

>>Android/Embedded System

Akıllı Aygıt ve IoT Gömülü Platform Deneyleri için



HBE-SM9-Smart

- Samsung Exynos 5422 Uygulama İşlemci tabanlı Gömülü Cihaz
- Octa Core CPU(Cortex-A15 Quad + Cortex-A7 Quad) ve LPDDR3 2GByte Hafıza
- Geniş Görüş Açılı ve Yüksek Parlaklık ile Kontrast aralığı dahil 7" 800 x 1280 IPS Ekran
- USB 3.0 ve Bluetooth V4.0, Wi-Fi 802.11 b/g/n ve 10/100Mbps Ethernet destekler.
- Dijital Audio, HDMI V1.4 tabanlı Dijital Videoyu destekler.
- Gömülü Araştırması için GPIO/Interrupt/ADC dahil İşlemcili Çevresel Aygıt

Giriş

HBE-SM9-Smart; LPDDR3 hafızasını destekleyen deneyler, Mali-T628 MP6 GPU, USB3.0 ve HDMI 1.4a, Gömülü/Android Platformunda yüksek değerli insan gücü yetiştirmek için geliştirilmiş ve Heterojen Octa Core Platform tabanlı Samsung Exynos 5422 çalışmalarını için en iyi Gömülü Ekipmandır.

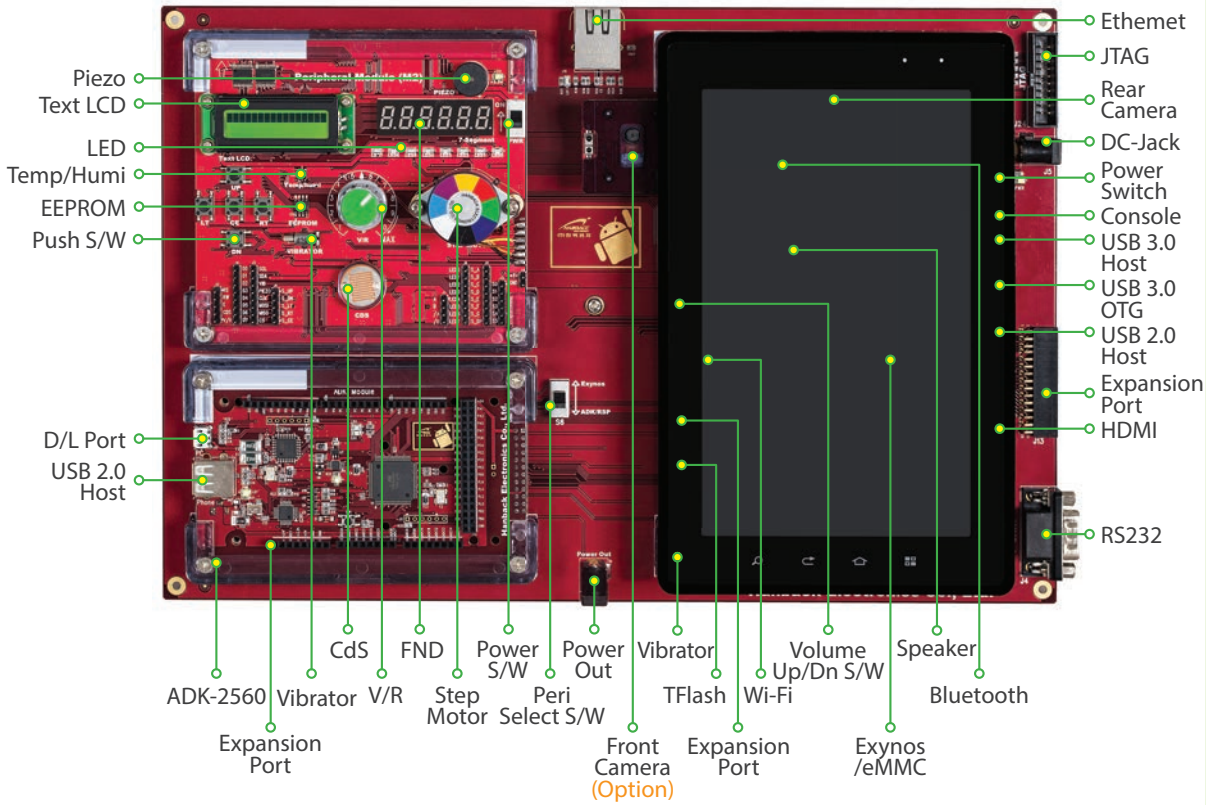
Özellikler

- Providing Knowledge and Experience to test Smart Device and develop the Next Smart Convergence Service in the latest 32bit Octa Core Processor by the best Embedded Module and Embedded Peripheral Device Module for research directly controlled by Processor.
- Optimum Performance and Reliability by installing Heterogeneous Octa Core Processor, Exynos 5422to Embedded Module. Especially, providing 15% improved Performance by HMP (Heterogeneous Multi-Processing) effect than existing Exynos 5420 and the high performance Memory, LPDDR3 2Gbyte RAMand GPU, Mali- T628 MP6 not to make Performance delayed.
- Providing Brightness(450nits) and Color Sense(800:1 contrast range) enough to show User Experience(UX)by installing 7" LG Display of 800x1280 pixel resolution preventing Diff used Refl ection and supportingWide Viewing Angle 170°/170° to up/down and left/right.
- Providing Intenerated Development Environment to build Linux Kernel, generate and build DeviceDriver Project and install it to Target in Windows without other Linux Host Environment.
- Providing the Research/Development Environment of Peripheral Device the same as that of the latestSmart Phone and Smart TV through Peripheral Device for research directly connected with GPIO/Interrupt and ADC Interface of Processor in order to design and study Embedded Peripheral Device.
- Providing Experimental Contents using HBE-ADK-2560 and HBE-SmartCAR as Smart Terminal through USB 3.0/Bluetooth 4.0 for creative Convergence Application Experience.

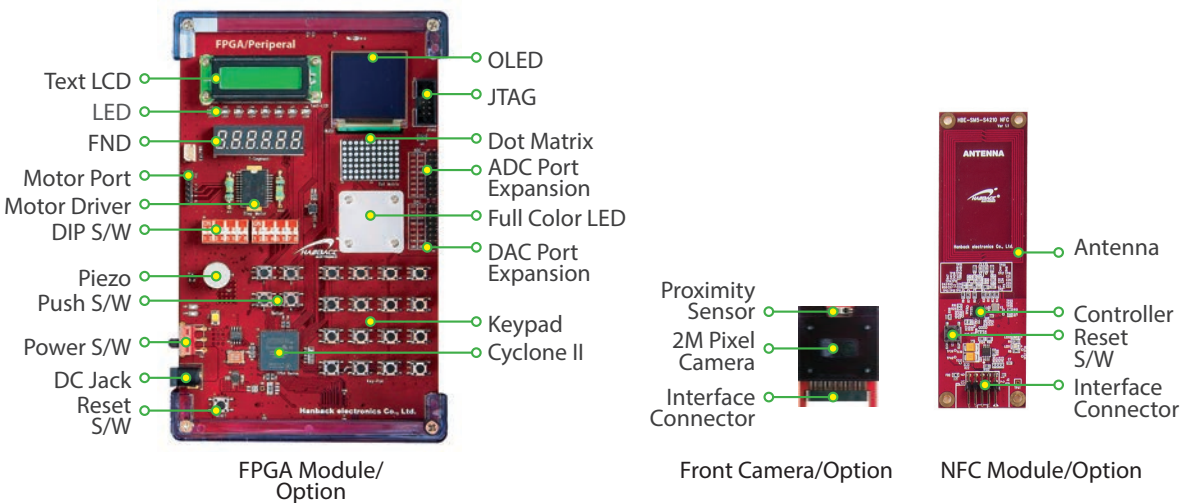
Android/
Embedded System

HBE-SM9-Smart
AndroX Studio™ v2.x

Configuration and Name



[Basic Configuration]

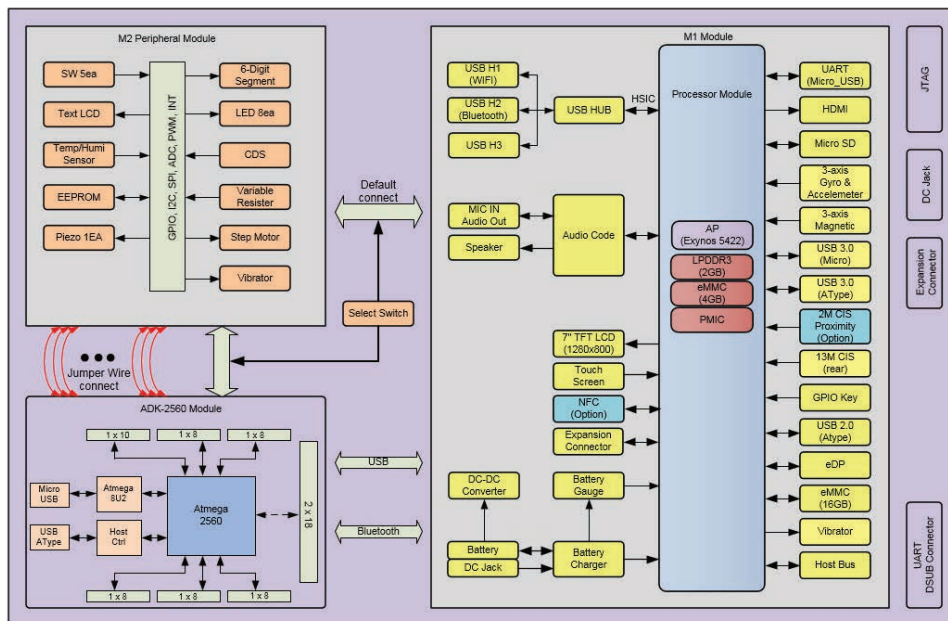


[Option Module]

Android/Embedded System

>>HBE-SM9-Smart

Block Diagram



Expected Effect

- Able to execute the latest Smart Phone Contents Education by selecting Heterogeneous Octa Core Application Processor, the same specifications with Galaxy S5.
- Due to Modular Design, able to separate Embedded Module for independent use as needed and able to design Peripheral Device Module for research to the Module of other functions User need again.
- Providing Embedded Lecture Note as a Textbook, used for holders of Samsung during several years in order to educate Embedded Platform for the industries.
- Widows based Embedded Platform integrated Development Environment(AndroX Studio) not requesting to educate Linux and to build complicate Development Environment in order for developmental education of Embedded Linux Kernel and Device Driver.
- Support of App Inventor provided by MIT in addition to Java to write Android Application Program, in order to help Specialization of High School and University and Minimization of Time and Efforts spent to implement Application Program when operating Capstone Design.

Specifications of Hardware

• Basic Configuration

List	Specifications	
M1 Module (Main Module)	Processor	Samsung Exynos5422 Octa ARM Cortex™-A15 Quad 2.1Ghz and Cortex™-A7 Quad 1.5GHz CPUs
	Memory	2Gbyte LPDDR3 (800MHz)
	3D Accelerator	Mali™-T628 MP6
	Display	7 inch 800x1280(WXGA) pixels IPS LCD, DSI(Display Serial Interface)
	Touch Screen	7 inch 10 point Capacitive Multi-Touch Screen
	Touch Key	4EA Capacitive Touch Key
	Storage	eMMC 4GByte (eMMC 5.0) 8/16/32GByte MicroSD Card(default: 8GByte)
	Network	802.11 b/g/n Wireless LAN
	Bluetooth	4.0+EDR, 1.1/1.2/2.0/2.1+EDR compatible (*max data speed 3Mbps)
	PMIC	Power Management IC
	Digital Video	HDMI 1.4 Video Out(1080p)
	Sensor	3-axis Acceleration Sensor, Gyroscope Sensor, Magnetic Field Sensor
	Haptic	Vibration Motor
	Audio	Audio Codec, Standard 3.5mm headphone jack
	USB	USB 3.0 Host (Super Speed standard A Type Connector x 1port) USB 3.0 Device (Super Speed USB Micro A-B Type Connector x 1port) USB 2.0 Host (High Speed standard A Type Connector x 3ports)
	UART	1 Port Serial to USB (Micro Type, default: debugging UART)
	Battery	3.7V Lithium Polymer Battery (4400mAh)
	Charger	Lithium Polymer Battery Charger
	Expansion Connector	2x7(1EA)
Camera	13M Pixel CMOS Camera (rear), CSI (Camera Serial Interface)	
Size	122 x 192mm	
M2 Module (Peripheral Module)	Interrupt Device	Button Switch 5EA
	Display Device	2x16 Text LCD, 1x8 LED's, 6-Digit Seven Segment
	Actuator	Step Motor, Vibrator
	I ² C Device	Humidity and Temperature Sensor
	SPI Device	EEPROM
	ADC Device	CdS, VR (Variable Resister)
	PWM Device	Piezo
Size	122 x 112mm	
ADK-2560 Module	Microcontroller	ATmega2560
	Clock	7.3728MHz
	USB Controller	ATmega8U2
	GPIO Socket	2x18(1EA), 1x10(1EA), 1x8(5EA)
	Size	122 x 77mm
Base Board	UART	1 Port RS232 Level UART (9p D-sub Connector)
	JTAG	2x10 Box Header
	Ethernet	10/100 Base-T, RJ-45
	Expansion Connector	2x15(1EA)
	Size	315 x 209mm

HBE-SM9-Smart

AndroX Studio™ v2.x

Android/Embedded System

>>HBE-SM9-Smart

• Option Module

List	Specifications	
M3 (FPGA/Peripheral) Module	FPGA	Altera Cyclone-2 (EP2C8F256C8)
	Clock	50MHz
	Input Device	Key Pad(4 x 4), Dip Switch(8P x 2), Tact Switch 4EA
	Display Device	2x16 Text LCD, 1x8 LED's, 6-Digit Seven Segment, Full Color LED 4EA, Dot Matrix 7x5 2EA
	PWM Device	Piezo
	ADC	SPI Interface 8bit/8-Channel
	DAC	SPI Interface 8bit/8-Channel
	Actuator	Step Motor Driver, Motor(Optional)
	Size	122 x 192mm
NFC Module	Microcontroller	ATSAM3X8EA-AU (ARM®Cortex®-M3 up to 84MHz)
	Clock	12MHz
	NFC Controller	NXP PN544
	Communication Port	1 Port I ² C
	Frequency	13.56MHz Baseband
	Detect Range	Max 5cm detection range (dependent on air-interface protocols and tag brands)
Antenna	PCB Antenna	
Camera Module	2M Pixel CMOS Camera (Front/Option)	

Specifications of Software

List	Specifications	
IDE	AndroX Studio 2.1.4	
Boot Loader	U-boot 1.3.4	
Operating System	Linux Kernel 3.10.9	
Platform	Android kitkat 4.4.2	
M1 (Embedded Module)	Display	MIPI base display driver
	Touch Screen	Touch screen driver
	Audio	Audio driver, ALSA
	Bluetooth	Bluetooth driver, Bluez
	Wi-Fi	Wi-Fi driver, wpa_supplicant, iwconfig, libnetutils, Connection Manager
	Network Server	SSH Server, SFTP Server
	USB	USB gadget driver, USB accessory gadget (ADK 2011 Support)
	Ethernet Device	Ethernet driver, Connection Manager
M2 (Peripheral Module)	Interrupt Device	Button Switch Linux Device Driver/Linux Native Application/Android Application
	Display Device	Text LCD/ 7-Segment Linux Device Drivers/Linux Native Applications/Android Applications
	Output Device	LED/ Piezo Linux Device Drivers/Linux Native Applications/Android Applications
	Actuator Device	Vibrator/ Step Motor Linux Device Drivers/Linux Native Applications/Android Applications

Specifications of Software

Android/ Embedded System

List	Specifications
M2 (Peripheral Module)	I²C Device Humidity and Temperature Sensor Linux Device Driver/Linux Native Application/Android Application
	SPI Device EEPROM Linux Device Driver/Linux Native Application/Android Application
	ADC Device CdS/ VR(Variable Resister) Linux Device Drivers/Linux Native Applications/Android Applications
ADK-2560 Module (Integration Firmware)	Interrupt Device Button Switch Firmware
	Display Device Text LCD/ 7-Segment Firmware
	Output Device LED/ Piezo Firmware
	Actuator Device Vibrator/ Step Motor Firmware
	I²C Device Humidity and Temperature Sensor Firmware
	SPI Device EEPROM Firmware
ADC Device CdS/ VR(Variable Resister) Firmware	

HBE-SM9-Smart

AndroX Studio™ v2.x

* This can be changed to improve the Performance.

Product Configuration



HBE-SM9-Smart
1EA



User Guide
book 1EA



AndroX
Studio DVD
1EA



Platform DVD
1EA



Micro To A type
USB Cable 2EA



Charger(5V 4A)
1EA

Android/Embedded System

>>HBE-SM9-Smart

Educational Contents

Basic Education Courses	Contents	
Understanding ARM Embedded System for Smart Device Beginners	<p>PART I Start Up</p> <ul style="list-style-type: none"> - Before Starting - Understanding Environment for Experiment - Development Environment - Target Setting - Target Recovery <p>PART II Understanding Target</p> <ul style="list-style-type: none"> - ARM Architecture - ARM Commands - Structure of Target Hardware 	<p>PART III Development Environment of AndroX Studio</p> <ul style="list-style-type: none"> - Understanding AndroX Studio - Target Management - Eclipse Platform <p>PART IV Understanding Embedded System Programming</p> <ul style="list-style-type: none"> - ARM Cross Tool Chain - Make Utility - Understanding Native Project - Optimizing ARM Code - Linux Kernel
	<p>PART I Developing and Using Android Device</p> <ul style="list-style-type: none"> - Experiment Environment and Module - LED Device Driver - Push Switch Device Driver - Vibrator Device Driver - 6-Digit FND Device Driver - Text LCD Device Driver - Piezo Device Driver - Variable Resistor Device Driver - CdS Device Driver - Temperature/Humidity Device Driver - EEPROM Device Driver - Step Motor Device Driver <p>PART II Sample of Android using Embedded Linux Device Driver</p> <ul style="list-style-type: none"> - Controlling LED interworking with Android - Operating Switch interworking with Android - Controlling Vibrator interworking with Android - Controlling 6-Digit FND interworking with Android - Controlling Text LCD interworking with Android - Controlling Piezo interworking with Android - Operating Variable Resistor interworking with Android - Inputting CdS interworking with Android - Operating Temperature/Humidity interworking with Android - Controlling EEPROM interworking with Android - Controlling Step Motor interworking with Android 	
Developing and Using Android Device	<p>Chapter I Introduction to Arduino</p> <ul style="list-style-type: none"> - Arduino? - Setting Development Environment of Arduino - Installing Program Upload Driver - Setting Arduino IDE <p>Chapter III Programming Experiment</p> <ul style="list-style-type: none"> - Controlling LED -Controlling LED with Switch - Controlling Piezo - Controlling Vibrator - Controlling Text LCD - Reading CdS Value - Reading Variable Resistor Value - Controlling 6-Digit FND - Controlling Temperature/Humidity - Writing and Reading EEPROM Memory Value - Operating Step Motor 	<p>Chapter II Arduino Grammar</p> <ul style="list-style-type: none"> - Structure - Variables - Functions <p>Chapter IV Interworking with Android</p> <ul style="list-style-type: none"> - Controlling LED interworking with Android - Operating Switch interworking with Android - Controlling Piezo interworking with Android - Controlling Vibrator interworking with Android - Controlling Text LCD interworking with Android - Operating CdS interworking with Android - Operating V/R interworking with Android - Operating FND interworking with Android - Controlling Temperature/Humidity interworking with Android - Controlling EEPROM interworking with Android - Controlling Step Motor interworking with Android
	<p>M2(Peripheral)Module Programming with Arduino</p>	

Android/ Embedded System

Applied Education Courses	Contents										
<p>Developing and Using System Bus based Linux Device Driver</p>	<p>Part I Manufacturing Embedded Linux Device Driver</p> <ul style="list-style-type: none"> - Configuration of HBE-SM9-S5422 - LED Driver - FND Driver - Piezo Driver - Text LCD Driver - Dip Switch Driver - Dot Matrix Driver - Full Color LED Driver - OLED Driver <p>Part II Samples of Android using Embedded Linux Device Driver</p> <ul style="list-style-type: none"> - Sample of LED interworking with Android - Sample of FND interworking with Android - Sample of Piezo interworking with Android - Sample of Text LCD interworking with Android - Sample of Dip Switch interworking with Android - Sample of Dot Matrix interworking with Android - Sample of Full Color LED interworking with Android - Sample of OLED interworking with Android 		<p>HBE-SM9-Smart</p> <p>AndroX Studio™ v2.x</p>								
<p>Learning Android Application Program from Samples</p>	<table border="0"> <tr> <td data-bbox="520 1021 823 1122"> <p>Chapter I Understanding Android Platform</p> <ul style="list-style-type: none"> - Android? - Android Device </td> <td data-bbox="892 1021 1281 1178"> <p>Chapter II Development Environment of Android Application</p> <ul style="list-style-type: none"> - Basic Information for Application Program - Development Tool of Android Application Program - Hello Android ~ - Executing at Android Device </td> </tr> <tr> <td data-bbox="520 1211 839 1368"> <p>Chapter III Using Canvas</p> <ul style="list-style-type: none"> - Displaying String - Making Android Character with Shapes - Displaying Image - Gesture - Image canvas and Fast drawing </td> <td data-bbox="892 1211 1206 1368"> <p>Chapter IV Basic User Input Process</p> <ul style="list-style-type: none"> - Basic Input Device - Key Event - Touch Event - Gesture - Image canvas and Fast drawing </td> </tr> <tr> <td data-bbox="520 1413 823 1592"> <p>Chapter V User Interface</p> <ul style="list-style-type: none"> - Layout and View - Button and Dialog Box - Checkbox and Radio Button, Edit Text - List View - Option Menu and Toast - Interworking with HTML document </td> <td data-bbox="892 1413 1158 1536"> <p>Chapter VI MultiMedia</p> <ul style="list-style-type: none"> - Replaying Sound - Recoding and Replaying Audio - Using Camera - Voice Recognition and Synthesis </td> </tr> <tr> <td data-bbox="520 1637 823 1783"> <p>Chapter VII Sensor</p> <ul style="list-style-type: none"> - Vibrator - Proximity Sensor - Accelerometer - Magnetic Field(Compass) Sensor and Direction Sensor </td> <td></td> </tr> </table>		<p>Chapter I Understanding Android Platform</p> <ul style="list-style-type: none"> - Android? - Android Device 	<p>Chapter II Development Environment of Android Application</p> <ul style="list-style-type: none"> - Basic Information for Application Program - Development Tool of Android Application Program - Hello Android ~ - Executing at Android Device 	<p>Chapter III Using Canvas</p> <ul style="list-style-type: none"> - Displaying String - Making Android Character with Shapes - Displaying Image - Gesture - Image canvas and Fast drawing 	<p>Chapter IV Basic User Input Process</p> <ul style="list-style-type: none"> - Basic Input Device - Key Event - Touch Event - Gesture - Image canvas and Fast drawing 	<p>Chapter V User Interface</p> <ul style="list-style-type: none"> - Layout and View - Button and Dialog Box - Checkbox and Radio Button, Edit Text - List View - Option Menu and Toast - Interworking with HTML document 	<p>Chapter VI MultiMedia</p> <ul style="list-style-type: none"> - Replaying Sound - Recoding and Replaying Audio - Using Camera - Voice Recognition and Synthesis 	<p>Chapter VII Sensor</p> <ul style="list-style-type: none"> - Vibrator - Proximity Sensor - Accelerometer - Magnetic Field(Compass) Sensor and Direction Sensor 		
<p>Chapter I Understanding Android Platform</p> <ul style="list-style-type: none"> - Android? - Android Device 	<p>Chapter II Development Environment of Android Application</p> <ul style="list-style-type: none"> - Basic Information for Application Program - Development Tool of Android Application Program - Hello Android ~ - Executing at Android Device 										
<p>Chapter III Using Canvas</p> <ul style="list-style-type: none"> - Displaying String - Making Android Character with Shapes - Displaying Image - Gesture - Image canvas and Fast drawing 	<p>Chapter IV Basic User Input Process</p> <ul style="list-style-type: none"> - Basic Input Device - Key Event - Touch Event - Gesture - Image canvas and Fast drawing 										
<p>Chapter V User Interface</p> <ul style="list-style-type: none"> - Layout and View - Button and Dialog Box - Checkbox and Radio Button, Edit Text - List View - Option Menu and Toast - Interworking with HTML document 	<p>Chapter VI MultiMedia</p> <ul style="list-style-type: none"> - Replaying Sound - Recoding and Replaying Audio - Using Camera - Voice Recognition and Synthesis 										
<p>Chapter VII Sensor</p> <ul style="list-style-type: none"> - Vibrator - Proximity Sensor - Accelerometer - Magnetic Field(Compass) Sensor and Direction Sensor 											

Android/Embedded System

>>HBE-SM9-Smart

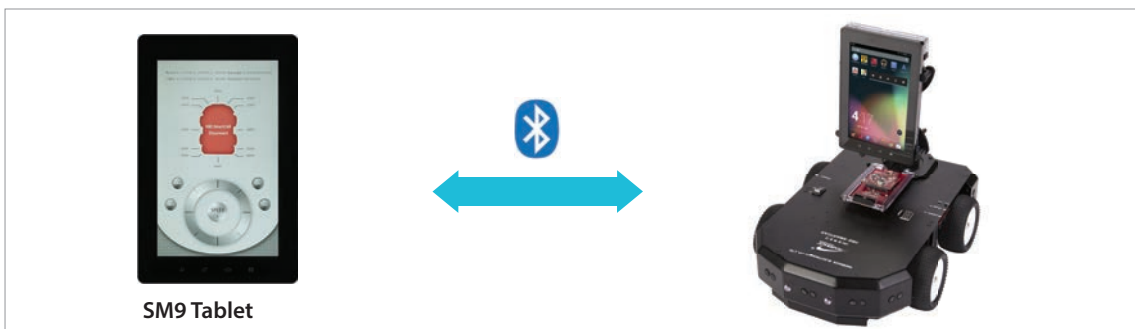
Application Option for IoT and Creative Engineering

- Based on Internet, providing Intelligent Technology and Contents communicating Information between Things and Things and Things and Human mutually
- Providing Solution interworking with Open Source Hardware based Camera, Sensor and Actuator
- Providing Android, Linux based Open API in order to experience Controlling of various electronic devices with building Experience Room

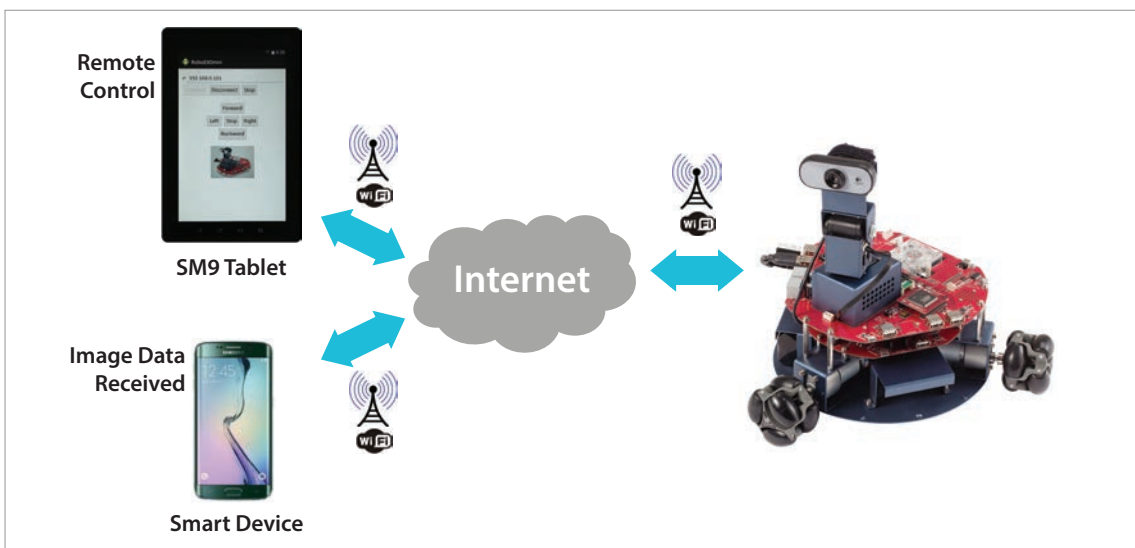
Basic Test-Bed implementing Intelligent Home Network which controls various Home Appliances through Wireless Communication of Bluetooth and Zigbee with Smart Device



Remote Control by Autonomous Algorithm and Smart Device suitable for ICT convergence service through Intelligent Mobile Robot



Remote Control and Image Data Transmission through Smart Device by interworking Actuator of OmniWheel with Brain Module of high performance Processor



Android/ Embedded System

HBE-SM9-Smart

AndroX Studio™ v2.x

“MuseumHelper” composed to guide Exhibits at a Museum through Service



IoT SmartHome to control Bluetooth 4.0(BLE) based Light and Door lock and control Gas Detector through Gateway and Ventilator

