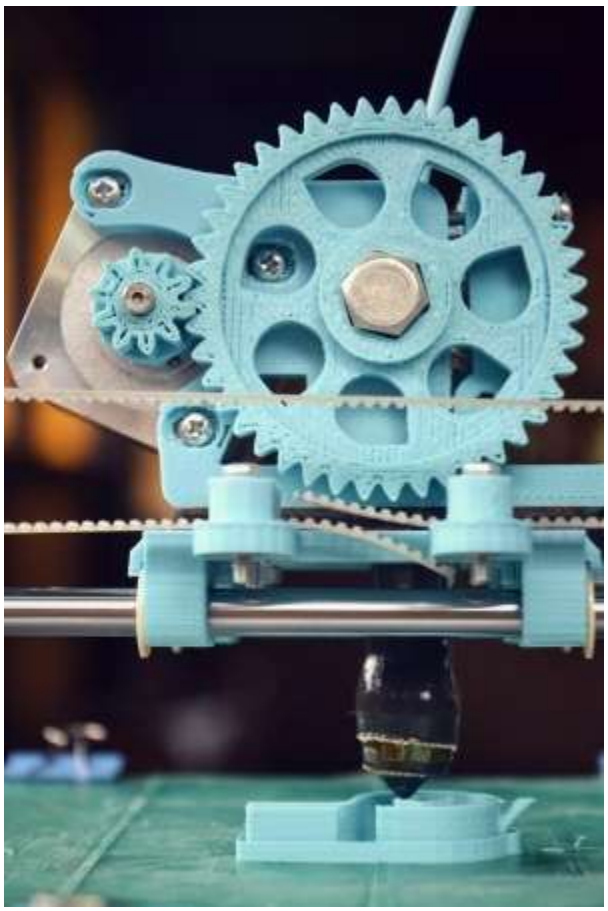
FROM REAL TO VIRTUAL AND BACK: CURRENT AND FUTURE TRENDS IN 3D IMAGING



By now, you've probably heard a lot about 3D data acquisition and reconstruction. The 3D revolution is quickly changing our modern world. Fast-evolving technologies have made it increasingly simple for even home users to translate objects from the physical world into digital data that can be stored, manipulated, edited, and otherwise tweaked in cyberspace.

This trove of digital information can then be used to summon imaginative objects into the real world. Already, functional 3D printers enable hobbyists to recreate any number of objects, of course with certain limitations. Most consumer-level objects are rendered in thermoplastic or biodegradable organic materials.

At present, 3D imaging and printing are novelties among consumers. However, 3D imaging/printing is poised to become the next transformative technology. Consumers may be slower to adopt, but commercial interests cannot afford to ignore the promise of 3D acquisition and reconstruction for tasks like rapid prototyping and more. Experts expect the technology to drive innovation in numerous industries, including architecture, engineering, art, aerospace, education, manufacturing and even medicine.

Endless Possibilities

The possibilities of 3D imaging seem limitless. It’s now possible to build rough prototypes using traditional methods, scan those objects into a computer, manipulate the obtained data sets to make final virtual improvements, and then 3D print the final prototype object. Even though computer assisted design (CAD) has been around for decades, advances in computing and other technologies are taking CAD to a new level.

The potential advantages for manufacturing are fairly obvious. Opportunities for streamlining the prototyping process are one example. Once 3D data has been acquired, it can be quickly manipulated, refined, altered and improved using nothing more than sophisticated software. Digital modeling and fabrication are quickly becoming indispensable tools. 3D modeling software, combined with machines, such as CNC routers, laser cutters, and 3D printers are capable of yielding physical objects in a variety of materials.

3D printing, also called additive manufacturing (AM) uses 3D data to build an object in physical space. Data is sent to an industrial robot, capable of sequentially depositing layers of material, or using techniques such as sintering or extrusion. The difference between the old and new is simple: Old techniques relied on carefully removing material to arrive at a final prototype. AM uses sequential-layer material addition or joining, under automated control, to produce a 3D object from the ground up.

Image Acquisition

There are a number of techniques available to acquire appropriate 3D image files. The process can be as simple as using multiple exposures from 2D cameras, to sophisticated images constructed using computed axial tomography (CT) scan.

Of course, CT uses X-rays to penetrate beneath the surface of an object, providing detailed information about its internal structure.

3D images may also be acquired using other forms of sensors. Lasers, for example, are employed by the Laser Imaging Detection and Ranging (LIDAR) system to provide terrestrial scanning information about large, possibly hidden objects in the landscape. When combined with ground-level images (photogrammetry), this technology can render 3D models of buildings, roads and other structures — yielding, in essence, a virtual cityscape in three dimensions. Add data in the form of GPS-location tagging, and the model becomes a reliable, detailed representation of the real world. Already, this technology is harnessed to improve outcomes in archeology, architecture and other fields.

Saving Lives — Limitless Potential

Perhaps some of the most exciting potential applications involve the medicine field. A branch of 3D imaging/printing called bioprinting is already being used to manufacture tissues for prostheses and grafting — including skin, bone, cartilage, and even heart tissue. This remarkable use of AM combines biocompatible materials with cells and other components to generate living, functional tissues suitable for transplantation and safe assimilation into the body.

“3D printing allows for tailor-made materials for personalized medicine,” said Horacio R. D’Agostino, M.D., in a recent press release. “It gives us the ability to construct devices that meet patients’ needs, from their unique anatomy to specific medicine requirements … With some patients, the current one-size-fits-all devices are not an option,” added D’Agostino. “3D printing gives us the ability to craft devices that are better suited for certain patient populations that are traditionally tough to treat, such as children and the obese, who have different anatomy. There’s limitless potential to be explored with this technology.”

This arguably represents the most sophisticated use of the technology to date, as the challenges involved in building suitable biological materials from scratch are considerable. Just a handful of years ago, these trials seemed insurmountable, yet new applications are emerging almost on daily. Limitless potential indeed.

Source: http://www.apriso.com/blog/2015/03/from-real-to-virtual-and-back-current-and-future-trends-in-3d-imaging/