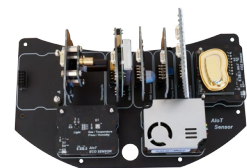


AIoT SerBot Series

SerBot • SerBot Plus • SerBot PrimeX
(Excluding LiDAR)



Kustom Version
(Supply Case : The Korea Military Academy)



Sensor Pack
Module provided for AIoT SerBot Plus



AIoT Tiny MCU
Modules provided for AIoT SerBot PrimeX

- AI and IoT Convergence Training Equipment based on Indoor Service Robot Platform
- Drive part adopts 3-axis omni-wheel to maximize robot's movement efficiency and minimize rotation radius
- The main module is an edge supercomputer that supports all existing AI frameworks
- Provides a 7-inch touch display with 1280x720 resolution and a 160-degree wide-angle camera with 8M pixels
- Provides Gigabit Ethernet, dual-band Wi-Fi and Bluetooth
- Digital microphones and speakers support Speech-to-Text and Text-to-Speech as well as voice command
- Supports various IoT sensor modules through 4 dedicated expansion interfaces
- High-capacity battery and dedicated charging system enable continuous experiment while charging
- Soda OS and Pop library, the exclusive AIoT operating system
- Interpreter-based C/C++ development environments optimized for beginners to programming, including Python 3
- A dedicated web browser-based learning environment for training Python 3 and C/C++ simultaneously on PCs and tablets
- mDNS/DNS-SD based distributed name resolution and network service publishing and discovery support
- Open Integrated development environment based on Visual Studio Code for professional application development
- Educational contents for artificial intelligence and deep learning based service robot
- AIoT SerBot Plus provides high-performance 360 degree lidar and dedicated library
- AIoT SerBot Plus provides 8 types of IoT sensor modules connected to a dedicated expansion interface
- AIoT SerBot PrimeX provides 6 ultrasonic sensors and 3 PSD sensors for obstacle detection
- AIoT SerBot PrimeX provides Cortex-M series high performance MCU module and CAN module
- AIoT SerBot PrimeX's main module contains edge supercomputer up to 21TOPS supporting all popular AI frameworks



Training Contents

Introduction to AloT SerBot

Structure of AloT SerBot

Practice environment of AloT SerBot

AI Technology

Supervised learning and unsupervised learning

Theory and Practice of Pop.AI-based Linear and Logistic Regression

Theory and Practice of Pop.AI-based Perceptron

Theory and Practice of Pop.AI based ANN, DNN, and CNN

Theory and Practice of Pop.AI & OpenAI-based

Reinforcement Learning

Understanding Tensorflow

Data Processing Technology

Numpy for fast multi-dimensional matrix operations

Pandas for analyzing time series and tabular data

Matplotlib for data visualization

Service Robot Application Technology

UI Exercise

Exercise for TTS (Text to Speech) & STT (Speech to Text)

Exercise for audio playback & recording

Camera exercise

Basic driving exercise

Voice command driving exercise

Remote control exercise

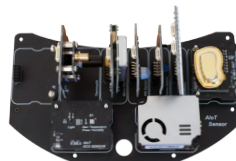
Deep learning-based driving exercise



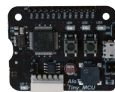
Product Configuration



AloT SerBot PrimeX



Sensor Pack
Modules provided for AloT SerBot Plus



AloT Tiny
MCU
Modules provided for AloT SerBot PrimeX



Platform USB
(include OS image and Tools)
1EA



12V 4A Charger
1EA



Micro SD Adapter
1EA



USB to Ethernet
Adapter
1EA



Ethernet Cable
1EA



Micro USB Cable
1EA



User Guide
book
1EA



Software Specifications

List		Specifications
Soda OS	Linux Kernel	4.19
	Desktop	X-Server, Openbox, LightDM, Tint2, blueman, network-manager, conky
	CLI	Zsh, Tmux, Peco, powerlevel9k thema, Powerline fonts
	Tool Chain	GCC 9, JDK, Node JS, Python3, Clang
	IDE	Visual Studio Code, NeoVim, Geany
	Connectivity	Mosquitto(MQTT), Bluez, mtr, nmap, iptraf, Samba, Blynk Server, Remove Desktop Server
	Multimedia	portaudio, sox, OpenCV 4, snowboy, Google Assistant
	Data Science & AI	Python3, Numpy, Matplotlib, sympy, Pandas, Seaborn, Scipy, Gym Scikit-learn, Tensorflow, Kerast
Pop Library	Output Object (C/C++, Python3)	Led, Laser, Buzzer, Relay, RGBLed, DCMotor, StepMotor, Oled PiezoBuzzer, PixelDisplay, TextLCD, FND, Led Bar
	Input Object (C/C++, Python3)	Switch, Touch, Reed, LimitSwitch, Mercury, Knock, Tilt, Opto, Pir, Flame LineTrace, TempHumi, UltraSonic, Shock, Sound, Potentiometer, CdS SoilMoisture, Thermistor, Temperature, Gas, Dust, Psd, Gesture
	Multimedia (Python3)	AudioPlay, AudioPlaylist, AudioRecord, Tone, SoundMeter
	Voice Assistant (Python3)	GAssistant, create_conversation_stream
	AI (Python3)	Linear Regression, Logistic Regression, Perceptron, ANN, DNN, CNN, DQN



Hardware Specifications of AloT SerBot

Motor Control Board

List	Specifications
Battery	11.1V / 14000mA
Wheels	3 Omni-Wheels
Motor	DC 12V Motor 3EA Gear Rate 1:50 Speed 6000RPM

Main Module

List	Specifications
CPU	Quad-Core ARM A57 @ 1.43 GHz
GPU	Maxwell Core 128EA
Memory	4GB 64-bit LPDDR4 25.6 GB/s
Storage	MicroSD (64GB)
Video Encoder	4K@30 4x 1080p@30 9x 720p@30 (H.264/H.265)
Video Decoder	4K@60 2x 4K@30 8x 1080p@30 18x 720p@30 (H.264/H.265)
Camera	MIPI CSI-2 DPHY Lanes
Connectivity	Dual Band Wireless Wi-Fi 2GHz/5GHz Band, 867Mbps, 802.11ac Bluetooth 4.2, Gigabit Ethernet
Display	HDMI and Display Port
USB	4x USB 3.0, USB 2.0 Micro-B

Base Board

List	Specifications
Microphone	High Performance Digital Microphone x 4EA - Sensitivity : -26 dBFS(Omnidirectional) - Acoustic Overload Point : 120dB SPL - SNR : 63dB
Speaker	Output : 3W x 2EA - 3.5mm Audio Jack - Frequency Response : 30Hz ~ 20KHz
Sensor Module Interface Block 4EA	+5V, +3.3V, GND, I ² C, ADC, GPIO, SPI
6-AXIS Sensor	Sensor : MPU6050N Resolution : 16bit Gyroscope Range : +-250, +-500, +-1000, +-2000°/S Accelerometer Range : +-2, +-4, +-8, +-18g
Camera	Image Sensor : Sony IMX219 Resolution : 8M Pixel Native Resolution Sensor (3280 x 2464 Pixel Static Images) Video : 1080p30, 720p60 and 640x480p90 Angle of View: 160 Degrees
LCD	7inch TFT LCD, HDMI Resolution 1024 X 600
Weight	5.2Kg
Size	290 X 290 X 310 (mm)
Basic Module	Input Device : Tact Switch x 2EA(GPIO) Output Device : LED 8EA(I ² C) Actuator : Passive Buzzer(GPIO)



Hardware Specifications of AIoT SerBot Plus

The specifications of AIoT SerBot is included

SLAM & Sensor Pack

List	Specifications
LiDAR	Distance Range : 12m
	Angular Range : 0 ~ 360Degree
	Distance Resolution : (0.5(0.15 ~ 1.5meters)
	Angular Resolution : 0.9Degree
	Sample Duration : 0.25 Millisecond
	Sample Frequency : 4KHz
Flame Module	Scan Rate : 10Hz
	Sensing Range : 60 Degree
Eco Sensor Module	I/O Interface : 2 pin Digital Output
	Light Sensor
	- Illuminance to aDigital Converter
	- Wide range : 1 ~ 65535(lx)
	Temperature Measure : -40 ~ 85°C
	Humidity Measure : 0 ~ 100%r.H.
Carbon Dioxide(CO2) Gas Sensor Module	Pressure Range : 300 ~ 1100hPa
	VOC Measure : Ethane, Ethanol, Acetone, Carbon Monoxide, Butadiene, methyl
	I/O Interface : I²C
	Measuring Range : 0 ~ 10000 ppm
	Accuracy : ±7% ~ ±50ppm
	Response Time : 18 ~ 30 sec
Pixel Display	I/O Interface : I²C
	Color : Pixel RGB
	Pixel : 8X8
	I/O Interface : GPIO(Serial protocol)

List	Specifications
Dust Sensor Module	Measurement Range
	- PM1.0 : 0 ~ 10000ug/m3
	- PM2.5 : 0 ~ 10000ug/m3
	- PM10 : 0 ~ 10000ug/m3
	Resolution : 1ug/m3
	Respond Time : 1sec
Digital Thermopile Module Laser(DTPML)	Time to First Reading : ≤8seconds
	I/O Interface : I²C
	IR refresh Rate : 50Hz
	Digital Resolution : 0.1°C
	Standard Start-UP Time : 3 sec
	Accuracy : ±2%
Microwave Motion Sensor Module	Stabilization Time : 1 min
	I/O Interface : SPI
	Frequency Setting : 10.525 GHz(Typ)
	Spurious Dmission : -7.3 dBm
	Pulse Repetition Frequency : 2KHz
	Setting Time : 3 µsec
PIR Sensor Module	I/O Interface : Pulse Operation
	Sensing Range : 110°
	Spectral Response : 5 ~ 14 µm
	Operating Voltage : 3.3V
	I/O Interface : Digital Out



Hardware Specifications of AIoT SerBot PrimeX

The specifications of AIoT SerBot Plus is included

Body

List	Specifications
Distance Measure Part	Processor : 32bit Cortex-M Processor
	Ultrasonic Tx/Rx 6 pair
	PSD 3EA
	Interface : UART, CAN
CAN	CAN BUS Transceiver
	Compatible with ISO11898-2 Standard

MCU Module

List	Specifications
Core	ARM Cortex-M4
Flash Memory	1MB
SRAM	192+4 Kbyte
USB	Micro USB (OTG Support)
Basic Peripheral Device	LED 2EA, Switch 2EA, CdS 1EA, Piezo Buzzer 1EA
Interface & Expansion Connector	CAN Port 2EA (Expansion 1EA)
	UART 2EA(TTL 1EA, Serial to USB 1EA)
	GPIO, SPI, I²C, ADC, PWM, UART etc.

Main Module

List	Specifications
CPU	6-core NVIDIA Carmel ARM v8.2 64-bit
	6MB L2 + 4MB L3
	Max Freq : 2-core@1900MHz, 4/6-core@1400MHz
GPU	384-core NVIDIA Volta™ GPU with 48 Tensor Cores
Memory	Max Freq : 1100MHz
	8GB 128-bit LPDDR4x@ 1600MHz
Storage	16GB eMMC 5.1
Video Encoder	2x464MP/sec(HEVC), 2x4k@ 30(HEVC)
	6x 1080p@ 60(HEVC), 14x 1080p@ 30(HEVC)
Video Decoder	2x690MP/sec(HEVC), 2x4k@ 60(HEVC), 4x4k@30(HEVC)
	12x1080p@ 60(HEVC), 32x 1080p@ 30(HEVC), 16x 1080p@30(H.264)
CSI Camera	Up to 6 cameras(36 Via Virtual Channels)
	12 lanes MIPI CSI-2, D-PHY 1.2(up to 30 Gbps)
Connectivity	Dual Band Wireless Wi-Fi 2GHz/5GHz Band, 867Mbps, 802.11ac
	Bluetooth 4.2
	10/100/1000 Base-T Ethernet
Display	2 multi-mode DP 1.4/eDP 1.4/HDMI 2.0
USB	4x USB 3.0, USB 2.0 Micro-B