3D Tech for AEC: 4 Trends You Need to Know
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The digitization of construction is dependent on the development of 3D technologies. Many established companies and startups are endeavoring to take advantage of 3D capture, visualization and modeling technologies that go beyond creating 3D CAD models. From 3D scanning done by robots to software that can make 3D measurements from 2D pictures, the below are four trends in 3D AEC tech to keep your eye on.

**Automatic and Autonomous 3D Reality Capture**

“Deploying an integrated solution in the real-world environment doing dirty and dangerous work, before, during and after the construction stage is a common vision… which can help drive the transformation of the construction industry.”

– Michael Perry, VP of Boston Dynamics

When working at a construction site, keeping track of progress is an important task to keep jobs on schedule. The process of capturing jobsites accurately and completely can be a time-consuming one, which can reduce the frequency of captures performed – ultimately diminishing the value that the scans were intended to provide.

There is clear value to reality capture tools that can help contractors to spot mistakes while there is still time to correct them, confirm that communications between design and construction teams are effective, and just getting more people on the same page about the status of a project. Some companies are even required to turn over this documentation to stakeholders after the building is completed.

To accomplish these scans or captures at a frequency that is most useful, however, can be a daunting and time-consuming one for individual jobsite workers. Several AEC technology companies are now developing solutions intended to minimize the man hours involved while maximizing the usefulness of the result. One way that this has been tackled is by introducing autonomous or semiautonomous vehicles or platforms to perform the capture for them.
Boston Dynamics

In 2019, Boston Dynamics announced several key partnerships in the AEC space to bring their robotic “dogs” to the construction site. Designed to be cutting edge in how it navigates uneven terrain and varying conditions, “Spot” the robot can carry various scanning packages of laser scanners or 360 cameras. AEC companies Trimble, Hilti, HoloBuilder and Faro announced that their platforms were being developed to work with the robot platform, meaning that there’s a good chance you might find one of these walking around your jobsite sometime soon.

Scaled Robotics

Robotics and software company Scaled Robotics has taken a slightly different approach, by developing the software and hardware together to make the capture of on-site conditions as intuitive as possible. Built on top of the Autodesk Forge API, their software should be really familiar to those in the AEC space, and the simple controller for the robot makes it easy to adopt. Their robot system uses a lidar attached to a semi-autonomous wheeled robot that can automatically navigate around obstacles in pre-programmed paths. One setup, the robot captures scans along the path, and the resulting data is processed and analyzed into actionable information – creating a heatmap of problem areas, highlighting sections that are out of spec, etc.
OpenSpace

Rather than wrangling robots, OpenSpace has harnessed the power of workers who are already on the job with their solution. By using smart, hardhat-mounted sensors, construction sites can be scanned while supervisors are doing their site walks, or while construction is occurring. Since their debut, OpenSpace reports that its customers have now collected more than 500 million square feet of data from construction projects around the world.

Quicker Modeling and Viewing

“We can create intelligent 3D mesh models in a fraction of the time. This accelerated modeling and reduced risk of error contribute to a direct reduction in costs when compared against traditional methods of modeling and point cloud data analysis.”

– Ben Callan, BIM Coordinator at ISG

When a project has complex models with huge file sizes, they quickly become unwieldy, and can become relegated to only the computer with enough processing power to handle them. The problem of being able to view, share, and get actionable information from such huge files is a complex one, but several companies have pioneered solution to get scans and models into use more quickly and easily through a combination of machine learning, cloud processing, and other strategies.

Pointfuse

The Pointfuse modeling engine was designed to convert the point clouds generated by 3D scanners into usable 3D models as quick as possible. The new solution uses data from mobile mapping systems and converts them into mesh models.
for use within popular BIM and facility management software platforms. Early testing identified that 3D was as quick to create as traditional 2D workflows and exported data was in the region of hundreds of kilobytes compared to the gigabyte data volumes of the original point cloud.

**Tridify**

Tridify, a Finnish company that started out by developing VR applications for engineers and architects, have been working on a solution to get BIM viewable for more people. Tridify has augmented their BIM processing service to allow for a BIM to be *instantly available online and shareable* via a web link. To accomplish this, Tridify generates interactive 3D models from BIMs that have been exported to an IFC format. The interactive BIM is then accessible online, and can be embedded on a website or even viewed on a mobile phone.

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**New Ways to Visualize: Augmented and Virtual Reality**

“We feel like the great revolution of this technology is that it goes well beyond visualization and simulation. It’s also about transportation – the ability to take anyone, from any place, with any idea in to a shared space, instantly.”

— Gabriel Paez, CEO of The Wild

With the push to digitize construction workflows comes an obvious need: to be able to visualize the work on the jobsite. It is now not enough to have the building model locked in the trailer on a desktop computer or seen only on printed plans. There have been several innovations for enterprise use that harness augmented reality (AR) or virtual reality (VR) to produce views that were previously science fiction.

As faster wireless networks and 5G begin to come online in 2020, these AR and VR applications are poised for broader adoption throughout the AEC pipeline.
Trimble Site Vision

With their focus on accuracy, Trimble has devised an augmented reality application for viewing models exactly where they should be in the field, via a smartphone or tablet. Their SiteVision application can download models of buildings, piping, or whatever else needs to be viewed, and then position them with embedded GNSS coordinates. The model can then be walked through, examined and modified. If there are any clashes or conflicts, especially with objects in place in the real world, they can be captured through the app to inform future design decisions.

Microsoft Hololens 2 and Bentley SYNCHRO

Bentley Systems’ SYNCHRO software has been used to develop construction plans that can be viewed as they happen through time – to help planners identify any contingencies, dependencies or potential wastes of time by coordinating the “dance” of systems being installed. Liberating SYNCHRO from the desktop is the Microsoft Hololens 2, a mixed reality headset that displays partially see-through projections. With the XR version of SYNCHRO, users wearing the Hololens 2 can place a model in front of them on any surface or even stand inside the room that they are examining. The annotations and embedded information and the capacity for more than one team member to be looking at the same visualization promises to be a leap forward in how design and construction teams plan their work.
The Wild

Designed to be a fully immersive VR workspace, The Wild is aimed at changing the way in which people work collaboratively. The Wild acts as its own environment, where participants can join up to look at BIM files together. They can hover over a city like giants, put a building on a table in front of them, or even teleport to inside – all while sharing the same view, regardless of physical location. Having someone on site, a stakeholder or owner, and the construction manager all in the same space at the same time is cost and time-saving, and The Wild hopes that the ease of getting everyone in the same virtual space will contribute to fewer mistakes and rework as well.

2D Images to 3D Measurements

“Creating a 3D solution compatible with smartphones is a huge step towards reaching that goal, allowing the broader community of billions of iPhone and Android users to access the capabilities of our technology.”

– Matterport CEO R.J. Pittman

There are some steps in the construction workflow that are repetitive, tedious, and prone to user error. Taking measurements on the job site is one of those that tops the list of most repeated actions – and also one that can be miscommunicated when passed through a line of people who need to know that measurement. Several scanning companies have introduced ways to use photographs and scans to quickly annotate and share measurements, making sure that the people who need the measurements are getting the right ones quickly.

Leica BLK3D Web

Knowing that not all of the people on a jobsite would have access to powerful 3D scanning software suites, last year Leica created a BLK3D web version of their BLK3D Imager software. The new software works with the small, portable
BLK3D device which captures 2D images embedded with 3D data. Resembling a smartphone in size, the device has a stereo camera and built-in edge computing power that has applications for project management, site inspection, validation, and change documentation. With a BLK3D Publisher license, 3D image files can be easily and securely uploaded to the cloud. Once published, the 3D image files can be viewed and measured with BLK3D Web via a shared link – getting everyone on the same page quickly.

**Matterport “smart measurement”**

Aimed at bringing 3D capture and measurement to the broadest audience possible, Matterport has been working hard on a phone-based application that can turn consumer smartphones into 3D capture devices without the need for any additional hardware. Their cloud-based imaging processing software and AI engine, Cortex, makes it possible to turn 2D panoramic images captured with smartphone cameras into 3D, allowing iPhones and Android devices to become 3D capture devices. The bonus is that there is now the ability to interactively and automatically measure and share the dimensions of any feature. This includes objects within the space but also things as large as floor plans, doorways, windows and walls. Using a combination of computer vision and AI, Matterport is capable of segmenting and identifying rooms within a space, providing dimensions in all axis, and calculating area and volumetric-related information, which is both useful and accessible without expensive equipment.

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