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Technical Magazine

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MECHANICAL ENGINEERING

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DEPARTMENT VISION

TO BECOME A CENTRE OF EXCELLENCE IN MECHANICAL ENGINEERING STUDIES AND RESEARCH.

DEPARTMENT MISSION

- Provide congenial academic ambience with necessary infrastructure and learning resources.
- Inculcate confidence to face and experience new challenges from industry and society.
- Ignite the students to acquire self-reliance in State-of-the-Art Technologies.
- Foster Enterprising spirit among students.

MESSAGE FROM HOD

I feel ecstatic to introduce you to Department of Mechanical Engineering, which is the foundation of Engineers. Department of Mechanical Engineering strives for increasing the knowledge, enhancing the critical thinking, ability to change information into knowledge and power of analyzing the things technically of each and every individual of ever changing society through students.

We always intend to impart knowledge through a closed knit family of highly competent faculty. Department of Mechanical Engineering plays a vital role in an engineering college catering to the teaching of Mechanical and Humanities courses for engineering students.

Our Laboratories have been very well established not only to cover complete syllabus but to motivate students to learn beyond the syllabus which definitely develops complete knowledge of the subject (both the practical and theoretical depth of knowledge) and develop skill sets of students to become promising engineers in future.

I would like to conclude with the words of Thomas Friedman who has rightly opined “World is flat opportunities are immense. It’s just a question of identifying opportunities and making the best of them”. I wish a very best of luck to the students.

MESSAGE FROM EDITOR

The Magazine "MECHZINE" team works to bring out the annual official student-publication of department of Mechanical Engineering. Each year, our team works extensively to bring out the technical report writing skills of the students. The final publication reflects and encompasses the creative technical presentation skills inherent to the academic and upcoming areas in the field of Mechanical Engineering.

The magazine's primary focus has been geared at covering articles reflecting the student's knowledge and associations with latest and leading edge-technologies.

The magazine continues to expand its reach to achieve its vision of being a truly representative student publication.

I am thankful to all the staff and students of MECH department for their contributions in making of "MECHZINE" and I hope to build on this ethos just as much during the upcoming academic years.

MR. V. ARAVIND RAM SHARMA
EDITOR

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WHAT IS MANUFACTURING OPTIMIZATION (AND WHY SHOULD YOU CARE)?

MS. LAHARI
IV MECH B SEC

Product design and manufacturing optimization is a messy business. Glues, screws, and the ever-shrinking PCB has made it harder and harder to build something remarkable that stays remarkable for more than one lifecycle.
Not only are products getting more complex, but the process to build them at scale is getting more complicated. COVID-19 has disrupted travel and supply chains the world over – yet the pressure to launch new products has only gotten higher. In fact, the only thing higher would be consumer expectations – which demand pure perfection in exchange for mercy in their reviews.
Manufacturing Optimization is a holistic discipline that enables manufacturers to get from proto to mass production and beyond as quickly as possible, with as little waste as possible. It's a data-driven embrace of a better way – one that leverages emerging technology built on the powerful shoulders of math.
It's also not new. Major hardware brands have always looked to optimize their build processes, typically in the form of large one-off consulting engagements. A brand might invite an expert team in to analyze their end-to-end product development and manufacturing processes and recommend a list of opportunities to improve, to be executed over months or years following the audit.

Today, with the expansion of IoT connectivity in factories and cloud platforms that provide data access and transformation, teams are increasingly able to take optimization into their own hands, driving continuous – rather than instantaneous – optimizations at the level of individual processes, whole factories, or even across a complex supply chain.

To put it less whimsically, manufacturing optimization means using data to go faster. Faster at finding defects, faster at validating solutions, and faster at maturing products. Faster where it counts.

PRODUCT DESIGN OPTIMIZATION

Product design optimization is a focused subset of optimization which takes into account the shape, size, component assembly, desired functionality, and consumer lifestyle of a market need in order to build the most effective device possible to meet the demand.

- As manufacturers look to build new products to introduce to post-COVID market, designs will need to be smarter and processes more efficient to lower costs and reduce rework that may waste limited supply resources.
- They must also reach for unprecedented functionality to outpace competitors in their market and establish undeniable demand for the product.

This requires that engineers analyze their product design to assess if components are too close together or difficult to place facing the same direction, if placement of functional parts are too close batteries or overhangs, if component fragility is a potential problem, etc.

A product designer must predict the needs of the manufacturer so that both market needs and the manufacturing process are achievable. Their goal is to minimize operational time and cost, eliminate needless material that add weight, reinforce weak areas that may fail or cause issues in the field, and other design-specific defects. This can include deciding between glues and screws, whether or not to hand solder, or the size of your coax cables.

HERE ARE A FEW NEW APPROACHES TO CONSIDER:

Find more issues in EVT builds. If you focus on getting a full catalog of issues, you'll realize that certain design features create clusters of similar issues that might be better resolved through a broader design change.

Operate against the entire pareto. Most product teams are just scrambling to fix the obvious issues that happen. Those are often not the most critical or nefarious. Change your mindset to find every issue as early as possible. Putting more effort here (or deploying an optimization tool to do so) will save weeks by allocating resources to solve issues more efficiently.

Focus on traceability. Make sure you have the right data ahead of time, it will save you time later.

4D PRINTING: ALL YOU NEED TO KNOW

MR. KUMARASWAMY
II MECH

Introduction

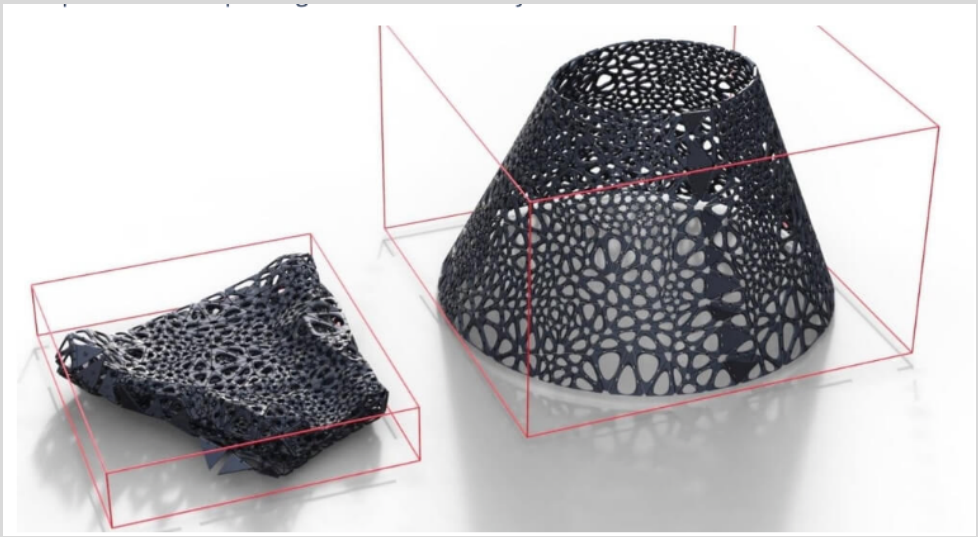
3D Printing technology has existed for almost 30 years now. Yet, while the Additive Manufacturing industry is still discovering new applications, new materials, and new 3D printers, another technology is arising.

It is called 4D Printing and is coming straight from the future! How do we add the fourth dimension to 3D printing? Even if we have previously introduced you to how materials change shape with this technology, in this blog post we will go together through 4D Printing technology itself, and investigate its potential and its future applications.

What is 4D Printing?

4D printing is the process through which **a 3D printed object transforms itself into another structure** over the influence of external energy input as temperature, light or other environmental stimuli.

This technology is part of the project of MIT Self-assembly Lab. The purpose of this project is to combine technology and design to invent self-assembly and programmable material technologies aiming at reimagining construction, manufacturing, product assembly, and performance.



What is the difference between 3D Printing and 4D Printing?

- Obviously, 4D Printing has one more “D” than 3D Printing. What does that mean and why does it bring so much added value to the technology?

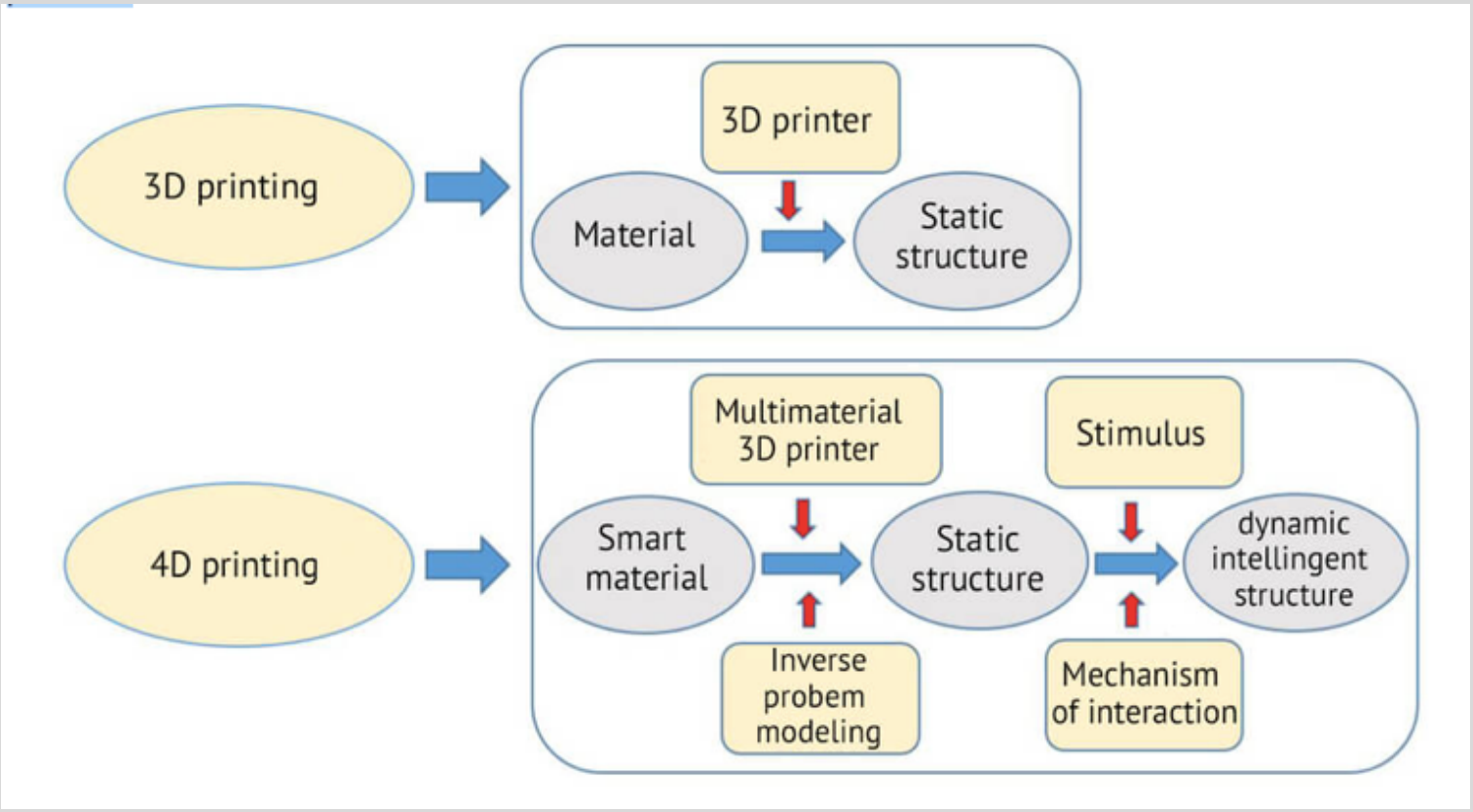
- 3D Printing is about repeating a 2D structure, layer by layer in a print path, from the bottom to the top, layer by layer until a 3D volume is created.

- 4D Printing is referred to as 3D printing transforming over time. Thus, a fourth dimension is added: time.

- So, the big breakthrough about 4D Printing over 3D Printing technology is its ability to change shape over time.

- **How does 4D printing work?**
- 4D printing technology uses commercial 3D printers, such as Polyjet 3D printers.
- The input is a “smart material”, that can be either a hydrogel or a shape memory polymer.
- Thanks to their thermomechanical properties and other material properties, smart materials are given the attributes of shape change and are differentiated from the common 3D printing materials.

- On the other hand, objects printed with 3D Printing technology, are characterized by rigidity.
    - That means that the 3D printed objects are going to keep their 3D shape once printed.



Advantages of 4D Printing

- **Size changing**
  - The most obvious advantage of 4D printing is that through computational folding, objects larger than printers can be printed as only one part.
  - Since the 4D printed objects can change shape, can shrink and unfold, objects that are too large to fit a printer can be compressed for 3D printing into their secondary form.
- New materials= new properties
  - Another advantage of 4D Printing technology is the usage of possible applied materials. 4D printing has a vast potential to revolutionize the world of materials as we know it today. Imagine 4D printing being applied to a variety of smart materials that today we cannot even imagine!
  - Until now, we have seen experiments of Multimaterial Shape Memory Polymers. Materials like the ones featured in the video below, “remember” their shape, actively transforming configurations over time in response to environmental stimuli.

Potential Applications of 4D Printing

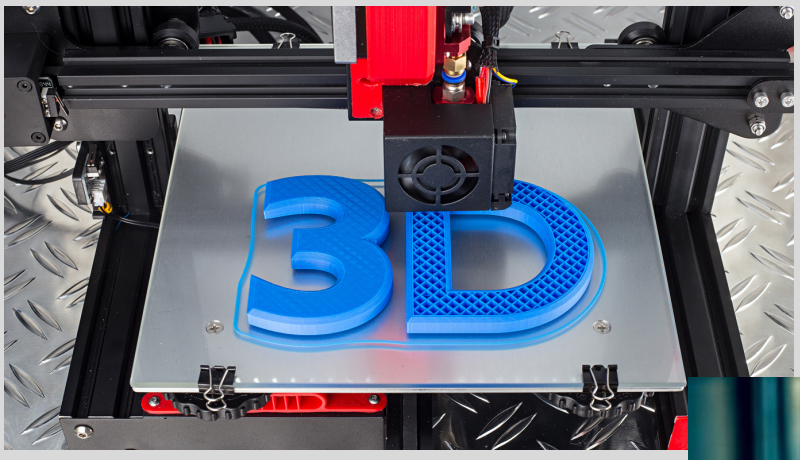
Though, even if these examples are not characterized by great complexity, we can foresee great potential in this technology.

Self-repair piping system

One potential application of 4D Printing in the real world would be pipes of a plumbing system that dynamically change their diameter in response to the flow rate and water demand. Pipes that could possibly heal themselves automatically if they crack or break, due to their ability to change in response to the environment's change.

Self-assembly furniture

Since 3D printing furniture is limited by the size of the printer, 4D printing could allow to just print a flat board that will curl up into a chair by just adding water or light to it.



HYPERLOOP

MS.JYOSHNA
II MECH

Hyperloop is a new form of ground transport currently in development by a number of companies, It could see passengers travelling at over 700 miles an hour in floating pod which races along inside giant low-pressure tubes, either above or below ground

There are two big differences between Hyperloop and traditional rail. Firstly, the pods carrying passengers travel through tubes or tunnels from which most of the air has been removed to reduce friction. This should allow the pods to travel at up to 750 miles per hour.

Secondly, rather than using wheels like a train or car, the pods are designed to float on air skis, using the same basic idea as an air hockey table, or use magnetic levitation to reduce friction.

Supporters argue that Hyperloop could be cheaper and faster than train or car travel, and cheaper and less polluting than air travel. They claim that it's also quicker and cheaper to build than traditional high-speed rail. Hyperloop could therefore be used to take the pressure off gridlocked roads, making travel between cities easier, and potentially unlocking major economic benefits as a result.

The idea of using low-pressure or vacuum tubes as part of a transport system has a long heritage.

The Crystal Palace pneumatic railway used air pressure to push a wagon uphill (and a vacuum to drag it back down) way back in Victorian south London in 1864.

Similar systems using pneumatic tubes to send mail and packages between buildings have been in use since the late nineteenth century, and can still be seen in supermarkets and banks to move money around today.

One clear predecessor of the Hyperloop is the 'vactrain' concept developed by Robert Goddard early in the twentieth century; since then, many similar ideas have been proposed without much success.

However, it was entrepreneur **Elon Musk** who really reignited interest in the concept with his 'Hyperloop Alpha' paper in August 2013, which set out how a modern system would work -- and how much it would cost.