



RESEARCH ARTICLE
APPLICATIONS OF 3D PRINTING

*Prof. Jotsna S. Saindane

JSMF, Narhe Technical Campus, Rajarshi Shahu School of Computer Applications, Narhe Pune-41

ARTICLE INFO

Article History:

Received 20th July, 2016
Received in revised form
22nd August, 2016
Accepted 08th September, 2016
Published online 30th October, 2016

ABSTRACT

This research paper discusses the different applications of 3D printing in various industries. Imagine a 3D printer printing whatever your child or you want to print. Right from printing the parts for your child's game, printing synthetic parts of organs such as kidney, windpipe, lungs, a customized meal, to printing parts of an aircraft, everything is possible.

Key words:

3D printing, Applications, 3D Models.

Copyright © 2016, Prof. Jotsna S. Saindane. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Citation: Prof. Jotsna S. Saindane, 2016. "Applications of 3D printing", *International Journal of Current Research*, 8, (10), 39805-39807.

INTRODUCTION

What is 3D Printing and why is it Important

3D printing converts digital 3D models into solid objects by building layers. This is quite similar to the 3D models in the computer games. These 3D models can be in the form of Computer Aided Design (CAD) model or a digital scan. A slicing software such as a 3D modeling software applicationslices the 3D model into thousands of horizontal layers andslim cross sections.When you feed these slices in a file into your 3D printer, the printer prints these slices layer by layer in 3D. Just like a jigsaw puzzle, these slices arearranged and a physical 3D object such as a models or prototypes of body organs such as kidneys, lung, aircraft and automobiles parts, dental models and many other models and prototypes for various other applications. Recently, the University of Michigan, USA used a 3D-printed lung splint to replace the windpipe because a prematurely born baby could not breathe normally. The doctors used the Computerized Tomography (CT) scans and created an accurate 3D image and printed the 3D-printed lung splint, which saved the life of a newborn baby. (For more information, see 3D-printed Splint Saves the Life of a Baby)

Applications of 3D printing

Medical and Dental

The most useful and important application of the 3D printing technology is the 3D-printed surgical guides. Now, the surgeons can perform surgeries using 3D-printed surgical guides while performing difficult and complicated surgeries. With the help of 3D-printing technology and other technologies such as augmented reality, the job of the surgeons has become much easier and the success rate of surgeries has increased and many lives can now be saved. The most accurate casts or prototypes can be created using the 3D-printing technology. For example, the metal casting for dental crowns, infected jaw bone can be created without causing a lot of pain by preventing continuous experiments with different prototypes. This technology helps in creating the most accurate dental parts.

Aerospace

NASA is testing on-demand printing of aircraft parts in the space, which would make *made in space* a reality. Now in the Sci-Fi movies, we might see this soon that during the space wars, the people in spacecraft are printing parts instantly and replacing the damaged parts of their spacecraft to save their lives and their spacecraft. Space scientists are testing 3D printing and creation of aircraft parts in zero gravity on the International Space Stations. This would help astronauts to print aircraft parts and in medical emergencies, they can also print organs instantly with the help of their doctors when required.

*Corresponding author: Prof. Jotsna S. Saindane,
JSMF, Narhe Technical Campus, Rajarshi Shahu School of Computer Applications, Narhe Pune-41

Boeing in collaboration with BAE Systems is already planning to print the entire airplane wing in future, they are already printing and using smaller aircraft parts. The weight of these printed parts is extremely less compared to the parts used earlier. In the next decade, the growth of 3D printed parts in aerospace is estimated to be \$2 billion. GE is creating 3D-printed parts for the GE9X engine, the world's largest jet engine.

Unmanned Aerial Systems

This helps in monitoring the disaster scene, planning and taking appropriate actions as per the data received and printed from the unmanned aerial system. The aerial system monitors the disaster and reports to the mission control. The mission control prints an unmanned aerial vehicle according to the requirements of the disaster by using the data received from the aerial system. BAE Systems has invested 117m in research and development to develop the unmanned aerial system.

Teaching Astronomy to Blind Youth - Tactile Astronomy

Mr. Arturo Pelayo has created 3D-printed models and prototypes of stars, galaxies and other geographic elements such as craters, mountains to teach astronomy to blind youth. (For more information, see Tactile Astronomy and Teaching Astronomy to blind youth - Tactile Astronomy - a case study)

Printing Customized Fast-Food on Demand

3D printing technology has made printing your favorite fast-food possible. You can also request specific flavors, colors, shapes while placing your order. The restaurant can serve the customized meal to you with the help of this technology. Edible food inks and the algorithms to print the food has made this possible. Be ready to eat a variety of fast-food items in a few years using this new technology. All you need to provide your Masterchef is your best choice of ingredients or a picture of what you want to eat. Fast-food would literally become fast-food at the speed of clicking your Print button and printing your meal in 3D. In Spain, a restaurant serves customized food to its customers as per the designs specified by them. They are making special dishes using colors, shapes, and designs and mostly they are using mashed potatoes and chocolates to make these specially designed food items.

Rapid Prototyping

3D printing technology is used for rapid prototyping

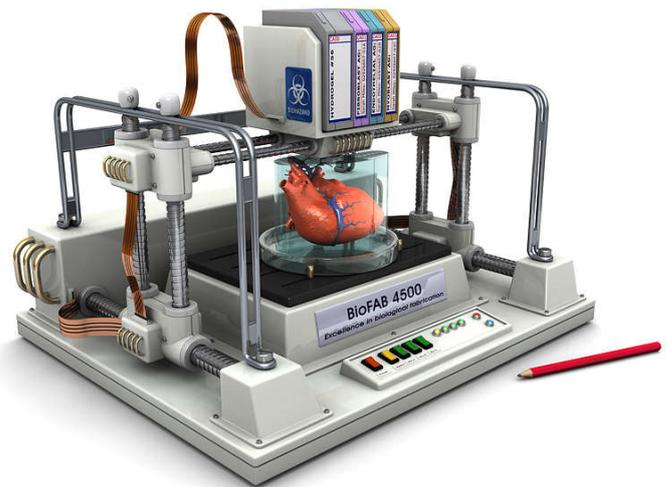
in many fields such as architecture, healthcare, and entertainment. The rapid prototyping method is used to create scale models and movie props, the objects used by actors or set decorators in a movie. It is also used to make a copy of ancient artifacts or reconstruct artifacts in museums and in archaeology.

Forensic Pathology

In criminal investigations, to establish the validity of the pieces of evidences or trick the criminal and get the truth from the criminal, they might need to be reconstructed the broken objects that were earlier found at the site of the crime.

Bioprinting

In the biotechnology field, 3D printing is called bioprinting where this technology is used to re-engineer the tissues. Organs and body parts are created using inkjet techniques of bioprinting where layers of living cells are placed on a gel medium and slowly developed to create 3 D structures. In 2002, Professor Makoto Nakamura realized that the droplets of ink in a standard inkjet printer are approximately of the same size as human cells. He decided to use this technology and created a working bioprinter and printed bio-tubing similar to a blood vessel by 2008. Professor Nakamura hopes to print all the human organs for making organ transplants.



Cosmetic applications

In future, you will be able to change your face as per your wish. Yes, this will be possible using a type of situ bioprinter. 3 D printing technology is going to change many things in our lives. The most important aspect of this technology is speed, reduced cost, convenience, and flexibility to do the seemingly most difficult things. This printer vaporizes old cells from the face and substitutes them with new cells. Making yourself look similar to your favorite actor will be possible soon but it will be definitely costlier than your regular cost of beauty parlors.

Customized and on Demand Printing in the Air

Now, airlines, are printing the catering objects they need to serve their customers using the 3D printer. Air New Zealand has already started using this technology to serve its business class customers. It saves the cost of manufacturing and replacing kitchen objects. Above all, it helps in giving a personalized and unique experience to its customers.

Lightest Invisibility Cloak

Scientists from the State University of New York (SUNY) at Buffalo and Kansas State University are working on creating an invisibility cloak using the worlds lightest material - Graphene aerogel. Graphene aerogel is extremely light. It is thousand times less dense and lighter than water.

REFERENCES

Professor Richard Archer, 2013. "Head of Massey University's Institute of Food, Nutrition, and Human Health. Auckland, November.

Mr. Gaurang Trivedi, Consultant, 2014. Hi-Tech Outsourcing Services, November.

Explaining The Future.com, pictures of Bioprinters

Mr. Amit Chowdhry, 2013. Contributor, Forbes Magazine, October.
