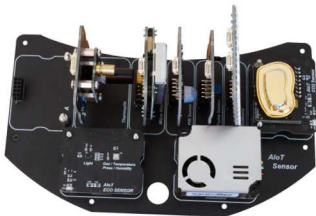


AIoT AutoCar

Series

AutoCar • AutoCar Plus
(Excluding LiDAR)

8 sensor modules provided in AIoT AutoCar Plus



- AI and IoT convergence training equipment based on autonomous vehicle platform
- 128 core GPU supercomputer platform for edge devices as main processor
- Provides freely movable 8M pixel 160 degree wide angle pan-tilt camera module
- 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
- Steering system supports real car-like driving mechanism and deep learning based autonomous driving technology
- Adopted 7,000mA battery, and able to continue the 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 learning Python 3 and C/C++ simultaneously on PCs and tablets
- mDNS/DNS-SD based distributed name resolution and network service publishing and discovery
- Open integrated development environment based on Visual Studio Code for professional application development
- Educational contents for artificial intelligence and deep learning based autonomous vehicle
- AIoT AutoCar Plus provides high-performance 360 degree Lidar and dedicated library
- AIoT AutoCar Plus provides 8 types of IoT sensor modules connected to a dedicated expansion interface

Training Contents

Introducing AIoT AutoCar
 AIoT AutoCar Configuration
 AIoT AutoCar Lab Environment

AI Technology

Supervised 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 Multidimensional Matrix Operations
 Pandas for Analyzing Time Series and Tabular Data
 Matplotlib for Data Visualization

Deep Learning Based Autonomous Driving Technology

Overview of Autonomous Driving Technology
 Basic Driving Practice
 Remote Operation Practice
 Collision Avoidance Practice
 Driving Practice Along the Objects
 Transfer Learning Practice
 Advanced Learning for Autonomous Driving

Product Configuration



AIoT AutoCar Plus



8 sensor modules provided in AIoT AutoCar Plus



Software Specifications

List	Specification
Soda OS	Linux Kernel 4.19
	Desktop X-Server, Openbox, LightDM, Tint2, bluelman, 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
Pop Library	Data Science & AI Python3, Numpy, Matplotlib, sympy, Pandas, Seaborn, Scipy, Gym Scikit-learn, Tensorflow, Keras
	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 AIoT AutoCar

Main Module

List	Specification
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 Encode	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

Body

List	Specification
Motor	Rear Wheel - RPM 500 - Gear Rate 1:30 - Max Speed 1.5m/s
Steering	Servo Motor - Stall torque : 9.4 kgf·cm (4.8 V), 11 kgf·cm (6 V) - Operating speed : 0.17 s/60°(4.8 V), 0.14 s/60°(6 V)
Camera	Image Sensor : Sony IMX219 Resolution : 8M Pixel Native Resolution Sensor (3280 x 2464 Pixel Static Images) Video : 1080p30, 720p60 and 640x480p90 Inux IItergration : V4L2 driver available Focal length : 3.04 mm Angle of View : 160 Degrees Focal Ratio (F-Stop) : 2.35
PAN/TILT Part	Servo Motor - Stall Torque : 9.4 kgf·cm (4.8 V), 11 kgf·cm (6 V) - Operating Speed : 0.17 s/60°(4.8 V), 0.14 s/60°(6 V) Servo Brackets 2EA Camera Guide
Sound	Sound IC : WM8960 Interface : I ² C, I ² S Channel : Input 2ch, Output 2ch Programmable ALC / limiter and Noise Gate On-chip Headphone Driver 40mW Output Power Into 16Ω at 3.3V 2CH Microphone Stereo Speaker
Voltage/Current Meter	DC 4~28V measurement Current 0~10A measurement Tolerance +- 1% Operating Temperature -10°C ~ 65°C
LED	Front/Rear LED 4EA
Sensor Module Block	Sensor Block 1 : +5V, +3.3V, GND, I ² C, ADC 2EA, GPIO 3EA Sensor Block 2 : +5V, +3.3V, GND, I ² C, ADC 2EA, GPIO 3EA Sensor Block 3 : +5V, +3.3V, GND, SPI, GPIO 3EA Sensor Block 4 : +5V, +3.3V, GND, ADC 1EA, GPIO 7EA
6-AXIS	Device : MPU6050N Resolution : 16bit Gyroscope Range : +-250, +-500, +-1000, +-2000°/S Accelerometer Range : +-2, +-4, +-8, +-18g Interface : I ² C Supply Voltage : 3.3V
OLED	Driver IC : SSD1306 Size : 0.91inch Resolution : 128x32 Interface : I ² C Supply Voltage : 5V Size : 313 X 247mm
Battery	11.1V/7000mA 12.6V/4000mA Charger Support
Size	280 X 195 X 160(Exclude Camera Module : 85) (mm)
Weight	2.1Kg
Wheels	4 Wheels
Basic Module	Input Device : Tact Switch x 2EA(GPIO) Output Device : LED 8EA(I ² C) Actuator : Passive Buzzer(GPIO)



Hardware Specifications of AIoT AutoCar Plus

The hardware specifications of AIoT AutoCar is included

SLAM

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
	Scan Rate : 10Hz

Sensor Pack

List	Specifications
Flame Module	Sensing Range : 60 Degree I/O Interface : 2 Pin Digital Output
Eco Sensor Module	Light Sensor - Illuminance to Digital Converter - Wide range : 1 ~ 65535(lx)
	Temperature Measure : -40 ~ 85°C
	Humidity Measure : 0 ~ 100%r.H.
	Pressure Range : 300 ~ 1100hPa
	VOC Measure : Ethane, Ethanol, Acetone, Carbon Monoxide, Butadiene, Methyl I/O Interface : I ² C
Carbon Dioxide(CO2) Gas Sensor Module	Measuring Range : 0 ~ 10000 ppm
	Accuracy : ±7%~±50ppm
	Response Time : 18 ~ 30 sec I/O Interface : I ² C
Pixel Display	Color : Pixel RGB
	Pixel : 8X8 I/O Interface : GPIO(Serial Protocol)
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
	Time to first Reading : ≤8seconds
	I/O Interface : I ² C
Digital Thermopile Module Laser(DTPML)	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
Microwave Motion Sensor Module	Frequency Setting : 10.525 GHz(Typ)
	Spurious Dmission : -7.3 dBm
	Pulse Repetition Frequency : 2KHz
	Setting Time : 3 μsec I/O Interface : Pulse Operation
PIR Sensor Module	Sensing Range : 110°
	Spectral Response : 5 ~ 14 um
	Operating Voltage : 3.3V
	I/O Interface : Digital Out