

Hands-on

Robotic School, January 20-25, INRIA Sophia-Antipolis

1 Principle of the hands-on

- at the very beginning of the school you will receive the description of a task that will have to be realized with a robotized system
- 8 teams of 3-4 people will be randomly selected
- each team will receive an hardware set (see section 3). **No additional sensors, motors, board beside the one provided in the hardware set may be used for developing your system, otherwise your team will be disqualified.** However basic and simple material such as raw material, tape, elastic band may be used. You may also use your own laptop as soon as it does not include any specific sensor or motor control board beside the one that are available on all laptop.
- each team will realize its own robotized system in full autonomy without any outside help during the school week
- on Friday each team will present the application of its system to the task during a public presentation. Expect to be allowed a set-up time of 5 minutes and a running time of 5 minutes during which no interaction with your system will be allowed: the system should be fully autonomous during these 5 minutes
- **this is not a competition!** There will not be any winner or loser, we just want you to show your group spirit (not especially a team spirit), your imagination, how you have integrated in your system the fundamentals of robotics that will be presented during the school

2 Pre-requisites

The Arduino and sensors that are part of the hardware set offer you a limited amount of computer power and possible perception. Hence it may be useful to master the use of Arduino and the possibility for them of controlling DC motors and servomotors. There are numerous web sites for that purpose

- installing the open-source Arduino Software (IDE): <https://www.arduino.cc/en/Main/Software>
- using the Uno: <https://www.makerspaces.com/arduino-uno-tutorial-beginners/>
- controlling DC motors: <https://howtomechatronics.com/tutorials/arduino/arduino-dc-motor-control-tutorial/>
- using the RS105 motor controller <https://www.gotronic.fr/pj-657.pdf>
- a library to control servomotors: <https://www.arduino.cc/en/reference/servo>
- a tutorial for the control of servomotors: <https://www.instructables.com/id/Arduino-Servo-Motors/>

Hence it may be useful to be familiar with the Uno, its programming and its possibilities to manage motors and sensors.

3 Hardware set

- one Arduino starter kit of type 1 (composition see section 3.1)
- one Arduino kit of type 2 (composition see section 3.2).
- one motor shield RS015 (<https://www.gotronic.fr/art-carte-de-contrrole-rs015-17744.htm>)
- two continuous rotation servos
- 3 miniature servos
- one power source 3-12 Vcc (<https://www.gotronic.fr/art-adaptateur-psu15rs-20065.htm>)
- one converter usb to serial (<https://www.gotronic.fr/art-convertisseur-usb-serie-ftdi-gt1125-26140.htm>)
- a set of tools (<https://www.gotronic.fr/art-trousse-de-11-outils-set25-22606.htm>), a saw, a scissor
- a set of spring (<https://www.gotronic.fr/art-assortiment-de-200-ressorts-fd6200-11598.htm>)
- a set of gears (<https://www.gotronic.fr/art-kit-d-engrenages-c6085-11869.htm>)
- one free-wheel (<https://www.gotronic.fr/art-roue-metallique-ow007-17749.htm>)
- batteries, tapes, tapemeter, set of screws, glue

Furthermore raw material such as cardboard, plastic sheets and tubes, elastic tensioner will be available.

3.1 Composition of Arduino starter kit type 1

- 1 Arduino Projects Book (170 pages)
- 1 Arduino UNO board rev.3
- 1 Easy-to-assemble wooden base
- 1 9v battery snap
- 70 Solid core jumper wires
- 2 Stranded jumper wires
- 6 Photoresistor [VT90N2 LDR]
- 3 Potentiometer 10kilohm
- 10 Pushbuttons
- 1 Temperature sensor [TMP36]
- 1 Tilt sensor
- 1 LCD alphanumeric (16x2 characters)
- 1 LED (bright white)
- 1 LED (RGB common cathode)
- 8 LEDs (red)
- 8 LEDs (green)
- 8 LEDs (yellow)
- 3 LEDs (blue)

1 Small DC motor 6/9V
1 Small servo motor
1 Piezo capsule [PKM17EPP-4001-B0]
1 H-bridge motor driver [L293D]
2 Optocouplers [4N35]
5 Transistor [BC547]
2 Mosfet transistors [IRF520]
5 Capacitors 100 nanoF
3 Capacitors 100 muF
5 Capacitor 100 pF
5 Diodes [1N4007]
3 Transparent gels (red, green, blue)
1 Male pins strip (40x1)
20 Resistors 220 ohm
5 Resistors 560 ohm
5 Resistors 1 kilohm
5 Resistors 4.7 kilohm
10 Resistors 10 kilohm
5 Resistors 1 megohm
5 Resistors 10 megohm

3.2 Composition of Arduino starter kit type 2

- 1 carte Arduino Uno
- 1 cable USB
- 1 connecteur HE14 40 points
- 1 bote de connexions 840 points
- 140 ponts de connexions
- 10 resistances 10 kohm 1/4W
- 10 resistances 2,2 kohm 1/4W
- 10 resistances 220 kohm 1/4W
- 10 resistances 330 kohm 1/4W
- 5 condensateurs 100 nF
- 5 condensateurs 10 nF
- 5 condensateurs 100 microF/25 Vcc
- 1 thermistance 47 kohm
- 1 LDR
- 5 leds
- 1 potentiometre ajustable 10 kohm
- 2 transistors BC547
- 1 buzzer
- 5 boutons-poussoirs 12x12mm
- 2 optocoupleurs 4N35
- 2 apteurs d'inclinaison
- 1 diode 1N4007
- 1 transistor MOS IRF520