

The 3-D Scanning Game Changer

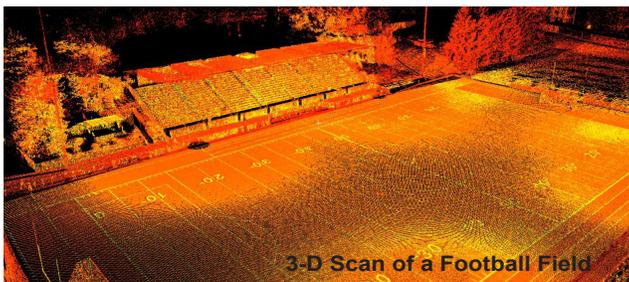
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When paradigm shifts occur, you know it. I remember like it was yesterday the first time I saw Michael Jordan play basketball. It was one of those “Whoa!! Who (in all that’s holy) is THAT guy?!” Same goes for Tiger Woods and the first time I saw him swing a golf club. I honestly don’t know much about sports, but those first impressions were all it took to know these guys were game changers. The rest, as they say, is history.

One thing I do know is the A/E/C business - and over the past 30 years I’ve seen and been part of a few “game changers” there as well – like when computers took away my ink pens, my blueprints and my addiction to inhaling ammonia. After that came the Internet, digital cameras and smartphones; no need to discuss those.

Now it’s happening again. The world of engineering, construction and manufacturing is currently undergoing a new game changer – this time through the expanding functionality and use of 3-D scanners. All I can say is I hope I live long enough to fully experience how 3-D scanners will issue a burgeoning paradigm shift in manufacturing and construction. But even if I don’t last that long, exciting opportunities are being realized right now - and its time to act on them. You see, whenever manufacturing processes experience a quantum technological leap, like they did with the cotton gin or the assembly line, new economic frontiers open up in the those industries. In more specific terms, now that 3-D scanners are being fully integrated, it’s time to revisit all that we assume as a “given” regarding the economic realities of manufacturing and construction because things that didn’t “pencil” before - now will!

As a brief overview, 3-D scanners are like a 3-D fax machine. Scanners work by shooting thousands of pulses of light per second at the desired object(s) being scanned. Those light pulses will “bounce” off almost any surface and reflect back to the scanner which, by the way, can be either stationary or in GPS calibrated motion. The reflected light is recorded by the scanner as a 3-D image and as thousands of 3-D (X,Y,Z) coordinates – properly referred to as a “point cloud.” The scanner keeps repeating the process and then statistically refines the accuracy of the point cloud. For example, scanners are now being used to re-manufacture engine parts. Now that’s accurate!



With the advent of 3-D scanning, combined with the computing power to process it, the number of new and creative business opportunities is truly staggering. Let your mind run wild: You want perfectly fitting shoes? Scan your feet and email the file to a shoemaker. Want to re-create the skeleton of a T. rex? Go to the museum and scan one. How about a brand-new, exact replica of a WWII Spitfire? Just scan the parts of one and send the files to a CNC machine or its applicable equivalent. Do you need to mill out-of-production parts (for engines, pumps, boats, etc.), custom moldings, antiques, furniture, etc.? No problem. Here’s another one. How about a 30 foot tall exact replica of Michelangelo’s David? That image might be a little disturbing – but you get the point. Prior to 3-D scanning and powerful computers, none of these things were economically viable or practical. For example, asking to borrow Michelangelo’s original statue to use as a mold for replication might not be well received. With this technology, all those limitations are gone ... poof!

In the A/E/C industry, 3-D scanning has been slow to take off. This is primarily due to entrenched standard practices, limited computing power (point cloud files are huge), and similar to when the Internet began, a lack of application vision and realization of its economic advantages. We’re also suffering from a deficit of specialized software and software operators – i.e., AutoCAD operators who can master programs such as Revit and Navisworks (as BIM applications) and learn how to apply them to real-world applications. All that said, real-world functionality has now been proven to a point where development of a marketplace for scanning applications is beginning in earnest. It’s just a question of market vision and exploring the new frontier.

For the A/E/C community, many of the initial forays into the marketplace for 3-D scanning are being pursued in the surveying/facility documentation service market. Huge advantages can now be realized because, for many applications, scanners can reduce the required in-field survey time. What once took a survey crew five days in the field can now be done in one. Moreover, instead of collecting a thousand conventional X,Y,Z points, we now can scan hundreds of thousands. Office reduction time can be as simple as “harvesting” from the point cloud the original sought after 1,000 points, or more time can be spent harvesting and processing a million points – reduction time is simply a function of knowing what you’re trying to accomplish.

This is where the economics in the A/E/C world have shifted. It’s well known that “field time” is the most expensive task of a land or facility survey. With 3-D scanning, it only needs to be scanned once and you’ve got it all – and I mean ALL. If you want to know dimensionally everything about an object to two or more decimal places, just harvest that information



from the point cloud in the comfort of your office.

The more difficult site access is the more advantages 3-D scanning has because you no longer need to “occupy” the point you’re measuring as is the conventional practice. For example, if you want to develop a 3-D model of the local zoo’s grizzly bear exhibit, just scan it from the spectator viewing platform. That should make OSHA happy. What about performing a seismic certification on an oil rig clear up in Barrow, Alaska? Trust me; you only want to go there once. And with scanners, you don’t have to worry about informing your client that your survey crew didn’t collect enough data and need to fly back to Barrow.

There are other benefits as well. Years later, that same client may have a new project on the oil rig – like replacing some old piping. Those projects start by performing an existing pipe inventory. Its January and fifty below in Barrow! No worries. A site visit to measure pipe is no longer necessary. Not only do you already have all the data, but you can prepare the inventory from your winter office in Hawaii. Your client will also appreciate the savings in travel and site visit costs. That is until scanning becomes a standard surveying practice – which it will.

Are there drawbacks? You bet. Scanning is difficult in heavy brush if ground topography is being gathered. Anytime a lot of superfluous stuff is in the way, it’s not good. But mostly that can be overcome through multiple scanner setups. Scanning also doesn’t do that well in heavy rain, for obvious reasons or get those measure downs for manholes of structures below the surface. For large, open-field surveying, a scanner currently only has about a 200 foot effective radius. That means lots of setups to survey large areas. Conventional approaches using longer shots or GPS technology may work better for that “open field” style surveying. There are other current hurdles as well but you can count on technology improving over time. For now though, it’s time to dive in and learn every aspect of this technology and its applications. When clients want to know “what, when and how much” PACE will demonstrate our leadership by having those answers. That knowledge is also the seed of creativity. I don’t know about you – but I love doing things that were never done before!

Have no doubt; 3-D scanning is here and here to stay. Its equally certain that A/E/C industry will evolve to fully integrate the technology. Those who have the vision and are recognized as “first movers” to embrace the paradigm shift will capture a larger share of the market and be rewarded with the marketing bragging rights.

All that enthusiasm aside, the devil, as they say, is still in paying attention to details. In order to fully embrace this change and integrate it into our services, careful consideration of a number of factors is necessary. A very short list of some of these are as follows:

1. *What will the future market segmentation of scanning services look like?* For example, it’s very possible that services for scanning freeways, bridges and airports

may be dominated by DOT’s, Port Authorities and/or Google. Should PACE target those potential clients or exploit other markets?

2. *What methods should be used to price scanning services?* Who will own the scanned data? Who will be certified to “harvest” and manage point cloud data? Could it be that “he who owns the data makes the rules?”
3. *Services need to match current capabilities* – Caution is warranted to ensure that we don’t over sell and under deliver. There are inherent liabilities with new practices and service offerings. For example, under what conditions can and will certain accuracies be achieved?
4. *Data storage and retention* – As for many new technologies, the magnitude of the data is increasing, and increasing exponentially. How should that data be archived for future use? Large (10+ acre) “data centers” are now being constructed. How will those fit into the picture?
5. *Client deliverables* – What steps are necessary to ensure that client expectations are met using scanning and modeling technology? We don’t want to model the whole piano when only rough dimensions are required. The job requirements should control which tool or technology to use. Not the other way around.

Although the above are very important considerations, they are not intended to assuage anyone’s ambition to pursue 3-D scanning product ideas or service offerings. It’s still early in the paradigm shift. This is the time to think up applications and find those opportunities that now make perfect economic sense. Paradigm shifts like this don’t come along that often – let’s not let the opportunities posed by this one pass us by.

How PACE Can Help

PACE is available to assist you by providing:

- Strategies to capture as much data as economically as possible the first time without remobilizing
- Methods and procedures to capture data safely and efficiently
- Accurate and well-defined deliverables that are clear and concise
- An approach that will help you collaborate with other stakeholders
- A review of your existing data gathering processes to discover new efficiencies through the use of 3-D scanners

For more information on PACE’s 3-D scanning capabilities, please contact David Poulson at 503.597.3222 / davep@paceengrs.com or Aaron Blaisdell, PLS at 425.827.2014 / aaronb@paceengrs.com.

