

From 3D CAD to 3D printed model

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Abstract. *This paper aims to outline the general steps that must be considered to obtain a physical model, on the Prusa 3D printer, starting from the CAD model (e.g. STL files) or a set of images from medical imaging (e.g. DICOM files). There is a multitude of software that allows obtaining CAD models as there is, at present, a multitude of 3D printing that operates with a wide range of materials. Prusa 3D printers have proven to expand rapidly, especially during this period of the pandemic, internationally through practical contributions. This pandemic, initially, generated an important fusion from different fields trying to solve important issues in a very short time. It was found that 3D printers play an important role nowadays. This paper is aiming, also, at identifying sources of 3D CAD and medical imaging models that can be used with 3D printers to aid or better understand different objects. Currently, 3D printing has a strong development in all scientific and non-scientific fields by contributing to the conversion of digital models into physical, tangible models. For this, it is necessary to understand the general stages that assist this process.*

Keywords: 3D Prusa, STL, medical imaging.

Introduction

When using this sentence (on 21 December 2020): “from 3D CAD to 3D printed model Prusa” in the keywords section, of science direct, it was found 136 results from which 11 review articles. If the sentence is modified to: “from 3D CAD to 3D printed model” appeared 9347 results from which 685 review articles. If it is used only: “3D printer” it appears 18197 results from which 1314 review articles.

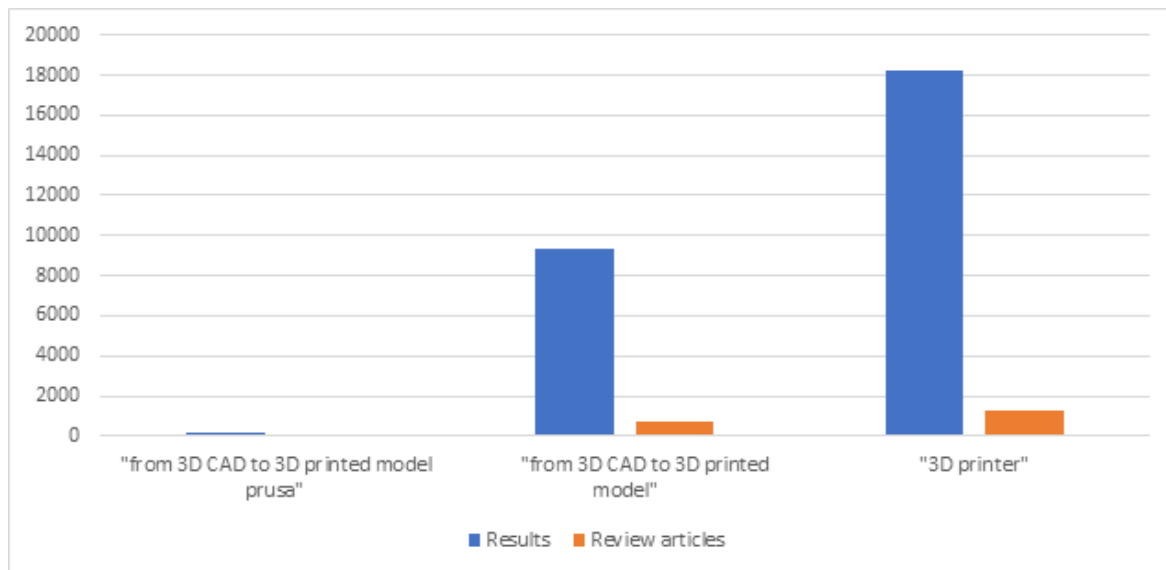


Figure no.1. Articles and review articles, on science direct, of 3D printer studies.

This finding is a small indication of the great impact that 3D printers have on our lives. On the same search engine, it was found a number of 175 results when using “3D printer librarians”, which suggests a small interest in implementing the 3D printers assisted by librarians.

3D printing is proving to be an unlimited resource of innovative ideas in all current fields (Rafael M. Cardoso, et al., 2020; Umme Kalsoom, et al., 2018; Sarwar Beg, et al. 2020) technical and non-technical. 3D printing involves several methods and materials to work with.

In the Medical Engineering laboratory, of our Faculty, there are a couple of printers 3D PRUSA which have the role of facilitating the way from models (medical prototypes CAD) to physical, palpable models. In this direction, below, is presented, in stages, the way to obtain the g-code based on which 3D objects can be printed till obtaining the final, physical model.

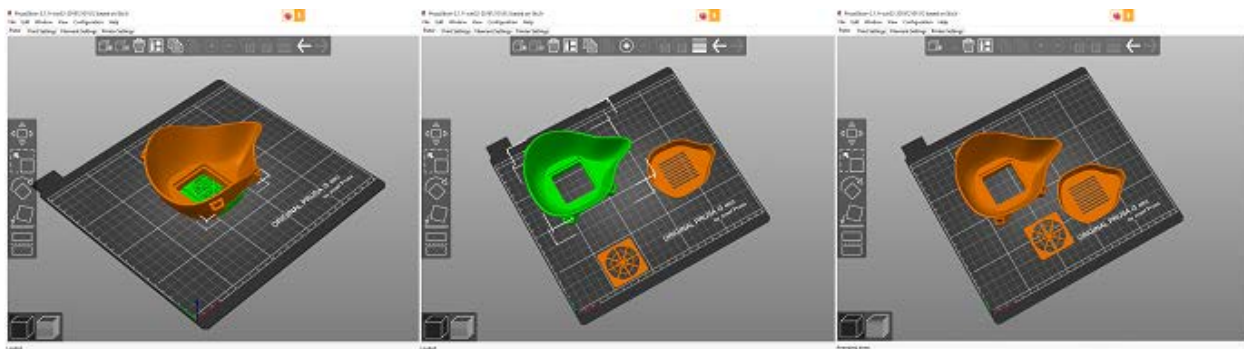
General steps for converting a 3D CAD model to a printed one

Prusa as well as any other producer, on market, offers a great deal of information for the users, from guides to DIY projects. Considering also the great impact of the open-access models available online, it is concluded that the basis for using 3D models on 3D printers is consolidated. Knowledge in 3D CAD software offers consistency for obtaining personalized models. It is important to mention here that the legislation, nowadays, might need some new input as there were found situations in which people 3D printed weapons.

Considering the guides (Original Prusa i3 MK2S, Guides, 2021) from Prusa and also the empirical knowledge it was found a number of 11 steps in making a g-code and 3D printing it on the PRUSA printer. It is presented a 3D model, open access, facial mask developed and used in the present pandemic.

1. Import the model (STL, OBJ, AMF, 3MF) by accessing File/Import... or by dragging the file in the workspace. The software used is Prusa Slicer.
2. Arranging the parts on the work table (if it is possible to print several models simultaneously). The operation can be performed with the mouse or using the shortcuts (Figure no. 2 a, b, c) on the left of the screen (move, scale, rotate, place on face, cut). The parts can be arranged automatically by the shortcut at the top (Figure

no. 2 c).



a)

b)

c)

Figure no. 2. Arranging the parts on the work table: a) first situation; b) second situation; c) the third situation.

2. Opt for the parts settings (Figure no. 3) on the right side of the screen, so you can usually go to the predefined parameters (optimal 0.15 mm; PRUSA PLA you can choose the color of the material and its type; the model of the Original Prusa i3 MK2S print, Infill 20% - you can choose to decrease or increase this value depending on the amount of inner material you want; Brim off or on- print a layer around each piece on the first pass of the print head)

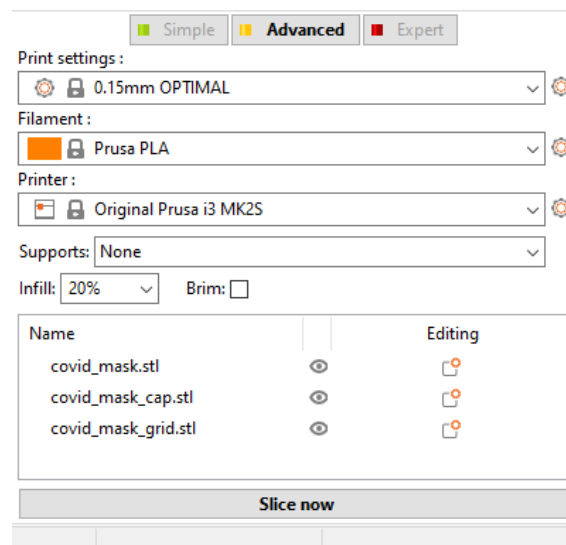


Figure no. 3. Parts settings.

4. Click the Slice now command (Figure no. 3). Data are obtained, sliced info, amount of material used in meters, mm³, and grams, estimated cost, and duration.
5. Press the Export G-code command (Figure no. 4); select the location where the file is saved with the corresponding g-code.
6. Upload the obtained file to the SD card in the printer driver.
7. Access from the button (potentiometer type) on the printer unit - Load Filament (insert the filament, cut at a sharp angle, into the casting/melting head).
8. A layer of glue (of the solid type on the tube) is deposited near the area where the pattern will be printed.
9. Access from the button (potentiometer type) on the printer unit - Print from SD (select

the file with the previously created g-code).

10. At the end of printing, access the button (potentiometer type) on the printer unit - Unload the filament (remove the filament from the casting/melting head and secure it in a hole on the side of the spool to prevent tangling of the thread on the spool)

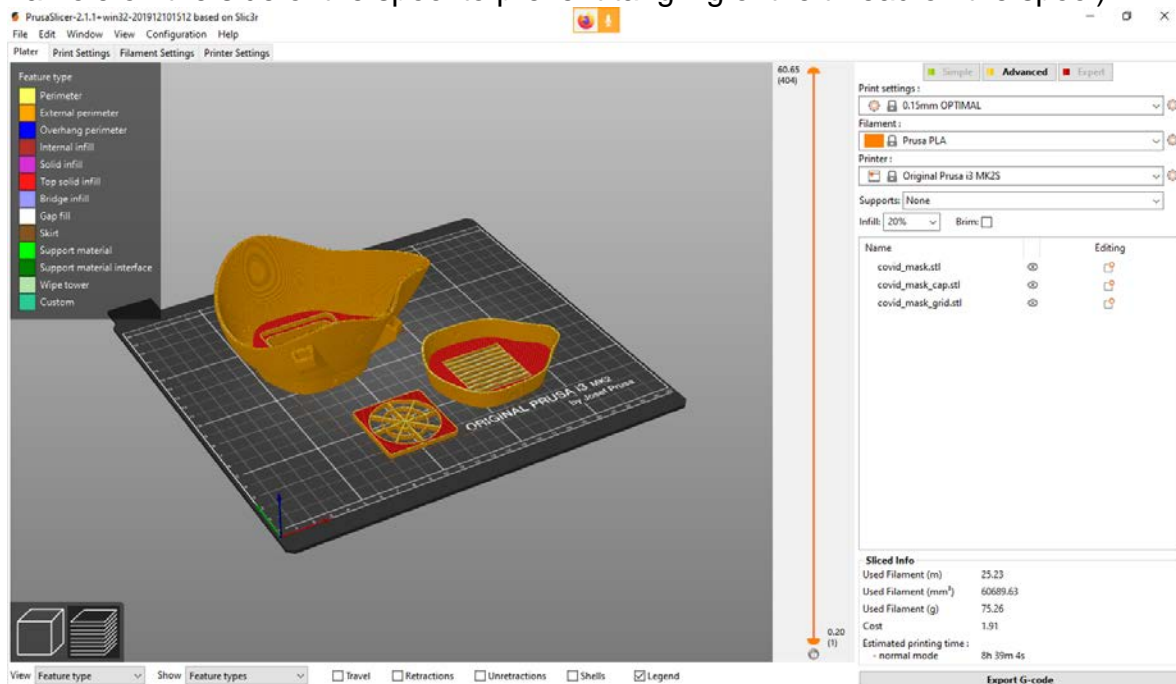


Figure no. 4. Export G-code for further printing.

11. Peel the model off the work table and clean the work table with technical alcohol.

Conclusion

The steps presented in this paper might be considered general if materials such as PLA or ABS are used in the manufacturing of the 3D printed model. Although each manufacturer has its software some of the instructions are similar or otherwise intuitive. The 3D printed models will play an important role in the technical and non-technical fields, as well as a method assisted by librarians.

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