

Artificial Intelligence-Based
Autonomous Driving

Service Robot Training Equipment

AIoT SerBot II



SerBot II

- AI application practice equipment based on indoor service robot platform
- NVIDIA high-performance on-device AI platform is adopted for Brain board
- Touch display and high-resolution wide-angle camera for GUI-based user interface and deep learning are provided
- Gigabit Ethernet, dual-band Wi-Fi, and Bluetooth are provided
- Voice recognition and audio playback through digital microphone and speaker are possible
- Various IoT sensor modules through 4 dedicated expansion interfaces are supported
- The driving part adopts a 3-axis omni wheel to maximize the robot's movement efficiency and minimize the turning radius
- For precise control of the driving part, controller equipped with a high-performance MCU controls omni wheel motor, encoder and sensor
- Connected via highly reliable CAN FD communication for collaboration between brain board and controller
- Built-in power path management circuit to make it possible to continue practicing even while the battery is charging
- Service robot development is supported through ROS2, robot standard middleware
- High-level Pop libraries enabling to focus on application implementation is provided
- CUDA-based PyTorch and Tensorflow artificial intelligence framework are supported
- Web browser-based Google block coding platform (Blockly) is supported
- Pre-set integrated development environment based on Visual Studio Code for professional application development is supported
- Provides deep learning-based service robot learning content
- On-device AI autonomous driving training equipment



© Operating Program

List		Specifications
Linux OS	Desktop	X-Server, Openbox, LightDM, Tint2, blueman, network-manager, conky
	CLI	Zsh, Oh-My-Zsh with powerlevel9k thema and nerd fonts, Tmux, fzf, bat, lsd
	Tool Chain	Python3, NodeJS, Java, Clang, GCC, LLVM
	IDE	Visual Studio Code, Jupyter Lab, NeoVim
	Connectivity	Remote Desktop Server with NoMachine, MQTT Broker with mosquitto, Jupyter Lab Server Bluez, paho-mqtt
	Multimedia	portaudio, sox, OpenCV, Google Assistant
	Data Science & AI	Python3, Numpy, Matplotlib, sympy, Pandas, Seaborn, Scipy, Gym Scikit-learn, Tensorflow, Keras
Middleware	ROS2	Rviz2, RQt, ament, RTPS, Fast DDS, TF2
Pop Plus Library	Output Object	Led, Laser, Buzzer, Relay, RGBLed, DCMotor, StepMotor, Oled PiezoBuzzer, PixelDisplay, TextLCD, FND, Led Bar
	Input Object	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	AudioPlay, AudioPlayList, AudioRecord, Tone, SoundMeter
	Voice Assistant	GAssistant, create_conversation_stream
	AI	Linear Regression, Logistic Regression, Perceptron, ANN, DNN, CNN, DQN

© Hardware Specification

List		Specifications						
Body	Size	290x290x310mm	Weight	5.2Kg(About)	Battery	14.8V/7000mA 2ea	Wheels	3 Wheels
	Motor: 3ea	RPM500, Encoder	Gear Rate	1:30	Max Speed 1.5m/s			
	UltraSonic Sensor 6ea	Effectual Angle < 15° Measuring Angle : 30°	Ranging Distance : 2cm ~ 400cm Trigger Input Pulse width : 10us		Resolution : 0.3cm			
	PSD 3ea	Effectual Angle < 15° Measuring Angle : 30°	Ranging Distance : 2cm ~ 400cm Trigger Input Pulse width : 10us		Resolution : 0.3cm			
Brain Module (Default)	CPU	Quad-core ARM Cortex-A57 MPCore processor						
	GPU	NVIDIA Maxwell architecture with 128 NVIDIA CUDA® cores						
	Memory	4 GB 64-bit LPDDR4, 1600MHz 25.6 GB/s						
	Storage	MicroSD 64GB						
	Video Encoder	4Kp30 4x 1080p30 9x 720p30 (H.264/H.265)						
	Video Decoder	4Kp60 2x 4Kp30 8x 1080p30 18x 720p30 (H.264/H.265)						
	Camera	MIPI CSI-2 lanes						
	Connectivity	Dual Band Wireless WiFi 2GHz/5GHz Band, 867Mbps, 802.11ac		Bluetooth 4.2		1x Gigabit Ethernet		
	Connector	1x HDMI 4x USB 3.0 Type-A, 1x Micro-USB (device mode)						
Brain Module (Option)	CPU	8-core ARM® Cortex®-A78AE v8.2 64-bit CPU 2MB L2 + 4MB L3						
	GPU	NVIDIA Ampere architecture with 1024 NVIDIA® CUDA® cores and 32 tensor cores						
	Memory	16GB 128-bit LPDDR5 102.4 GB/s						
	Storage	NVMe SSD 256GB						
	Video Encoder	1x 4K60 3x 4K60 6x 1080p60 12x 1080p30 (H.265) H.264, AV1						
	Video Decoder	1x 8K30 2x 4K60 4x 4K30 9x 1080p60 18x 1080p30 (H.265) H.264, VP9, AV1						
	Connector	1x HDMI 2.1						
	USB	4x USB 3.2 Type-A (10Gbps), 1x USB2.0 Type-C (Device Mode)						
Top Board	Information	Power Voltage Display (3 Digit FND) Piezo : Alarm Low Battery or Booting		LED : Low Battery, Normal Battery				
	Application Controller	ARM® 32-bit Cortex®-M4 CPU with FPU 210 DMIPS 1.25 DMIPS MHz (Dhrystone 2.1), and DSP instructions CAN FD Communication App. Sensor Control IMU Sensor Control Power Check						
	CAN FD	CAN FD Controller CAN FD Transmitter x 2ea						
	IMU Sensor	Pitch Roll Yaw (X Y Z axis) Accelerometer + Angular Velocity + Angle +Magnet Field I²C Interface						
	Camera	Image Sensor: Sony IMX219 Resolution: 8M pixel native resolution sensor (3280 x 2464 pixel static images) Video: 1080p30, 720p60 and 640x480p90 Linux intergration: V4L2 driver available Focal length: 3.04 mm Angle of view: 160 degrees Focal ratio (F-Stop): 2.35 Tilt : 0° ~ 100° Tilt						
	Microphone	High performance Digital Microphone x 4ea Sensitivity : -26 dBFS(Omnidirectional) Acoustic Overload Point : 120dB SPL SNR : 63dB						
	Light Sensor	Illuminance to digital converter		Wide range : 1 ~ 65535(lx)		Interface: PC		
	App. Sensor Module Bldk x 7ea	Power: +5V, +3.3V, GND Interface: I²C, ADC, GPIO, SPI						
Motor Board	Power Block	Battery Charger Controller Block INFET Low Loss Ideal Diode PowerPath Control Indicator State : DC Adapter, Charging, Complete, Current Limiting +5V, +12V Switching Power Block +3.3V Power Block						
	Motor Controller	ARM® 32-bit Cortex®-M4 CPU with FPU 210 DMIPS 1.25 DMIPS MHz (Dhrystone 2.1), and DSP instructions CAN FD Communication Motor Driving Control UltraSonic Sensor Control PSD Sensor Control Battery Temperature						
	Motor Driver 3ea	Double H bridge drive		Drive current 3.4A(MAX single bridge)		Direction, PWM Control		
	TFT LCD	7inch 1024 x 600	Interface HDMI	Touch Screen	Speaker 2ea			
Base Components	LiDAR(option1)	Distance Range : White object: 12 meters Black object: 10 meters Minimum Operating ranging : 0.2m Angular Range : 0 ~ 360degree Sample Frequency : 16KHz Scan Frequency: 10Hz Angular Resolution : 0.225°						
	LiDAR(option2)	Both outdoor and indoor environments with reliable resistance to daylight (≥80Klux) Distance Range : White object: 0.05~40 meters (under 70% reflection) Angular Range : 0 ~ 360degree Sample Frequency : 32KHz Scan Frequency: Typ. 10Hz, 10~20Hz Angular Resolution : Typ. 0.1125°, 0.1125°~0.225° Resolution : 10mm						

© Training Contents

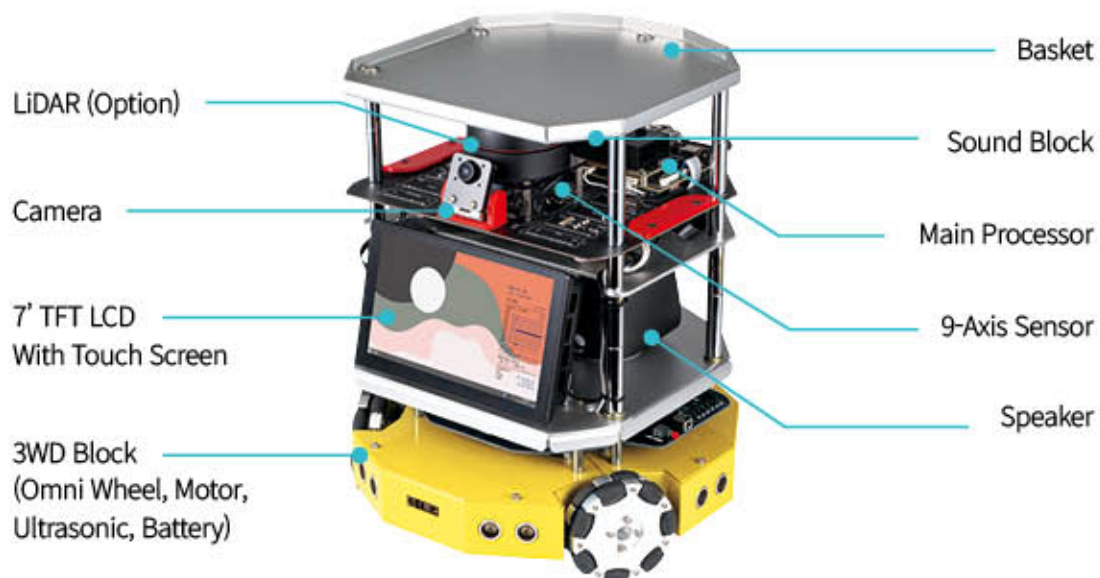
DDS/RTPS network-based autonomous driving control in ROS2 environment

- WSL2-based Linux development environment
- Understanding Python core syntax for ROS2
- Understanding network programming for ROS2
- ROS2 installation and environment configuration
- Understanding node, topic, service, and parameter action
- ROS2 build environment
- Publisher node and subscriber node
- Services and user defined interface
- Action and multi-node
- Launch and multi-execution
- Advanced ROS2

Deep learning-based autonomous driving technology

- WSL2-based Linux development environment
- Supervised learning and unsupervised learning
- Linear Regression and Logistic Regression
- ANN, DNN, CNN basics
- Understanding machine learning framework
- Fast multidimensional matrix library
- Time series, table data analysis library
- Data visualization library
- Overview of autonomous driving technology
- Basic driving and remote operation
- Avoid collision and move along object
- Transfer learning
- Advanced autonomous driving

© Layout



© Component



SerBot II

