. Air Quality Sensor MQ135 :

Signal	: Analog Voltage
Detection Range	: 10-300 ppm – NH3
	: 10-1000 ppm – Benzene
	: 10-300 ppm Alcohol

3. Soil Moisture Sensor

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

4. Ambient Light Sensor : LDR

Operating Voltage	: 5.0 V
Output Signal	: Analog voltage

5. Soil / Water Temperature Sensor – RTD100

Temp. Range (°C)	: 0 to 100 °C
Operating Voltage	: 3.3 to 5.0 V
Output Signal	: Analog voltage

6. PIR Sensor

Operating Voltage	: 5.0 V
Detection Range	: 2 Meter
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
25. Maintenance and Service Support : 1 Year

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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