Effect and Use of 3D Printers Technologies

Abhay Mishra and Vivek Srivastava

Abstract The next new trend called additive fabrication manufacturing was as large as the mobile phone industry. 3D printing is also called as additive design technology. 3D printers print objects from a real 3D physical model physical prototype. In 3D printers, the printout consists of plastic, ceramic, nylon and over one hundred other components layers by layer (fabrication with additives). Factory, industrial design, art, clothes, furniture, architecture and building, automobile, dental and medical, aerospace, geographic details, education, structural engineering, and many other fields of study are where 3D printing found to be useful. In any area of implementation, it was found to be a simple and cost-effective approach. Applications for 3D printing are on the rise, and this is an important method that you can search for. We will discuss in this paper the way 3D printing works and existing and potential implementations.

Keywords 3D printing · Applications · Technology · Printing layer · Cost-effective

1 Introduction

3D printing or additive processing is a method by which nearly every type of digital model can create a three-dimensional solid object. There are various types of successive layers of paper. Traditional processing techniques rely on methods like cutting or drilling for material removal when successive 3D printing layers are added [1–3]. It thus employs an edge-by-layer layering technique before the whole structure is formed. Thus, 3D printing brings us from our mass production line to a one-off production that can be tailored [4]. You can render anything practically from a house to a chocolate bar, so to speak.

In the 1980s, the first 3D printers were used to draw a pattern in a liquid polymer. Thanks to the laser, the traced template was hardened into a sheet and then you designed a plastic structure [5]. Since then considerable improvement has been made

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in the manufacture of chemicals such that extrusion of materials is now implemented. Thus, an entity is made from matter forced from a mechanical head like inkjet printers onto paper [5]. Inkjet printers are often printed ink.

Interestingly enough, with technical advancements, the expense of purchasing 3D printers has fallen. The domestic use of 3D printers has grown, with an estimated expense of several hundred dollars. The key downside, however, is that the printing of 3D objects involves skills [6]. Indeed, both the digital and final printing involve a qualified person. In sectors such as the car industry and the aerospace industry, there has also been a increasing commercial use of 3D printers [7]. For starters, the automobile and aerospace industries manufacture spare parts that result in improved magnitude economics. The work that some analyzers have performed on the introduction of 3D printers as the second industrial revolution is emerging as a production line in the industry. The 3D printing technology is developing.

In terms of medicine, 3D printing has become increasingly popular, from bionics, to prosthetics and digital dentistry. This ultimately influences all facets of medicine profoundly and changes them [8]. Most of the research is still in the exploratory stages, but experts anticipate the use of 3D printing as a tool to revolutionize the medicine of tomorrow.

2 How It Works

3D printing starts with a simulated object template as shown in Fig. 1. The virtual design is a blueprint for the actual object that is made. This model can be designed

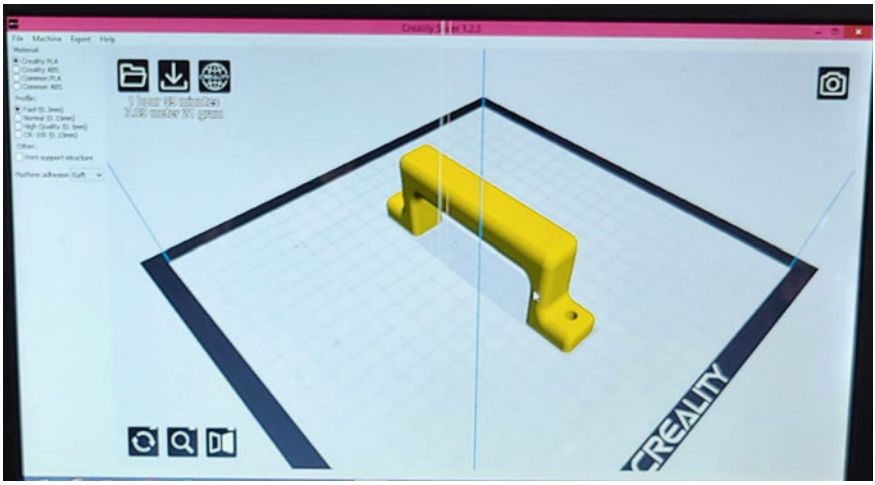

Fig. 1 3D object and digital model

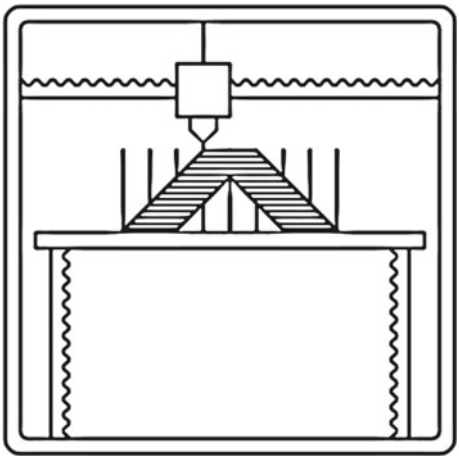

Fig. 2 3D printing layer by layer

from scratch with a 3D modeling program like computer-aided design (CAD). An existing object can also be used with a 3D scanner.

This scanner produces an object's 3D digital copy and places it in a 3D modeling program. In preparation for printing, the image is then cut into hundreds or thousands of horizontal layers. This optimized file is now being downloaded from the 3D printer. The printer creates an object layer by layer seen in Fig. 2.

The printer [9] reads each slice (2D picture) and creates a layer-by-layer object, and there is no sign of visible layering but a structure of the three-dimensional object [2].

3 Applications of 3D Printing

In various and varied sectors, 3D printing technology was used. Figure 3 shows the diverse uses of 3D printing, including research, artistic materials, visual aids, display

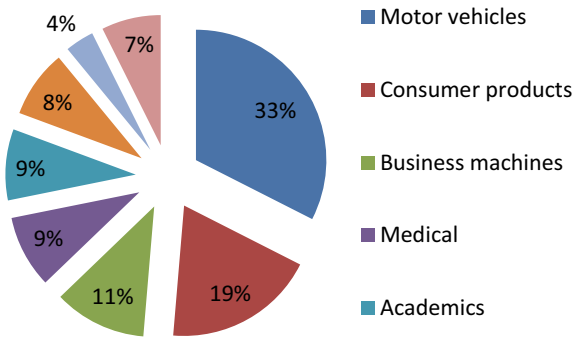

Fig. 3 3D printing application [10]

models, instrument coverings, customized parts, functional models and designs, as well as the production of series.

3.1 Construction

In China, 10 single-story houses were built every day [11], which typically takes weeks and months. Thus, 3D printing offers an inexpensive, faster, and safer alternative to more traditional buildings. The WinSun Decoration Design Engineering was using four gigantic 3D printers to build homes in Shanghai and to build walls layer by layer by mixture of cement and building waste. Each of them has a width of 10 m and a height of 6.6 m [11]. It was cost-effective and time-effective for any house for $5000.

3.2 Medicine

Hearing aids: 3D printing technology was used for hearing aids.

Bioprinters: Organ printing or body component printing [1] and some parts are used as implants in the body's actual components. Body parts were printed to list only those, such as pelvic titanium, trachial plastic splint, and titanium masks.

New organic printers actually use pharmaceutical testing as well as entire organs and bones to print human tissue [12]. The processing of tissues has taken significant strides in the printing of 3D blood vessels [13]. This was accomplished by integrating the developments of 3D biomaterial and bioprinting technologies with the vascularization of hydrogel constructions.

Digital Dentistry: Thus people get personalized 3D-printed teeth [6]. Dental implants are produced commercially and increase the speed and efficiency of the entire process. A one size fits all depending on age before fake teeth. Now people of the same age may have teeth of different sizes that cause people to feel uneasy with fake teeth. Thus, custom implants have actually given the consumers a sigh of relief because they can now receive the right teeth for themselves.

Prosthetics: Many people need replacement body parts from individuals who are born to accident victims without limbs. The cost for obtaining substitute body parts was once extremely costly, but the costs were substantially decreased thanks to 3D printing. The prosthesis did great things to people with disabilities with the world-famous example of the Paralympic champion Oscar Pistorious. As a kid, his legs were cut off from Oscar Pistorious, but it did not stop him, let alone from running during the Olympics [6, 8].

Bionics: 3D printed bionic ears [6] were produced by Princeton researchers and John Hopkins. The listening takes place via electronics. This can help hearing deaf people.

Artificial Organs: The additive processing of stem cells also gives rise to numerous options to print artificial organs, although most work is still being performed experimentally. Scientists were enabled, for example, by 3D printing at Heriot-Watt University, to grow clusters of embryonic stem cells. This realm of expectations for the printing of the actual artificial organ [6, 14] looks forward to an endless era.

3.3 Manufacturing

The period of rapid development has started with 3D printing. Now you can pass beyond the prototyping stage to hit the final product [15]. The 3D printing technology is applied to print car and aircraft parts. Parts are distributed easily and effectively, allowing a major contribution to the supply chain [15]. Custom products are created as buyers can change and submit the program model file to the producer. Nokia has made substance able advances in manufacture in this area with the launch of 3D modeling files from its case to its end users [16] so that it can tailor the 3D case to the needs of its customers.

3.4 Domestic Usage

In the house, 3D printers can be used to create small objects, such as necklaces, rings, and ornamental objects. In a domestic climate, small plastic toys may also be made. In the future, instead of shopping, people will print their own goods at home [15, 17].

3.5 Clothing

The fashion sector was not spared either. It is made of 3D printed clothing. 3D-printed bikinis, shoes, and clothing are experimented by fashion designers. For athletes with 3D prototype [4], Nike made a 2012 Soccer Shoe Vapor Laser Talon [18] and a New Balance customized football shoe [4]. The production was carried out on a business scale.

3.6 Academia

3D printing has also been introduced into the research programmed for use from imprinted molecular structures to plastic gears [19]. Students can now print 3D

versions of their idea that allows students to understand them. Students can better understand ideas, since they can be seen in reality.

4 Benefits

The following benefits were demonstrated by 3D printing:

- Lower cost: In China, 10 storage houses for less than $5000 could be built per house [11]. Similar building costs far beyond the price specified.
- Time: 3D object printing can be carried out directly, unlike the traditional production, where various components had to be combined for the final product. Three-dimensional printing enables companies to build models of work within hours instead of days or weeks [4, 18].
- Efficiency: 3D printing technology makes generating prototypes much easier and faster.
- Flexible: The 3D models may use various materials. For a wide variety of projects in many industries, this makes creating models or prototypes very simple.
- Durable products produced: The objects will not absorb humidity or warp with time, so that they last longer.
- Quality: Products are manufactured with good surface finish.
- Functional Models: True live immersive models can be created in contrast to digital paper models. Things are more practical than that.

5 Future Work

In the field of 3D printing, the future looks bright with the following areas:

5.1 Manufacturing

A survey conducted by Gartner found that in the next five years, 65% of supply chain experts plan to invest in 3D printer in manufacturing industries. According to the latest report, 3DP could serve a demand of $400 billion by 2030 [10]. Organizations that are now piloting and building the 3DP foundation are ideally equipped to gain potential value the sectors illustrated in Fig. 4.

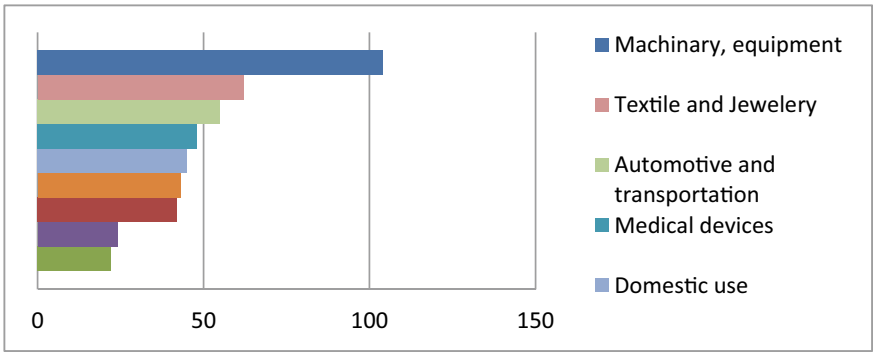

Fig. 4 Recent analysis representing a $400 billion manufacturing market for 3DP by 2030 [10]

5.2 Medicine

3D printed organs: In future, transplantation parts will be the outcome of combining stem cell research and 3D printing. 3D printing of functional components [6, 20] is possible.

Skin grafting: Healthy skin from one section of the body protecting the injured portion of the body is used in the grafting of the tissue. It is well known that the operation is a very difficult process. Researchers at the University of Toronto have developed a skin grafting procedure to selectively create layers of skin, and to transform skin cells and various polymers into 3D impressers. Wake Forest University in Winston-Salem, inspired by the veterans of conflict, the College of Regenerative Medicine, is designed to print the skin directly on burnt wounds. They noticed that most of the casualties of war were burnt patients who had to undergo a hideous skin grafting procedure. In the near future, all this analysis will eventually become a reality.

5.3 Commerce

Amazon has established a store for a 3D printer. They plan to sell 3D digital design files and then the customer prints it by himself [15]. This will revolutionize the product supply side as consumers can print whatever products they wish.

6 Conclusion

The 3D printing industry is on the road to progress, as seen by development prospects. As technology advances, applications for 3D printing are growing. The

way customers get goods will change 3D printing, as shown by the Amazon platform. The sector is certainly a game changer with a lot of opportunities.

- A Gartner study revealed that 65% of supply chain experts expect to invest in 3D printers in the industrial sectors in the next five years.
- The immediate future offers the usage and advancement of innovation technologies in the areas of individual health treatment, as well as scientific and study practices.
- Medicine is optimistic for the future of 3D printing technologies, but 3D printing will revolutionize a significant portion of healthcare in general.
- Focusing on education will enable more 3D printing applications and adoption.

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