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AI (Artificial Intelligence)

AI Nvidia Lidar Steering Smartcar nano

HANBACK ELECTRONICS Since 1984

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You can learn from the basic theory of AI (Artificial Intelligence) to algorithms using TensorFlow for machine learning and deep learning. And with Nvidia's high-performance GPUs, you can experience high levels of image processing and machine learning. Various operation practices are available using LiDAR applied to autonomous vehicles.

AI (Artificial Intelligence)

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Product Overview

You can learn from basic theory of artificial intelligence to algorithms using TensorFlow which is used for various fields of machine learning.
You can also experience high-performance services such as object and letter recognition through learning, face recognition and edge detection through image processing.
Image classification, labeling, deep learning, and object detection for creating training models are also available.
In addition, you can measure distances and angles using LiDAR and experience the shortest path search algorithm.

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Product Features

- Experience from the basic theory for machine learning to the algorithm for implementation
- Deep learning training available
- Provides services for machine learning and deep learning using TensorFlow for high performance numerical computation
- Provides practical exercises for Neural Network
- CUDA, a GPU-based high-speed parallel computing technology, enables calculations 10 times faster than regular CPUs
- Provides real-time AI exercises implemented by CUDA high-speed parallelism
- Provides real-time image processing service using the attached camera
- Practice image classification, labeling, and deep learning for object recognition
- Provides Data set for traffic light recognition
- Arduino integrated development environment allows anyone to quickly and easily implement firmware for electronic device control. Based on development environment using Processing/Wiring language, it is effective to develop Interactive Object, easy to operate microcontroller, and easy to program via USB
- Intelligent robot that autonomously drives by detecting and determining acceleration, vibration, shock and motion information of robot with built-in acceleration and gyroscope sensor
- DC Geared motor has built-in encoder to detect the motor's operation status and calculate rotation direction and speed
- Precise steering control using Servo motor and the rotation of the front wheel for the direction of travel are possible
- It is possible to acquire the technology to utilize the ultrasonic sensor, and to learn various things such as object detection and obstacle recognition by intelligent robot application
- It is a self-driving robot equipped with LiDAR sensor, so that you can learn about ROS and SLAM.
- It provides distance measurement and object angle measurement using LiDAR and optimized path search algorithm.

Hardware Specifications

Module		Category	Specifications
Nvidia Jetson nano		CPU	ARM Cortex-A57 Quad core 1.43GHz
		GPU	128-core Maxwell
		Video	- 4K@30 , 4K 1080p 30 ,9x 720p 30 (H.264/H.265) Encoder - 4K@60 , 2x4K@30 , 8x 1080p@30 , 18x 720p @30 (H.264/H.265) Decode
		Memory	4 GB 64 bit LPDDR4 25.6 GB/s
		Display	HDMI 2.0 , eDP 1.4
		CSI	1x MIPI CSI-2 DPHY lanes
		Data Storage	Micro SD
		Other	GPIO, I²C, I²S, SPI, UART
		USB	4x USB 3.0, USB 2.0 Micro-B
		Connectivity	1 Gigabit Ethernet, M.2 Key E
		Size	100mm x 80mm x 29mm
Steering Smartcar	Main Controller	Contoroller	ATmega2560 (Google ADK Platform with Arduino Mega2560)
		Driving Clock	16MHz
		Flash Memory	256KB
		EEPROM Memory	4KB
		SRAM Memory	8KB
		ADC	10bit 16Channel
		USB Host Controller	MAX3421E USB 2.0 With SPI Bus
	Sensor Controller	Contoroller	ATmega128
		Driving Clock	7.3278MHz
		Flash Memory	128KB
		EEPROM Memory	4KB
		SRAM Memory	4KB
		Ultrasonic Tx Sensor	MA40S4S (40KHz / 20Vp-p)
		Ultrasonic Rx Sensor	MA40S4S (40KHz / 20Vp-p)
	9-Axis Physical Sensors	MPU6050	3-Axis MEMS Gyroscope
			3-Axis MEMS Accelrometer
		AK8975	3-Axis Compass
	Motor	DC Motor	12V DC Geared Encoder
		Servo Motor	15kg/cm at 6V, 0.14 sec/0.12sec 4.8V/6V
		Motor Driver	L298P
	Digital Voltmeter	Controller	ATmega8
		Display	3digit 7-segement
Size	340mm x 600mm x 220mm		

LiDAR Specifications

Item	Unit	Typical	Max	Comments
Distance Range	Meter(m)	0.15 - 6	TBD	White objects
Angular Range	Degree	0-360	n/a	
Distance Resolution	mm	<0.5 <1% of the distance	n/a	<1.5 meters All distance range
Angular Resolution	Degree	≤1	n/a	5.5Hz scan rate
Sample Duration	Millisecond(ms)	0.5	n/a	
Sample Frequency	Hz	≥2000	2010	
Scan Rate	Hz	5.5	10	Typical value is measured when LiDAR A1 takes 360 samples per scan

Software Specifications

Module	Category	Specifications
AI	TensorFlow	TensorFlow 1.13.1
	keras	keras 2.2.4
Nvidia Jetson Nano	OS	Ubuntu 18.04
	CUDA	CUDA 10.0
	cudnn	cudnn 7.3.1
	Multimedia	OpenCV 3.4.0
	Others	- Python 3.6 - ros kinetic
Steering Smartcar	Arduino Integrated Development	Arduino IDE
	User Library	Arduino Private Library by Hanback Electronics
	Functional Test Firmware	Motor/Encoder, Ultrasonic Sensor, Infrared Sensor, LED, Compass Sensor, Gyro Sensor, Accelerometer, UART

Training Contents

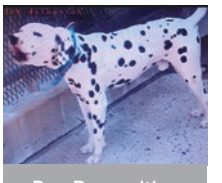
1. Deep Learning with AI Nvidia Lidar Steering Smartcar nano

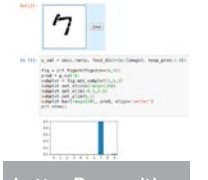
AI / Machine Learning / Deep Learning / Introduction to Equipment / Image Processing / Deep Learning Using TensorFlow / Creating Learning Model

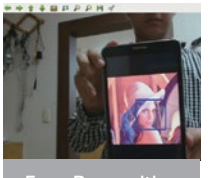
2. Robot Control with AI Nvidia Lidar Steering Smartcar nano

Steering Smartcar / Robot OS / Connecting Steering Smartcar and Jetson Board / Moving & Tracking / Getting Directions with Lidar

APPS

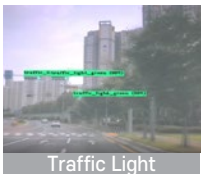

Dog Recognition


Letter Recognition


Face Recognition


Lane Recognition


Object Recognition


Traffic Light Recognition

Block Diagram