DERMAP

INSTRUCTIONS FOR FABRICATION

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DERMAP is a project developed with the collaboration of Polifactory within the Distributed Design Market Platform 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.

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Distributed Design Market Platform

Co-funded by the Creative Europe Programme of the European Union

1. Basic info about the project

DERMAP is a device that supports people in measuring the evolution of their *vitiligo*[1].

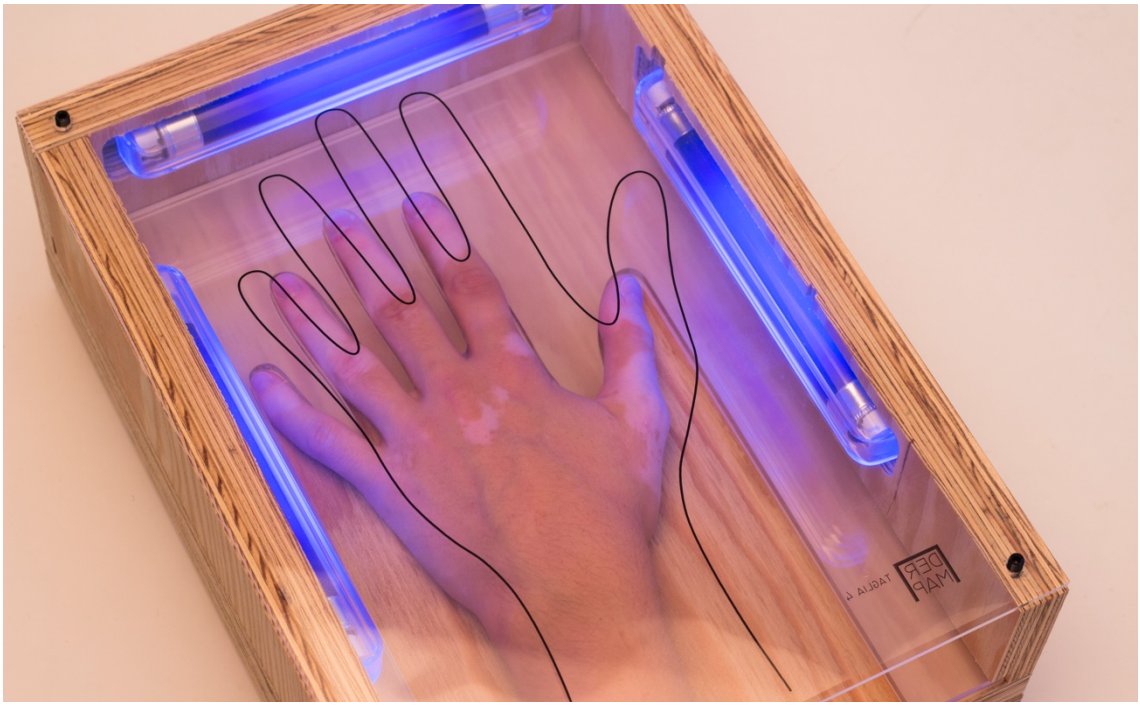


Fig. 1. DERMAP: the final object (photo credits: Gabriele Renna)

Dermap is a device designed for the people with vitiligo. It is an analogical object that allows the autonomous mapping of the vitiligo situation on the hands, in order to keep its progress or regression under control from home. In fact, by inserting the hand inside a preformed mask and lighting the Wood lamps that allow you to view the spots in a clearer way, it will be possible to trace the outlines of the latter by drawing on appropriate sheets of acetate. The collection of the sheets, superimposed on each other in the same position, will allow an immediate visualization of the progress of the disease.

[1] Definition of Vitiligo from Enciclopedia Britannica: *Vitiligo*, also called leukoderma, hereditary patchy loss of melanin pigment from the skin. Though the pigment-making cells of the skin, or melanocytes, are structurally intact, they have lost the ability to synthesize the pigment. The reason for this condition is unclear. Vitiligo appears clinically as milk-white, irregularly oval patches of skin, which are small at the beginning but enlarge gradually. These patches are roughly symmetrical and are seen most commonly on the hands, wrists, face, neck, and upper trunk. The hair growing in the depigmented area is also white. Individuals with vitiligo (about 1 percent of the adult population) are usually in good general health, but vitiligo presents a cosmetic problem that can be serious in dark-skinned individuals. The normal skin colour rarely returns and there is no known cure (see: www.britannica.com/science/vitiligo).

BILL OF MATERIALS

The table below contains all the materials necessary for the reproduction of the product (consumables, electronics, components).

Name and tipology	*Link*	*Quantity*	*Price*
Wood lamps (with their circuits)	https://www.amazon.it/Multipack-Portable-Ultraviolet-Blacklight-Detector/dp/B00BIQJEF2/ref=pd_sbs_60_6?_encoding=UTF8&pd_rd_i=B00BIQJEF2&pd_rd_r=7b9fbcdb-bd8b-11e8-a0fb-1fb7d17320f9&pd_rd_w=WpBCo&pd_rd_wg=j6mSq&pf_rd_i=desktop-dp-sims&pf_rd_m=A11IL2PNWYJU7H&pf_rd_p=18ac1db8-8667-475d-a3cb-dc2e0028cb9b&pf_rd_r=6XZ99FNZQ2A6BPHHH4XC&pf_rd_s=desktop-dp-sims&pf_rd_t=40701&psc=1&refRID=6XZ99FNZQ2A6BPHHH4XC	3	16,79 €
3 mm PMMA sheets (transparent)	https://temaplex-shop.com/plexiglas-trasparente-incolore/157-plexiglas-trasparente-incolore-3-mm.html	1	33,92 € (1 sqm)
4 mm PMMA sheets (opaline, black)	https://temaplex-shop.com/plexiglas-colorato/21-plexiglas-colorato-4-mm.html	1	59,17 € (1 sqm)
8 mm PMMA sheets (opaline)	https://temaplex-shop.com/plexiglas-bianco-opalino/27-plexiglas-bianco-opalino-8-mm.html	1	103,13 € (1 sqm)
18 mm multilayer plywood panel (1220 x 2440mm)	https://www.leroymerlin.it/catalogo/pannello-compensato-multistrato-pino-fenolico-naturale-18-mm-al-taglio-35823865-p	1	54 €
Acetate sheets	https://www.amazon.it/Copertine-acetato-trasparente-rilegatura-micron/dp/B01MUZ1N8U/ref=sr_1_24?s=office&ie=UTF8&qid=1538983806&sr=1-24&keywords=fogli+acetato	100	11,90 €
Headless screws	https://www.leroymerlin.it/catalogo/vite-grani-5-x-20-mm-34429682-p	8	12 €

TECHNOLOGY AND TOOLS USED

- CNC 3 axis milling machine (working area 1250x2500 mm) to cut the multilayer plywood panel
- Laser cutting machine (cutting area max 440x740 mm) to cut PMMA sheets (for DERMAP has been used a Trotec Laser Speedy300)
- FDM 3D printing machine to print the anti-slip rubbers
- Laser printer (A4 size) suitable for printing acetate sheets
- Drill to make the connection holes for the cables
- Vinyl glue for the plywood base (in our case Vinavil 59)

SECURITY TOOLS AND DEVICES

Mask and goggles are mandatory for the use of the milling machine.

2. Step by step explanation

Design logics and ergonomics principles

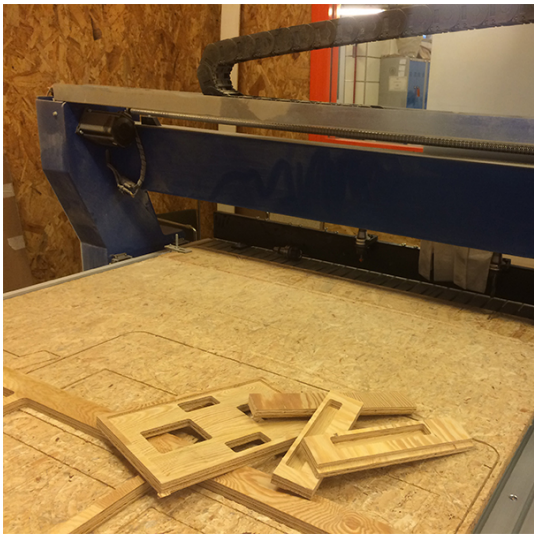
Dermap is an open source and economic tool to allow the users to map their own *vitiligo* in an autonomous and simple way. It is a totally analogical user-friendly device: after inserting the hand inside a preformed mask, the user can draw on a sheet of acetate correctly positioned the outlines of the spots on his hand, highlighted thanks to the presence of UV light lamps. By carrying out this passage over time and collecting the acetates with the status of the vitiligo of that moment mapped, it will therefore be possible to compare the various states by simply overlapping the sheets, identifying a possible expansion or narrowing of the disease.

Step 01 - Cutting the wooden structure

The structure is made by 18mm multilayer plywood and cut using a CNC milling machine.

- Download **Dermap_digitalfiles.zip** and select the .dxf files "**cuts_sx.dxf**", "**cuts_sx.dxf**" and "**cut_basis.dxf**" and prepare the files for the CNC milling machine (generate the g-codes and set-up your CNC milling machine).

- Mill the plywood panel to create the five pieces of the structure: 2 parts that form the basis, and 3 parts that form the side walls of the wooden structure.

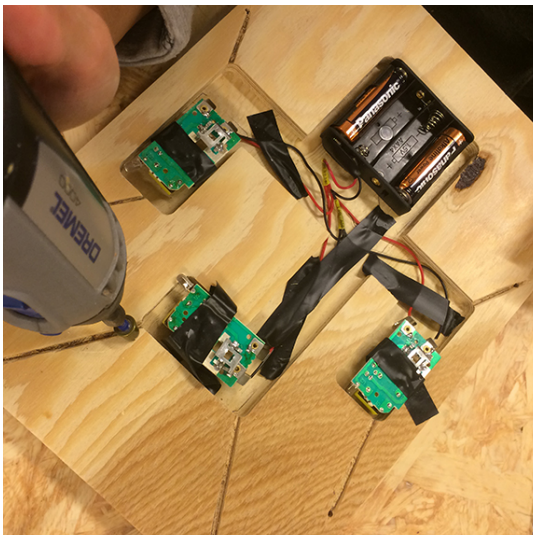


- Make holes in the wooden structure in order to insert the lights cables. Use a column drill with a 4mm tip to created two holes for each side wall, in order to connect the bottom with the housing for the lamp, and six holes in the base, to allow the connection of cables with the cards (there are three tabs).

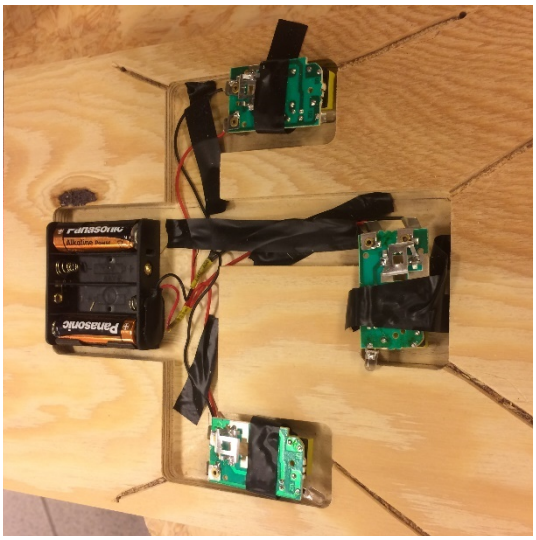
Step 02 - Installing electric circuits and lights on the wooden structure

- Place each of the three lamps in their housing and fix them to the wood with double-sided tape and insert the cables into the appropriate slots.

- Insert the electric boards into the recesses of the base and fix them with an insulating tape to hold them in place. To allow the passage of the cables from the side supports containing the lamps to the cards, we dug some carvings using a Dremel electrotool.



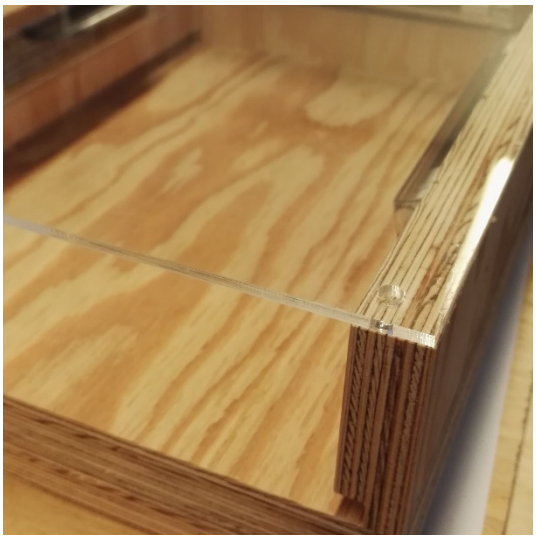
- Disconnect the cables from the boards (through the use of a soldering iron) to insert the lamp correctly into the wooden supports.



Step 03 - Laser cutting of covers and frame masks

- Cutting mask: Download **Dermap_digitalfiles.zip** and select the following .dvg files for the masks: "**mask_01.dvg**", "**mask_02.dvg**", "**mask_03.dvg**", "**mask_04.dvg**", "**mask_05.dvg**", "**mask_06.dvg**" and prepare the files to cutting the PMMA sheets using the laser cut.

- Top panel: Download **Dermap_digitalfiles.zip** and select the .dvg file named “**top_panel.dvg**” and prepare this file for the laser cut.

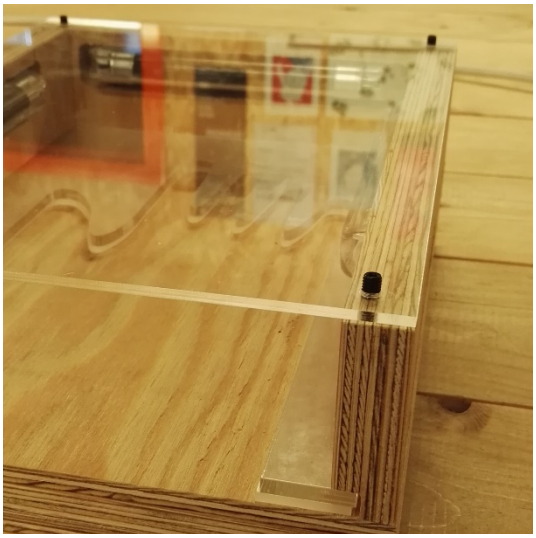


- Bottom panel: Download **Dermap_digitalfiles.zip** and select the .dvg file named **“bottom_panel.dvg”** and prepare the file to cut the PMMA sheet using the laser cut.

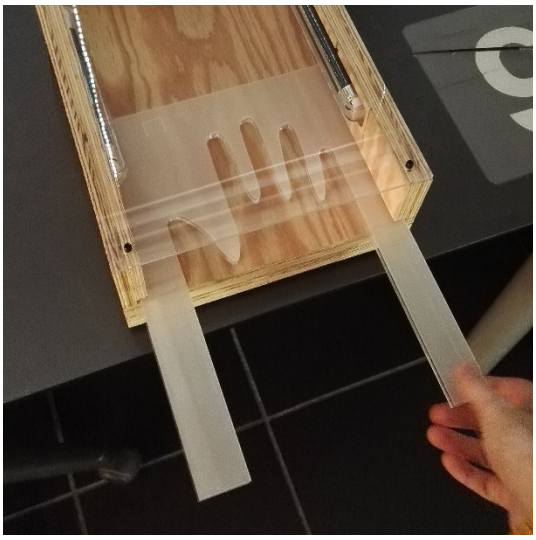
Step 04 - Final assembling

- Assemble the plywood structure using vinyl glue.

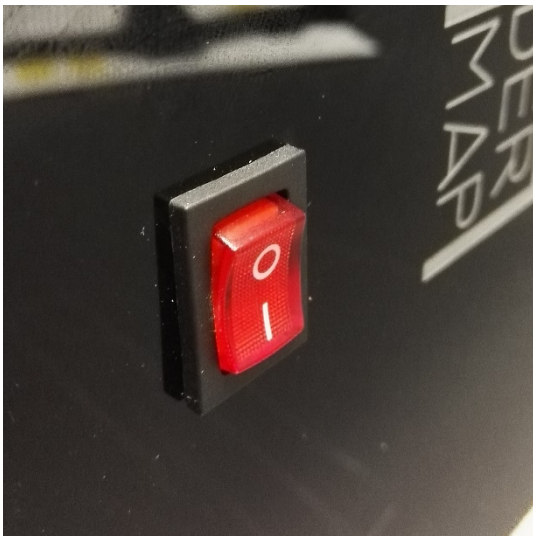
- Join the transparent top panel to the plywood structure using 4 screws.



- Insert the shaped masks with the handprints and slide them into the wooden frame.



- To turn on the DERMAP lighting system, a switch connected to the electrical circuits was installed on the base of the wooden frame.



- Download **Dermap_digitalfiles.zip** and select the following .pdf files for the masks: “**sheet_01.pdf**”, “**sheet_02.pdf**”, “**sheet_03.pdf**”, “**sheet_04.pdf**”, “**sheet_05.pdf**”, “**sheet_06.pdf**” and print the file of your size on an acetate sheets. Join the sheet to the structure, using the 4 screws, on which the vitiligo stains will be progressively noted.

- Using a FDM 3D printing machine to print the four feet (download reference: **feet.stl**)

- Fix the closure using four headless screws on which the 3D printed feet will be mounted (download reference: **feet.stl**).

3. Credits

DERMAP 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 Market Platform with the related documentation.

The authors of DERMAP are **Marianna Accorsi**, **Giulia Sala**, and **Giuseppe Valentino**. DERMAP is a project developed with the collaboration of Polifactory within the Distributed Design Market Platform 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.

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

4. Downloadable files

All DERMAP files can be download at:

www.polifactory.polimi.it/polifactory_progetti/ddmp-fabcare?lang=en

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