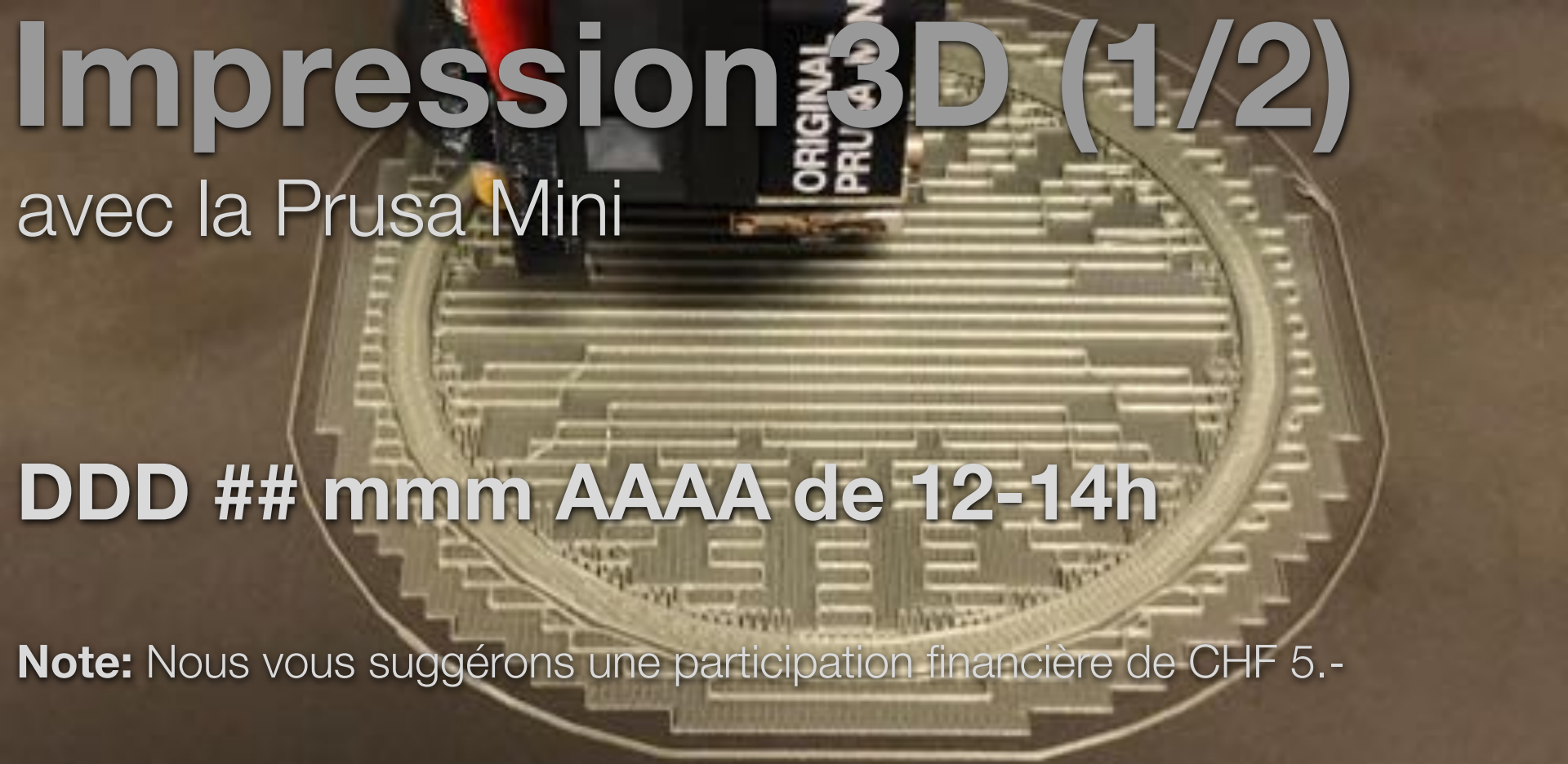
Impression 3D (1/2)

avec la Prusa Mini



DDD ## mmm AAAA de 12-14h

Note: Nous vous suggérons une participation financière de CHF 5.-

David.Ott@unige.ch

2020-10-09

Démystifier

le sujet

&

Autonomiser

les utilisateurs

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Ce que vous allez apprendre

1. Connaissance générale impression 3D
2. Astuces de conception pour impression 3D
3. PrusaSlicer et comment “slicer” un modèle 3D
4. Checklist pré-impression
5. Lancer une impression
6. Retirer une impression

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Impression 3D /
Agenda

- History
- Types
- Examples
- Modeling
- Process
- Prusa Mini

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In 1987 Chuck Hull commercialises the first ever 3D printer, the SLA-1.
Source: https://www.3dsourced.com/guides/history-of-3d-printing/

Impression 3D /
History

1940 : First numerically controlled machines are being researched
1952 : First commercial numerically controlled lathe (MIT)
1974 : In a New Scientist column, David Jones (aka Daedalus) describes the SLA process
1981 : Dr Hideo Kodama (NMIRI) published details concerning a layer-by-layer ‘rapid prototyping‘ technique
1986 : Charles ‘Chuck’ Hull files patent for **SLA** technology
1987 : Chuck Hull (3D Systems) commercialises first 3D printer
1988 : Carl Deckard (U of Texas) files patent for **SLS** technology
1989 : Scott Crump (Stratasys) files patent for **FDM** technology
2005 : Adrian Bowyer initiates the RepRap project
2012 : Josef Prusa founds Prusa Research
2014 : I buy my first 3D printer kit (approx. chf 1500.-)
2019 : FacLab of UNIGE is inaugurated on the 1st of April and procures a Peopoly Moai 130 SLA 3D printer
2020 : FacLab procures 3x Prusa Mini

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Impression 3D /
Types

- The Types of 3D Printing Technology in 2020
  - https://all3dp.com/1/types-of-3d-printers-3d-printing-technology/

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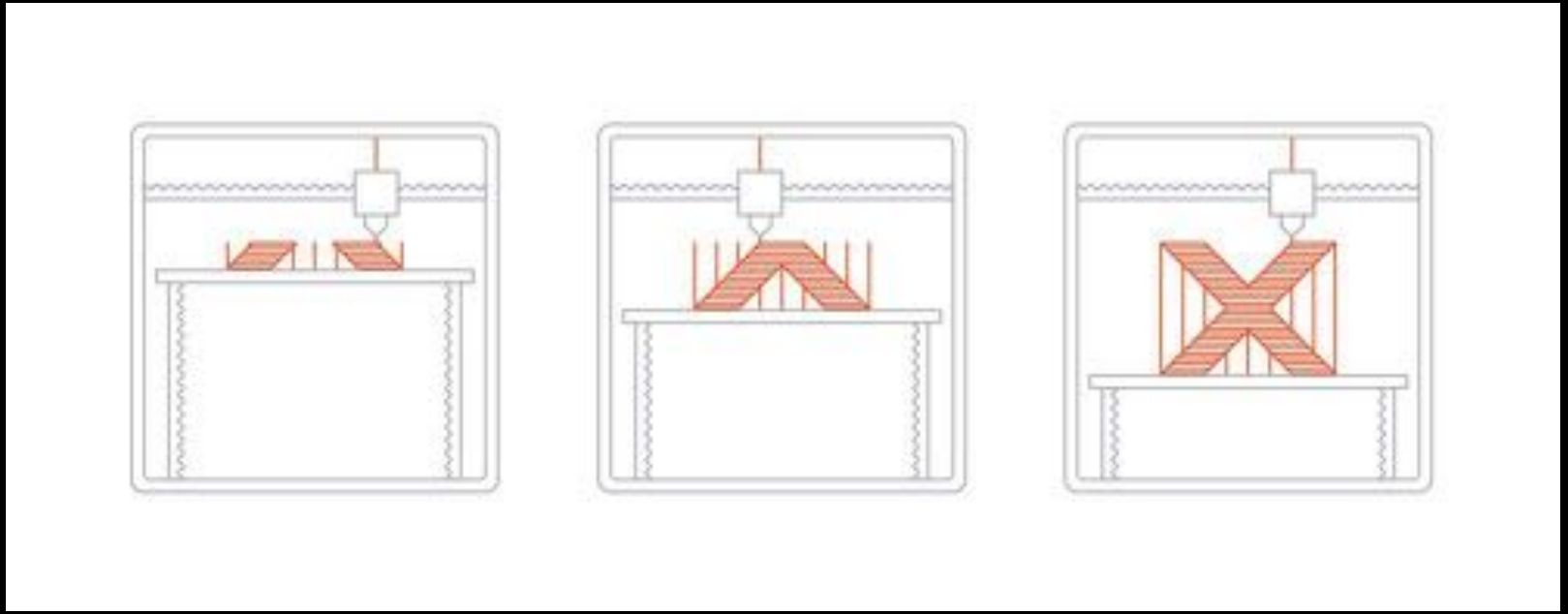
Impression 3D / Types /

Material extrusion (FDM|FFF)



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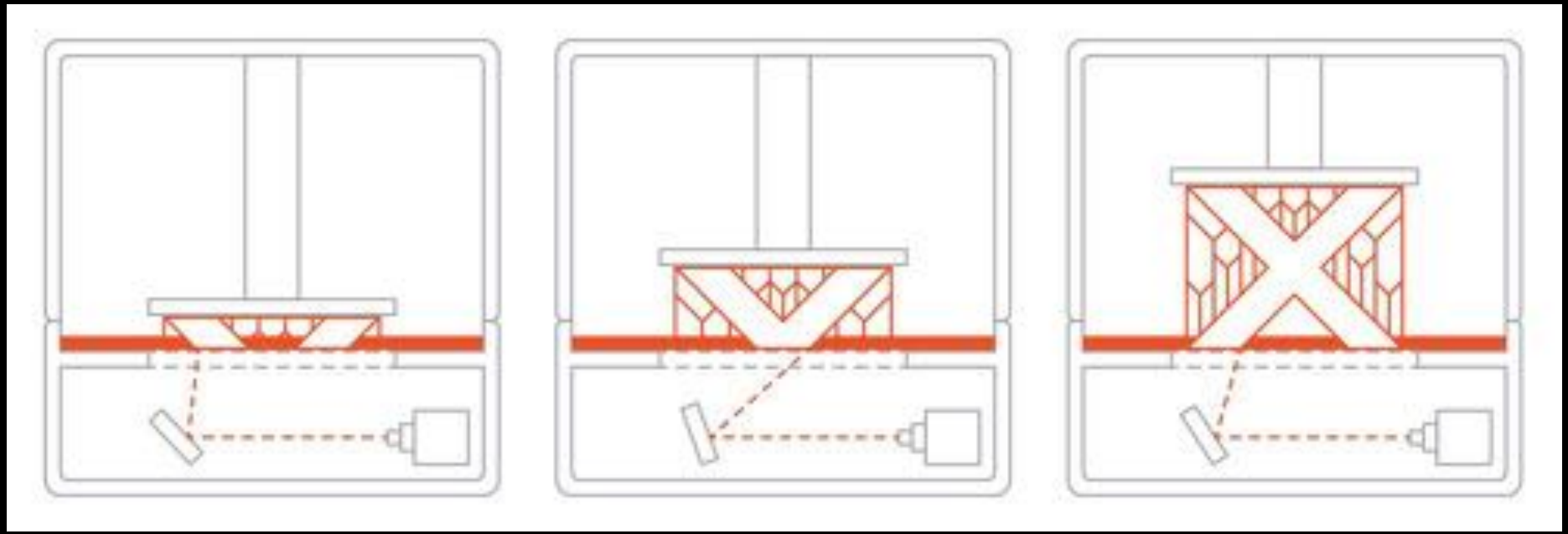
The Types of 3D Printing Technology in 2020 /

Vat polymerization (SLA|DLP)



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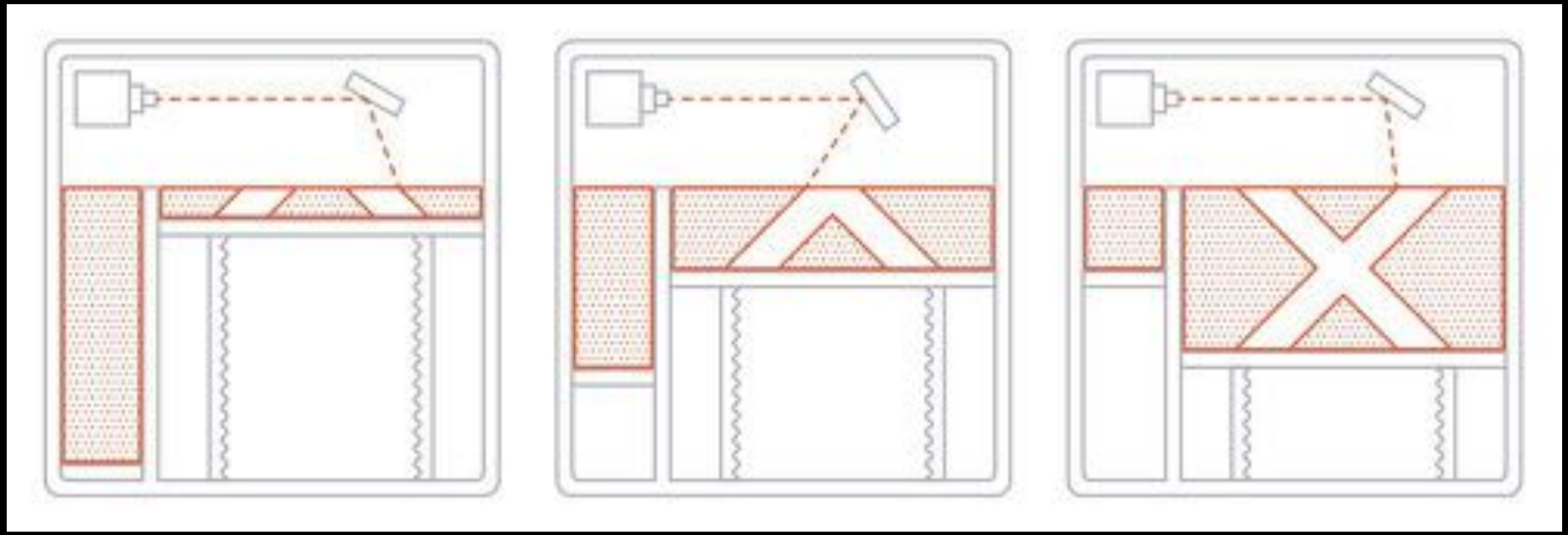
The Types of 3D Printing Technology in 2020 /

Powder bed fusion (SLS)



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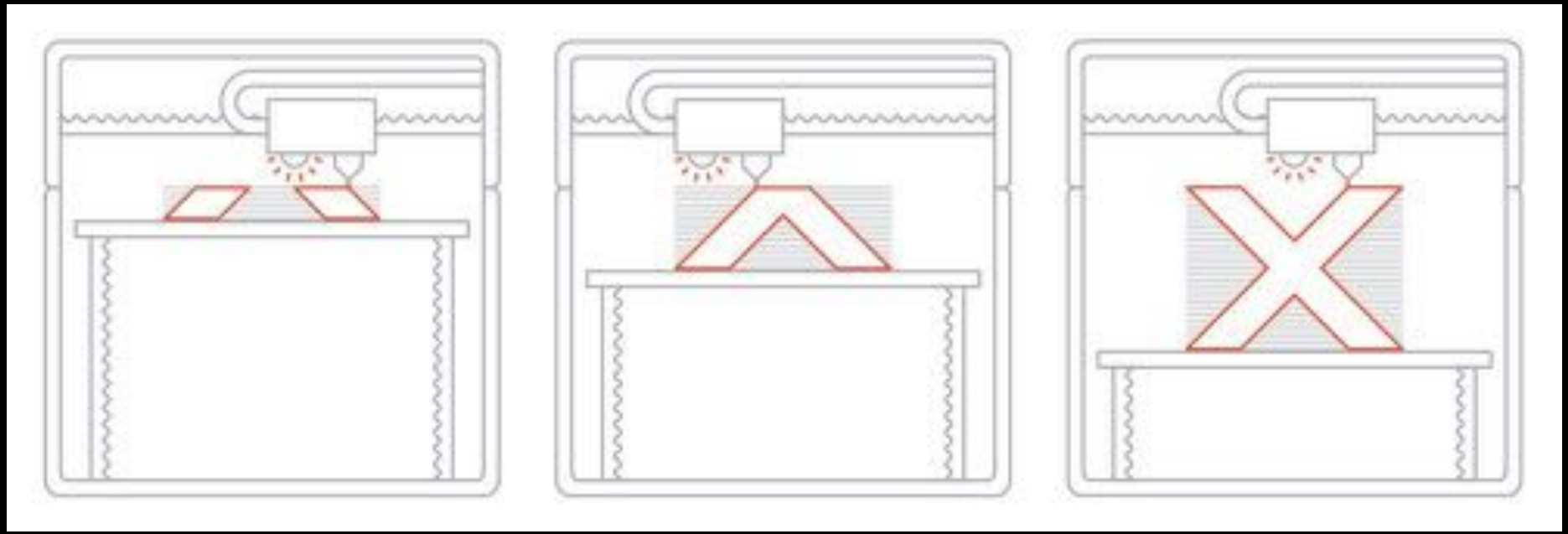
The Types of 3D Printing Technology in 2020 /

Material jetting (MJ|DOD)



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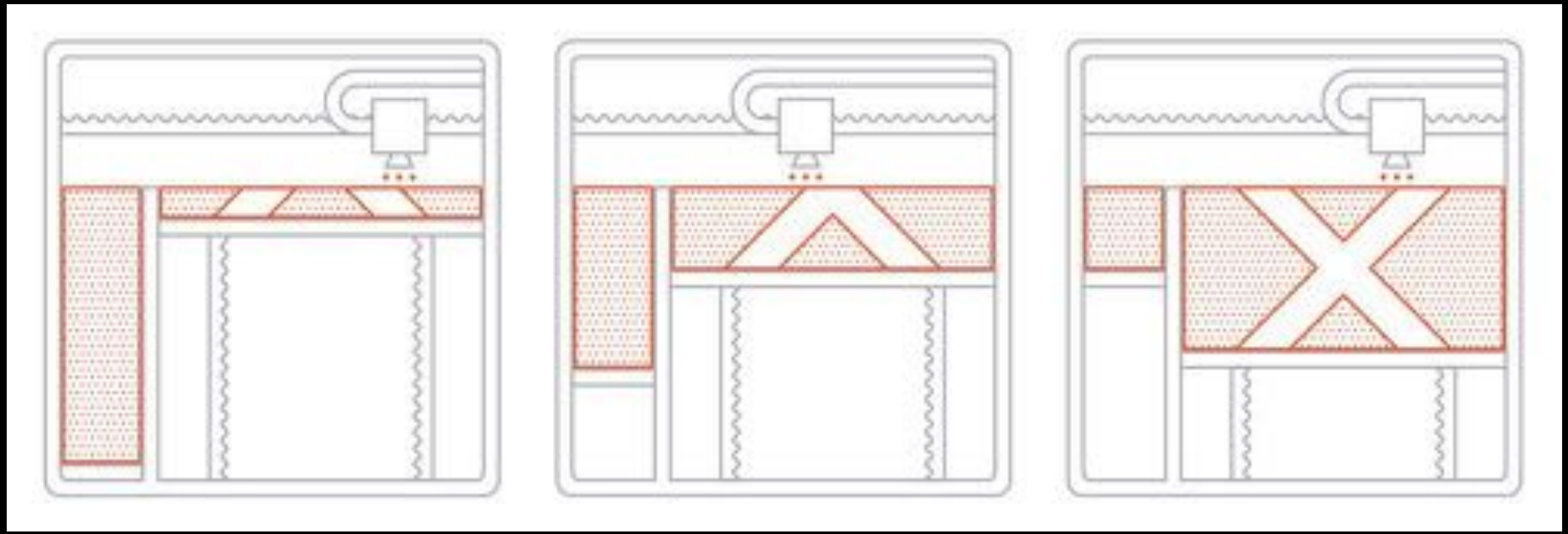
The Types of 3D Printing Technology in 2020 /

Binder jetting (BJ)



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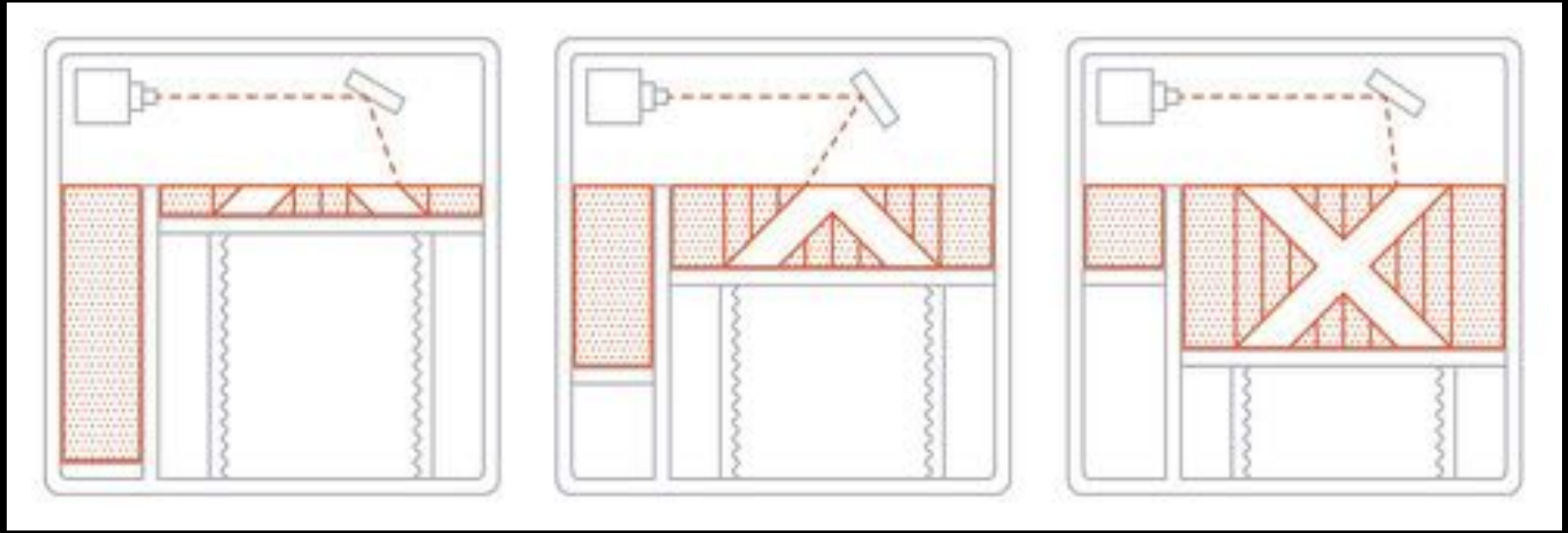
The Types of 3D Printing Technology in 2020 /

Powder bed fusion (DMLS|SLM|EBM)



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Impression 3D /
Filament material

- https://prusament.com/materials

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Impression 3D / Filaments / PLA

PLA is the most commonly used filament. It's a very strong, easy to print and biodegradable material. The perfect choice for printing large objects thanks to its low thermal expansion (with little to no warping) and for printing tiny parts because of its low melting temperature.

- Pros
  - Easy to print
  - Can print tiny parts
  - Can print huge objects
  - Hard
  - Low warping
- Cons
  - Brittle
  - Low temperature resistance
  - Difficult post-processing

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Impression 3D / Filaments /
PETG

...

- Pros
  - Easy to print
  -
- Cons
  - ...

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Impression 3D /
Examples

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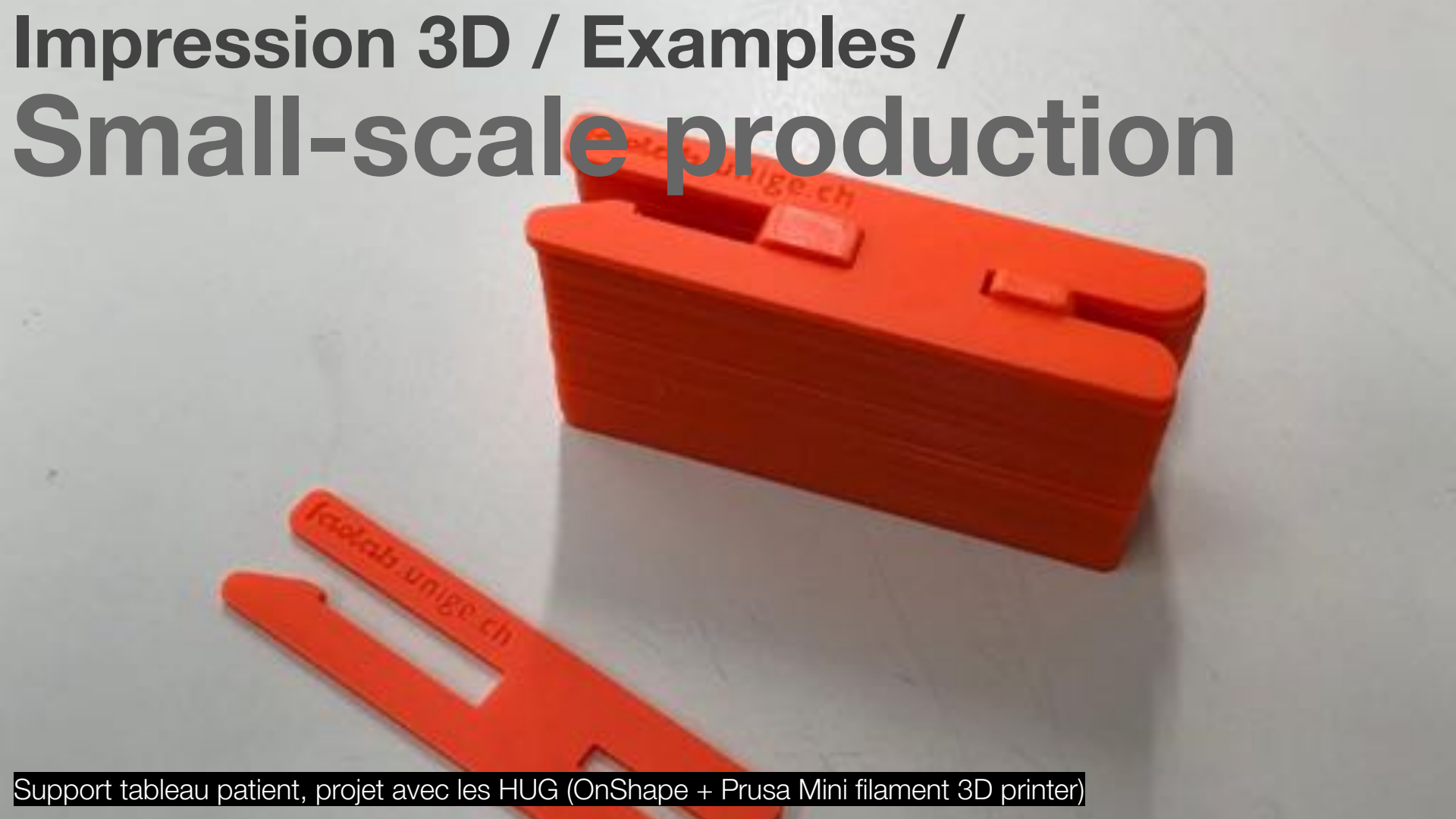
Impression 3D / Examples /
Custom tools

Bic pen holder tool for Cricut Maker (OnShape + Peopoly Moai 130 resin 3D printer)

Impression 3D / Examples /
Small-scale production



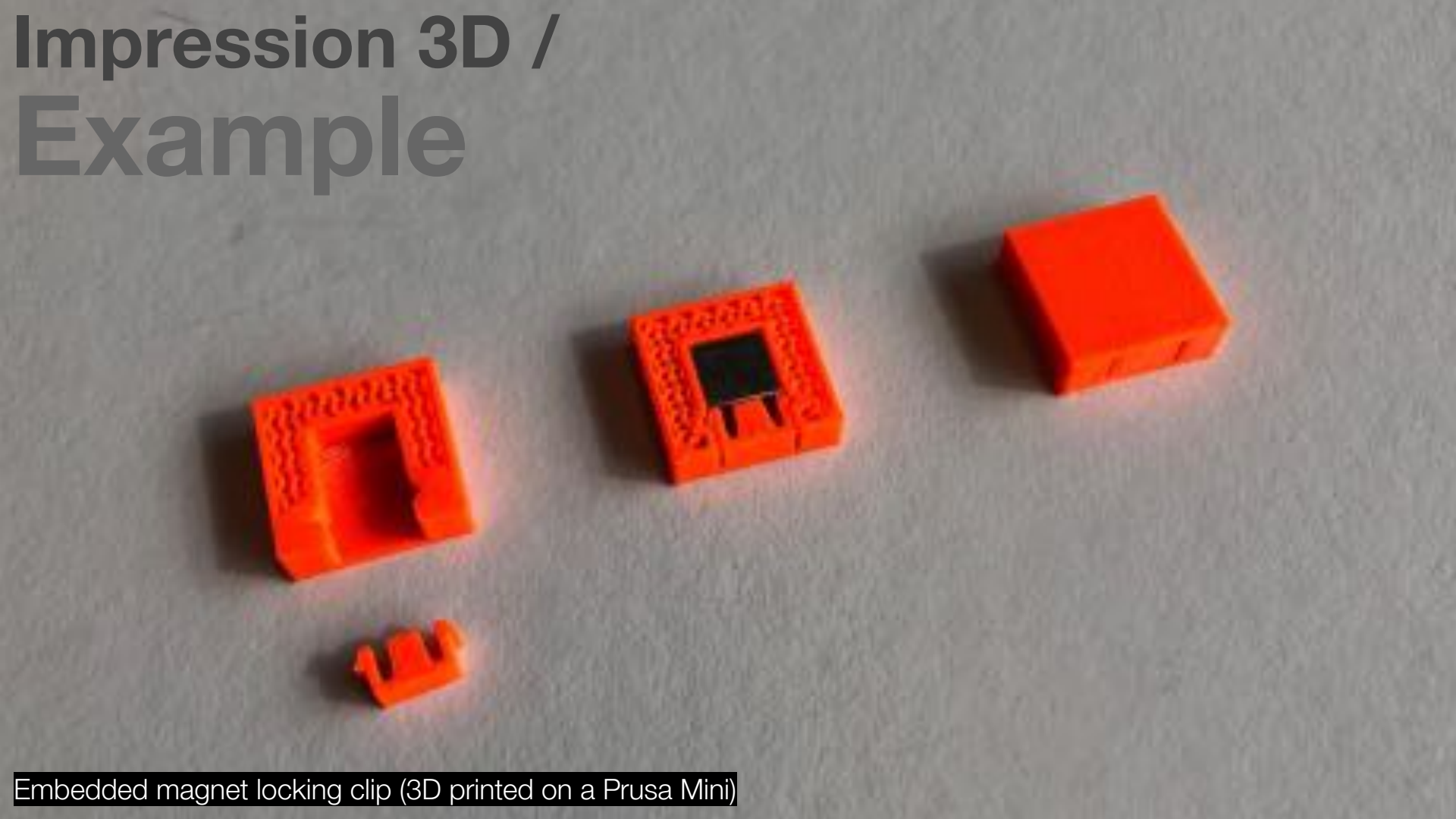
Support tableau patient, projet avec les HUG (OnShape + Prusa Mini filament 3D printer)

Axe de planche à roulette imprimé 3D.

Impression 3D / Example

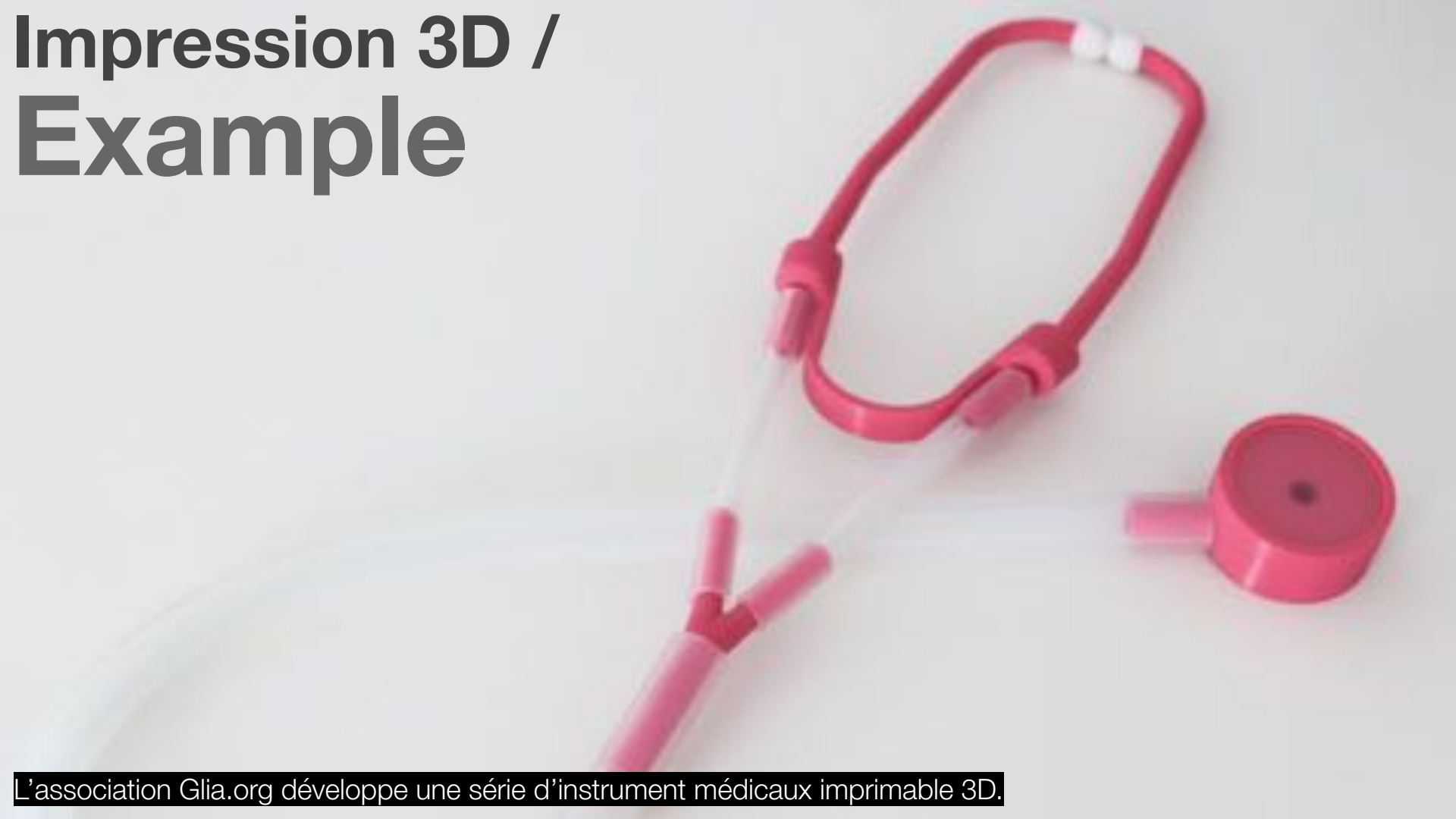
Keyring “thingie” 3D printed steel (approx CHF 17.- on Shapeways.com)

Impression 3D / Example



Embedded magnet locking clip (3D printed on a Prusa Mini)

Impression 3D / Example



L’association Glia.org développe une série d’instrument médicaux imprimable 3D.

Impression 3D /
Example

Heroforge.com - Un service d’impression de figurines (ici en million de couleurs).

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Impression 3D /
Utilisation de la Prusa Mini

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Machines & consommables /
Conditions of use

- Respect other users
- Never print unknown materials
- Never leave the 3D printer unattended
- Share and document all your projects!

- **But please make things !**

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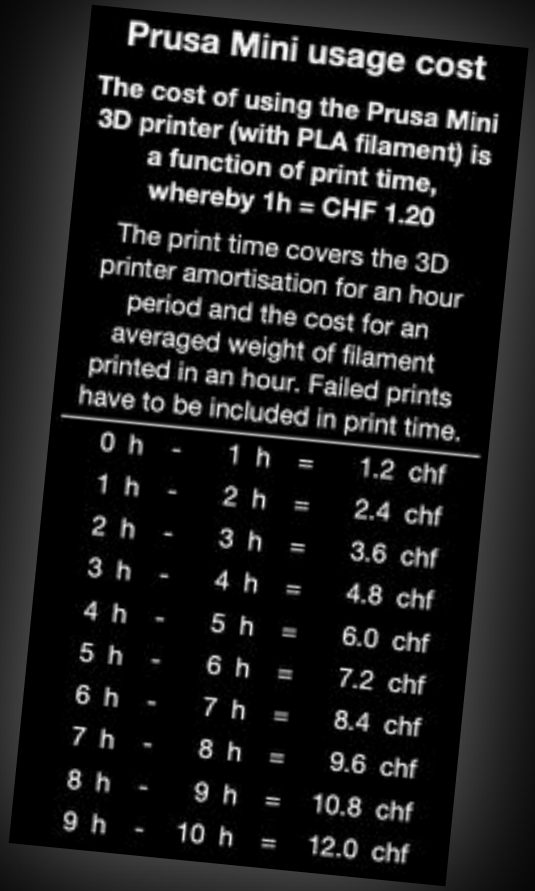
Prusa Mini /
Coût d'utilisation

- **1h = CHF 1.20**
- Combinaison
  - Amortissement
    - Par heure entamée
  - Matière
    - Par heure
      - Consommation moyenne



Prusa Mini usage cost

The cost of using the Prusa Mini 3D printer (with PLA filament) is a function of print time, whereby 1h = CHF 1.20

The print time covers the 3D printer amortisation for an hour period and the cost for an averaged weight of filament printed in an hour. Failed prints have to be included in print time.

0 h	-	1 h	=	1.2 chf
1 h	-	2 h	=	2.4 chf
2 h	-	3 h	=	3.6 chf
3 h	-	4 h	=	4.8 chf
4 h	-	5 h	=	6.0 chf
5 h	-	6 h	=	7.2 chf
6 h	-	7 h	=	8.4 chf
7 h	-	8 h	=	9.6 chf
8 h	-	9 h	=	10.8 chf
9 h	-	10 h	=	12.0 chf

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Impression 3D /
Processus

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Impression 3D /
Processus

Design ➜ Slice ➜ Print

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Impression 3D / Processus /
Design

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Impression 3D / Processus / Design / Applications

- Recommended by Faclab
  - OnShape OR Fusion360
  - OpenSCAD
  - (AB3D OR) TinkerCAD OR BlockSCAD

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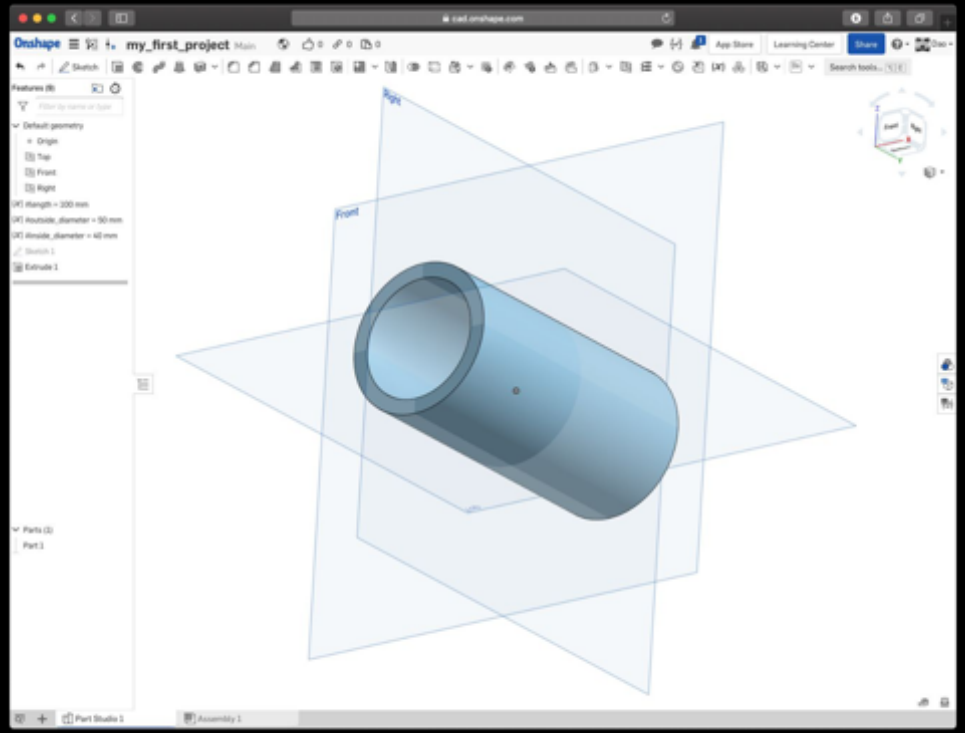
Impression 3D / Processus / Design /
OnShape



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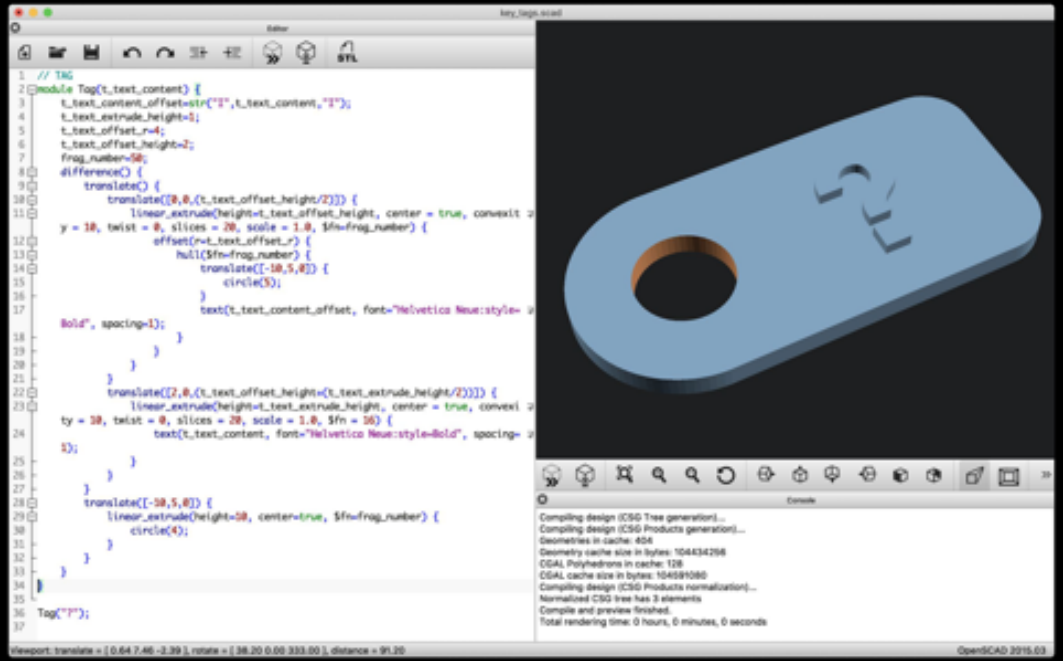
Impression 3D / Processus / Design /
OpenSCAD / BlockSCAD



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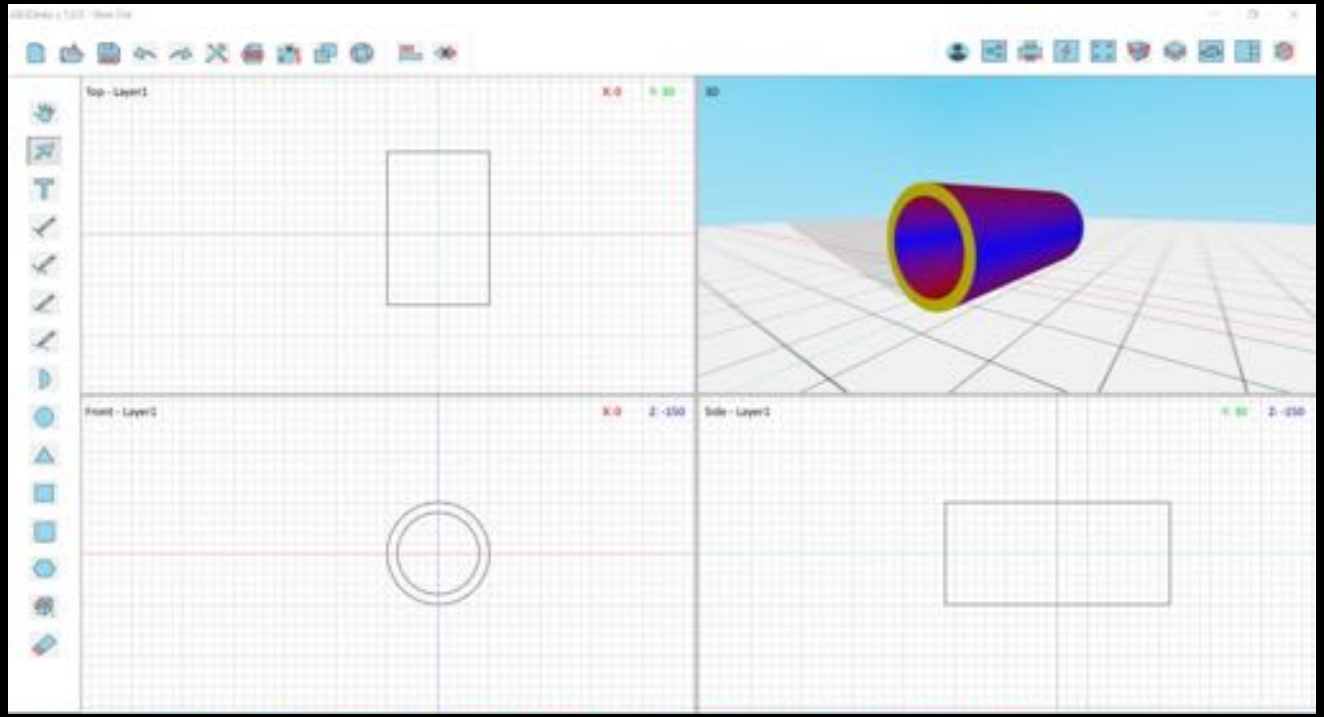
Impression 3D / Processus / Design /

AB3D



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Impression 3D / Processus / Design / Autres outils

- TinkerCAD
- FreeCAD
- SketchUp
- Solidworks
- Blender
- Autocad
- Online apps
  - 3D slash
  - Doodle3D

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Impression 3D / Processus / Design /
Divers outils & services en-ligne

- Tools
  - Netfabb (check and repair STL)
  - Meshmixer
  - Slicer for Fusion360
  - Terrain2STL (from a terrain relief to STL)
- Online 3D printing services
  - Shapeways.com
  - I.materialise.com
- 3D printable solutions repositories
  - Printables.com
  - Thingiverse.com
  - Cults3d.com
  - MyMiniFactory.com
  - Free3d.com (for OBJ files)

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Impression 3D / Processus / Design /
Formats de fichiers

- STL
  - "Standard Triangle Language" and "Standard Tessellation Language"
  - Open source
  - Created in 1987, still widely used today, but almost no longer relevant!
    - No color, no material, no texture, no scale
- OBJ, AMF & 3MF
  - More recent
  - Store color, material, texture, geometry

More info: https://all3dp.com/1/3d-printer-file-format/

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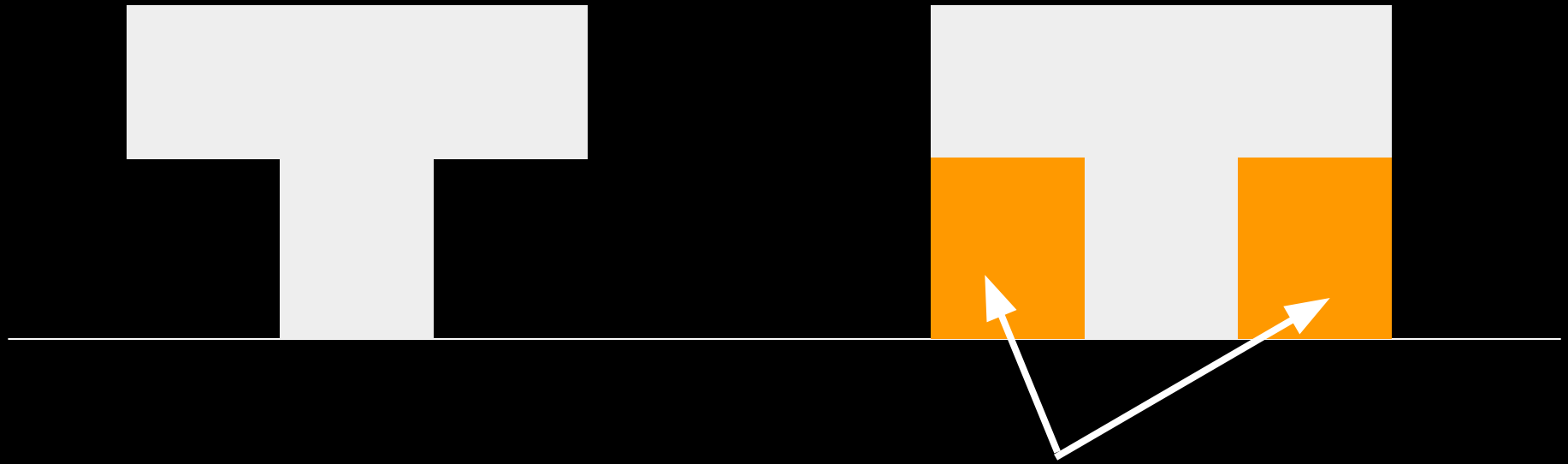
Tips

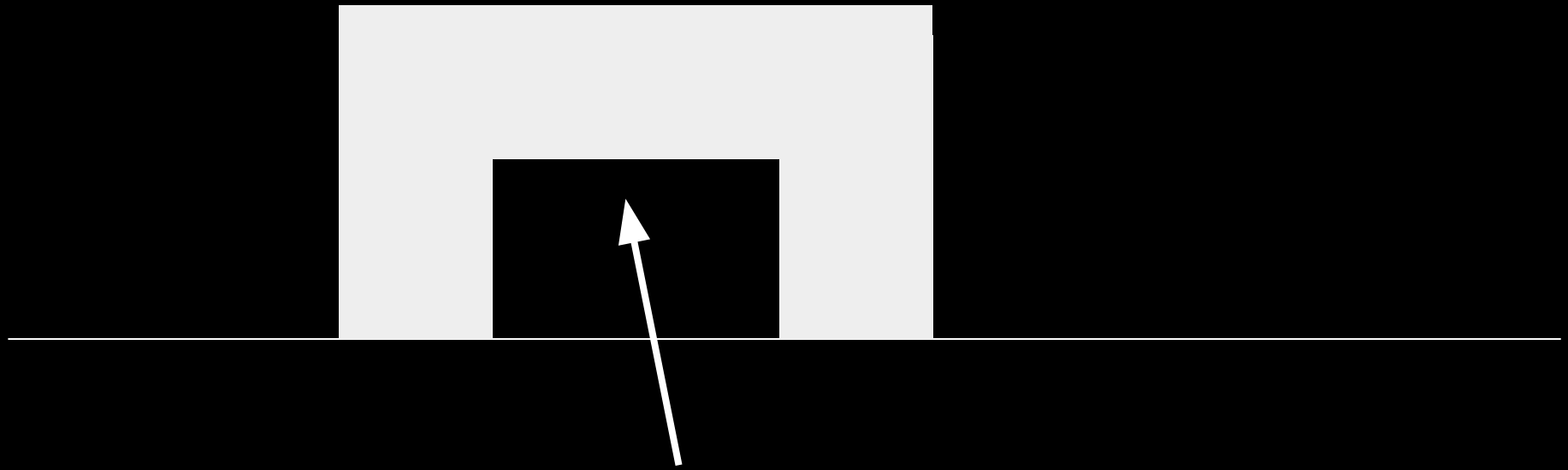
- Eviter les surplombs
- Ponts ok jusqu’à 1cm
- Eviter les petits détails

Eviter les surplombs

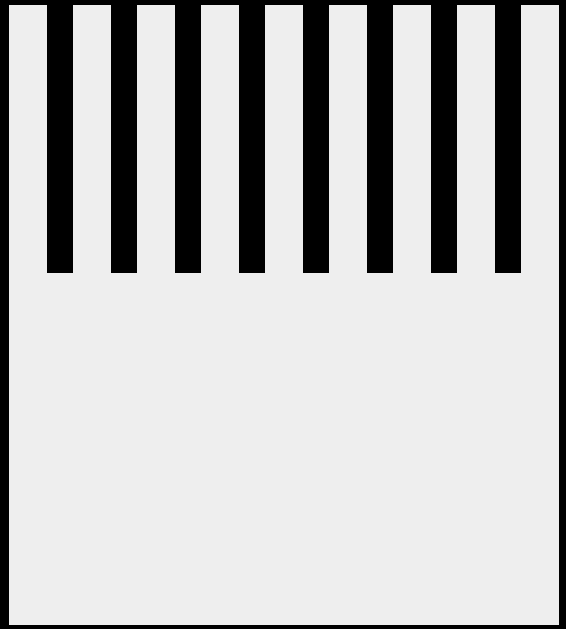


Les surplombs nécessitent un support d'impression

Ponts ok jusqu’à 1cm



Eviter petits détails



Petit = <1-2mm

Impression 3D / Processus /
Slice

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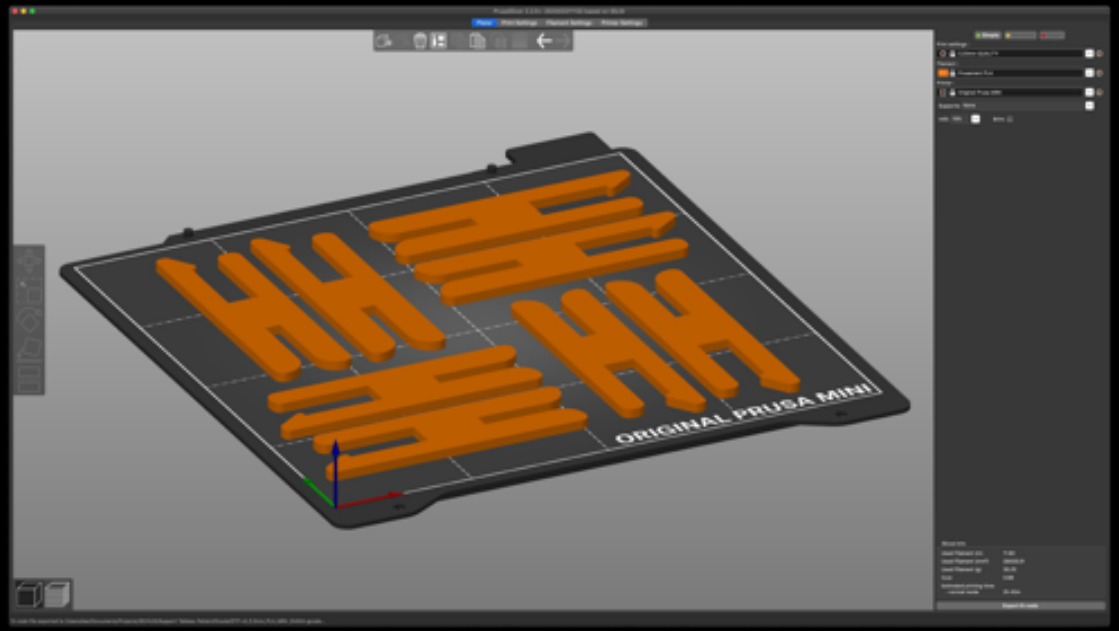
Impression 3D / Slice / Apps /
PrusaSlicer



Get it here, it's free! https://www.prusa3d.com/prusaslicer/

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Basic settings

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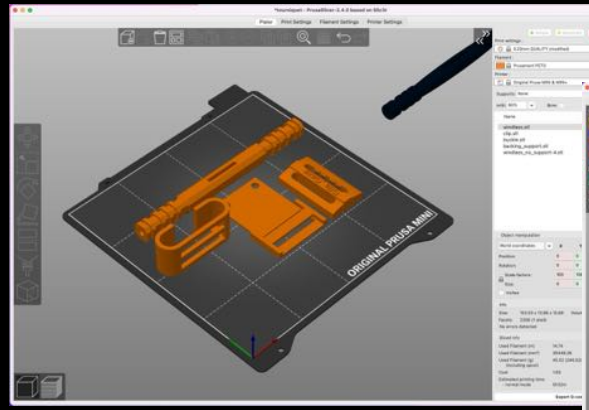
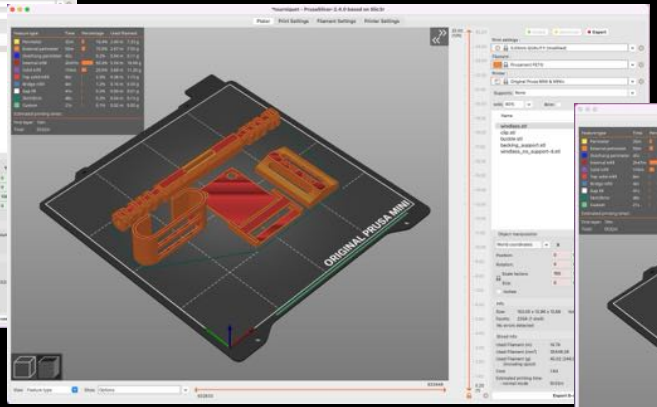
Impression 3D / Slice / Apps /

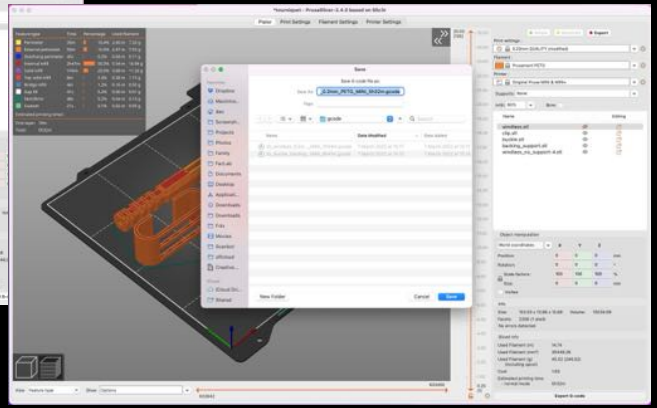
PrusaSlicer



Editor view



Preview



bidule_0.2mm_PETG_MINI_5h32m.gcode

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Impression 3D / Processus /
Print

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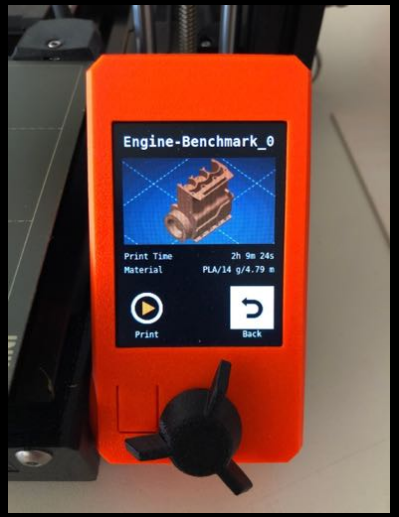
Vérifier avant l'impression

- Le plateau est-il propre et dégraissé ?
  - Utiliser de l'alcool (isopropylique) à 96° pour nettoyer la surface du plateau
- Le bon matériel est-il chargé ?
  - Vérifier sur la bobine s'il s'agit bien de Prusament PLA ou Prusament PETG
- Y-a-t'il assez de filament sur la bobine ?
  - Peser la bobine et comparez au poids entre parenthèse dans PrusaSlicer
- La bobine de filament tourne librement ?
  - Si besoin ajuster l'écartement des rails/roulement à billes

Impression 3D / Processus / Print /

Naviguer le contrôleur



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Retirer une impression

1. Attendre que le plateau refroidisse
2. Retirer le plateau
3. Plier le plateau pour décoller l'objet imprimé
4. Re-positionner le plateau
5. Nettoyer le plateau

Ce que vous avez appris

1. Connaissance générale impression 3D
2. Astuces de conception pour impression 3D
3. PrusaSlicer et comment “slicer” un modèle 3D
4. Checklist pré-impression
5. Lancer une impression
6. Retirer une impression

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