The Eyes Have It

Visualization is being used in many areas of engineering. Read some insights from an engineering firm manager who has spent 15 years working with the technology.

For companies in the AEC industry, the use of 3D visualization technology is becoming a much larger part of the project-delivery process. At National Survey & Engineering, headquartered in Brookfield, Wisconsin, and serving the land development industry, visualization services have been part of the firm's offerings since 1999. With 250 employees in five offices—four in Wisconsin and one in Pittsburgh—the firm uses visualization technology in many residential, commercial, and transportation projects.

JON CHAPMAN

Jon Chapman, National Survey & Engineering's manager of visualization services, shared his views on how visualization technology has changed, where it's headed, and considerations for making the technology part of your firm's services.

PE: You've been working on virtual imaging projects for over 15 years. What are the biggest changes in the technology and its application that you've seen during this time?

Chapman: The use of virtual imaging on projects has become much more mainstream in the past 15 years. Early on in my profession, I had to spend a lot of time educating clients on the technology and showing them how it could help their cause. That has changed over time. Now, many clients are already convinced they need it before we talk to them, which is great, because then we can concentrate more on the product itself.

PE: Describe the level of demand that National Survey & Engineering is seeing for visualization services.

Chapman: We have seen an increase in the volume of work in the time I've been at National Survey & Engineering. We originally started the service as an internal support service, but over the years, we have grown it into a stand-alone service for external clients as well.

PE: What are the factors driving that demand?

Chapman: Like many industries, our services depend a lot on many influencing factors, including the economy, the cost of undeveloped land, the municipality in which the project is being proposed, the type of client and the type of project. We have done a lot of residential work over the years, but within the past year or two, residential has slowed some, but our commercial work has increased during that same time. There are different ways of looking at it. For instance, with the residential market slowing, you could argue that that would lead to less of a demand for visualization services. However, you could just as easily

AN AERIAL PERSPECTIVE RENDERING DEPICTS PROPOSED IMPROVEMENTS, INCLUDING A SERIES OF FOUR ROUNDABOUTS AT THE I-94/COUNTY HIGHWAY P INTERCHANGE AT THE PABST FARMS DEVELOPMENT IN OCONOMOWOC, WISCONSIN.

argue that the same slowing could make the market more competitive for builders and developers, which would then force them to become more creative at how they market their product. Visualization is an ideal tool for presales and marketing.

PE: How do the various players in a project—owner, engineer, architect—benefit from 3D visualization?

Chapman: It depends on the type of project. If we take a commercial project, for instance, oftentimes we get involved while the project is still being designed. Several options may have been designed. Which is the best one? Visualization helps to remove the visual ambiguity that surrounds traditional plans and elevations. The designers can use the technology to help evaluate multiple design concepts, enabling them to pick the highest quality solution. It has been our experience that when used during the governmental approval process, visualization improves the quality of communication between the municipality and the developer, as it simplifies the issues at hand and helps both parties mutually solve problems more quickly. This ultimately results in a better project getting built sooner, which obviously makes everyone happy. It's a win-win-win.

PE: What developments in visualization technology are you most excited about?

Chapman: The technology that we use in design visualization is commonly referred to as "trickle down" technology from the feature film and gaming industries. So, with that being said, high-definition video is exciting to us as it really has not been used much in our industry. We have recently done some testing, and we will be offering that output in the very near future. Also, I believe that immersive virtual reality, as it becomes more affordable, will make major impacts in our industry. In immersive VR, the user becomes fully immersed in an artificial 3D world and is able to interact with that environment through the use of input devices—such as data gloves, joysticks, and hand-held wands—and other sensual technologies, such as directional sound, tactile and force feedback devices, and voice recognition.

PE: Are there any significant barriers or shortcomings of visualization technology that you believe deserve the most attention?

Chapman: I think the biggest shortcoming surrounding design visualization as a whole stems from the users. Typically we are, by our own nature, very technical people. It is easy to get caught up in the technology and lose sight of the big picture. At the end of the day, the imagery that we create as professionals will be used by somebody to make some kind of decision. Whether it's a plan commissioner recommending approval or denial of a project or a potential buyer trying to make a decision about buying a house, that decision will be influenced by emotion. It's the emotion that our imagery invokes that we should be most concerned about. Sometimes, a more "photorealistic" image will help you to invoke the right emotion, other times something more conceptual or softer will be much more effective.

It is easy to get caught up in the technology and lose sight of the big picture....It's the emotion that our imagery invokes that we should be most concerned about.

PE: Do you have any must-follow rules for creating 3D visualizations that work or potential pitfalls to avoid?

Chapman: Client communication and education. Oftentimes, a client will tell you

PHOTO CREDIT: NATIONAL SURVEY & ENGINEERING

what they think they want, without knowing what's involved in fulfilling that request. Take the time to thoroughly meet with your client, listen, ask questions, and offer sound advice based on your experience. The time that it takes to do this will enable you to put together a detailed scope of services, which will serve as a map of sorts for both you and your client throughout the creation process, and ultimately lead to a successful project and a happy client.

PE: NSPE has many members who work for small and medium-sized engineering firms. What advice do you give to those who may be considering offering visualization services?

Chapman: Understand what you will need in terms of an investment in order to offer these services. There are software and hardware costs, which based on the typical visualization configuration we use at National Survey & Engineering will run, at a minimum, $12,000 for software (multiple pieces of software needed) and $4,500 for a workstation. This investment will give you the means to produce renderings.

If you are going to create animations, you will need to understand the basics of what is involved in the production of these animations. When you watch a movie, what you are actually seeing are anywhere between 24 and 30 individual still images, or frames, played in rapid succession. Depending on the complexity of your scene, the level of detail required, and the quality of your lighting solution, each frame may take anywhere from 3–60 minutes to process on one computer. If you have a 60-second animation, that equates to a minimum of 1,440 frames, and at a very modest six minutes of processing time per frame, that equates to 8,640 minutes, or 144 hours, or six straight days of uninterrupted computing time. Quite frankly, this is not practical for a variety of different reasons.

There is a better solution. This is where "render farms" come in. Render farms are simply any number of computers on a network that work together as a team to process your animation. So, instead of one computer processing those 1,440 frames, you could have 20 computers working on it, cutting your render time down tremendously—in this particular case, it would cut it down to approximately 430 minutes or just a little over seven hours.

At National Survey & Engineering, we have built a small to medium-sized farm of nearly 80 computers, or nodes. These nodes are primarily made up of workstations that are used during normal business hours by other staff, and then used in off business hours as render nodes. If you don't have a farm setup similar to this, there is one other option, and that is to use a render farm service. There are several, and the premise is very similar for all of them. You submit all of your project files to the service, and then you pay them to use their render nodes. Once all of the frames are processed, you download them via the Internet. Pricing varies, depending on the service.

The most important investment, however, should be in your artists. Ideally, look for tech-savvy people with a strong artistic foundation, an architectural influence, and good trouble-shooting skills. Just when you have a particular workflow or technique mastered, relentless "advancements" in technology, such as a new version of software or a new media, change the game. To keep up with all of the advancements in technology, an investment in training and R&D is critical. For National Survey & Engineering, some of that training is provided by outside consultants. The rest is simply the time our staff puts in to keep abreast of all of these changes. It is a never ending, constant battle, and if you choose not to fight, you will lose. PE

PHOTO CREDIT: NATIONAL SURVEY & ENGINEERING

A RENDERING OF A PROPOSED COMMERCIAL DEVELOPMENT WAS PREPARED BY NATIONAL SURVEY & ENGINEERING FOR MUNICIPAL APPROVAL PURPOSES AS WELL AS SALES AND MARKETING EFFORTS.

