

Wearable Devices Lab

2019-2020

Goal: Using the Arduino platform, develop a wearable device for monitoring some form of motor/perceptual/cognitive performance of the user according to the following requirements:

- The device should be useful for some user population that needs to be explicitly identified. The project proposal should explicitly discuss this 'social utility'.
- The device must be stand-alone and must detect some type of activity, for example:
 - Movements, forces
 - Muscle or brain activity
 - Emotionsthrough the use of sensors:
 - Kinematics or kinetics (e.g. protractors, accelerometers, strain gauges, foot switches, load cells)
 - Electrophysiological (e.g. EMG, EEG, ECG)
 - Psycho-physiological (e.g. body temperature, skin impedance, heart rate variability)
- The device must process the detected signals and display some type of performance measurement, or drive some type of actuator, or transmit the detected signals remotely. For example, the device may use:
 - Motors, vibrators, buzzer
 - LCD or OLED display
 - Wireless connection (WiFi, bluetooth ...) with internet or smartphone or PC
- Data and signal processing must be based on clearly formulated hypotheses and be implemented in a technically sound and testable way.

The device:

1. must be non-trivial and demonstrate your programming skills
must use hardware and language resources appropriately in order to reduce the complexity of the implementation
2. may be a variation of one of the examples seen during classes or of an existing device. In this case it is necessary to mention the original device.

You will need to form spontaneous working groups (singles or couples). Each group will get a development board (Arduino Uno) for free (two if couples) and will be responsible for the purchase or construction of each additional component. The maximum cost of additions to the basic development board cannot exceed 40 euros. The cost of the components must be documented at the time of submission (list of parts, LOP).

Each group will submit one single device, which will get one collective evaluation.

The project work development will have two phases with different deadlines:

1. **Project idea development.** Do some research on the internet to see if there are devices similar to what you intend to develop. If so, you must demonstrate that yours is an improvement. Make up a name for your device. Prepare a short presentation (1 slide, 1 minute) of your project idea. Possible structure:
 - (device name) is... (describe what it does)
 - This device is aimed at... (specify who could use it)
 - Unlike ... (list of main alternatives),

- This device.... (describe the main peculiarity of your device)

This presentation will be made in class to 'defend' your design idea.

Deadline: **Tuesday 19 May**

2. Submission of the project with presentation and demonstration of the device made.

The final evaluation will be based on

- originality and functionality;
- User interface and ease of use;
- Implementation (hardware solution, software structure and correctness of the processing carried out)

Deadline: **Monday July 13rd**