AIoT AutoCar

AI and IoT convergence training equipment based on autonomous vehicle platform

As an application device for implementing autonomous vehicles with on-device AI, various vehicle services can be implemented by providing a steering device and a separate sensor module that move like a real vehicle

AIoT AutoCar

- 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

Software Specifications

	LIST	Specification
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, 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

LIST		Specification
Main Module	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	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/60⁰(4.8 V), 0.14 s/60⁰(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 intergration: 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/60⁰(4.8 V), 0.14 s/60⁰(6 V) Servo Bracket 2EA CAMERA Guide
	SOUND	Sound IC: WM8960 Interface: I^2C, I^2S 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^2C, ADC 2EA, GPIO 3EA Sensor Block 2: +5V, +3.3V, GND, I^2C, 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^2C Supply Voltage: 3.3V
	OLED	Driver IC: SSD1306 Size: 0.91inch Resolution: 128x32 Interface: I^2C Supply Voltage: 5V Size: 313x247mm
	BATTERY	11.1V/7000mA 12.6V/4000mA Charger Support
	Demension	280 x 195 x 160(exclude camera module: 85) mm
	Weight	2.1Kg
	Wheels	4 Wheels

Training Contents

Introducing AIoT AutoCar
- AIoT AutoCar Configuration
- AIoT AutoCar Lab Environment

AI Technology
- Supervised and Unsupervised Learing
- Pop.AI-based Linear and Logistic Regression Theory and Practice
- Pop.AI-based Perceptron Theory and Practice
- Pop.AI based ANN, DNN, CNN Theory and Practice
- Pop.AI & OpenAI-based Reinforcement Learning DQN Theory and Practice
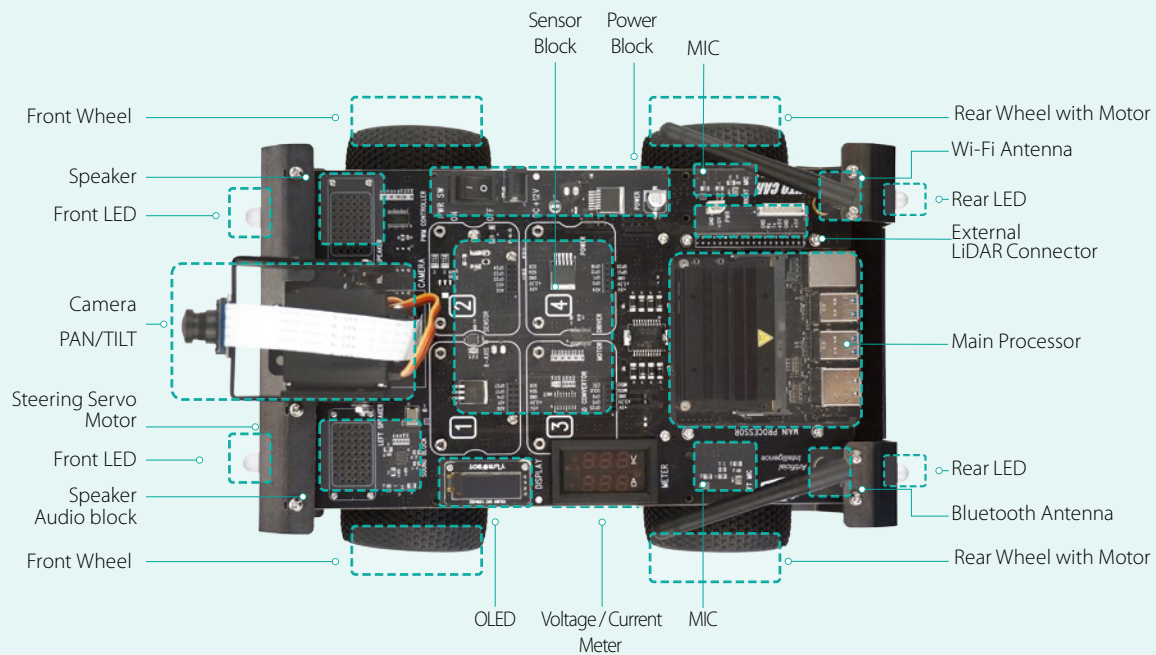- Understanding TensorFlow

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

Layout

Sensor Block · Power Block · MIC

Front Wheel · Rear Wheel with Motor · Wi-Fi Antenna
Speaker · Front LED · Rear LED · External LiDAR Connector
Camera PAN/TILT · Main Processor
Steering Servo Motor · Front LED · Speaker Audio block · Rear LED · Bluetooth Antenna
Front Wheel · Rear Wheel with Motor

OLED · Voltage / Current Meter · MIC

Product Composition

Platform USB (include OS image and Tools) 1EA	12V 4A Charger 1EA
	Micro SD Adapter 1EA

AIoT AutoCar

USB to Ethernet Adapter 1EA

Ethernet Cable 1EA

Micro USB Cable 1EA

User Guide book 1EA