

Safety Instructions

Use a lab coat or apron for keeping yourself clean.

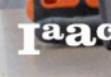
Don't touch your face and pull your hair back. Wash your hands.

Wash your hands, or disinfect them with alcohol-based hand sanitizer before and after the process.

Clean your working area with alcohol before the demonstration, throughout and after the process.



This manual is based on Impressio 3D Amb Puré de Patates by FLU and is developed by Fab Lab Barcelona at IAAC for the SHEMAKES project.



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Biomaterial Design Extruding

An immersive demonstration

EXTRUDING
3d printing
mashed potatoes

Materials & Tools

Materials

- ▶ 125g Bag of instant Mashed Potatoes (1 bag)
- ▶ 500-600ml Water
- ▶ 5-10g Of xanthan gum
- ▶ Kitchen paper
- ▶ Optional : Food coloring gels (different colors)

Note: scale the amounts according to the total amount of paste to prepare for the attendants to the activity.

Safety Equipment

- ▶ 95% Ethanol
- ▶ Kitchen paper
- ▶ Disposable gloves
- ▶ Lab Coats

Tools

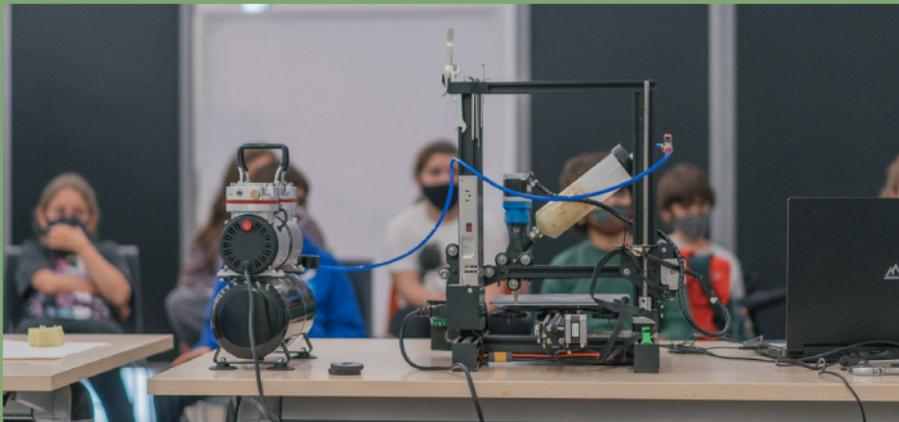
- ▶ 1 scissors
- ▶ 1 set of plasticized sheets of paper or cardboard to print on
- ▶ Several syringes
- ▶ Mixing bowls
- ▶ Measuring Jar
- ▶ Spatulas or big spoons
- ▶ Air Compression 3D paste extruder (ANYCUBIC KOSSEL PRO or similar)

3D printing mashed potatoes

Step by step instructions

Process overview

- ▶ Step 1 : Prepare the paste (filament)
- ▶ Step 2 : Syringe test extrusion
- ▶ Step 3 : Prepare computer file
- ▶ Step 4 : Prepare 3D printer
- ▶ Step 5 : Extrude



Step 1: Prepare the paste (filament)

- ▶ Fill the measuring jar with 500 – 600ml of tap water.
- ▶ Add the content of the package.
- ▶ Mix with the spatula until you get an homogenous mix. The mix should be thick rather than liquid.
- ▶ Touch the mix and try to form a shape with your fingers.
- ▶ Add the xanthan gum.
- ▶ Touch the mix again and feel how the gum gives elasticity and allows you to shape the paste with your fingers into little spheres or cubes.

Step 2: Syringe test extrusion

- ▶ Take a syringe. Each participant can also try to replicate the same test in parallel.
- ▶ Fill the syringe with the paste letting the air out.
- ▶ Push the bottom of the syringe, and see how the paste comes out in the form of a filament.
- ▶ Make a drawing with this filament on the plastified carton.
- ▶ Make the same drawing on top of the previous drawing, making several layers of material.

Step 3: Prepare computer file

- ▶ In a 3D modelling software of choice (like rhino), model in mm a simple volume to print, taking into account the maximum size the printer (3D paste extruder) allows.
- ▶ The volume can be done through the extrusion of a closed or open curve. To begin, you can extrude a circle to get a cylinder, or a star.
- ▶ Take into account that through the extrusion of the paste, the printer will not provide any kind of support to the piece, so we need to consider the shape has stability.
- ▶ In a visual programming environment (like grasshopper) set the parameters for printing, including horizontal slicing distance, nozzle diameter (2-4mm), speed, etc.
- ▶ Once the figure is ready, copy (ctrl+c) the code from the visual programming environment.

Step 4: Prepare the 3D printer

- ▶ Load the tube with the paste, avoiding to leave bubbles or air inside the tube.
- ▶ Select the nozzle and place it firmly on the tube front end, close the tube's rear.
- ▶ Place the tube on the printer and connect it to the air

pressure system.

- ▶ Turn on the air pressure, set the desired pressure from 1.5 to 3 bar.
- ▶ Calibrate the 3D printer.

NOTE : It is highly recommended that the facilitators go through this process several times before the activity, and ideally have previous experience, so they are knowledgeable of the correct parameters for the particular machine that is being used.

Step 5: Extrude the file

- ▶ Place a piece of paper or cardboard (ideally plasticized) on the base of the printer to then remove the printed piece.
- ▶ Go to the printer software (could be Repetier or similar).
- ▶ Paste (ctrl+v) the code taken from the visual programming environment.
- ▶ Set home, including in Z direction the height of the plastified cardboard base.
- ▶ Print.