Chapter 2

Importance of 3D Printing Technology in Medical Fields

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ABSTRACT

Three-dimensional or 3D printing technology is a growing interest in medical fields like tissue engineering, dental, drug delivery, prosthetics, and implants. It is also known as the additive manufacturing (AM) process because the objects are done by extruding or depositing the material layer by layer, and the material may be like biomaterials, plastics, living cells, or powder ceramics. Specially in the medical field, this new technology has importance rewards in contrast with conventional technologies, such as the capability to fabricate patient-explicit difficult components, desire scaffolds for tissue engineering, and proper material consumption. In this chapter, different types of additive manufacturing (AM) techniques are described that are applied in the medical field, especially in community health and precision medicine.

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INTRODUCTION

Three-dimensional printing is also known as an additive manufacturing technique where the things are made by depositing or fusing the materials layer by layer-for example ceramics, metal, plastic, powders or living cells [Schubert et al., 2014]. This process is also referred solid free-form technology (SFF) or rapid prototyping (RP) Various 3D printers are like as a conventional inkjet printers. Though, the finish product differs in that a 3D object is produced. 3D printing has taken many places in medical field among which bio-printing is use for cellular-scaffold printing and other biomedical application i.e. regenerative medicine. Numerous 3D printing techniques are available now a day with varying parameters i.e. printing speeds, printing methods, extrusion pressures, and printing materials [Banks, 2013]. With the help of Computer Aided Design software any imaginable objet can print by this technology. Basic principles of 3D printing processes are follows: i. Designing the CAD file through printer specific software, ii. Uploading the printer specific software to the 3D printer, iii. Running the program and iv. Print the final object. In this technology, the radiographic 2D images like MRI, CT, X-rays can be converted to 3D complex objects with customized medical structures [Sun et al., 2005].

TYPES OF 3D PRINTING TECHNOLOGY

Various methods of three-dimensional printing technology are available, stereo-lithography (SLA) technology is one of them [Hornbeck, 1997]. In this technique the SLA materials are generally light sensitive, solidification is initiated by laser undergoing photon [Mertz, 2013]. On the other hand other 3D printing technologies are now offered as well as selective laser sintering (SLS), fused deposition modelling (FDM), three-dimensional bio-printing (3DP), digital light processing (DLP), and laminated object manufacturing (LOM). Table 1 represents the processes and materials details which are using different types of 3D printing technologies. Whatever the printing technology is different but the fundamental hypothesis is that the item containing with the limited layers, also the more consisting the information of layers and also requires to elevate the declaration [Gross, 2014]. Different methods are available to attach the layers, several materials can be simply melted and
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