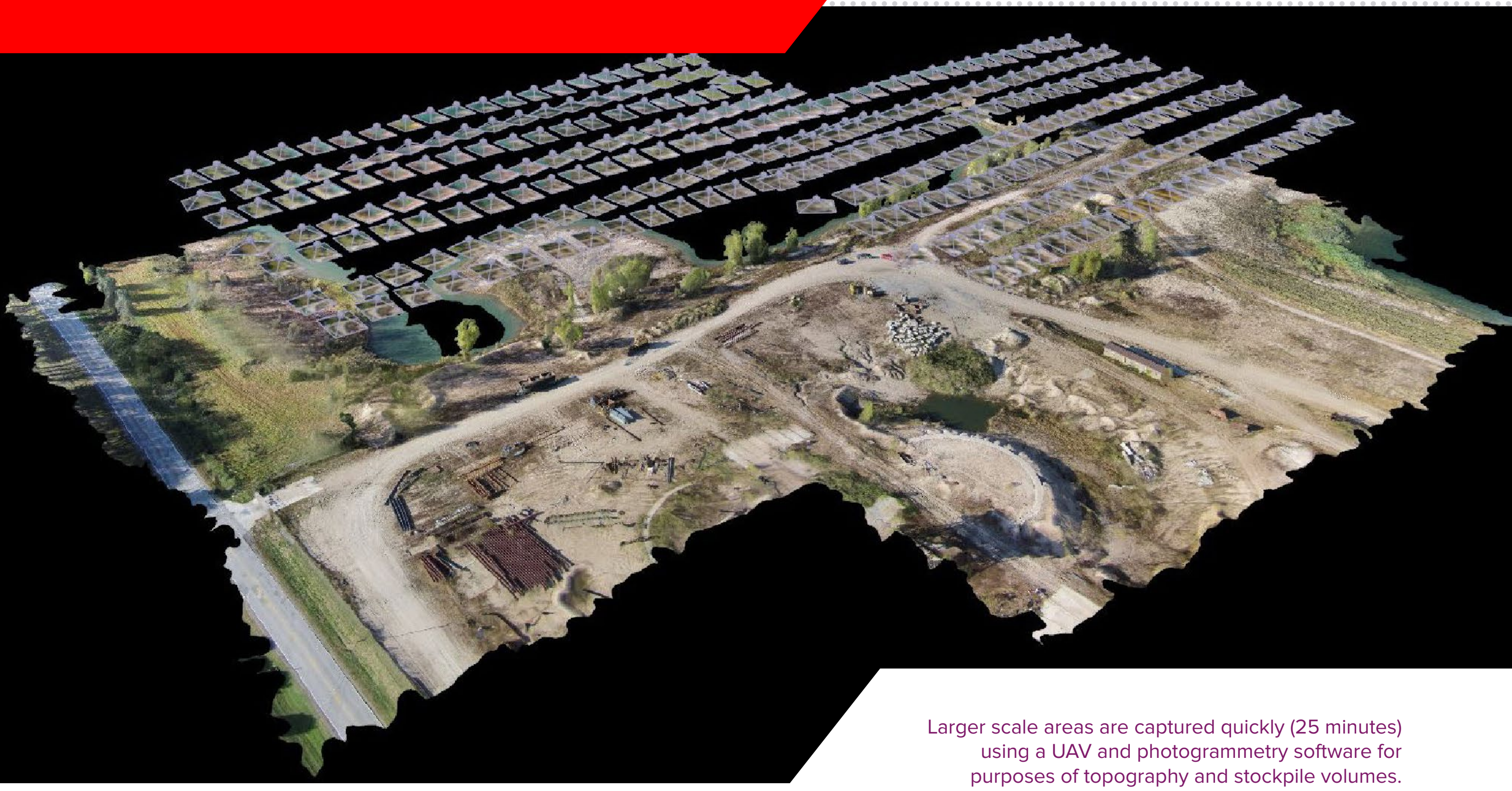

Larger scale areas are captured quickly (25 minutes) using a UAV and photogrammetry software for purposes of topography and stockpile volumes.

What's in Store for Reality Capture for 2016?

Building information modeling and 3D design are nearly standard in the building industry. It took companies a long time to understand the power and efficiencies that came with switching from 2D to modeling. The same is happening with reality capture. Reality capture is not new, but like 3D modeling, it has taken some time for engineers to understand its power and justify the investment.

2016 is going to be a big year for professionals looking at 3D scanning and drone-based photogrammetry to see how these technologies can improve their existing workflows.

Today, cameras mounted on any kind of platform, for example an unmanned aerial vehicle (UAV), can take photos at high enough resolutions to create 3D models for many applications. Obviously, cameras do not generate as accurate a model as a high definition scanner (HDS). However, depending on project needs, a less detailed model can sometimes be more efficient as well as less expensive.

As the Federal Aviation Administration finalizes the requirements for UAV flights, the data that drones can capture is becoming more usable—finding its way into conceptual designs as well as finals when the

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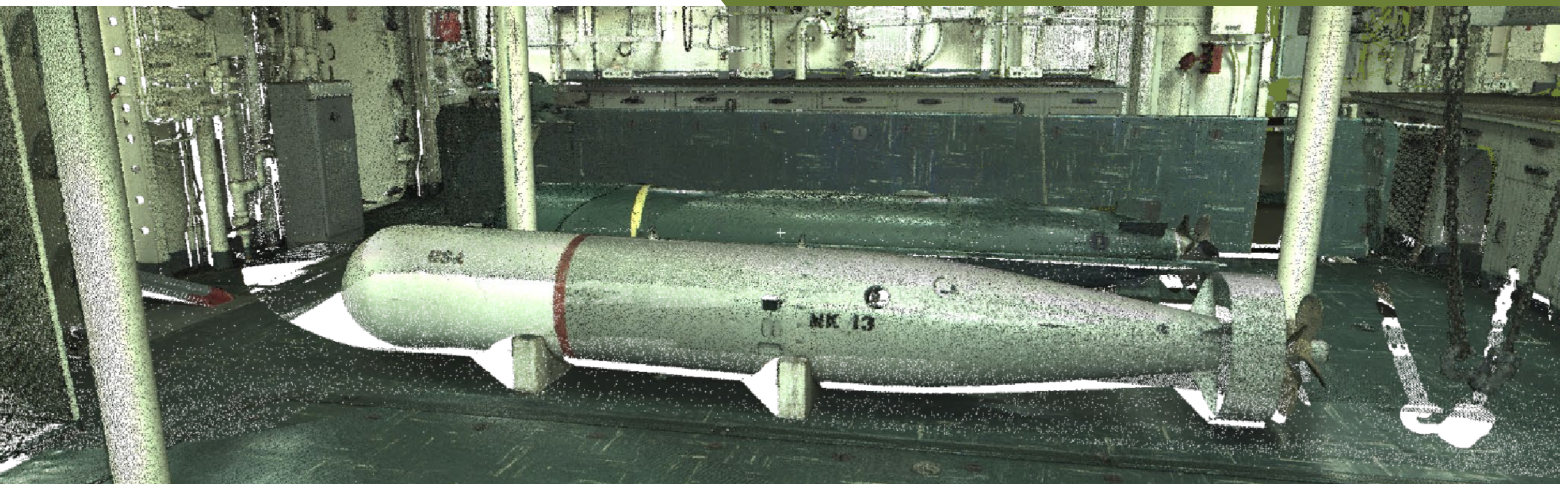

Intricate and precise details (3mm of 3D Positional accuracies) are able to be captured with this HDS Laser Scan of the USS Hornet torpedo work room in Oakland, CA.

tolerances they provide are acceptable. Whether capturing data with a UAV or a point and shoot camera with low-cost entry, firms continue to grow their understanding of reality capture technology and its applicability to particular markets. Through photogrammetry, users can take their collected photos and run them through a pixel mapping process, generating tie points and densified point clouds, volume calculations, or even 3D meshes and contour lines.

Buying a camera and a UAV will only take you so far, however. Firms must consider the processing, modeling and management phases as well to turn a point cloud into a profitable addition to workflow processes.

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Capture

The three basic ways to capture terrain or built environment information digitally include High definition mobile LiDAR systems like Leica's Pegasus systems, digital cameras using photogrammetry and terrestrial based LiDAR or 3D laser scanners.

UAV's have increased the speed of data collection, and they can carry either cameras or an aerial LiDAR unit. Both scanning and photogrammetric methods result in a point cloud. While scanning can capture fine details such as material textures, the speed with which photogrammetry produces a point cloud is significantly faster. So you have to weigh capture techniques against your final product. Do you require fine detail or not? If you do, the cost of HD scanning, while higher than camera-based capture, could be worth it—depending on your application.

Processing

There are a number of different ways to register the cloud to geo-coordinates. Most photogrammetric camera and scanner manufacturers provide proprietary software to bring the data gathered into a digital format for registration. Software companies also offer post-capture processing programs that recognize more than one format —Autodesk ReCap 360, for example.

The number one question in all of this is, what resolution and accuracy is needed to complete the project. Resolution is an extremely important consideration since point cloud files become huge very quickly. Their

With lighter weight, nimble, network and cloud based point cloud data available to all project stakeholders, project collaboration is improved throughout the project lifecycle.

size can overwhelm CPUs, creating file sharing and online collaboration problems. Keep in mind that capturing a large amount of data does not always equate to improved accuracy. The important thing is to right-size your choices. Maybe you simply can't make do with a 36-megapixel camera and do need an HD scanner.

Modeling

Once the point cloud has been registered to reference points that make up roofs, roads, walls, pedestals or any other structures, you'll need geometry recognition software to create solid models. Designers can then import the solid model into 3D design programs.

There are several options. Say you gathered the data with a Leica scanner to produce the point cloud and wanted to create an AutoCAD model, you could use CloudWorx for AutoCAD, or Autodesk ReCap. For BIM deliverables, Scan to BIM can extract models from a point cloud regardless of how it was imported into the Revit environment.

Further along the process, construction firms can use Navisworks to compare the design against the as-built reality, post construction. In this case, surveyors collect data using a Leica scanner, register and process it with Cyclone. Then a design engineer can use CloudWorx for Navisworks to bring the point cloud directly into Navisworks for clash detection, without ever needing to import/export the data to shift file formats.

Data Management

Leica built a data management tool called JetStream to remedy the system strain commonly found when working with large point clouds. JetStream is a server based high-performance data stream for HDS projects. It manages full density "ALL the data ALL the time" with a 'level-of-detail' delivered in real time, eliminating the requirement to refresh. Together JetStream and CloudWorx support high productivity workflows where no one gets bogged down waiting. JetStream's central data store compresses files to 10%-20% of their original size and network access eliminates data duplication on multiple workstations. This simplifies back-ups and file management while reducing time to design and money in terms of productivity.

Collaboration

Point clouds for project background in design, construction management, and owner involvement add great value by enabling collaboration. As reality capture and point clouds become ubiquitous, making them more nimble and accessible is key as we progress throughout 2016.

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