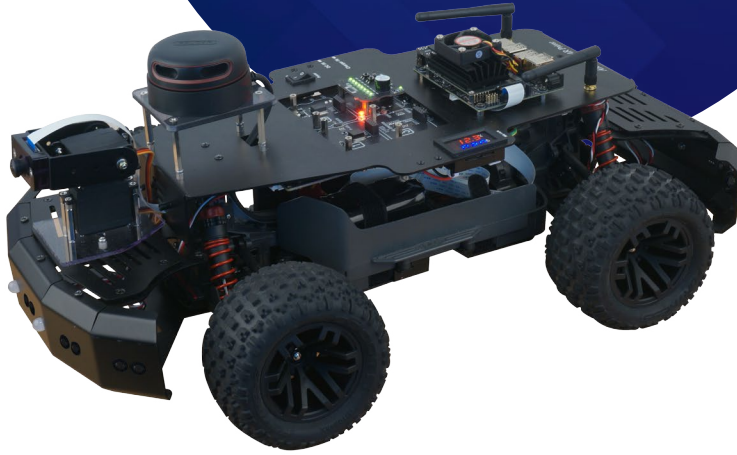
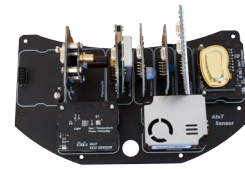


AIoT AutoCar Prime Series

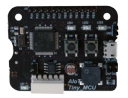
AutoCar Prime · AutoCar PrimeX



AIoT AutoCar PrimeX에 제공되는 모듈



Sensor Pack



AIoT Tiny MCU

- 자율주행차 플랫폼 기반 AI 및 IoT 융합 실습 장비
- 메인 프로세서로 GPU 기반 엣지 슈퍼컴퓨터 플랫폼 채택
- 커넥티비티에 필요한 기가비트 이더넷과 듀얼 밴드 Wi-Fi 및 블루투스 통합 모듈 제공
- 디지털 마이크 및 스피커를 통해 Speech to Text와 Text to Speech 및 음성 명령 지원
- 4개의 전용 확장 인터페이스를 통해 다양한 IoT 센서 모듈 지원
- 조향 장치 채택으로 실제 자동차 같은 운행 메커니즘 및 딥러닝 기반 자율주행 기술 지원
- 대용량 배터리 채택 및 전용 충전시스템을 통해 충전 중에도 실습 지속 가능
- AIoT 전용 운영체제인 Soda OS와 Pop 라이브러리 지원
- 파이썬3를 비롯해 프로그래밍 입문에 최적화된 인터프리터 기반의 C/C++ 개발환경 지원
- PC를 비롯해 태블릿 등에서 파이썬3와 C/C++를 동시에 학습할 수 있는 웹브라우저 기반 전용 학습 환경 지원
- mDNS/DNS-SD 기반 분산 이름 확인 및 네트워크 서비스 게시, 발견 지원
- 전문적인 응용 개발을 위해 Visual Studio Code 기반 공개용 통합개발환경 지원
- 딥러닝 기반 자율주행차 학습 콘텐츠 제공
- AutoCar PrimeX는 Cortex-M 계열 고성능 MCU 모듈과 CAN 모듈 제공
- AutoCar PrimeX의 메인 모듈은 인기 있는 AI 프레임워크를 모두 지원하는 최대 21TOPS의 엣지 슈퍼컴퓨터 내장
- AutoCar PrimeX는 전용 확장 인터페이스에 연결하는 IoT 센서 8종 제공

교육 콘텐츠

AIoT AutoCar Prime 소개

AIoT AutoCar Prime 구성
AIoT AutoCar Prime 실습 환경

딥러닝 자율주행 기반 기술

Pop.AI 기반 선형 및 로지스틱 회귀 이론과 실습
Pop.AI 기반 퍼셉트론 이론과 실습
Pop.AI 기반 ANN, DNN, CNN 이론과 실습
Pop.AI 및 OpenAI DQN 기반 강화학습 DQN 이론과 실습
텐서플로우 이해

딥러닝 자율주행 구현

딥러닝 자율주행 기술 개요
기본적인 주행 실습
원격 조작 실습
충돌 방지 실습
객체 따라 이동 실습
전이학습
트랙 주행 응용

제품 구성품



AIoT AutoCar PrimeX

AIoT AutoCar PrimeX에 제공되는 모듈

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

소프트웨어 사양

	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, Samba, Blynk, SSH, Remove Desktop
	Multimedia	portaudio, sox, OpenCV 4, snowboy, Google Assistant
	Data Science & AI	Python3, Numpy, Matplotlib, sympy, Pandas, Seaborn, Scipy, Gym Scikit-learn, Tensorflow, Keras, PyTorch
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



AIoT AutoCar Prime 하드웨어 사양

Body Frame

List	Specification
Sound	Stereo Codec With Headphone Amp Interface : I ² C(Control), I ² S(PCM Audio interface) Playback : 100dB SNR and -80 THD+N Recording : 85dB SNR and -73dB THD+N 2ch Microphone Stereo Speaker 2W
Voltage/Current Meter	DC 4~28V measurement Current 0~10A measurement Tolerance +- 1% Operating Temperature -10°C ~ 65°C
LED	Front/Rear LED 2EA
Sensor Module Block 4EA	Sensor Block : +5V, +3.3V, GND, I ² C, SPI, ADC, GPIO Default Module : Tact Switch 2EA, LED 8EA, Passive Buzzer 1EA
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
Illuminance Sensor	Sensor : CdS Operating Voltage : 3.3V Interface : Analog Output
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

Vision Processing & SLAM

List	Specification
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
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

Body

List	Specification
Battery	11.1V/7000mA
Motor	DC Geared Motor - DC 12V, Max. 12Kg-cm, 1540rpm
Steering	Servo Motor - Stall Torque(6.8V) : 21.5kg/cm - Speed : 0.16 sec/60°(5V), 0.14 sec/60°(6.8V)
Camera 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
Size	340 X 600 X 220 (mm)
Weight	6kg
Wheels	4Wheels

Body Frame

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 Max Freq : 1100MHz
Memory	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)

List	Specifications
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
Distance Measure Part	Processor : 32bit Cortex-M Processor Ultrasonic : Tx/Rx 10 Pair Interface : UART, CAN
CAN	CAN BUS Transceiver Compatible with ISO11898-2 Standard

MCU & Sensor Pack

List	Specifications
MCU Module	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
Flame Module	Interface & Expansion Connector CAN Port 2EA(Expansion 1EA) UART 2EA(TTL 1EA, Serial to USB 1EA) GPIO, SPI, I ² C, ADC, PWM, UART etc.
	Sensing Range : 60 Degree
	I/O Interface : 2 pin Digital Output
	Light Sensor Illuminance to Digital Converter Wide range : 1 ~ 65535(lx)
Eco Sensor Module	Temperature Measure : -40 ~ 85°C
	Humidity Measure : 0 ~ 100%r.H.
	Pressure range : 300 ~ 1100hPa
	VOC Measure : Ethane, Ethanol, Acetone, Carbon Monoxide, Butadiene, Methyl
Carbon Dioxide(CO ₂) Gas Sensor Module	I/O Interface : I ² C
	Measuring Range : 0 ~ 10000 ppm Accuracy : ±7% ±50ppm Response Time : 18 ~ 30 sec I/O Interface : I ² C

List	Specifications
Pixel Display Module	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
	I/Resolution : 1ug/m3
	Response Time : 1sec
	Time to First Reading : ≤8seconds I/O Interface : I ² C
Digital Thermopile Module Laser(DTPML) Module	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 Emission : -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 I/O Interface : Digital Out