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3D PRINTING USING IOT

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ABSTRACT

An abstract of 3D printing could highlight its transformative impact on various industries and disciplines. It would likely mention its ability to fabricate intricate objects layer by layer from digital designs, offering unprecedented flexibility and customization. Additionally, the abstract might discuss the diverse range of materials used in 3D printing, from plastics and metals to biomaterials, enabling applications in fields such as aerospace, healthcare, automotive, and consumer goods. Furthermore, it might touch upon emerging trends such as large-scale construction and the integration of artificial intelligence to optimize printing processes. Overall, the abstract would emphasize 3D printing's potential to revolutionize manufacturing, design, and innovation across numerous sectors.

INTRODUCTION

A typical introduction to the concept of 3D printing would include a general overview of this technology, including its fundamentals, uses, and importance. Here's an example of an opening: Overview of 3D Printing: Transforming Innovation and Manufacturing
3D printing is a revolutionary technology that has gained popularity recently. It has the ability to completely transform conventional production methods and open up new creative and innovative possibilities. 3D printing, commonly referred to as additive manufacturing, creates products layer by layer from digital blueprints as opposed to traditional subtractive manufacturing techniques, which entail removing material from a solid blocks.

The fundamental idea behind 3D printing is additive manufacturing, which builds three-dimensional things of almost any complexity or form by layering materials on top of one another. Compared to conventional production techniques, this additive approach not only enables unmatched design freedom but also drastically lowers material waste.

Applications for 3D printing are found in many different fields and businesses, including healthcare, architecture, fashion, aerospace and automotive engineering, and more. For example, 3D printing in aerospace makes it possible to fabricate lightweight, structurally sound components that improve performance and fuel efficiency. Comparably, 3D printing is transforming healthcare by making it easier to produce customised prosthetics, medical implants, and even organ models for surgery planning.

Furthermore, 3D printing has made manufacturing more accessible to people, small companies, and entrepreneurs, enabling them to quickly translate their ideas into real items with little initial outlay of funds. The hurdles to entry into the manufacturing industry have greatly decreased with the availability of increasingly more materials and affordable desktop 3D printers.

With advances in materials science, software, and hardware capabilities driving its rapid advancement, 3D printing technology has the potential to upend established production paradigms and spur advancements across a wide range of industries.

LITERATURE REVIEW

An introduction to the issue, including background on 3D printing technology, its history, and its relevance in many sectors, would usually come first in a literature review on the subject.

Thereafter, the review would examine the body of work and organise it according to several themes or subtopics. They could consist of:

❖ Technological Advancements: Talking about how 3D printing techniques like stereolithography (SLA), selective laser sintering (SLS), and fused deposition modelling (FDM) have developed.

❖ Applications: Examining the wide range of uses of 3D printing in a variety of sectors, such as consumer products, manufacturing, healthcare, aerospace, and automotive.

❖ Materials: Examining the several materials, including composites, metals, ceramics, and polymers, that are utilised in 3D printing. describing their characteristics, applicability for various uses, and new materials like electrical filaments and biodegradable polymers.

❖ Challenges and Limitations: Dealing with the present difficulties and restrictions associated with 3D printing technology, including issues with scalability, resolution, speed, expense, and material qualities.

❖ Regulatory and Ethical Considerations: Analysing 3D printing-related regulatory frameworks and ethical issues, such as those pertaining to intellectual property, safety requirements, and the effects of broad adoption on the environment and employment.

❖ Future Directions: Making predictions about the state of 3D printing technology, possible game-changing discoveries, new trends, and directions for more study and advancement.

It is important to critically assess the current research, pinpoint knowledge gaps, and suggest directions for further study throughout the literature review.

METHODOLOGY

The processes and techniques used to create three-dimensional items with additive manufacturing technology are referred to as 3D printing methodology.

❖ Digital design: The first step of the process involves either digitising an existing object using 3D scanning technology or creating a digital 3D model using computer-aided design (CAD) software. The real thing to be printed is designed using the digital model as a guide.

❖ Slicing: Slicing software is used to divide the digital model into thin, horizontal layers. A cross-section of the object to be printed is represented by each layer. Layer-by-layer material deposition and nozzle or laser movement in 3D printers are controlled by G-code, which is generated by the slicing software.

❖ Printing method Selection: An appropriate 3D printing method is chosen based on the intended material, resolution, and use. Stereolithography (SLA), Digital Light Processing (DLP), Selective Laser Sintering (SLS), and Fused Deposition Modelling (FDM) are examples of common technologies.

❖ Material Selection and Preparation: A variety of criteria, including strength, flexibility, durability, and surface polish, are taken into consideration while choosing the right printing material. Composite

materials, metals, ceramics, thermoplastics, and photopolymers are materials that are often utilised in 3D printing. Then, the material is fed into the 3D printer in pellet, powder, resin, or filament form.

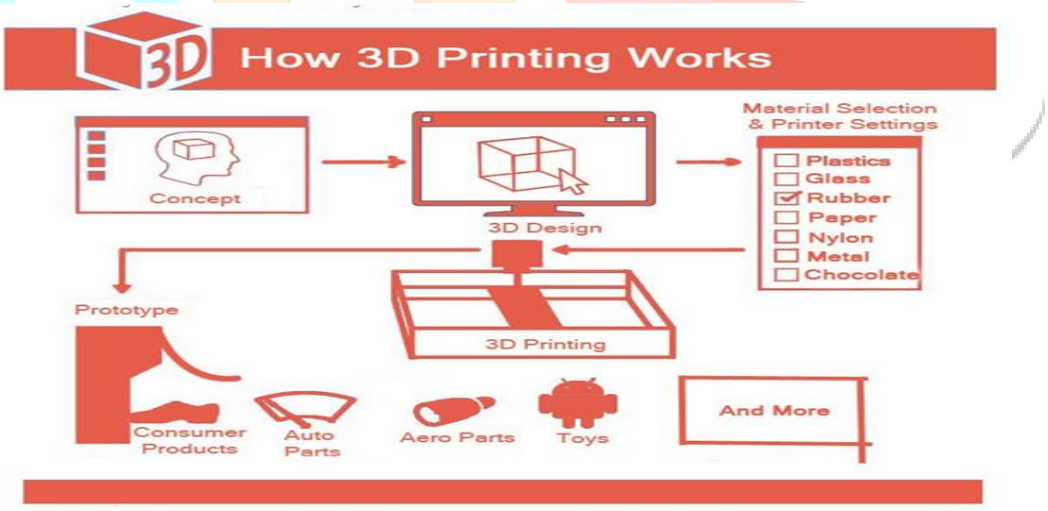
❖ Printing Procedure: The 3D printer starts printing by executing the commands produced by the slicing software. Layer by layer, the printing material is selectively deposited or cured by the printer nozzle or laser, progressively building up the item from the bottom to the top. Every layer unites with the one before it to form a strong, continuous framework.

❖ Post-Processing: To enhance the object's mechanical qualities, surface smoothness, or accuracy after printing, post-processing may be necessary. Depending on the printing technology and material used, post-processing processes might include sanding, polishing, painting, heat treatment, or removal of support structure.

❖ Quality Control: To make sure the printed item satisfies the required requirements and standards, quality control procedures may be used at any point during the printing process. Monitoring variables like layer height, temperature, speed, and material consistency may be necessary for this.

❖ Testing and Validation: In order to confirm that the printed item functions as planned and is suitable for its intended use, it may finally go through testing and validation. Functional testing, dimensional inspection, and mechanical testing are examples of testing techniques.

Manufacturers and designers may use 3D printing technology to create practical goods, prototypes, and complicated geometries at previously unheard-of speeds, flexibility, and efficiency by following these steps.



GENERAL PRINCIPLES

➢ Additive manufacturing follows three steps in the process.

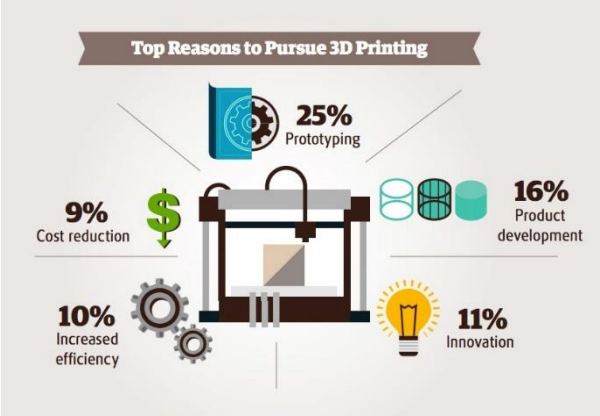
- Modelling
- Printing
- Finishing

➢ Modelling

- 3D scanners, animation modelling software, and computer-aided design (CAD) provide virtual blueprints that are used in additive manufacturing.
- The process of gathering information on the form, appearance, and analysis of real objects in order to create digital, three-dimensional models.
- Digital cross-sections of the models are cut out so that the machine may utilise them as consecutive printing guides.

- Printing
  - The machine reads the design from a 3D printable file in order to execute a print. (Stereolithography; STL file)
  - The model is constructed by layering liquid, powder, or sheet material over a sequence of cross sections.
- Finishing
  - For a lot of things, the resolution of the printer generated is sufficient.
  - Greater accuracy can be obtained by printing a slightly larger version of the intended object at normal resolution, then subtractive deleting material using a higher resolution.
  - Supports are used to support overhanging parts during creation and are either detachable or dissolvable when the print is finished.

BENEFITS OF 3D PRINTING

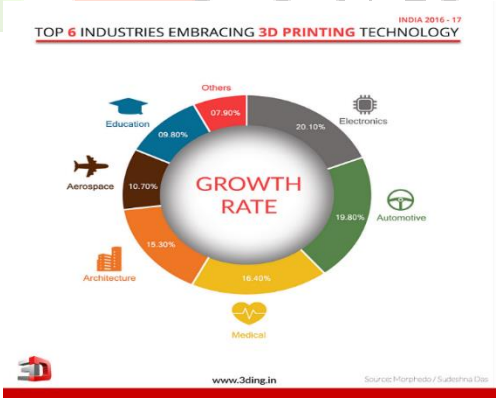


- Single step manufacturing process
- Increase innovation
- Improve communication
- Reduce development cost
- Faster product delivery
- Reduce material wastage

ADVANTAGES AND DISADVANTAGES

Advantages	Disadvantages
Ability to customize products	Intellectual property issues
Rapid production of prototypes	Unchecked production of dangerous items
Low cost of production	Limitations of size
No storage cost	Limitations of raw material
Quick availability of organs	Cost of printers

APPLICATIONS



- Health care
- Education
- Rapid prototyping & manufacturing
- Consumer production
- Automotive
- Construction
- Aerospace
- Entertainment

RESULTS AND FUTURE ENHANCEMENT

RESULTS:

- Social change
  - The traditional bond between the office and home might break down.
  - Send new object designs effortlessly throughout the world.
  - Inexpensive medical treatment.
- Reduction of environmental pollution
- However, materials that don't deteriorate might be discharged into the environment.
- Health effects
- Exposure to large amounts of harmful organic chemical particles.

- ❖ Ownership of intellectual property by 3D printer users.
- ❖ Criminals create products illegally using 3D printers.
- Anyone could download and replicate firearms.
- The capacity to create 3D firearms, explosives, and other weaponry.
- Card readers for bank machines.

FUTURE ENHANCEMENT:

- ❖ Open source laboratories using open source scientific equipment.
- ❖ Applications based on science, such as the reconstruction of fossils in palaeontology.
- ❖ Replicating precious and old artefacts from archaeology.
- ❖ Forensic pathology: reconstructing bones and body components.
- ❖ Restoring severely damaged evidence that was collected during crime scene examinations.
- ❖ The technologies being investigated at the moment for building construction.

CONCLUSION

- ❖ The world could undergo a radical transformation thanks to 3D printing technology.
- ❖ Many different industries benefit greatly from 3D printing.
- ❖ However, given that it is still a new technology, there are a few drawbacks that should be taken into account when selecting a technique for product creation.

REFERENCE LIST:

- Bhumika Marolia
- Youtube channel-Naadaya