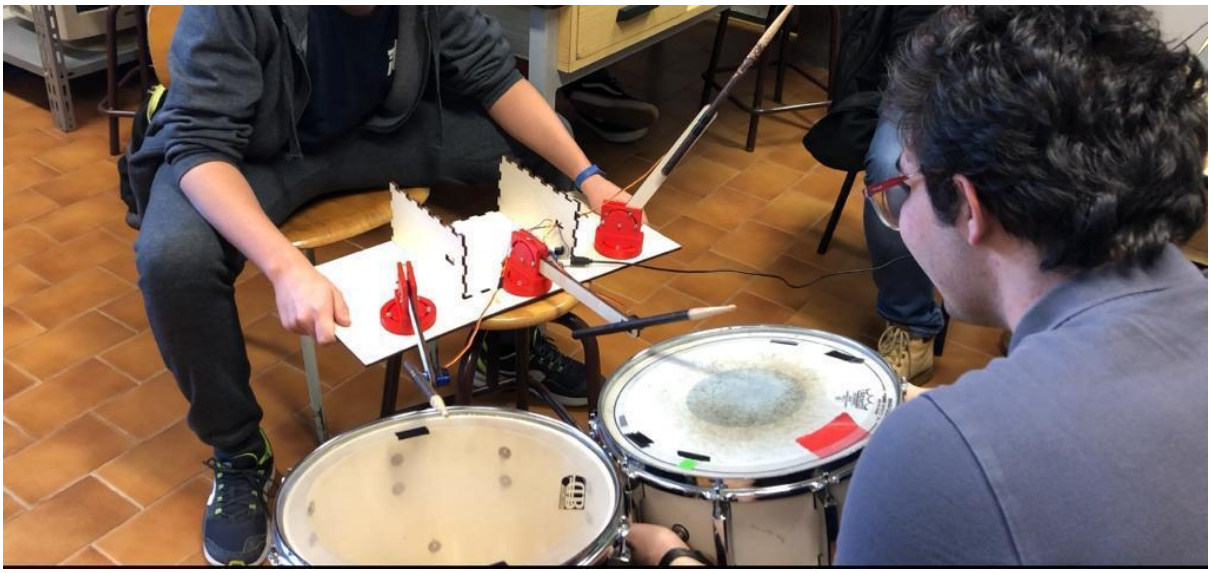
Druminator



Druminator is able to play an acoustic drum composed by 3 elements: the choice is between the HiHat, the Snare, and the FloorTom (used as a Kick). The idea came from one of the components of our team, who is a drummer. The aim of this idea is to join together the passion for robotics and for the music. From that, a robot that is able to show how to play that instrument, but also an auxiliary help for handicapped drummers.

In order to build this robot, some parts were made with the laser-cut machine present in our school, while the other parts were made with our 3D Printer. After our prototype got tested, we realized that the structure was undergone to so many vibrations due to the hit of the DrumStick on the element; so we have decided to make it in metal (this is better explained in the mechanical explanation).

The project was born and developed within the Robotika group, a team that was conceived last year in the “Istituto d’Istruzione Superiore “G. Vallauri” of Fossano (CN). The Robotika group is formed by students from the last three years of different branches: the IT technologies one, the mechanical one and the applied sciences one. The projects that come to life (inwardly) inside of the group must posses

characteristics of usefulness, sustainability and social commitment. The usefulness of the project is expressed through the planning of a device that responds to a real need, emerged from a comparison within the group after the manifestation of the problem (in house, with friends, read on a magazine, ...). A significant problem is the one with sustainability, that is expressed in particular with a limited budget for the purchase of components and with the valorization of disused materials for the realization of the new project. The recovery of the disused components and their rehash is fundamental. The social commitment is the direct consequence of the necessity of significant construction of the concept of citizenship. The projects which are developed within Robotika team are exactly the concrete try to respond to a real problem, felt important by the components, promoting a responsible use of the materials in an ecologically sustainable optic.

Druminator: features

This robot has a lot of features:

1. **“Manual” mode** (from the base): in this mode you can play the drum simply by pushing one of the three buttons on the base.
2. **“Manual” mode** (from the smartphone): in this mode you can play the drum simply by pushing one of the three buttons on the screen. Each of them is represented by an image of the instrument.
3. **“Rhythm” mode** (from the smartphone): in this mode the user can choose between a rock rhythm, a valzer one, a blues one and a dance one. The robot will play the chosen rhythm. After a certain amount of time, the rhythm will stop automatically. Otherwise, the user can stop it by pushing the stop button. The speed of the rhythm can be chosen and changed from the application on the smartphone.
4. **“Challenge” mode** (from both base and smartphone): when the user push the specific button on the application on the smartphone, the robot will start to light alternately the 3 leds. The user has to push the right button in a short time. If the user hit that, then the robot will play the instrument, otherwise it will emit a sound to indicate the mistake.

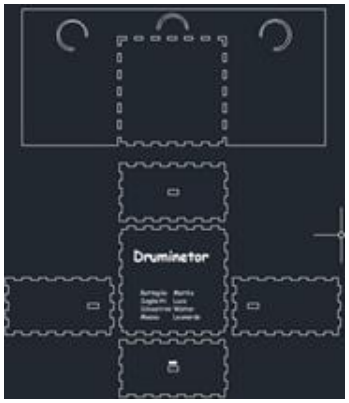
5. **“Custom” mode** (from the smartphone): the user has the possibility to create a custom rhythm with the specific screen on the application. The robot will play that.

Mechanical part

The prototype of the structure has been made with the laser-cut machine that our school has. Some other parts have been drawn and printed with the 3D-Printer. The final structure has been made with aluminium and iron. We also added 4 supports with shock absorbing parts so that the vibrations were lower. Thanks to that idea, we stabilized the entire robot.

The base of this structure is made of:

- 3 mechanical arms which can be adjusted by the user. On the extremities of them there are the drumsticks (we used the “Lantec babystick” due to their lightness).
- A metallic box in which there is the electronic part. From there, the link cables are connected to the motors that can make the drumstick move and to the power cable.



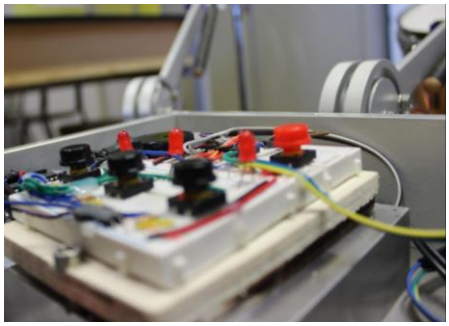
This is the image of the prototype

Electronic part

This part is made up of lot of linked components:

- An UNO Arduino Board (The power is 9V. The code is on this).
- A HC-06 Bluetooth module: it allows the communication between the phone and the robot.
- A breadboard that links:

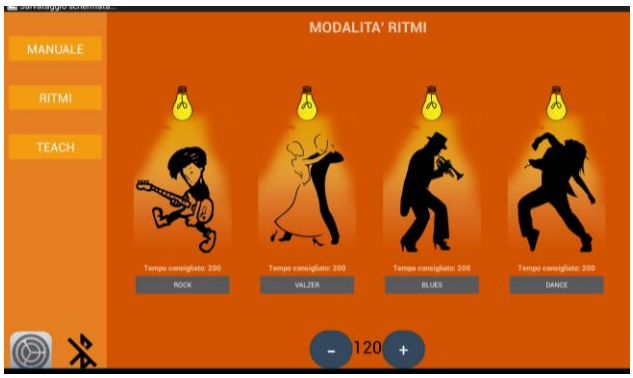
- 4 buttons: three of them correspond to a drum element. The fourth is used as a STOP for the rhythm mode. They are used to make the servos move. The fourth is used to kill every process.
- 3 leds: they are located in front of every button. In the manual mode they blink when the button is pushed, while in the challenge mode they indicate which one you have to push.
- 1 buzzer: it is only used in the challenge mode. When a mistake is made, it plays a sound.



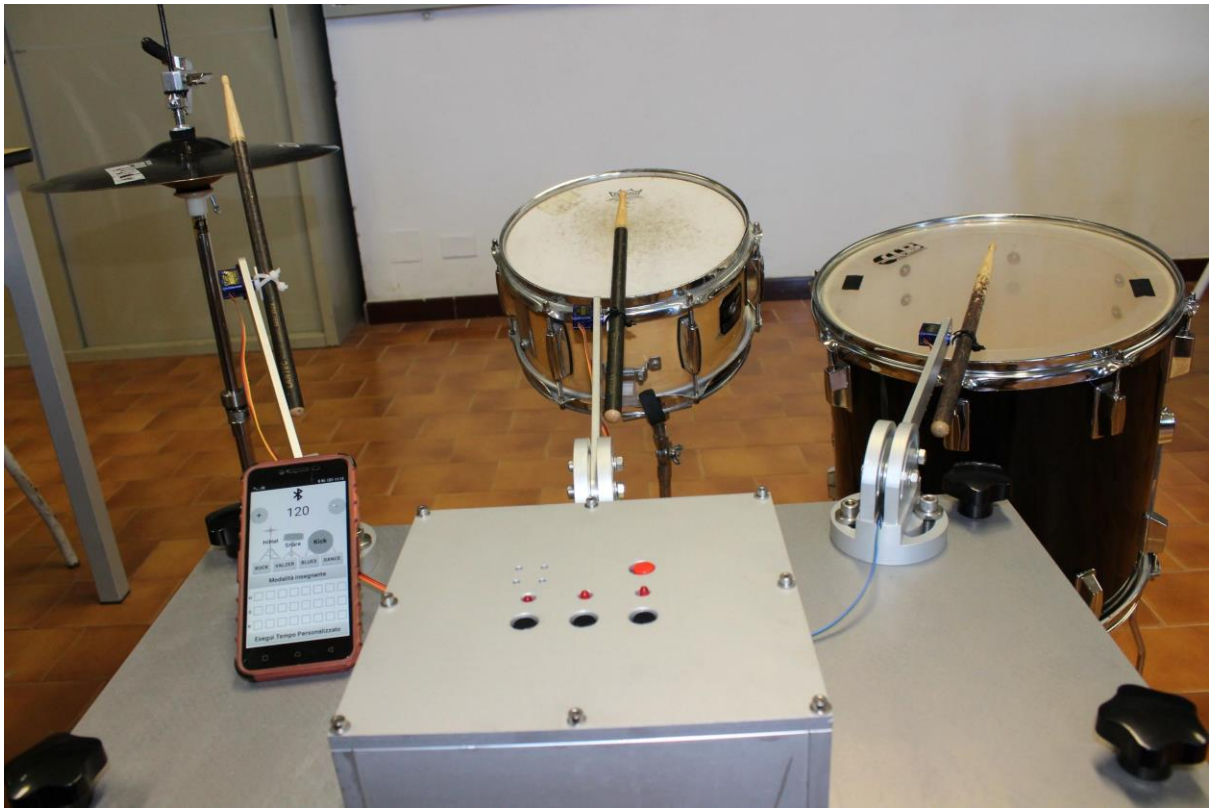
- 3 SG90 servomotors: each one of them is located on one of the three mechanical arms, to which the drumsticks are attached. They can play the instrument by changing their position.

Coding part

The main program loaded on the Arduino Board is in C language. The prototype of the application that manages the robot has been made up with AppInventor, while the final application is in Java for Android. The IDE that we used is Android Studio.



Final project



Conclusions

The total amount of money for the project is: more or less 25€ for the electronic part and 200€ for the mechanical materials and their processing.
Druminator clearly reflects the starting idea: in fact it can automatically work, and it allows who have never played the drum before to take confidence with it.
One of the major difficulties that we had to cope with was the using of the plywood. This material is in fact too flexible and light, and it doesn't reduce any vibration. Moreover, the usage of the SG90 servomotors, implied some complications caused by the out shaft made in plastic that cannot resist the knockback and generates more vibrations that are very dangerous for the SG90.
This project can be entirely reproduced at home. You only need to have a little bit of dexterity and will to do it!
Here you can find all the materials in order to reproduce the Druminator.

Made by Mattia Battaglio, Leonardo Massa, Luca Saglietti, Walter Silvestrini.