AIoT Programing Introductory Equipment for Training of IoT & Data Science and Machine Learning

PyC Basic II

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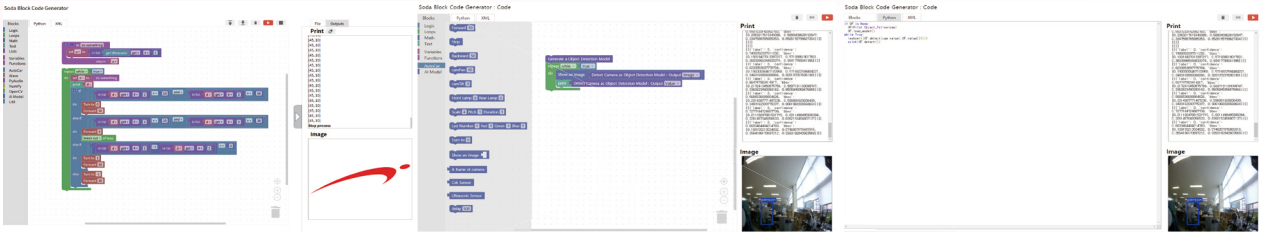
PyC Basic II

- AIoT programming introductory equipment for training IoT & data science and machine learning
- Realization of training with one board composed of high-performance, low-power ARM Quad core processor modules and various I/O devices optimized for training to collect and analyze sensor data and forecast them through the model definition in real time at AIoT environment
- To enhance the understanding of embedded interface, various input devices, such as GPIO-controlling button, ultrasound, ADC-based distance measurement, illumination, noise level, movement sensing, I2C-based proximity, ambient illumination, color, gesture, temperature, humidity etc., are provided
- To support the visualization of analyzed or forecast sensor data, various output devices, such as basic LED, OLED that can output texts or brief graphics, RGB-type 16x16 Pixel Display accompanied with colorful lighting effect, are provided
- Gigabit Ethernet, Dual-band Wi-Fi(2.4GHz & 5GHz) and Bluetooth 5.0 are provided to make the remote-control of the equipment possible with smartphone or tablet in the IoT connectivity environment
- Web-browser based dedicated learning environment that supports Python 3, C11/C++17 based on interpreter of European Institute of Particle Physics, and Blockly: the Google block coding platform is provided to enhance the expediency of AIoT programming
- Soda OS where Debian Linux is optimized for training of ARM-based IoT, data science, and machine learning, and PoP Libray where supports reliable hardware abstraction are provided
- Supports the open integrated development environment based on Visual Studio Code for professional application development
- Dedicated training contents required for realizing IoT, data science, and machine learning are provided

[Block-based Programming]



Operating Program

List		Specifications
Soda OS Lite	Linux Kernel	aarch64 5.x
	CLI	Zsh with Oh-My-Zsh, Tmux, powerlevel10k thema, Powerline fonts
	Tool Chain	GCC (c, c++), JDK, Node JS, Python3, Cling, Clang
	Connectivity	SSH Server, Bluez, MQTT Server(Mosquitto), Blynk Server
	Multimedia	OpenCV 4
	Data Science & AI	Numpy, Matplotlib, Pandas, Scipy, Seaborn, Scikit-learn
Pop Library with PyC Basic II	Output Object	Leds, PiezoBuzzer, OLed, PixelDisplay
	Input Object	Switchs, UltraSonic, Potentiometer, CdS, Sound, Psd. Pir, Gesture, TempHumi
	AI	Linear Regression, Logistic Regression, Perceptron, ANN

Hardware Specifications

List	Specifications
Base Board	Size: 174 x 184mm Power: 5V 5A
Main Module	CPU: ARM Quad core Cortex-A72 (ARM v8) 64-bit SoC @ 1.8GHz Memory: LPDDR4-3200 4GB Connectivity: Gigabit Ethernet, Wi-Fi 2.4G & 5G 802.11ac, Bluetooth 5.0, BLE USB: USB 3.0 2port, 2.0 2port HDMI: micro-HDMI 2port (up to 4kp60 supported) Codec: H.265 (4kp60 decode), H264 (1080p60 decode, 1080p30 encode) Graphics: OpenGL ES 3.0

Hardware Specifications

List		Specifications
Main Module		Data Storage: 32 GB Micro SD GPIO: 40 pin GPIO header (fully backwards compatible with previous boards) 2-lane MIPI DSI display port 2-lane MIPI CSI camera port Power supply: 5V DC via USB-C connector, 5V DC via GPIO header
Peripheral	OLED	Driver IC: SSD1315 Size: 1.3 inch Resolution: 128x64 Color: White Interface: I2C Operating Voltage: 3.3V
	Piezo Buzzer	Rated Current: Max30mA Sound Output at 10cm(dB): Min85dB Interface: GPIO Operating Voltage: 3.3V
	LED x 8EA	Color: Red Interface: GPIO Operating Voltage: 3.3V
	Pixel Display	Color: pixel RGB IC: WS2811 Pixel: 16x16 Operating Voltage: 5V Power: 0.3W/pixel Waterproof level: Non-waterproof Interface: GPIO (Serial protocal) Size: 110 x 110mm
	Distance Measuring Sensor	Sensor: PSD Detecting distance: 2~40cm Interface: Analog Output Operating Voltage: 5V
	Switch x 4EA	Interface: GPIO Operating Voltage: 3.3V
	Humidity & Temperature Sensor	Humidity Resolution: 12bit(0.04%RH), 8bit(0.7%RH) Humidity Accuracy: +-3%RH Temperature Resolution: 14bit(0.01C), 12bit(0.04C) Temperature Accuracy: +-4°C Interface: I2C Operating Voltage : 3.3V
	Illuminance Sensor	Sensor : CdS Operating Voltage: 3.3V Interface : Analog Output
	Sound Sensor	Sensor : Microphone Sensitivity : -40dB Operating Voltage: 5V Interface : Analog Output
	Gesture Sensor	Sensor : Digital Proximity Operating Voltage: 3.3V Interface : I2C
	Ultrasonic Sensor	Measuring distance: 20 ~ 5000(mm) Measuring angle: <15° Measurement resolution: 3mm Operating frequency: 40Hz Operating Voltage: 5V
	Potentiometer	Sensor : 10k(ohm) Variable Resistor Feature : 0~3.3V DC Variable Voltage out Interface : Analog Output Operating Voltage: 3.3V
	Camera	Image Sensor: Sony IMX219 Resolution: 8M pixel native resolution sensor (3280 x 2464 pixel static images) Video: 1080p30, 720p60 and 640x480p90 Linux Integration: V4L2 driver available Focal length: 3.04 mm Horizontal field of view: 62.2 degrees Vertical field of view: 48.8 degrees Focal ratio (F-Stop): 2.0

Training Contents

Introduction to Data Science and Artificial Intelligence in IoT environments (Python Version)

Training Environment of PyC Basic

Control of IoT Sensors
- Training for Control of LED, Switches, and Ultrasonic
- Training for Control of Potentiometer, CdS, Sound, Psd, and Pir
- Training for Control of Piezo Buzzer
- Training for Control of TempHumi, Apds, and Oled
- Training for Control of PixelDisplay

IoT Communication
- Training for MQTT
- Training for Control of Sensors based on MQTT
- Training for Interworking of Cloud and Smartphone

Data Analysis and Visualizing Library
- Training for Numpy and High-speed Multi-dimensional Matrix Calculation
- Training for Pandas and Analysis of Time Series and Table Data
- Training for Matplotlib and Data Visualization

Introduction to Artificial Intelligence
- Training for Linear Regression
- Training for Logistic Regression
- Training for Perceptron
- Training for ANN

Hardware Interface (C/C++ Version)

Signal Types and GPIO Basic Training
- Learning of basic concepts for hardware interface (Signal Types and Peripherals)
- LED digital outputting through GPIO
- Switch digital inputting through GPIO
- Realizing various switches using polling and event sensing

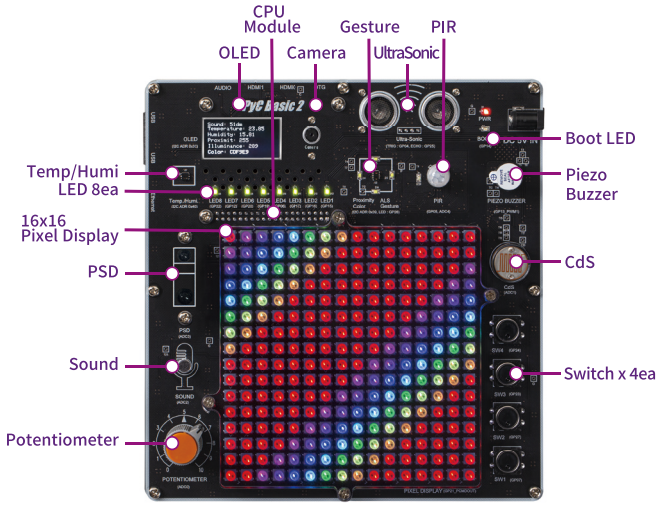
GPIO In-depth Training and PWM Application Training
- Solving of various practice examples using LED and switches
- Learning of Thread concept and handling of switches using Thread
- Handling of Buzzer and LED through hardware PWM
- Realizing of software PMW and accordingly handling of buzzer and LED
- Solving of various practice examples using buzzer and LED

Data Sheet Interpretation and 12C Application Training
- Understanding of 12C communication method and checking of how 12C communication is applied, watching the SHT20 data sheet
- Reading the sensor values of temperature and humidity using 12C communication
- Reading the sensor values of temperature and humidity through Thread

SPI and ADC Basic Training
- Checking of how SPI communication is applied, watching the MCP3028 data sheet
- Understanding of ADC principle and checking of how the struc ture of ADC is, watching the MCP3028 data sheet
- Reading the sensor values using SPI and ADC
- Solving the various practice examples using Potentiometer sensor

Application Training and Comprehensive Training of SPI and ADC
- Understanding the principle of Sound and CdS sensors and read ing the values using SPI and ADC
- Reading the PSD values using PSD data processing method
- Solving the various practice examples using Sound, SdS, and PSD sensors
- Solving the various practice examples using peripherals of PyC-Basic II

Layout



Components

Platform USB
(include OS image and Tools)
1EA

5V 5A Power Adapter
1EA

Micro SD Adapter
1EA

USB to Ethernet Adapter
1EA

Ethernet Cable
1EA

User Guide book
1EA