REDSHIFT
INSTRUCTIONS FOR FABRICATION

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1. Basic Info

REDSHIFT is an VR experience to understand how waves work, with the help of a controller add-ons to intensify the feeling.

On earth, every day, we can observe two types of waves: Light and Sound. These waves are characterized by:
- Amplitude, the increasing or decreasing of space between the peak of the wave.
- Frequency, the increasing or decreasing of the number of peaks in a selected distance.

The same waves are present in all the universe on a bigger and different scale. One phenomenon that can be observed is the REDSHIFT.

This theory is based on how the perceived light undergoes a colour shift towards the red spectrum, due to changes in its frequency and wavelength.

Given that the phenomena are observable only by a space telescope, RedShift is an educational digital experience in VR that aims to help people understand the effects generated by the modulation of wavelength and frequency.

In the VR experience, the user controls the shift of the two main characteristics (amplitude and frequency) through hand movements via the headset controllers.

To intensify the experience the physical hack is created by increasing the resistance between the body and the controller.

The creation of the VR Experience in Unity was guided by these definitions of amplitude and frequency, to better understand how these phenomenons gave different feedbacks both auditory and visual.

The physical hack was created to be comfortable and ergonomic, shaping it to fit on the body. It was made through 3D modelling, Laser cutting and 3D printing and finally assembled in all its parts.

BILL OF MATERIALS

The table below contains all the materials necessary for the reproduction of the product.

MAKE

Name	Material and Technology	Qty
Gloves	Neoprene 2 mm, dimensions, laser cutted	2
Velcro (gloves)	height 20 mm, length 95mm	2
Velcro (thigh)	height 20 mm, length 300mm(soft) 50mm(hard)	1
Thigh band	elastic band, height 30 mm, length 600 mm	1
Connection between gloves	elastic band, height 30 mm, length 1300 mm	1
Plastic buckle.stl	Pla, FDM 3D printing	3
label (optional)	thermo adhesive vinyl (due dots 12 mm diameter each)	1

TECHNOLOGY AND TOOLS USED

- FDM 3D printer to print the buckle
- Laser cutter
- Sewing kit
- Iron (optional)

SECURITY TOOLS AND DEVICES

Face mask to manage the fumes coming from the laser cut

2. Step By Step Explanation

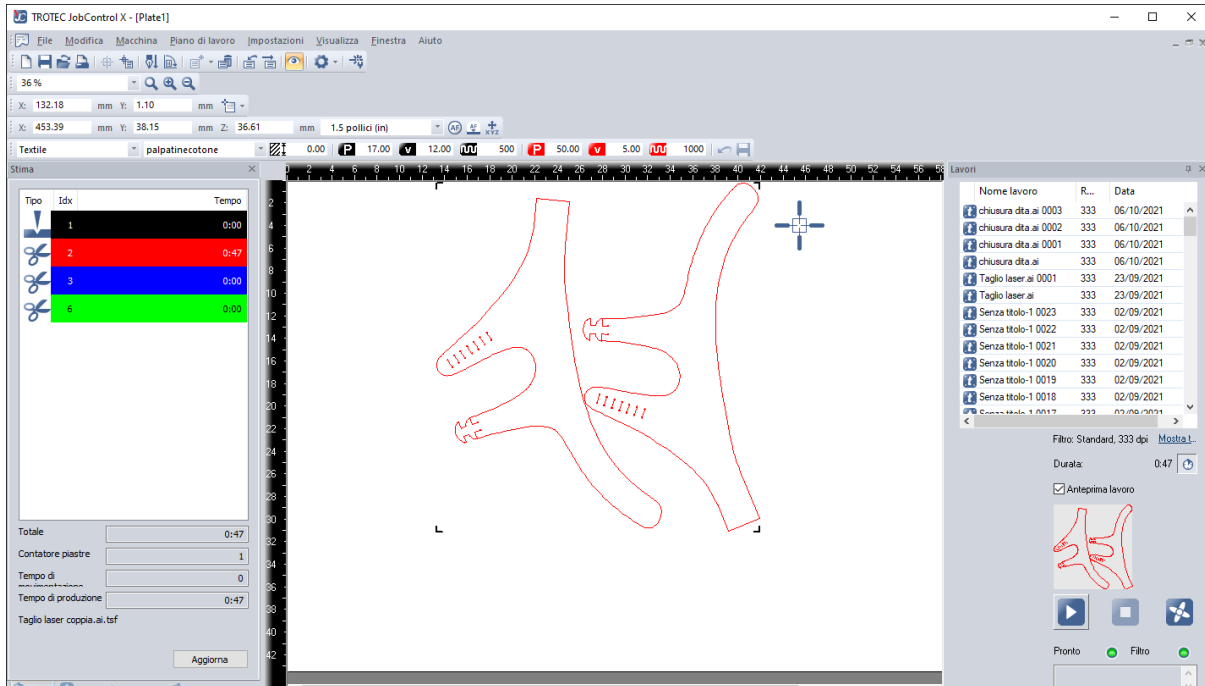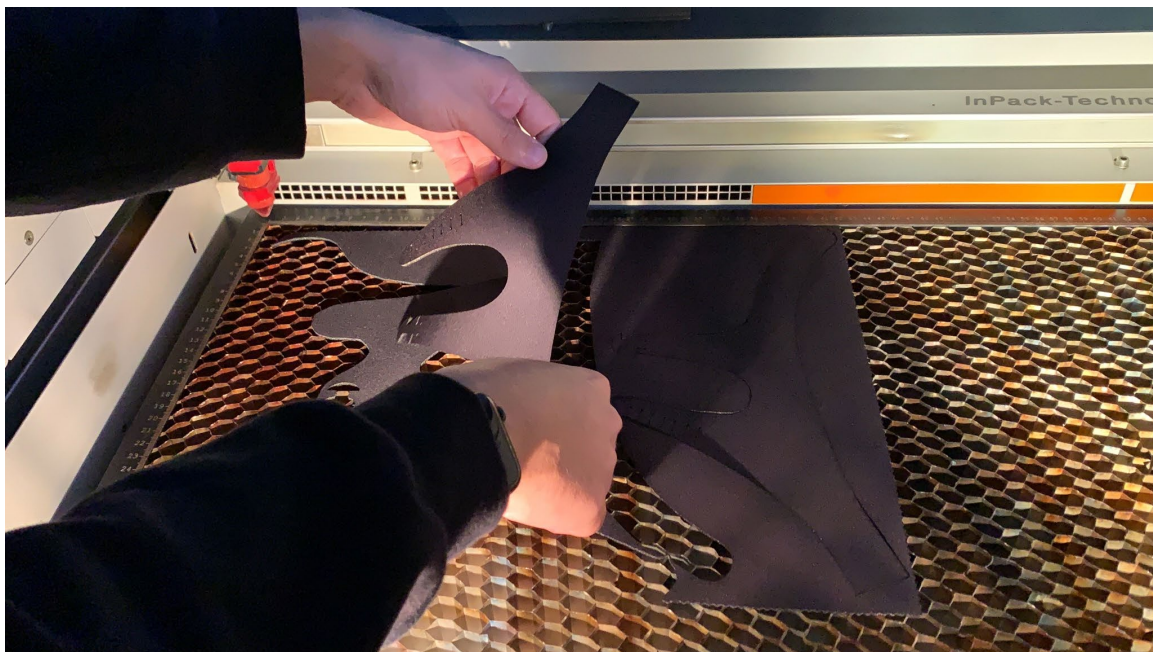### Step 01 – Select Gloves_neoprene2mm.ai for the laser cutting

Fig.1. The position of the gloves on the laser cutter.

Step 02 – Proceed with the laser cutting operations
Take the neoprene textile and proceed with the setting of the laser cutter. No engraving, just passing through cutting.
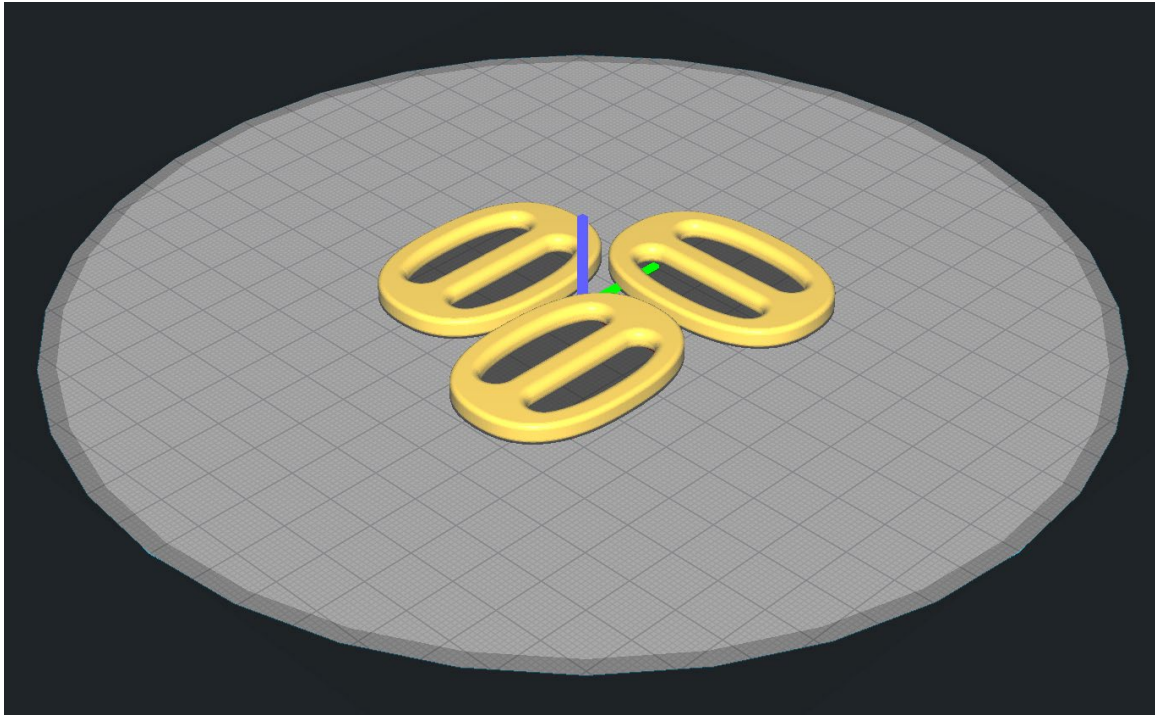
Fig. 2. The end result of the cutting

Step 03 – 3D printing the buckles

Select and extract **buckles_fdm** file from RedShift_digitalfiles.zip

Place 3 copies of the same item in the slicer and print them.

Fig. 3. 3D printing process

Step 04 – Velcro

Use a pair of scissors to cut the velcro at the desired length:

- Gloves: 90 mm of soft velcro and 40 mm of hard velcro
- Thigh band: 350 mm of soft velcro and 40 mm of hard velcro

Step 05 – Elastic band

Cut the elastic band to be used around the thigh (dimensions 30 mm x about 600 mm).

Step 06 – Sew the velcro

Sew the velcro on the gloves and on the thigh band as shown in the pictures.

Fig. placement of the velcro on the gloves

Fig. placement of the velcro on the thigh band

Step 07 - Sew the buckles

Sew the buckle on the gloves, and at the end of the thigh band

Fig. placement of the buckle on the glove

Fig. placement of the buckle on the thigh band.

Take the longer elastic band (dimensions 30 mm x about 1300 mm) and:

07a   Sew the elastic band on the left hand buckle
07b   Go through the right hand
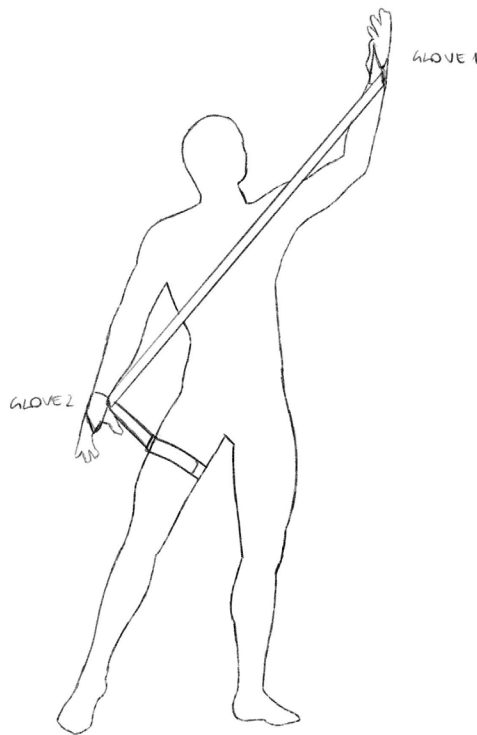07c   Sew the elastic band on the thigh band.

Step 08 - Apply the thermal adhesive canvas (optional)

To help facilitate the recognition of the right and left hand we applied two small dot of 12mm of diameter in different colors.

Fig. Thermal adhesive vinyl applied.

Step 09 - Assembling the gloves.

Once the gloves and the thigh bend are made, assemble the pieces using the 1300 mm elastic band. Make a simple saw to secure the band to the buckle on the thigh band and then pass the band through the buckle on the right glove to reach the buckle on the left glove. Secure everything by making a simple saw on the buckle on your left hand making sure that the right hand is free to slide on the band creating a triangle between the thigh and the hands.

Step 10 - Upload the app on Oculus Quest 2

DISCLAIMER: the following instructions are meant for use on Oculus Quest 2. For other devices, please check first on the web.

10a Setting up the VR:

Enable the developer mode for your Quest 2 through your phone, reboot your Oculus Quest 2 by turning it off and on.

After it has rebooted, Connect your VR device to your computer using a USB cord. (The charging cord that came with your quest will work as long as your computer has a USB C port.)

Now that your Quest is plugged into your computer, look inside your VR headset.

There might (or might not) be a pop-up that asks you to "allow USB Debugging". If so, click ok (using the Oculus Quests' controllers.)

- If you get an "Oculus Link" pop up. Click "Not Now."
- If it asks you to set up a guardian, go ahead and do so.
- Then, take off your headset.

10b Install and configure SideQuest

Go to the [SideQuest website](#) and install the latest version available for Windows.

Make sure your Oculus Quest 2 device is turned on and out of standby mode. Connect the device via USB to your computer

The SideQuest software should recognize it automatically (top left bar). In the top right menu, select the icon with a folder and a down arrow named "Install APK file from folder on computer". At this point look for your .apk build and wait for it to be copied to your device (you will notice a green bar at the bottom of Side Quest).

10c Run the project on Oculus Quest 2

Disconnect the visor from the USB and put it on. Access the Oculus Quest internal store taking care to filter (top right box) for "Unrecognized" (i.e. all those unofficial apps). In the list start the application (which will show the name defined in the first steps).

3. Credits

RedShift is a project publicly released and made available in open source mode according to the **Creative Common License (CC-BY)** and promoted by Distributed Design with the related documentation.

The authors of RedShift are Alberto Ambrosini, Valentina Giulietti, Maria Grazia Lamberti, Elena Mariani, Lorenzo Pedini, Alessandro Tonini. RedShift is a project developed with the collaboration of Polifactory within the Distributed Design project co-funded by the Creative Europe Programme of the European Union. This publication reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

* POLIFACTORY and DD logos have to be inserted (a .svg file with the two logos is included in the .zip folder named RedShift_digitalfiles.zip)

4. Downloadable Files

RedShift files can be download at:

***www.polifactory.polimi.it/en/polifactory/ctrl

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