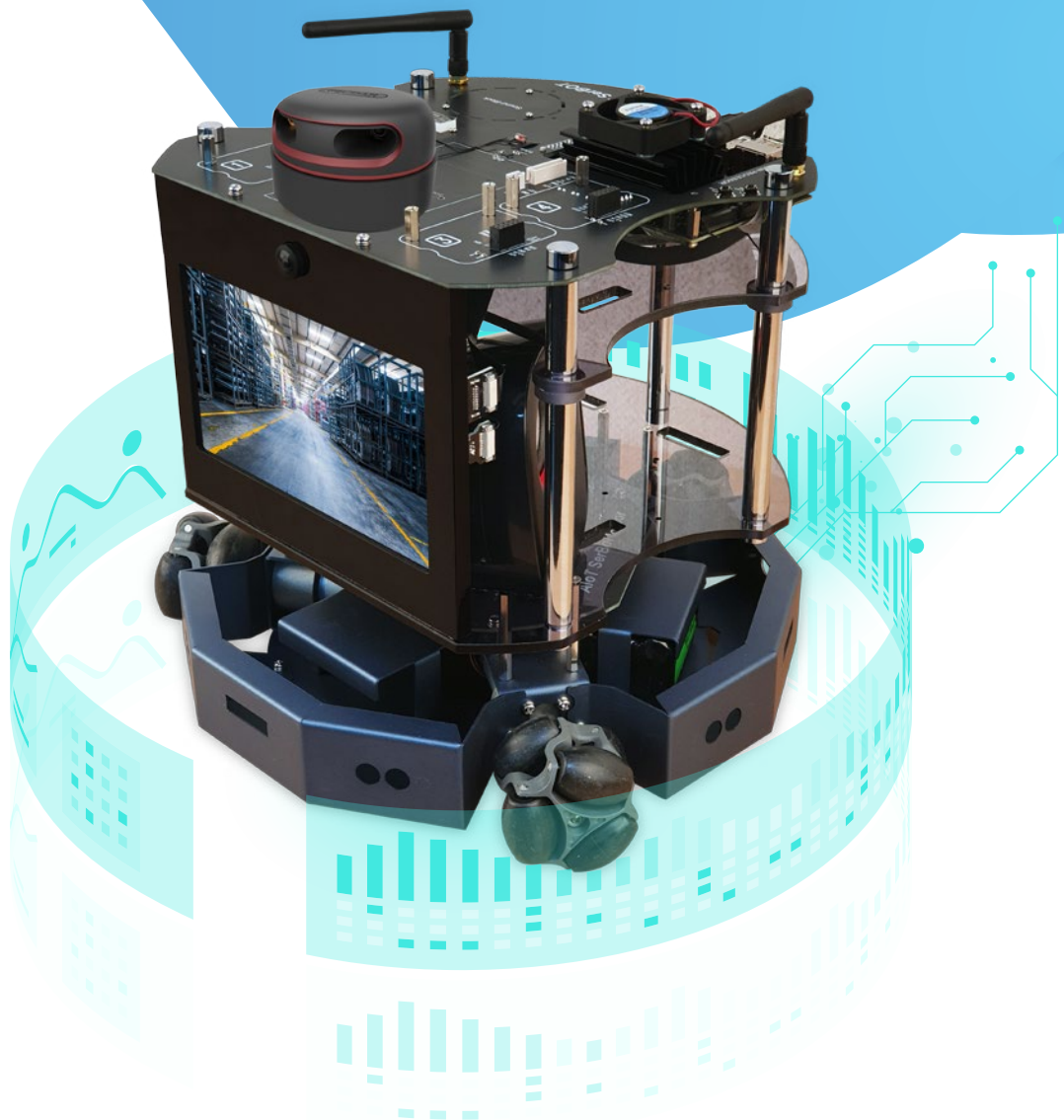


AI and IoT Convergence Training Equipment based on Indoor Service Robot Platform

www.hanback.com

AIoT SerBOT



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Product specifications and appearance of this catalog are subject to change without notice.

v2.0.0

AI and IoT Convergence Training Equipment
based on Indoor Service Robot Platform

AIoT SerBOT

**128 Core GPU
Supercomputer Platform**
for Edge Devices as Main Processor

7-inch Touch Display
with 1024x600 Resolution

**8M Pixel
160° Wide Angle
Camera**

**Gigabit
Ethernet**

**Dual Band Wi-Fi
(2.4GHz, 5GHz)
and Bluetooth 4.2**

- Digital microphones and speakers support cloud-based speech recognition and audio playback
- 4 dedicated expansion interfaces support various IoT sensor modules
- Drive part adopts 3-axis omni-wheel to maximize robot's movement efficiency and minimize rotation radius
- Adopted 14,000mA battery, and able to continue practice with separate power connection while charging the battery
- Soda OS, the exclusive AIoT operating system, and Pop library
- 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

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, Pwerline fonts, 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, Keras
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

AloT SerBOT			AloT SerBOT Plus		
List	Specifications		List	Specifications	
Motor Control Board	Battery	11.1V / 14000mA	LiDAR	Distance Range : 12m	
	Wheels	3 Omni-Wheels		Angular Range : 0 ~ 360degree	
	Motor	DC 12V Motor 3EA Gear Rate 1:50 Speed 6000RPM		Distance Resolution : <0.5(0.15 ~ 1.5meters)	
Main Module	CPU	Quad-core ARM A57 @ 1.43 GHz		Angular Resolution : 0.9degree	
	GPU	Maxwell Core 128EA		Sample Duration : 0.25 millisecond	
	Memory	4GB 64-bit LPDDR4 25.6 GB/s	Sample Frequency : 4KHz		
	Storage	microSD (64GB)	Scan Rate : 10Hz		
	Video Encoder	4K@30 4x 1080p@30 9x 720p@30 (H.264/H.265)	Flame Module	Sensing Range : 60 Degree	
	Video Decoder	4K@60 2x 4K@30 8x 1080p@30 18x 720p@30 (H.264/H.265)		I/O Interface : 2 pin Digital Output	
	Camera	MIPI CSI-2 DPHY lanes	Eco Sensor Module	Light Sensor	
	Connectivity	Dual Band Wireless WiFi 2GHz/5GHz Band, 867Mbps, 802.11ac Bluetooth 4.2, Gigabit Ethernet		- Illuminance to digital converter	
	Display	HDMI and display port		- Wide range : 1 ~ 65535(lx)	
	USB	4x USB 3.0, USB 2.0 Micro-B		Temperature Measure : -40 ~ 85°C	
Microphone	High performance Digital Microphone x 4EA - Sensitivity : -26 dBFS(Omnidirectional) - Acoustic Overload Point : 120dB SPL - SNR : 63dB	Humidity Measure : 0 ~ 100%r.H.			
Base Board	Speaker	Output : 3W x 2EA - 3.5mm Audio Jack - Frequency Response : 30Hz ~ 20KHz	Pressure range : 300 ~ 1100hPa		
	Sensor Module Interface Block 4EA	+5V, +3.3V, GND, I ² C, ADC, GPIO, SPI	VOC Measure : Ethane, Ethanol, Acetone, Carbon Monoxide, Butadiene, methyl		
	6-AXIS Sensor	Sensor : MPU6050N Resolution : 16bit Gyroscope Range : +-250, +-500, +-1000, +-2000°/S Accelerometer Range : +-2, +-4, +-8, +-18g	Carbon Dioxide(CO2) Gas Sensor Module	I/O Interface : I ² C	
	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		Measuring Range : 0 ~ 10000 ppm	
		LCD	7inch TFT LCD, HDMI Resolution 1024 x 600	Accuracy : ±7%~±50ppm	
		Weight	5.2Kg	Response time : 18 ~ 30 sec	
	Size	290 x 290 x 310 mm	Pixel display	I/O Interface : I ² C	
	Basic Module	Input Device : Tact Switch x 2EA(GPIO) output device : LED 8EA(I2C) Actuator : Passive Buzzer(GPIO)		Color : pixel RGB	
				Dust Sensor Module	I/O Interface : GPIO(Serial protocol)
			Measurement range		
		Digital Thermopile Module Laser(DTPML)	- PM1.0 : 0 ~ 10000ug/m3		
			- PM2.5 : 0 ~ 10000ug/m3		
		Microwave Motion Sensor Module	- PM10 : 0 ~ 10000ug/m3		
			Resolution : 1ug/m3		
		PIR Sensor Module	Respond time : 1sec		
			Time to first reading : ≤8seconds		
			I/O Interface : I ² C		
			IR refresh rate : 50Hz		
			Digital resolution : 0.1°C		
			Standard start-UP Time : 3 sec		
			Accuracy : ±2%		
			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 uSec		
			I/O Interface : Pulse Operation		
			Sensing Range : 110°		
			Spectral Response : 5 ~ 14 um		
			Operating Voltage : 3.3V		
			I/O Interface : Digital Out		

Training Contents

Introduction to AloT SerBOT

Structure of AloT SerBOT
Practice environment of AloT SerBOT

Data Processing Technology

Numpy for fast multi-dimensional matrix operations
Pandas for analyzing time series and tabular data
Matplotlib for data visualization

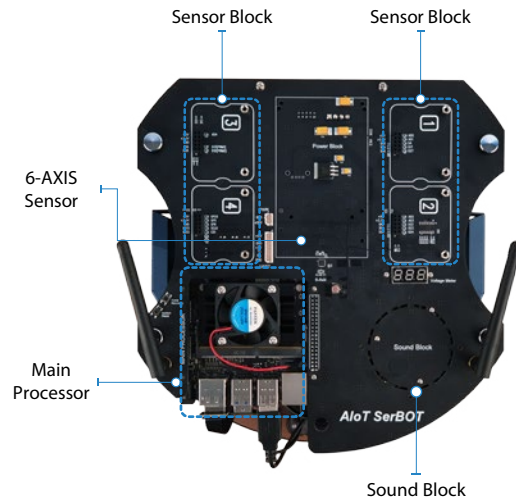
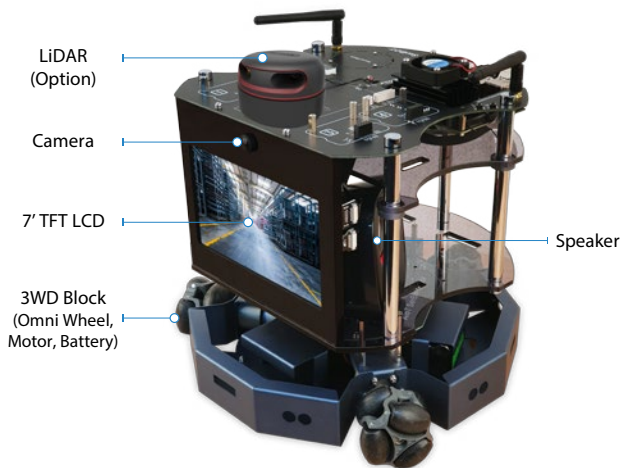
Service Robot Application Technology

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

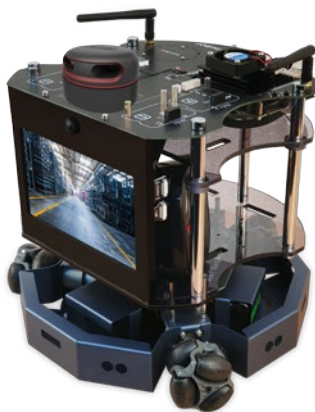
AI Technology

Supervised learning and unsupervised learning
Pop.AI-based linear & logistic regression algorithm
Pop.AI-based perceptron
Pop.AI-based ANN, DNN, and CNN
Pop.AI & OpenAI DQN-based reinforcement learning
Understanding Tensorflow

Layout



Product Configuration



AloT SerBOT



USB to Ethernet Adapter
1EA



Ethernet Cable
1EA



Micro USB Cable
1EA



User Guide book
1EA