

Generative Design



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Generative design is powered by artificial intelligence, which explores thousands of possibilities for innovative designs. The designs are not invented by artificial intelligence, rather they are human designs refined using artificial intelligence Technology replicates natural world's evolutionary approach with cloud computing to provide thousands of solutions to one engineering problem. The way everyday items from chairs to cars to power tools are made is being reimaged through a new process called generative design.

Generative Design –The user defines the rules and goals of the generative design process, and the computer software creates the possible outcomes within given parameters. The aim is to optimize solutions for one or more design goals.” Senior Specialist Dave Morse elaborates that, for CAD, CAM and CAE workflows, features of Autodesk Inventor are useful for design, simulation and visualization, but it’s Autodesk Fusion 360, a cloud-based product, which enables users to harness the power of the cloud for generative design.

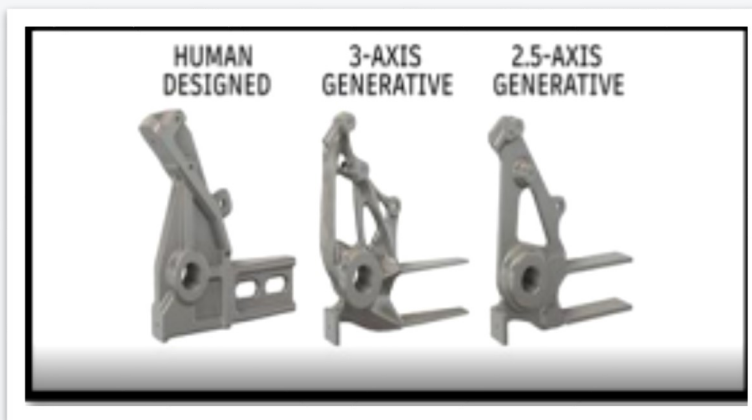
So what is Generative Design? Generative design controls machine learning to nature’s evolutionary approach to design. Designers or engineers input design parameters (such as materials, size, weight, strength, manufacturing methods, and cost constraints) into generative design software and the software explores all the possible combinations of a solution, quickly generating hundreds or even thousands of design options. From there, the designers or engineers can filter and select the outcomes to best meet their needs.

Imagine if instead of starting a “drawing” or CAD design based on what you already know or ideas that are in your head, you could tell a computer what you want to accomplish or what problem you are trying to solve. For example, say you want to design a chair.

Instead of drawing two or three options (maybe 10 if you're really creative), you can tell the computer you want a chair that supports X amount of weight, costs X much, and uses X material. The computer can then deliver hundreds, if not thousands, of practically and easily manufacturable design options that all meet that criteria and are likely options that you could not conceive on your own. That's the power of generative design.

Generative design is not limited to product development, it can also apply to larger scale projects such as buildings and office spaces. In the near future, items that we use every day, the vehicles we travel in, the layout of our daily work environment and more will be created using generative design. Products may take on novel shapes or be made with unique materials as computers aided engineers in creating previously impossible to conceive solutions.

In the following graphic example from the Redshift article, the human designed part costs \$15 to produce, but it requires the use of a custom die-cast process. The generative-designed version milled on a 3-axis CNC machine costs \$100. The fully-optimized 2.5-axis version costs \$25 with no custom tooling required and using existing machine-shop equipment.



Using artificial intelligence (AI), generative design enables engineers to create thousands of design options by simply defining their design problem inputting basic parameters such as height, weight it must support, strength, and material options.

A few of the most forward-looking companies in the world, including Airbus, Under Armour and Stanley Black & Decker, are using generative design to solve engineering challenges and come up with design solutions that the human mind could never think on their own. With generative design, engineers are no longer limited by their own imaginations or past experience. Instead, they are collaborating with technology to co-create more, better, with less: more new ideas, products that better meet the needs of users, in less time and with less negative impact on the environment.