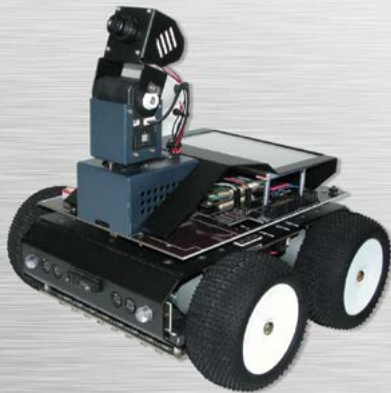


>>Intelligent Robot

Real Time Machine Vision based Intelligent Robot System



HBE-RoboCAR-Embedded II

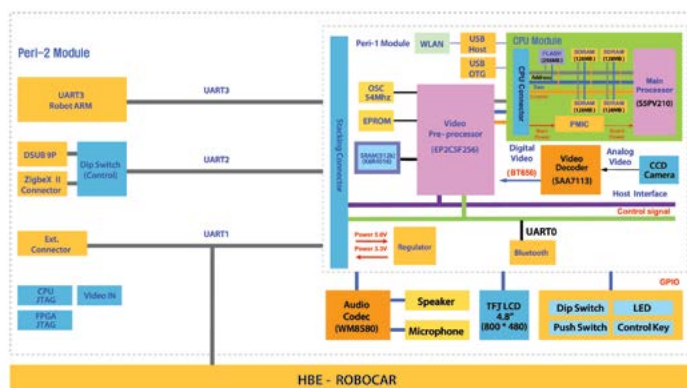
- High-performance Samsung S5PV210 (ARM Cortex™-A8 Core) Embedded Processor based Platform
- Linux 2.6.32 Program Development Environment
- Study of various Image Processing and Machine Vision Algorithm
- Study of OpenCV based Robot Vision Programming in Embedded Linux Environment
- Study and Application of Actuator Controller(ATmega128L) interconnection/operation
- Real Time processing Image LCD display
- Wireless control and Image acquisition Application using Bluetooth and Wireless LAN communication

Features

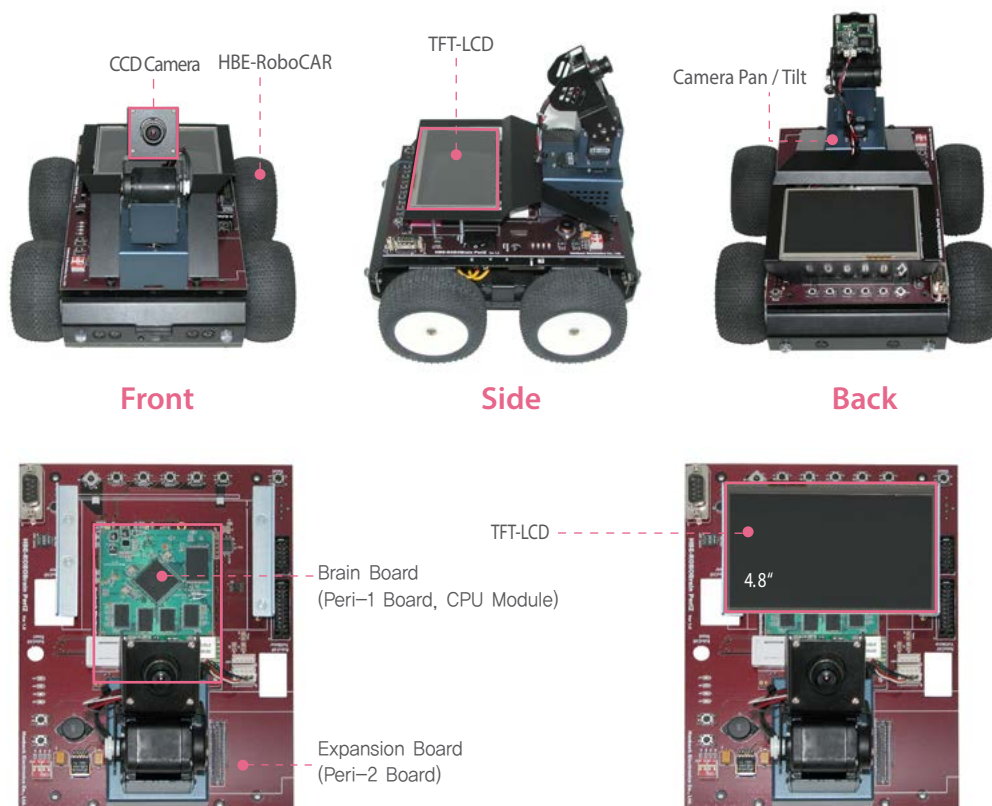


- This is composed of CCD camera for intelligent vision processing, Composite Video Input Port of external Camera and Servo Motor for Pan/Tilt.
- This has Conversion Function from Analog Video to Digital Video(Video Decoder).
- This has Image pre-Processing exclusive Processor(FPGA) like Color space converting.
- This provides many Wireless Communication Environments of Bluetooth, Wireless LAN and Zigbee for intelligent control of Robot.
- This provides Adapter and Switch for Battery power select with WLAN communication and Audio Input/Output.
- This provides effective Test through modulation on sections of Robot actuator, CPU module and Peripheral board(Peri-1, Peri-2).
- This has Embedded Linux and OpenCV porting for intelligent vision based various Tests.
- This is effective to Embedded system, Robot actuator and Real Time image processing based Project class and Capstone subject.

Block Diagram



Configuration and Names



Intelligent Robot

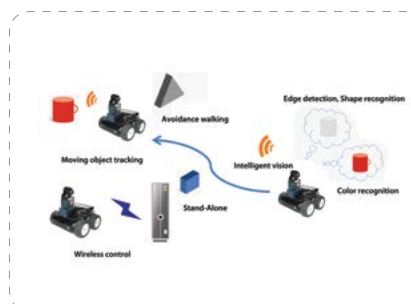
Autofly_Spring
HBE-RoboEX Series
HBE-SmartCAR
HBE-RoboCAR-Embedded II
HBE-ROBONOVA-AI II
HBE-RoboCAR
HBE-MCU-Robot
HBE-RoboBuilder-MSRDS

Main Test

• Application Test

We can conduct the test for fundamental autonomous driving, application test using image processing(intelligent vision) and intensified test of unmanned security robot with HBE-RoboCAR-Embedded II system. This can be used to Project class like embedded system application and intelligent robot and Capstone design subject effectively.

Autonomous Driving	Intelligent Control
• Driving Mobile Robot Operation Control - Pan /Tilt control • Mobile Robot Movement Control - Straight/Rotating driving • Mobile Robot Sensor Control - Acceleration Sensor - PSD sensor	• Mobile Robot Image Processing - Image Filter - Edge Detection • Color Recognition Robot • Shape Recognition Robot • Position Finding Robot
Application of Mobile Robot	
• Obstacle Avoidance Robot • Unmanned Security Robot Test - Moving Object Tracking Robot	• Driverless Car Test - Recognition/Adaptation of Driving Environment - Perform driving the reaction • Web Server remote control



Intelligent Robot

>>HBE-RoboCAR-Embedded II

Hardware Specifications

• CPU Module

Items	Description
CPU	Samsung S5PV210 (ARM Cortex™-A8)
Memory	512MByte(128M * 4) DDR2 SDRAM, 256MByte(256M * 1) NAND Flash Memory
PMIC	1EA Power Management IC
Connector	100pin * 2EA (Molex)
PCB Size	95 x 70 x 1.2 mm (L x W x H)

• CCD Camera

Items	Description
Total Pixels	542(H) x 492(V) (27M Pixels)
Electronic Iris	NTSC : 1/60 ~ 1/100,000, PAL : 1/50 ~ 1/100,000
Lens	3.6, option other lens
Imaging Device	1/3" Interline Transfer CCD
Others	Auto White balance/DSP(Digital Signal Processing)
Power IN	DC IN : +5 ~ +12V
PCB Size	32 x 32 mm (L x W)

• Peri-1 Board

Items	Description
FPGA	Altera Cyclone-II EP2C5F256C8, LE : 4,608
Config Device	Altera EPCS4S18N, 4Mbit
SRAM	Samsung K6R4016V1C, 256K x 16Bit
Video Decoder	Philips SAA7113H
WLAN	Wireless LAN (802.11 b/g/n)
USB	USB 2.0 Host : A type Connector USB 2.0 OTG : Mini type Connector
UART	Bluetooth UART 1EA : UART0 TTL Level UART 1EA : UART1
I/O Connector	3p Header 1 port: UART1 2p Header 2 port: Video IN 2p Header 2 port: Video OUT 2p Header 1 port: Power IN 2p Header 1 port: Power OUT
Internal Power	+5V, +3.3V, +1.2V
Power IN	DC IN : 5.0V Battery IN: 5.0 ~ 7.0V
Connector	CPU : 80pin * 1EA, 60pin * 4EA Peri-2 : 100pin * 2EA
PCB Size	95 x 70 x 1.2 mm (L x W x H)

※ Specifications can be changed without notice

• Peri-2 Board

Items	Description
TFT-LCD	4.8" TFT-LCD(800 * 480) with Touch Screen
Audio	IIS Audio Codec, built-in Speaker, 1EA MIC
UART	RS232 Level 1 port : UART2, TTL Level UART 3 port: UART1, UART2, UART3
Peripheral Device	4pin DIP Switch 1EA, Push Switch 2EA, LED 4EA, Control Switch 6EA
I/O Connector	9p D-SUB Connector 1EA : UART2, 4p Molex Connector 2EA : Video IN, UART 50p Connector 1EA : ZigbeX II Sensor Module
Internal Power	+12V, +9.6V, +5.0V, +3.3V, +1.8V
Connector	Peri-1 : 100pin * 2EA, RoboCAR : 20pin * 2EA
PCB Size	200 x 150 x 2.0 mm (L x W x H)

• Camera Pan / Tilt Actuator

Items	Description
Motor	Servo Motor AX-12+ (up/down, left/right) 2EA
Gear Reduction Ratio	1/254
Resolution	0.35°
Torque	Max Holding Torque(kgf.cm) : 12(at 7V), 16.5(at 10V)
Operating Augre	0.196 at 9.6V Power
Protocol Type	Half Duplex Asynchronous Serial Communication 8bit, 1stop, No Parity
Feedback	Position, Temperature, Load, Input Voltage, Etc
Communication speed	7345 bps ~ 1M bps
Power IN	9.6V, MAX Current 900mA

Contents

Contents of Education

With HBE-RoboCAR Embedded II, Controlling Intelligent Mobile Robot

- | | |
|--|---|
| 1. Introduction to Robot | 7. Sensor Control of Intelligent Robot |
| 2. Structure of Intelligent Mobile Robot | 8. Vision of Intelligent Robot |
| 3. Development Environment of Intelligent Mobile Robot | 9. Image Processing for Intelligent Robot |
| 4. Brain System Software of Intelligent Robot | 10. According to the brightness of a moving robot |
| 5. Operation Control of Intelligent Robot | 11. Web Server |
| 6. Movement Control of Intelligent Robot | 12. Bootloader Fusing with USB OTG |
| | [Appendix A OpenCV Porting] |

Components



HBE-RoboCAR-Embedded II



User's Manual and CD



HBE-AVR-ISP Programmer



Charger



Charger Power Cable



USB Cable (Mini to A)



Bluetooth Master Module

Intelligent Robot

Autofly_Spring
HBE-RoboEX Series
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HBE-RoboCAR-Embedded II
HBE-ROBONOVA-AI II
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