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Volumetric 3D Printing: A New Approach to 3D Printing

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I. INTRODUCTION

Today, there are many different methods of 3D printing, each with its advantages and disadvantages. One such method is the volumetric 3D printing method. Volumetric 3D printing or tomographic 3D printing is a resin-based printing process.In this article, we will explore the uses, disadvantages, and references of volumetric 3D printing.

II. WHAT IS VOLUMETRIC 3D PRINTING?

Volumetric 3D printing is a new approach to 3D printing that was developed by researchers at the University of California, Berkeley. This method uses a laser to create a 3D object by solidifying a resin from within the material. The resin is contained in a vat and is slowly drawn out of the vat as the object is printed.

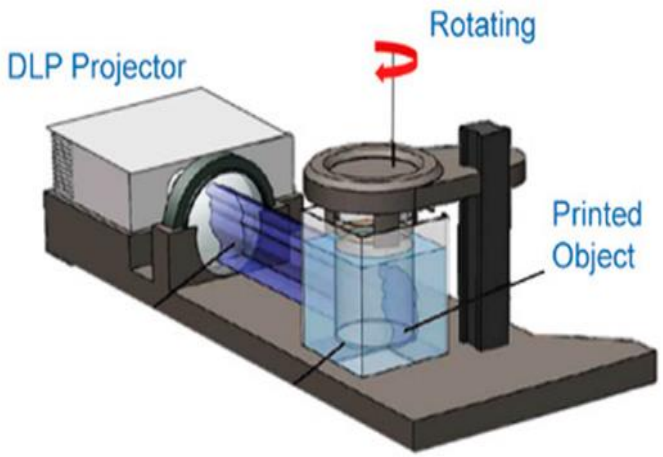

Fig. 1: Volumetric 3D Printing: M Lee et al. Chem. Revs. 2020

This method allows for much faster printing speeds than traditional 3D printing methods.(1)

III. USES OF VOLUMETRIC 3D PRINTING

Volumetric 3D printing has many potential uses in various fields. For example, this method could be used in the construction industry to quickly and efficiently print large structures, such as walls or beams.

It could also be used in the medical industry to print implants, prosthetics, or even organs. Another potential use for this method is in the manufacturing of complex objects, such as gears or turbines, that are difficult to produce using traditional manufacturing methods.(2)

IV. DISADVANTAGES OF VOLUMETRIC 3D PRINTING

While volumetric 3D printing has many potential uses, there are also some disadvantages to this method. One of the biggest disadvantages is the limited selection of materials that can be used. Currently, only a few types of resins are compatible with this method, which limits the range of objects that can be printed.

Another disadvantage of this method is the high cost of the equipment. The lasers and other equipment required for volumetric 3D printing are expensive, which makes this method less accessible to small businesses or individuals.

Finally, volumetric 3D printing can also be slower than other 3D printing methods for objects with complex geometries. The laser must travel through the resin in order to solidify it, which can take longer for objects with more intricate shapes.(3)

A cell-friendly visible laser light is utilised in volumetric 3D bioprinting to project several tomographic images onto a light-sensitive hydrogel containing stem cells. The arrangement of these projections creates a 3D light field with enough energy to crosslink the hydrogel precisely where the desired design demands, despite the fact that the entire volume is photo-exposed. illuminating a large vat of photopolymer resin with a single light source This produces a 3D object that floats in the host hydrogel and can be created in a matter of seconds..(4)

The varying light patterns are beamed from all angles, and the 3D object is cured rapidly (30 s), with an ideal printing resolution (40 μm). (5)

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With the use of cast gel MAgels loaded with cells cartilage of pinna and menisci are printed fester as compared to convention bio fabrication a method like inkjet ,extrusion based and lesser assisted.

Volumetric 3d printing enables the fabrication of entire cell laden constructs with arbitrary size and architecture within a time frame of seconds to tens of seconds.(6)

V. NEW VOLUMETRIC 3D PRINTING TECHNIQUE

Through this process objects can be created with high-resolution and high-speed. This method useful for printing opaque objects.(7)

Researchers from the School of Engineering at the École Polytechnique Fédérale de Lausanne, the Laboratory of Applied Photonics Devices, and the start-up Readily 3D collaborated on the project.

The team's article details how it was able to account for light scattering in opaque resins.

On the basis of a spatial frequency analysis of a stack of pictures taken perpendicular to the optical axis with a side-view camera, they suggested making a correction. By highlighting the characteristics of the greatest spatial frequencies, this picture analysis enables a numerical correction to be made to account for this frequency-dependent attenuation.(7)

In conclusion, volumetric 3D printing is a promising new approach to 3D printing that has the potential to revolutionize many industries. While this method has some disadvantages, such as limited material selection and high equipment costs, it also offers many advantages, such as faster printing speeds and the ability to produce complex objects. As research in this field continues, we can expect to see even more exciting applications for volumetric 3D printing in the future.

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