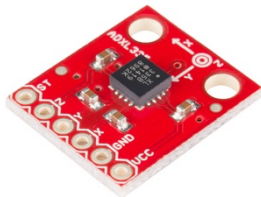
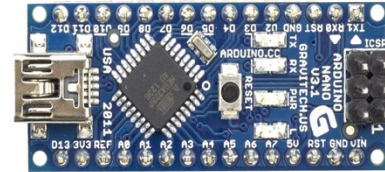


# "BEATBOX" - DESIGN RESEARCH DOCUMENT

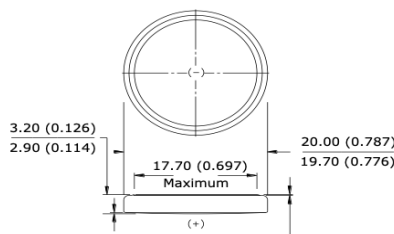
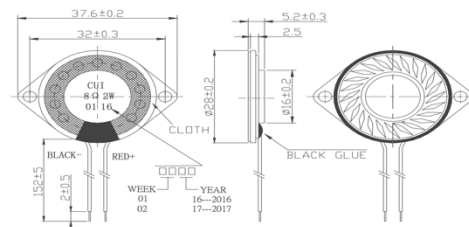
## 1. Electronic Research

- **Arduino Nano:** a compact, complete, and breadboard-friendly board based on the ATmega328. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one [1].



- **Accelerometer ADXL335:** it can measure the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion. As a result, it is suitable for detecting punch with high velocity. Single-supply operation is 1.8V to 3.6V [2]. The unit of the output is mV/g.[3]

- **Speaker CMS-28528N-L152B:** compact with longest length is 3.76 cm. Resonant frequency at 1V is between 600-00 Hz. Work normally at voltage of at least 4V.[4]



- **Battery and Battery Holder:** compact CR2032 – coin cell battery with the weight of 3.0 gram. Its holder 122-0120NI-GR has the size of 51x23x6. Voltage 3V [5]

- **Momentary Pushbutton:** 12mm Square, great for user input on a PCB or a good, big reset button on a breadboard [6]



- **Battery (addition):** 1.2v 900mAh AAA rechargeable battery

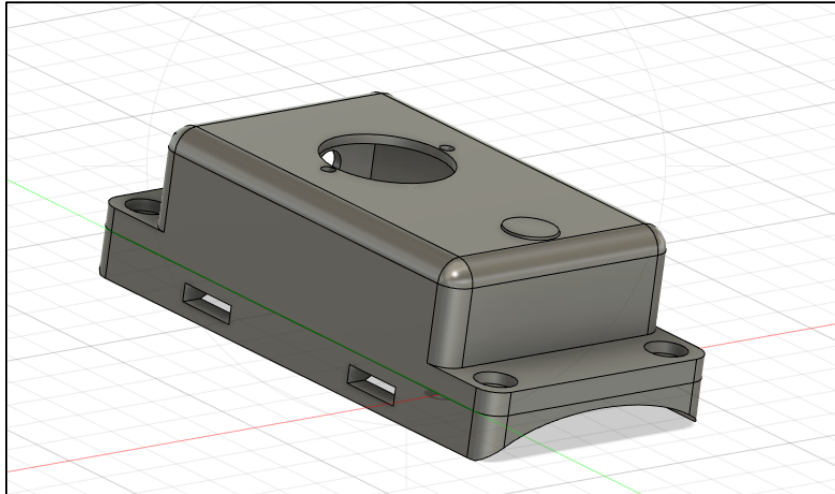
## 2. Research into physical form and mechanical structure

### - General view:

- + A rectangle hand-wearable gadget combined with straps.

### - Top view:

- + An old “Iphone” appearance: with a button at the bottom
- + A convex speaker at the center enables to play sufficient volume
- + Holes with magnets at the top 4 corners

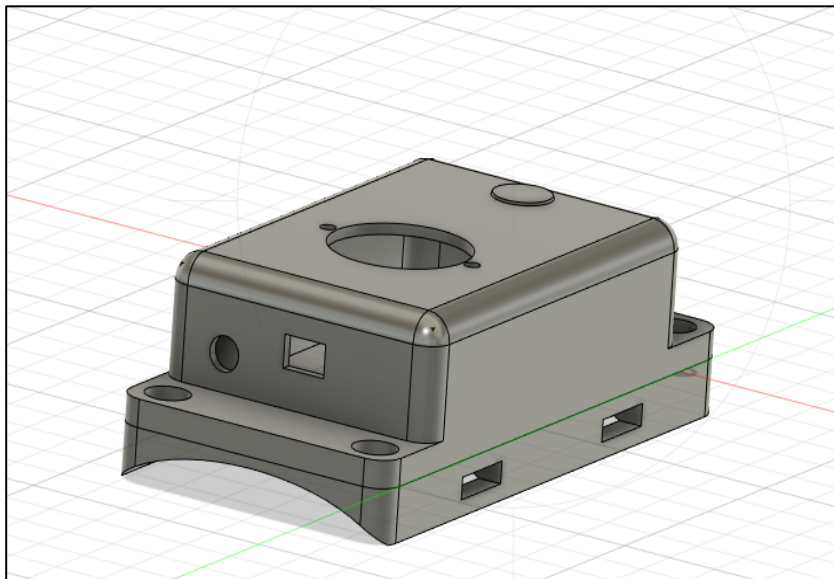


### - Front view:

- + A hole with LED.
- + A hole for plugging into user's personal device.
- + A concave base to fit in user's hand.

### - Side view:

- + Spaces to thread the straps



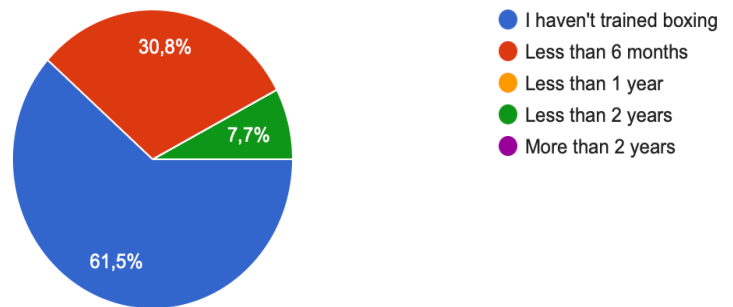
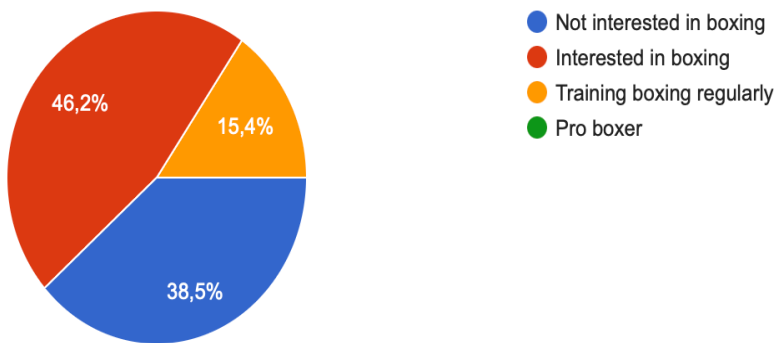
### 3. Research into user needs / user experience

#### - The boredom of traditional boxing training:

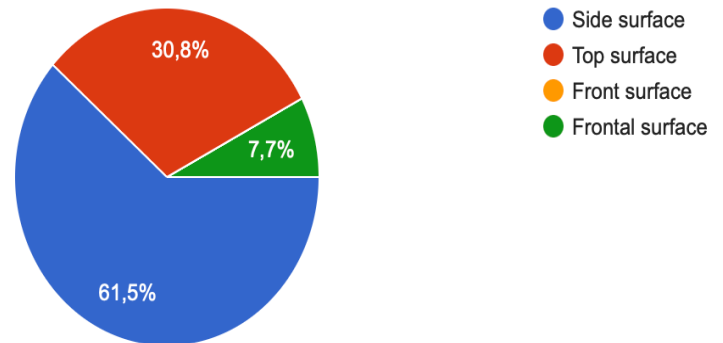
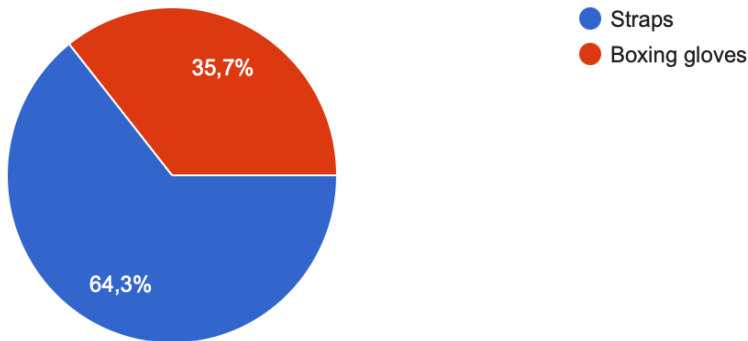
+ Laborious and tedious for people practicing boxing, as it requires punching into the air over and over again.

+ *"I find myself in a daydream throwing punches and moving about without any commitment or real enjoyment" [7]*

#### - User's demands and recommendation about the product:



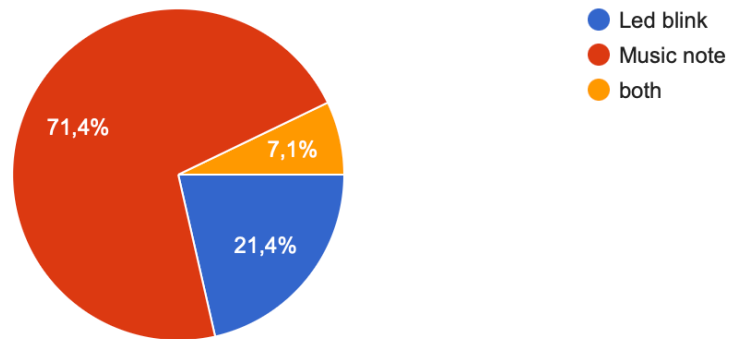
*Users and their background*



*Research into the device's outlook*

Which one do you prefer, a led blink or a music note for each movement? Or any other idea?

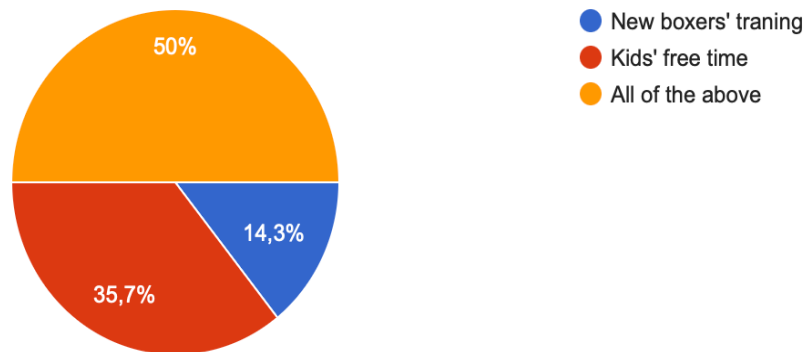
14 câu trả lời



*Research into the device's features*

Is this device more suitable for new boxers' training sessions or kids' free time?

14 câu trả lời



*Research into user group*

## References:

- [1] <https://store.arduino.cc/products/arduino-nano>
- [2] <https://www.analog.com/en/products/adxl335.html#product-documentation>
- [3] <https://www.mouser.fi/ProductDetail/Eagle-Plastic-Devices/122-0120NI-GR?qs=yqaQSyyJnNj0oj9Bsg2DhA%3D%3D>
- [4] [https://www.mouser.fi/datasheet/2/670/cms\\_28528n\\_l152-1777253.pdf](https://www.mouser.fi/datasheet/2/670/cms_28528n_l152-1777253.pdf)
- [5] <https://data.energizer.com/pdfs/cr2032.pdf>
- [6] <https://www.sparkfun.com/products/9190>
- [7] MrBumboclart. (2013, August 10). How to Make Shadow Boxing and Heavy Bag More Enjoyable. BoxingForum24. URL: <https://www.boxingforum24.com/threads/how-to-make-shadow-boxing-and-heavybag-more-enjoyable.485503/>