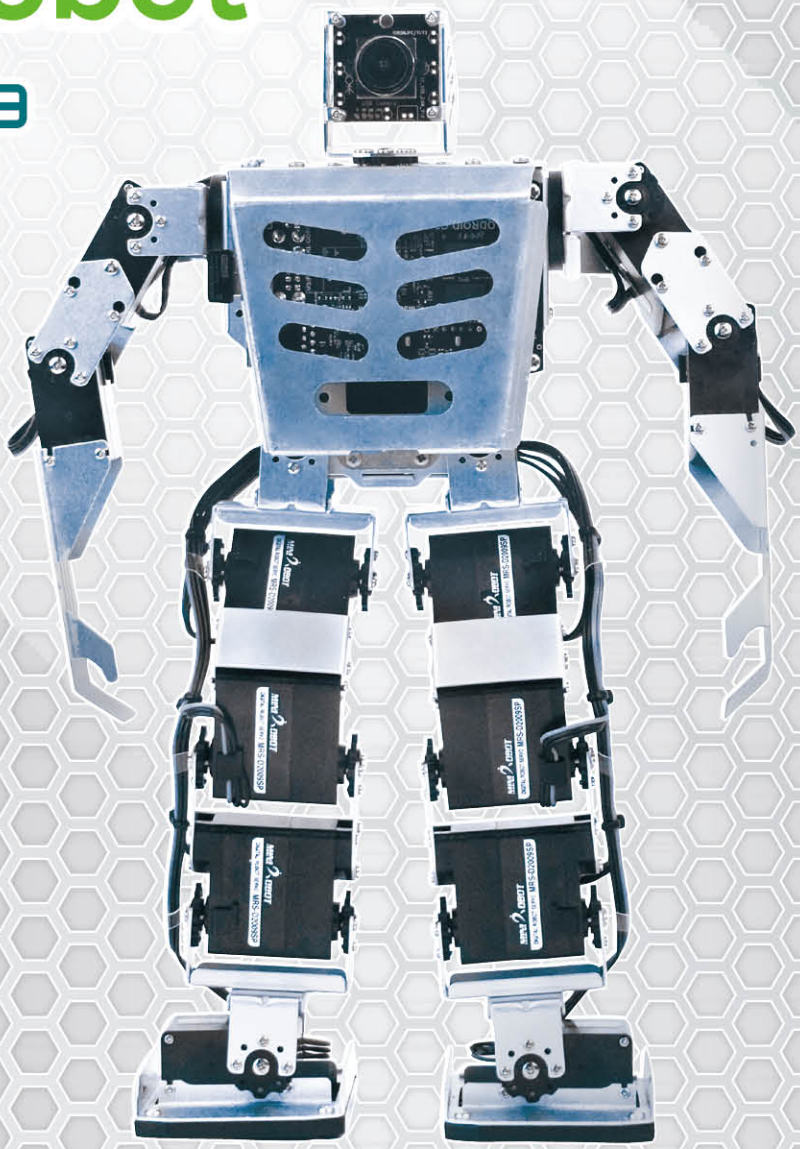
www.hanback.com

Intelligent Robot

## High-Speed Stand-Alone Embedded System Mounted

# Intelligent Biped Robot

## ROBONOVA AI 3



HANBACK ELECTRONICS

Since 1984


**HANBACK ELECTRONICS CO.,LTD.**

518 Yuseong-daero, Yuseong-Gu, Daejeon 34202, South Korea
TEL. +82-42-610-1111, 1164 (Dir.)
FAX. 042. 610. 1199
E mail. support@hanback.co.kr

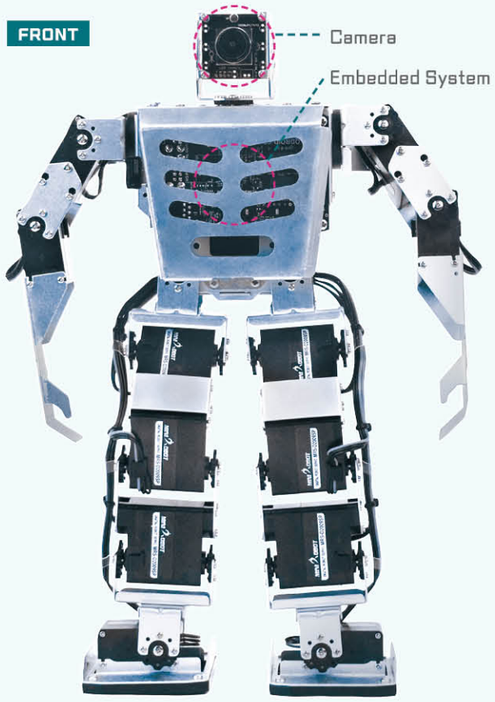

Homepage

High-Speed Stand-Alone
Embedded System Mounted

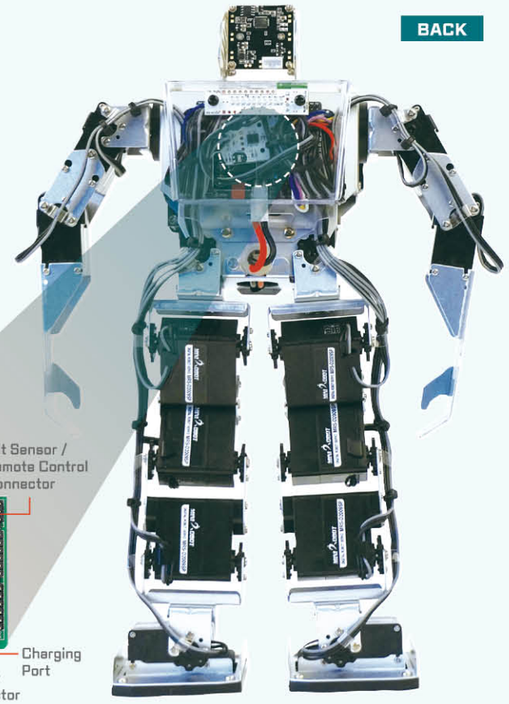
# Intelligent Biped Robot ROBONOVA AI 3

HANBACK ELECTRONICS

FRONT




BACK




HBE-ROBONOVA AI 3 is an intelligent 16-joint biped robot with an MR-C3024 controller board capable of controlling 32 servo motors simultaneously and an Amlogic embedded processor for high-resolution image acquisition, image processing and intelligence algorithms.
By equipping the existing biped robot with a brain board and a visual module, it is possible to perform intelligent actions as well as perform simple robot operations that were previously made and stored in the PC.
HBE-ROBONOVA AI 3 is an intelligent motion robot that processes video and vision algorithms and is the optimal platform to provide future intelligent robot education environment.

## HBE-ROBONOVA AI 3 Product Features

- Robust frame / high-efficiency motor technology integration
- Speed control by PWM technology / RC motor compatible
- Provide optimal robot motion program environment using ROBOBASIC and ROBOSCRIPT
- High resolution camera (Robot vision)
- 1.5GHz Quad Core CPU (Robot Brain) based on ARM Cortex-A53
- Linux 3.16.57 and Ubuntu program development environment
- Real-time image acquisition and image processing
- Real-time video monitoring using wireless LAN
- Robot vision using OpenCV image processing and machine vision algorithm

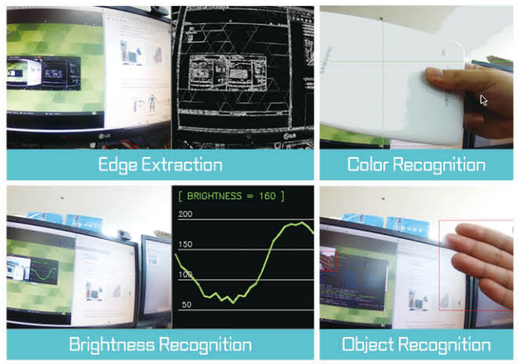
## Training Contents

1. Introduction to Robot
2. Structure of Intelligent Biped Robot
3. Development Environment of Intelligent Robot
4. Brain of Intelligent Robot
5. Controlling Operation of Intelligent Robot
6. Vision of Intelligent Robot
7. Image Processing for Intelligent Robot
8. Robot Control by Brightness
9. Color Recognition Robot
10. Moving Object Tracking Robot
11. Shape Recognition Robot Using Circularity
12. Position Finding Robot
13. Taekwon Robot

Main Exercise

## Intelligent Robot Control Test through 64bit Embedded System

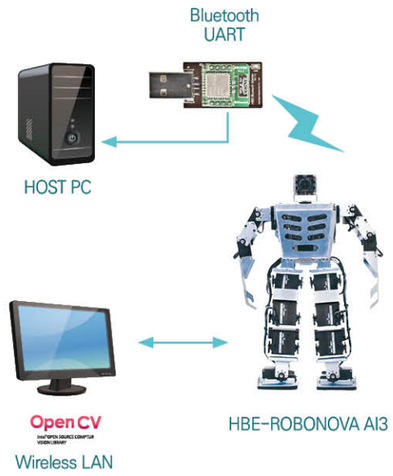
- Embedded system programming exercise based on Linux Kernel Ver 3.16.57
- Image data processing and recognition processing through visual module
- Intelligent control through UART (communication with robot control board by UART)
- Image processing and robot vision algorithm exercise
- Real-time image processing, tracking and recognition algorithm exercise using OpenCV Library

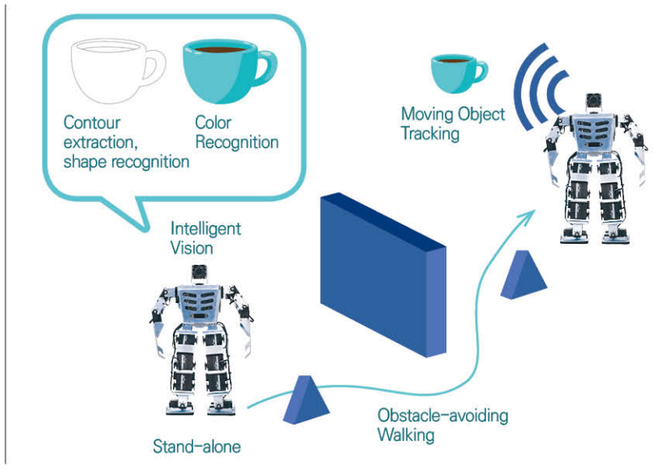



Main Exercise

## Bipedal Robot Intelligence Control Project Exercise with Cognitive Ability

- Embedded system programming, motor control, image processing, and machine vision
- Project exercise and capstone course application for robot contest platform ( Taekwon Robot, etc. )



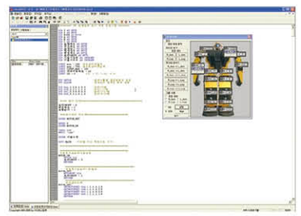




Main Exercise

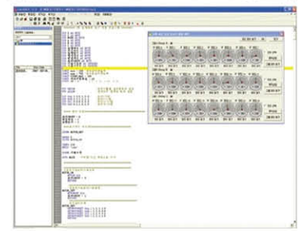
## Biped Robot Basic Control Exercise using Control Board(MR-C3024)

- Basic operation control test using ROBOBASIC and ROBOSCRIPT(ROBOBASIC v2.6 includes its own commands for robot control in addition to BASIC language and provides real time motor control program for multi-joint robot control for easy programming of robot operation)
- Robot operation control exercise using remote controller

ROBOBASIC Motor Control



ROBOBASIC Real-Time Servo Motor Control



## Software Specifications

| Module | Specifications |
|---|---|
| Operation Control Board | ROBOBASIC 2.6 |
| Brain Board | OS : Ubuntu 16.04 |
| | Kernel : Linux 3.16.57 |
| | Bootloader : U-Boot 2015.01 |
| | OpenCV : 3.4.2 |
| | Remote Viewer : VNC |

## Hardware Specifications

| Module | Specifications |
|---|---|
| Robot Body | HSR-8498 Digital Servo Motor x 17ea |
| | Control Pulse neutral : 1500us/0~180o, ±1100 ~ 1900 |
| | Pulse Cycle : 12 ~ 26ms (common : 21ms) |
| | Dimensions / Weight: about 310*180* 90mm / about 1.3kg |
| | Power Source: Li-ion 2900mA rechargeable battery 1 EA |
| Operation Control Board | 24 servo motors |
| | 32 input/output ports (I/O) |
| | 3 PWM signal ports |
| | 8 channel A/D conversion function |
| | Serial control function (VB, VC++ controllable) |
| | LCD module drive command function |
| | High-speed serial communication (UART) function |
| | Built-in flash memory |
| | Using ROBOBASIC V2.5 or higher |
| | Serial I.F cable downloading |
| | RC wireless remote control available |
| | Built-in wireless remote control |
| | Apply tilt sensor |
| Brain Board | CPU : Amlogic ARM Cortex-A53 1.5GHz quad core |
| | GPU : Mali-450 |
| | Memory : 2Gbyte DDR3 SDRAM |
| | Gigabit Ethernet |
| | eMMC5.0 HS400 Flash Storage slot / UHS-1 SDR50 MicroSD Card slot |
| | HDMI 2.0 4K/60Hz display |
| | 40pin GPIOs + 7pin I2S |
| Visual Module | Video pixel: 1920x1080 |
| | Output image format: YUV2/MJPEG |
| | Frame rate: 1280x720@30fps MJPEG, 1920x1080@30fps MJPEG |

## Product Configuration

HBE-ROBONOVA AI 3 Body

Platform USB (include OS image and Tools) 1EA


User Guide book 1EA

Remote Controller

Charger

Stereo Cable

AC Adapter

Bluetooth Master