

1 Robot Specifications

1.1 Mechanical Design

We started out using the Dynamic Anthropomorphic Robot with Intelligence-Open Platform (DARwIn-OP).

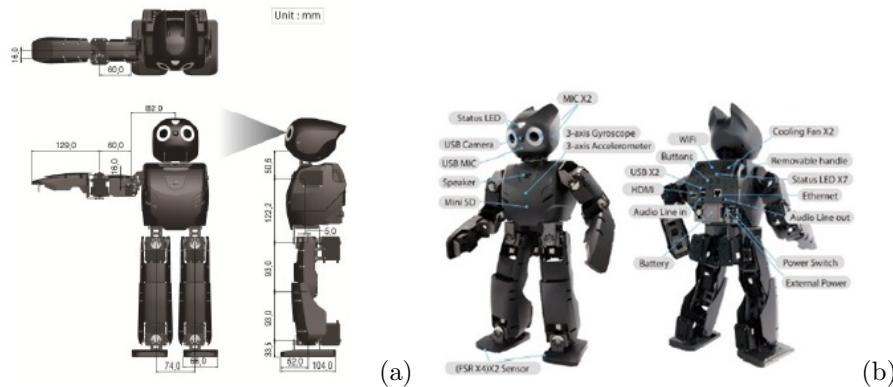


Fig. 1. (a) DARwIn-OP's dimensions. (b) DARwIn-OP's components.

Fig.1 illustrates the mechanical design of DARwIn-OP. This robot has a total of 20 degrees of freedom: 6 DoF for each leg (X2 for both legs), 3 DoF for each arm (X2 for both hands) and 2 DoF for the head. The center of mass is located in the middle of its upper body. This location is ideal for proper balancing. The robot's height is 45.5 cm and it weights 2.8Kg. The hollowness of its frames results in a low weight. The robot's walking speed is determined according to locomotion considerations. We are examining the possibility of switching to other robot models.

1.2 Actuators

DARwIn-OP uses Robotis RX-28M Dynamixel motors. It is possible to control all the servos by a single microprocessor via a TTL network since each motor has its own microcontroller. The RX-28M features a conventional potentiometer for position control. The RX-28 motor weights 72g and has a resolution of 0.29 and a gear reduction ratio of 193:1. Dimensions: 35.6mm x 50.6mm x 35.5mm

1.3 Sensors

DARwIn-OP has several kind of sensors as illustrated in figure 2. The basic sensors are 3-axis gyroscope and a 3-axis accelerometer for posture estimation and balancing. A camera (2MP HD Logitech C905, resolution 640x480) and 3 microphones are located in the head. 4 FSRs (Force Sensing Registers) are located in each foot.

1.4 Controller

DARwIn-OP originally came with a CompuLab FitPC2i board featuring a 1.6GHz Intel Atom Z530 processor with 1GB of RAM. During the past year, due to latency issues, the main-boards were replaced with Intel® NUCs, featuring the Intel® Core i5 4250U (1.3 GHz with turbo capability to achieve 2.6 GHz) Dual-Core processor. The robot uses a CM-730 micro-controller for motor control. The camera is connected to the NUC via a USB port.