

AI Autonomous Driving Vehicle Training Equipment

AutoCar III G



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- On-Device AI Autonomous Driving Vehicle Training Equipment
- High-performance on-device AI platform of NVIDIA is adopted for the Brain Board
- Built-in high-resolution wide-angle camera for deep learning-based autonomous driving practice
- Built-in 9-axis high-precision IMU sensor for path tracking and vehicle posture control
- Built-in high-precision serial servomotor for more accurate steering control
- Built-in DC motor with encoder and high-efficiency dual motor driver to increase driving accuracy
- Motor, encoder, and sensor control with a controller equipped with a high-performance MCU for precise control of the driving unit
- Connect brain board and controller with highly reliable CAN FD communication
- Built-in Gigabit Ethernet, dual-band Wi-fi, and Bluetooth for IoT connectivity applications
- Built-in digital microphone and speaker for voice recognition and audio playback
- Built-in power path management circuit enabling practice even while the battery is charging
- Indoor or indoor/outdoor DToF lidar for SLAM and path planning applications
- Selectable sensor pack with built-in breadboard to use various IoT sensor modules
- Selectable touch display to implement GUI-based user interface
- Provides high-level Pop Library to help focus on implementing autonomous driving
- Supports autonomous vehicle applications based on robot standard middleware ROS2 and Pop Library
- Supports CUDA-based PyTorch and Tensorflow artificial intelligence framework
- Supports web browser-based Google block coding platform (Blockly)
- Supports pre-set integrated development environment based on Visual Studio Code for professional application development
- Provides learning contents for self-driving cars based on deep learning



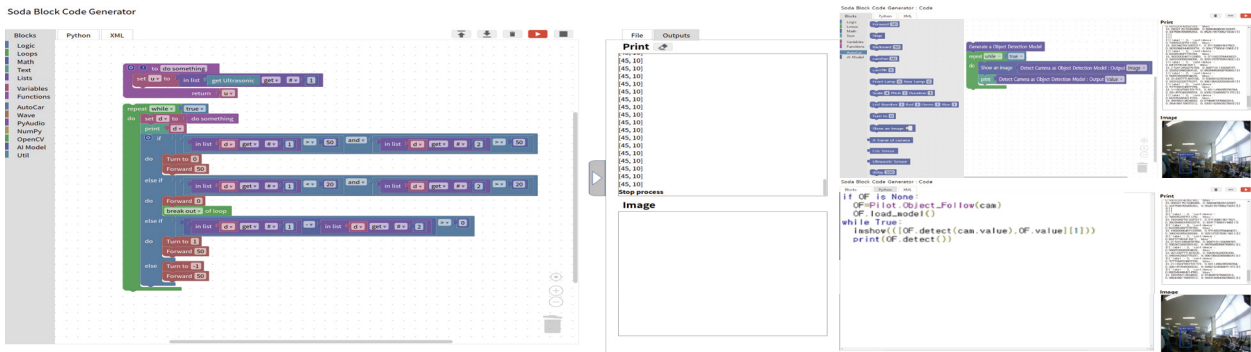
© Operation Program

| | List | Specifications |
|------------------------------------|--------------------|---|
| Linux OS | Desktop | X-Server, Openbox, LightDM, Tint2, blueman, network-manager, conky |
| | CLI | Zsh, Tmux, Peco, powerlevel9k thema, Powerline fonts, Powerline fonts |
| | Tool Chain | GCC, JDK, Node JS, Python3, Clang |
| | Connectivity | Mosquitto(MQTT), Bluez, mtr, nmap, iptraf, Samba, Blynk Server, Remote Desktop Server |
| | Multimedia | portaudio, sox, OpenCV 4, 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 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 Object Follow, Track Driving, YOLO |
| PC linkage development environment | Jupyter Lab | Python3 and Cling support IPython Widgets Terminal support Pop Library support |
| | Visual Studio Code | Remote SSH Python3 and Debugging support |
| | Insiders | Terminal support Pop Library support |

Hardware Specification

| | List | Specifications |
|----------------------|----------------------------|---|
| Body | Size: | 200 x 320 x 148mm Weight: 3Kg(About) Battery: 14.8V/7000mA Wheels: 4 Wheels |
| | Motor: | Rear Wheel Motor 2ea : RPM 500, Encoder Gear Rate 1:30 Max Speed 1.5m/s |
| | Steering : | Serial Bus Servo Motor , High-precision potentiometer for more stable operation, 35kg.cm Torque, Servo accuracy 0.2°, Metal Gear, avoid stalling and overheat protect |
| | UltraSonic Sensor 2ea : | Effectual Angle < 15° Ranging Distance : 2cm ~ 400cm Resolution : 0.3cm (Front 1ea, Rear 1ea) Measuring Angle : 30 degree Trigger Input Pulse width : 10us |
| | LED: | Front 2ea, Rear 2ea |
| Brain Parts | Barin Module : | 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) Connectivity : Dual Band Wireless WiFi 2GHz/5GHz Band, 867Mbps, 802.11ac Bluetooth 4.2 1x Gigabit Ethernet |
| | 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° ~ 120° Tilt |
| | Microphone : | High performance Digital Microphone x 4ea Sensitivity : -26 dBFS(Omnidirectional) Acoustic Overload Point : 120dB SPL SNR : 63dB |
| | Speaker : | Output : 3W x 2ea 3.5mm Audio Jack Frequency Response : 30Hz ~ 20KH |
| | Touch Display(option) : | 5inch Capacitive Touch AMOLED Display, 960x544, HDMI, Optical Bonding Toughened Glass Cover |
| | LIDAR(option) : | Distance Range : White object: 12 meters / Black object: 10 meters Minimum Operating ranging : 0.2m Angular Range : 0 ~ 360degree Sample Rate : 16KHz Scan Rate: 10Hz Angular Resolution : 0.225° Scan Field Flatness : ±1.5 Communication Speed : 256000 bps |
| | 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 Power Voltage Display(3 Digit FND) LED : Low Battery, Normal Battery Piezo : Alarm Low Battery or Booting |
| | Main Controller : | Arm® 32-bit Cortex®-M4 CPU with FPU 210 DMIPS/1.25 DMIPS/MHz (Dhrystone 2.1), and DSP instructions CAN Communication Motor Driving Control, Steering Control UltraSonic Sensor Control 9-AXIS Sensor Control Power Check |
| | Motor Driver 2ea : | Double H bridge drive Drive current 3.4A(MAX single bridge) Direction, PWM Control |
| | 9-AXIS Sensor : | AHRS IMU sensor. With its in-built posture solver and the dynamic Kalman filter algorithm, the sensor can accurately output the current posture of the product in a dynamic environment. The measurement accuracy of the X and Y axis can reach 0.05°, and the stability is extremely high. Data output frequency : 0.2~200Hz Baud Rate: 4800~961200 (adjustable) Output Content: 3-axis Acceleration+Angle+Angular Velocity+Magnetic Field+Quaternion Range: Acceleration (±6g), Gyroscope (±2000°/s), Magnet Field (±4900µT), Angle (X, Z-axis: ±180°, Y ±90°) Resolution: Acceleration (0.005g), Gyroscope (0.61°/s), Magnet Field (16 bits) Angle Accuracy(after calibrated): X, Y-axis: 0.05° (Static) , X, Y-axis: 0.1° (Dynamic) |
| Sensor Pack (option) | Tiny Bread-F405 Module : | Bread Board: 470 Tie-point (Terminal Strip, Distribution Strips) +5V, +3.3V, GND, I/O Connector ARM®32-bit Cortex®-M4 CPU CAN, ADC, I2C, SPI, GPIO etc USB OTG Port 1ea SPI CAN FD Controller and Transmitter Mixed CAN 2.0B and CAN FD Conforms to ISO 11898-1:2015 |
| | Switch Module : | Power : +3.3V, GND Input Device : Tact Switch x 4ea(GPIO 4) |
| | RGB LED Module : | Power : +3.3V, GND Output device : RGB LED 4ea(GPIO 12) |
| | Analog Module : | Power : +3.3V, GND Output device : CdS, NTC, VR(Analog 3) |
| | TPHG Sensor Module : | Power : +3.3V, GND I/O Interface : I2C Temperature Measure : -40 ~ 85°C Pressure range : 300 ~ 1100hPa Humidity Measure : 0 ~ 100%r.H. VOC Measure : Ethane, Ethanol, Acetone, Carbon Monoxide, Butadiene, methyl |
| | Thermopile Sensor Module : | Power : +3.3V, GND I/O Interface : I2C Factory calibrated in wide temperature range:-40~+125°C for sensor temperature and -70~+380°C for object temperature. High accuracy of 0.5°C over wide temperature range (0~+50°C for both Ta and To) High (medical) accuracy calibration Measurement resolution of 0.02°C |
| | TOF Sensor Module : | Power : +3.3V, GND I/O Interface : I2C 940 nm laser VCSEL Measures absolute range up to 2 m Eye Safe : Class 1 laser device compliant with latest standard IEC 60825-1:2014 – 3rd edition |
| | PGCA Sensor Module : | Power : +3.3V, GND I/O Interface : I2C, GPIO Proximity Sensing Gesture Detection RGB Color Sensing & Ambient Light Operating Range: 4~8in (10~20cm) White BackLight LED 4ea(GPIO Control) |

[Supports Google Block-Based Programming]



Training Contents

DDS/RTPS Network-Based Autonomous Driving Vehicle Control in ROS2 Environment

- WSL2-Based Linux Development Environment
- Understanding Python Syntax for ROS2
- Understanding Network Programming for ROS2
- ROS2 Installation and Environment Configuration
- Understanding Node, Topic, Service, and Parameter Action
- ROS2 Build Environment
- Publisher and Subscriber Nodes
- Services and Customized Interface
- Actions 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
- High Speed Multidimensional Matrix Library
- Time Series, Table Data Analysis Library
- Data Visualization Library
- Overview of Autonomous Driving Technology
- Basic Driving and Remote Control
- Collision Prevention and Follow Object
- Transfer Learning
- Advanced Autonomous Driving

Layout



Components



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