

FABRICATION AND PRODUCT DEVELOPMENT BY USING STEREO LITHOGRAPHY APPARATUS (SLA)

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Abstract - A **prototype** is an early sample, model, or release of a product built to test a concept or process. It is a term used in a variety of contexts, including design, electronics, and software programming. A prototype is generally used to evaluate a new design to enhance precision by system analysts users. This design of prototype is based on the state of material considered. As of now considered liquid rapid prototyping system is most widely used in the field of jewellery, dental and investment casting models.

KeyWords: design¹, electronics², software programming³, jewellery⁴, dental⁵

1. INTRODUCTION

A **prototype** is an early sample, model, or release of a product built to test a concept or process. It is a term used in a variety of contexts, including semantics, design, electronics, and software programming. A prototype is generally used to evaluate a new design to enhance precision by system analysts and users. Prototyping serves to provide specifications for a real, working system rather than a theoretical one. In some design workflow models, creating a prototype (a process sometimes called **materialization**) is the step between the formalization and the evaluation of an idea. A **prototype** can also mean a typical example of something such as in the use of the derivation 'prototypical'. This is a useful term in identifying objects, behaviors and concepts which are considered the accepted norm and is analogous with terms such as stereotypes and archetypes.

The word prototype derives from the Greek prototypon, "primitive form", neutral of prototypes, "original, primitive", from protos, "first" and typos, "impression".

1.1 BENEFITS OF PROTOTYPES

- Fail early and inexpensively
- Gather more accurate requirements
- Technically understand the problem
- Conflict resolution

- Funding
- Easily file patent

1.2 TYPES OF RAPID PROTOTYPING

Additive manufacturing:

- Stereolithography (SLA)
- Selective laser sintering (SLS)
- Direct metal laser sintering (DMLS)
- Fused Deposition Modelling (FDM)
- Binder jetting
- Poly jetting

Other techniques

- CNC Machining Prototyping
- Vacuum casting
- Investment Casting

2. PRINTER TECHNICAL SPECIFICATIONS

Printing

System	ANYCUBIC Photon S
Operation	2.8-inch Color TFT Screen
Software	ANYCUBIC Photon Slicer
Connectivity	USB memory stick

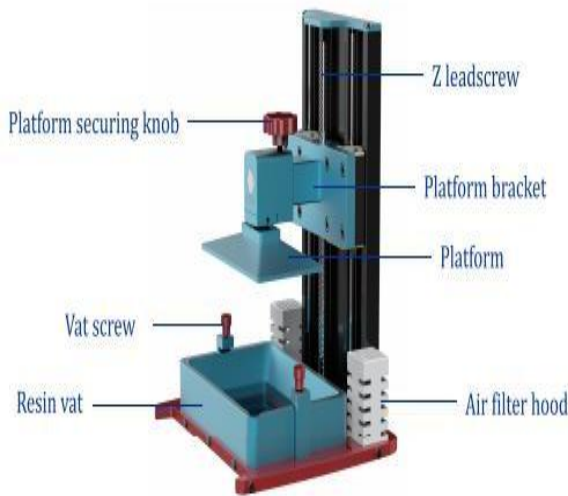
Specifications

Technique	LCD Shadow Masking
Light source	UV-LED (wavelength 405nm)
XY Resolution	0.047mm (2560*1440)
Z axis Accuracy	0.00125mm
Suggested Layer Thickness	0.01 ~ 0.2mm
Suggested Print Speed	20mm/h
Rated power	50W

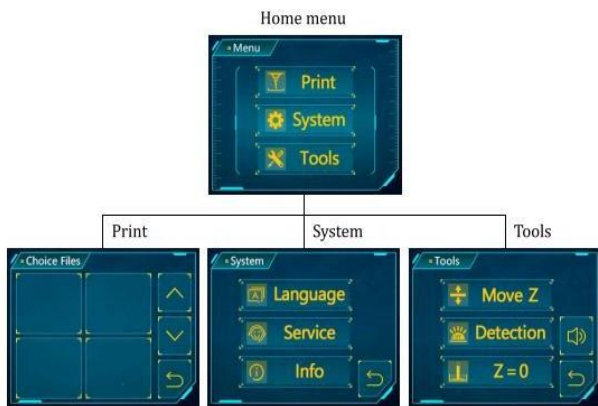
Physical Dimensions

Dimension	230mm (L) *200mm (W) *400mm (H)
Build volume	115mm (L) *65mm (W) *165mm (H)
Materials	405nm UV-resin
Net weight	~5.9kg

3. PRODUCT LAYOUT



4. INTRODUCTION TO OPERATION



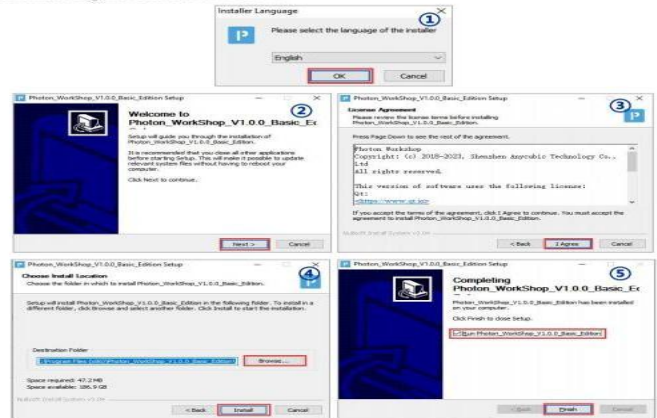
Home menu



5. INTRODUCTION TO SLICING SOFTWARE

1. Slicing software installation

Here Windows PC is taken for example. Slicing software is located in memory stick: "SD card" → "File_English_Photon S" → "Photon S slicing software". (You may have to close the anti-virus software before installing the slicing software.) Double click "Photon_WorkShop_V1.0.0_Basic_Edition.exe", and then follow the installation guide as shown below:



Double click "Photon_WorkShop_V1.0.0_Basic_Edition_20190129.dmg" to install the slicing software in Mac PC.

Note: ANYCUBIC may update the software and firmware without notice. Please visit www.anycubic.com for any updates.

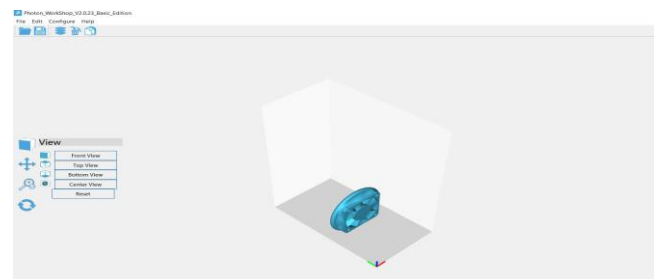
2. Manipulate 3D model in Photon Slicer

(1) Model Importing

After software has been installed, please run it for the first time. On the menu bar, click "File" → "Open file" (or click the "Open" icon at the top left (red square)) to import your own three-dimensional format model, i.e. STL file. Or you may input the Test (PHOTONS.stl) file in the memory stick.



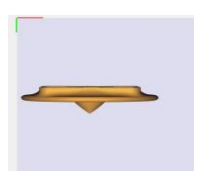
Note: click "configure" → "Language..." on the menu bar to choose the language, and then restart the software to change the language.



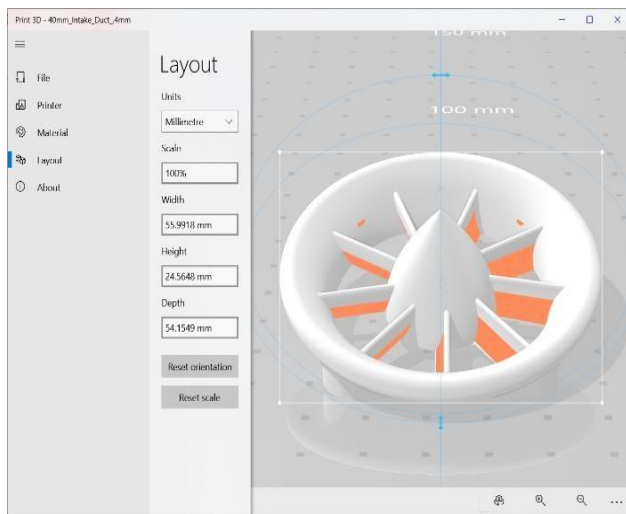
FRONT VIEW

TOP VIEW

BOTTOM VIEW



6. PROTOTYPE DESIGN



7. APPLICATIONS

- Fit/form, proof of concept prototypes and engineering verifications
- Investment Casting Patterns
- Rapid Tooling, Jigs & Fixtures
- Designer models, snap-fit assemblies
- Scale & exhibition models
- Optics, transparent covers Moulds & casting patterns

8. ADVANTAGES

- Fast implementation of prototypes in early stages of product development
- Single-stage production process produces smooth surfaces even without finishing
- Low material consumption: non-hardened synthetic resin can be reused
- Production of both flexible and rigid 3D objects
- Cost-effective production
- Customized colouring
- Multi-part assemblies are possible

9. LIMITATIONS

- Depending on the material, components may be brittle

- Support structures can limit design freedom

- Components are only UV-resistant to a limited extent

10. CONCLUSIONS

- Stereo Lithography Apparatus also known as SLA which is a liquid based prototyping system is more important and more useful for further and future generations.
- The use of this printer is most widely used in the fields of Dental and this machine plays a vital role in prosthetics, and orthotics. The future holds unlimited possibilities for 3D printing. With increasing accuracy and quality of the finished piece — and an ever-expanding list of materials to use for printing — the potential for wider application in clinical dentistry is exciting.
- Computer aided design/computer aided manufacturing (CAD/CAM) facilitates the in-office design and fabrication of dental prosthetics and appliances.
- In addition to chairside CAM milling equipment, the next generation of technology for designing and manufacturing onsite is available in the form of three-dimensional (3D) printers.
- The use of dental resins and 3D printing allows in-office fabrication of temporary prosthetics, surgical guides, orthodontic models, retainers and aligners.
- Adjusting 3D printers to a 50- μm or 25- μm setting allows the creation of models that are considered acceptable by clinical standards. And at the 25- μm setting, a higher level of accuracy is achieved because the layers are thinner.

11. REFERENCES

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