

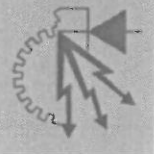
B666



Lodz University of Technology  
Institute of Automatic Control

# ROBOTICS Laboratory

Łódź, 2018



**Laboratory location:**

**Robotics Laboratory belongs to the Institute of Automatic Control, Department of Robot Control and is located in room E-100, second floor, building A12 (Faculty of Electrical, Electronic, Computer and Control Engineering).**

**Laboratory consists of 5 exercises; four of them are based on real robots and one on simulation software. Therefore, Students must observe safety precautions related to working with moving machines and high voltages.**

**Due to safety reasons, Students must use cloak room before entering laboratory.**

**No food and beverages are allowed in the laboratory.**

## Exercise 1 – BIOLOID robot

Bioloid is a powerful robot kit that can be assembled in any way the user wants. For example, you can make a puppy robot that can interact with you using sensors and buttons mounted on the body. You will learn how to use "Behavior control programmer" and "Motion Editor" to control, program, edit and run various robot's behavior. Please refer to the *Bioloid Users Guide* in order to understand robot construction and programming basics, specifically the assembly of Puppy robot shown in Fig.1.1. Check and answer to the teacher how many DOFs have legs, head and a body of Pappy robot. What kind of sensors are available on-board, where are they located?

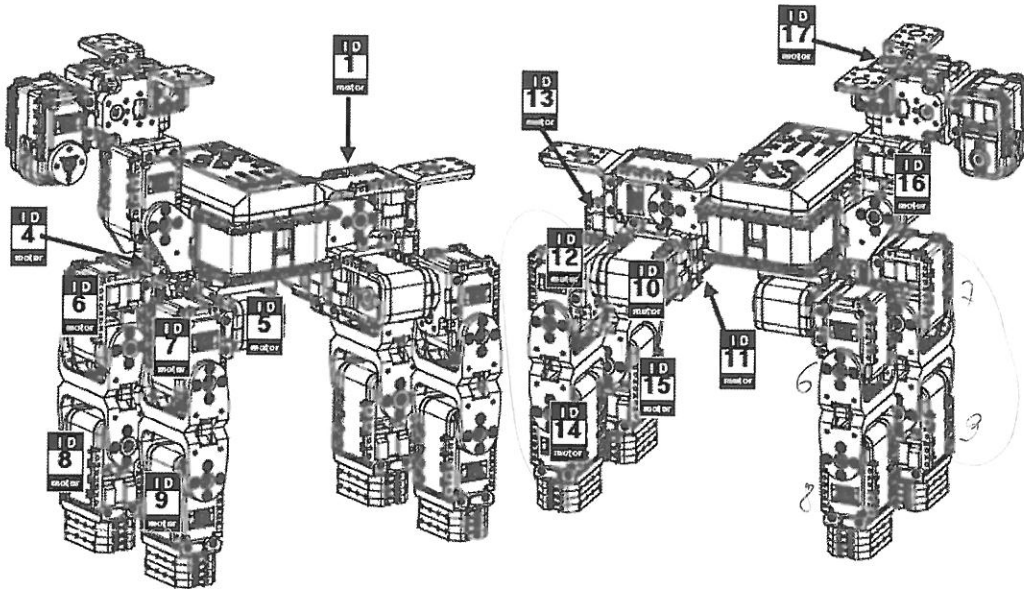


Fig. 1.1 Bioloid Kit assembled a Puppy robot

## Bioloid Controller CM-5

The main controller of Bioloid system is called CM-5, it is connected with PC via RS232.

**Connection and disconnection of the RS232 cable is allowed only when robot is switched off.**

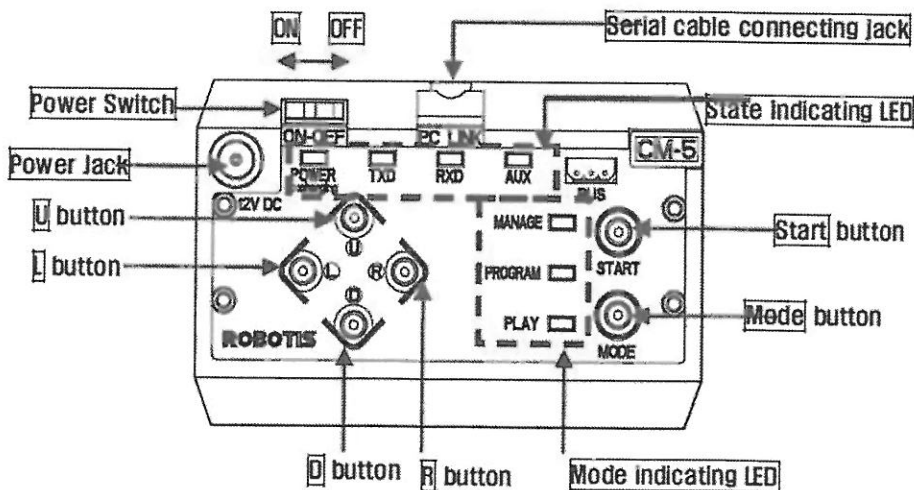


Fig. 1.2 CM-5 Bioloid Controller

Robot has three modes of operation (selected by "Mode" button, and signaled by LEDs): "Manage", " Program" and "Play". To confirm the chosen mode (LED is flashing) you have to press "Start" button (LED in on).

- "Manage Mode" – advanced mode to verify state of robot.
- "Program Mode" – used to program robot's motion in the "*Motion editor*".
- "Play Mode" – activated after downloading user's program prepared in "*Behavior control programmer*".

Please refer to the *Bioloid Users Guide* to check the function of other buttons.

**!!! In order to stop the robot use "Mode button" or "Power Switch" !!!**

Read carefully the *Bioloid Users Guide* to understand operation of "*Behavior control programmer*" and "*Motion Editor*" and realize the following tasks. These programs cannot operate simultaneously being connected to the robot, you have to disconnect robot or change the software. Remember to save your work systematically, use the Page Save button to save motion in the robot's controller when using "*Motion Editor*".

**Tasks to be completed:**

*a) simple motion and simple behavior: GRADE 3*

Using "*Motion editor*" teach the robot to move a leg and a head. "

Using "*Behavior control programmer*" teach the robot to play at least 7 notes with different times.

*b) intermediate motion and behavior: GRADE 4*

Using "*Motion editor*" teach the robot to move two legs as in one of the walking patterns of quadrupled animals.

Using "*Behavior control programmer*" teach the robot to generate intermediate motion when you clap hands twice.

*c) advanced motion and behavior: GRADE 5*

Using "*Motion editor*" and "*Behavior control programmer*" teach the robot to generate walking when you press one of the buttons and stop when robot detects an obstacle. Combine other motions in the single program.