

# >>Intelligent Robot

**Equipment for Education and Test to Learn Microcontroller more Easily and Interestingly With my Own Mobile Robot**



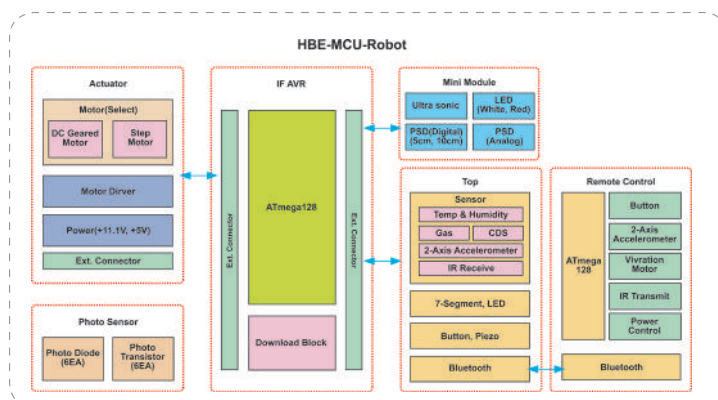
## HBE-MCU-Robot

- 8-bit Micro Controller(AVR) Test Equipment
- Support for Individual Actuator of DC Motor and Step Motor
- Available of Combination of Application modules to desired Configuration
- Easy Assembling and Disassembling by Magnet and Hand Screw
- Recognizing Obstacles from all directions with Octagon type
- Wire/Wireless Device Control by using Remote Control Module
- Easy to Download AVR by embedded ISP

### Features

- It can control Sensor and Communication Module by using 8-bit Micro Processor (ATmega128) and it is available of actuating test independently through the actuating systems(DC Motor and Step Motor).
- For different tests of Actuator for the equipment, there are actuators like DC Motor and Step Motor, which each is independent so that it is able to connect desired Actuator for testing.
- Devices such as AVR, Actuator and Sensor are independent and it is possible to test the equipment by making user's desired module.
- It is possible to test and assemble the sensors and LED device which can measure obstacles around them through Ultrasonic and PSD sensor more easily with the equipment by a magnet.
- When recognizing the obstacle with Sensor, not to make Dead Zone, it is made of an octagon so it is possible to measure from all directions by Sensor.
- For easy assembling and disassembling of the equipment and module, the equipment uses Magnet and for easy assembling and disassembling of PCB, it uses Hand Screw.
- With Remote Controller, which is the control board to control the equipment independently, it is possible to receive the control and sensor values for the equipment by radio.
- With Embedded ISP cable for downloading AVR of HBE-MCU-Robot and Remote Control module, it is possible of AVR programming by connecting the equipment only with USB cable.

### Block Diagram



## Product Specifications

### • Body

Items		Description
ATmega128		Up to 8MIPS Throughput at 16MHz 128k Byte Flash, 4k Byte Internal SRAM, 4k Byte EEPROM 8-Channel PWM, 8 Channel 10 bit ADC, I <sup>2</sup> C, Dual UART
Actuator	DC Motor	Motor : DC +12V, 1.5kg / cm Holding Torque, Up to 100RPM, Driver : Up to 4A output, Voltage Up to 46V
	Step Motor	Motor : 1.6kg / cm Holding Torque, 0.95A, 1.8 $\circ$ Step Angle Driver : Peak Output Current 3A, Voltage Up to 46V
LED		4 Digit Green LED
FND		1 Digit 7-Segment
Button Switch		User Push-button 4ea
Piezo		5V Input Piezo 1ea
Temperature & Humidity		-40 ~ 124 $^{\circ}$ C Range, 0 ~ 100% Range
Gas		HC, Ethanol, VOC Detection
CdS		Infrared Light Sensor
Accelerometer		Dual-Axis Accelerometer Sensor
Bluetooth		2.4GHz Embedded Bluetooth Module
IR receiver		Infrared receiver
Infrared		Photo Diode 6ea, Photo Transistor 6ea
Battery		DC +11.1V, 2200mA 2ea
Ext. Connector		20 Pin Header 2ea, 10 Pin Connector 2ea
Accessory		DC +12.6V, 1.2A Battery Charger, USB Cable App Body : ARM, Bumper, Support, Body Side

### • Remote Control

Items		Description
ATmega128		Up to 8MIPS Throughput at 8MHz 128k Byte Flash, 4k Byte Internal SRAM, 4k Byte EEPROM 8-Channel PWM, 8 Channel 10 bit ADC, I <sup>2</sup> C, Dual UART
Button Switch		User Push-button 10ea
Vibration Motor		Standard 3.0V, 10000 $\pm$ 2500 rpm Vibration Motor
Accelerometer		Dual-Axis Accelerometer Sensor
Bluetooth		2.4GHz Embedded Bluetooth Module
IR Transmit		Infrared Transmit

※ Specifications can be changed without notice

### • Contents in CD

Items		Description
Datasheet		Specific Device DataSheet for Equipment
Driver		USB to Serial Device Driver
Manual		HBE-MCU-Robot User's Manual
Source		User's Manual and Textbook Source
Software		AVR Studio and WinAVR Software

## Intelligent Robot

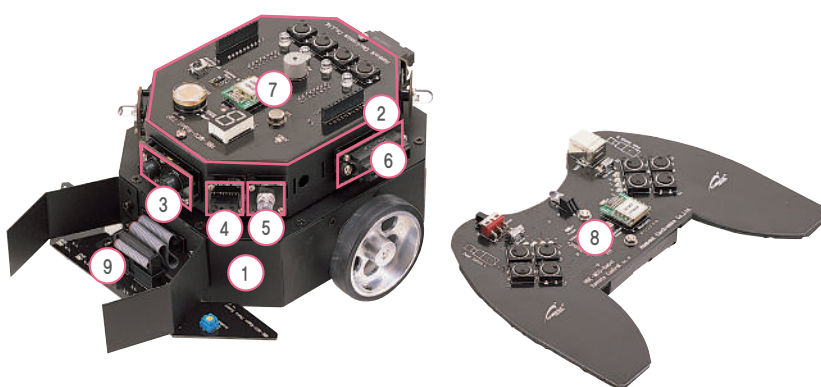
HBE-RoboEX-Series  
HBE-SmartCAR  
HBE-RoboCAR-Embedded II  
HBE-ROBONOVA-AI II  
HBE-RoboCAR  
HBE-RoboCAR-Vision  
HBE-MCU-Robot

# Intelligent Robot

## >>HBE-MCU-Robot

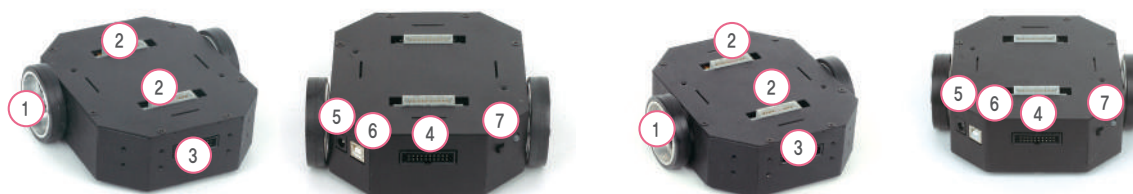
### Configuration and Name

#### • Finished Product



1. Actuator : Actuator for moving the equipment (DC & Step Motor)
2. Body Side : Body for mounting Application module
3. Ultra Sonic : Ultra Sonic Sensor module
4. PSD(Digital) : Infrared Distance Sensor module with Digital type
5. LED : LED module (White, Red)
6. PSD(Analog) : Infrared Distance Sensor module with Analogue type
7. Top : Board for Peripheral devices of Sensor and Communication module
8. Remote Control : Remote Control board for controlling the equipment
9. Photo Sensor : Board for recognizing the floor by using Infrared ray (Line Tracer function)

#### • Actuator



DC Motor Actuator

Step Motor Actuator

1. Motor : DC Motor and Step Motor, Actuator
2. Interface Con : Connector for Control Board Extension
3. Front Ext. Con : Connector for Front Extension
4. Back Ext. Con : Connector for Back Extension
5. DC Jack : Connector for Battery charging and Adaptor connecting
6. USB Con : Connector for AVR program and UART communication
7. Power : Equipment Power Switch and LED

## Hardware Specifications

## Intelligent Robot

### • IF AVR

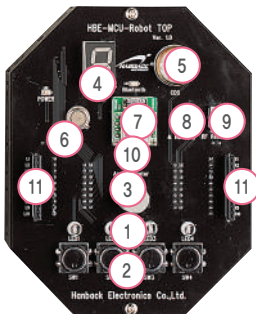


1. AVR : Micro Controller for control the equipment
2. USB Control : ISP & UART Select Switch
3. I/O Con : AVR pin Extension Connector
4. VCC : +5V Power Connector
5. GND : Grand Power Connector
6. Motor Con : Connecting Pin for Actuator Motor Data
7. Actuator Ext Data : Connecting Pin for Actuator Front and Back Extension Connector Data

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### HBE-MCU-Robot

### • Top



1. LED : 4EA High Brightness Extension LED
2. Switch : 4EA Button Switch
3. Piezo : Melody Output device by Frequency
4. FND : 7-Segment
5. CDS : Sensor for measuring the brightness
6. GAS : Sensor for recognizing volatile gases like Co and Alcohol
7. Bluetooth : Bluetooth module available of wireless communication
8. Temp & Humi : Sensor for measuring Temperature and Humidity
9. IR Receiver
10. Acceleration : 2-axis Accelerometer which senses the tilt of equipment
11. Ext Con : Connector for Data Extension(Able to extend Double Sided Board)

### • Remote Control



1. AVR : Micro Controller for the whole devices of Remote Controller(Power control function)
2. Acceleration : 2-axis Accelerometer which senses the tilt of equipment
3. Bluetooth : Bluetooth module for wireless communication
4. Tact SW : Equipment Control Switch
5. Push SW : Equipment Control Switch
6. Power : Power Switch
7. USB Con : Connector for AVR program and UART communication
8. Vibrator Motor
9. IR Transmitter
10. USB Control : ISP & UART Select Switch (Located on the back)

# Intelligent Robot

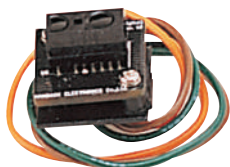
## >>HBE-MCU-Robot

### • Application Module



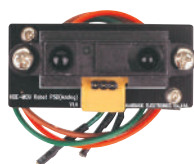
LED Module

High Brightness 8mm LED Module  
Red, White Color  
White 2ea, Red 2ea  
Size : 20 x 20 mm  
3 pin Cable



Digital PSD Module

PSD Sensor (Digital Output)  
Detecting distance : 5cm, 10cm  
5cm 1ea, 10cm 1ea  
Size : 20 x 20 mm  
3 pin Cable



Analog PSD Module

PSD Sensor (Analog Output)  
10 ~ 80cm Detecting distance  
Size : 45 x 20 mm  
3 pin Cable



Ultra Sonic Module

Ultra Sonic Sensor  
Sound Pressure :  $120 \pm 3\text{dB}$   
Detectable Range : 0.2 ~ 3 m  
Nominal Frequency : 40 kHz  
Size : 40 x 20 mm  
4 pin Cable



Photo Sensor board

6ea Photo Diode  
Sensor Receive Check through 6EA LEDs  
6ea Photo Transistor  
Connected with 20 pin Flat cable  
Sensor Sensibility Control through Potentiometer  
Size : 170 x 40 mm

### • Application Body



Support



Arm



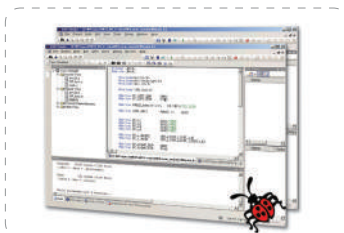
Bumper

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## Designing Environment

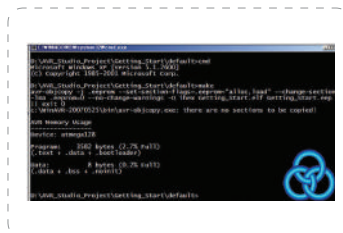
### • AVR Studio

Supported Over Developing Environment Software  
Windows 98 for Atmel AVR Device Integration  
Free Downloading from Atmel homepage and CD



### • WinAVR

Providing of C++ Compiler of AVR Studio



## Contents

### Contents of Education

#### HBE-MCU-Robot

1. INTRODUCTION
2. HOW TO CONNECT DEVICES
3. AVR DEVELOPING ENVIRONMENT
4. OPERATING ACTUATOR
5. CONTROLLING BASIC DEVICES
6. SENSOR CONTROL
7. CONTROLLING INTERFACE ENVIRONMENT
8. APPLICATION MODULES
9. CONTROL MODULES
10. APPLICATION DEVICES AND TOOLS

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