HUMAN PERCEPTION IN A DIGITAL WORLD

Virtual, augmented reality applications help users better understand the built environment

By Robert Manna

Though often used together, there are fundamental differences between virtual reality and augmented or mixed reality.

Virtual reality gives users, through a headset with built-in screens, the experience of inhabiting an artificial physical space that is entirely rendered by a computer.

Augmented or mixed reality is intended to blend the virtual (computer-driven) with actual reality via a headset or mobile device that allows the user to see the physical space while computer generated renderings of objects are overlaid and contextualized with it.

Each has its merits and applicability to the design, management and maintenance of facilities, as well as varying degrees of complexity to meet specific needs or expectations.

VIRTUAL ENCOUNTERS

The simplest approach to virtual reality is the use of a smartphone and a specific type of rendered image called a stereoscopic panorama — a 360-degree image rendered twice (slightly different viewpoint for each eye); they are often rendered from the computer models used to develop the design. The image is displayed on-screen and smartphone movement mimics the behaviour of standing in one spot and looking all around. If the smartphone is put into a harness like a Google Cardboard, the feeling will be like the user is standing in the space.

The smartphone and Google Cardboard approach are great for very quick turnaround and ease of sharing; however, the experience is quite limiting, particularly in terms of navigation. This approach is popular for broader use like fundraising and capital campaigns because it can be widely distributed, including posting on a website.

The same models used to generate stereoscopic panoramas can often be employed (with relative) ease to create a full walk-through experience where the participant can navigate the whole model. Materiality and geometry of objects may not be 100 per cent picture perfect; however, the intent is to convey an experience. Models can be dressed up to improve fidelity but at the cost of more time and effort since that is not the

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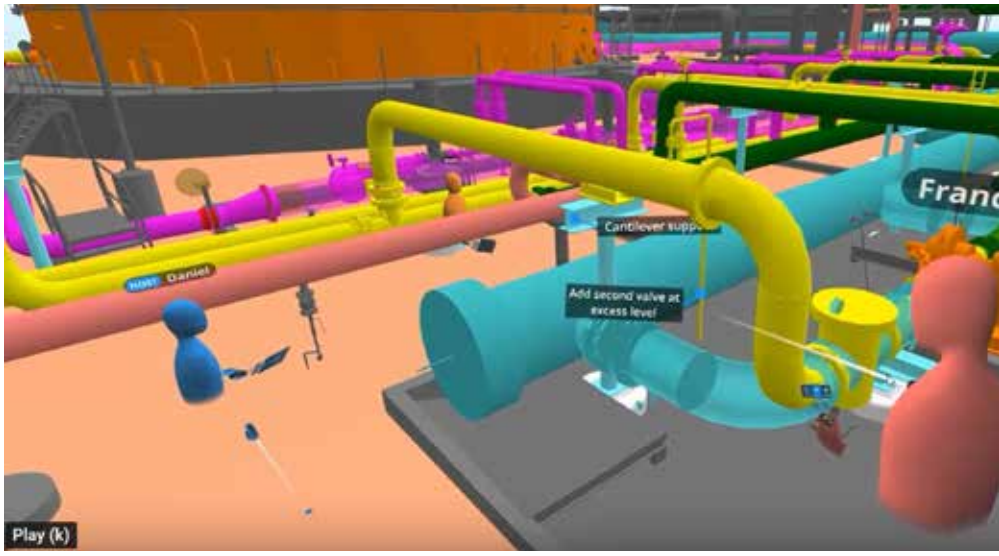
level of detail required to provide a set of drawings. Full walk-throughs require some type of dedicated virtual reality headset. This could be a tethered headset that is connected to a computer capable of high-end graphic output (similar to what a 'gamer' requires) and provides the highest fidelity, or a stand-alone headset, which only requires a WiFi connection and the Internet.

The full walk-through experience allows the user to 'feel' the virtual space. This level of virtual reality can be used to replace physical mock-ups, so users begin to intuitively understand how they would move around in the space and reach for or move objects. The drawback is the quickest way to produce walk-throughs does not typically offer any type of interaction with the space and its virtual objects. For example, maintenance personnel may be able to simulate reaching for a valve or replacing a filter, but they can't grasp or manipulate the environment.

If there is a need to more fully simulate the environment and provide a richer interactive experience, the same source models can be used as the basis to develop a more robust simulation with greater interactivity and multiple users. The effort now becomes a dedicated process to allow users to evaluate specific scenarios or perhaps rooms or systems for which the cost and expense of 'not getting it right' far outweighs the cost of setting up the virtual reality experience. This additional work might consist of richer materials and lighting effects; interactivity with a variety of objects in the space (doors,



▲ OPPOSITE PAGE: Various examples of virtual and augmented reality headsets. ABOVE: Users interacting in a virtual environment.

furniture, equipment, controls); or setting it up in such a way that multiple users can co-inhabit the same virtual space simultaneously and interact with each other.

WORLDS COMBINED

Advancing beyond virtual reality is augmented reality. While virtual reality puts the participant in an entirely synthetic space, augmented reality's intent is to combine the actual physical experience with the digital. Several manufacturers have released devices in the last five years that allow the user to see all their surroundings while being immersed in a digital experience. (Microsoft has made this a point of focus with its HoloLens.)

Augmented reality's strength is the combination of real and virtual. It can be used to envision an intervention in an existing space before construction begins. For example, in a complex mechanical room, the technology could show maintenance personnel what new pipes and equipment will look like and allow them to confirm accessibility for routine maintenance and up-keep. This information can have enormous benefits by ensuring the finished product can be properly used and maintained.

Augmented reality also has the potential to provide access to relevant digital data. This could be metrics coming from embedded sensors and systems (flow rates, temperatures) or the ability for an employee to call up the appropriate maintenance manual for a piece of equipment. It can be used to visualize concealed systems, pipes and conduit in walls, and air equipment above ceilings.

Use of this technology during occupancy assumes the necessary 3-D models and data for the facility are available and/or systems and accompanying sensors have been implemented that would allow the data to feed to the device. Also, while the more popular augmented reality devices are headsets, much of what the technology offers could be implemented on a smartphone or tablet device that has a camera. The user would 'view' through the device screen, which would superimpose the digital over the camera image.

REAL COSTS

Science fiction has long envisioned a future with this 'reality.' That future is now. Technology continues to evolve at a rapid pace and design teams can easily deliver stereoscopic images or simple walkthroughs. More complicated efforts like interactivity or augmented reality may require specialists or more advanced technology.

So how much is this going to cost?

The easiest way to answer this question is to seek opportunities to try various experiences and determine the value not only to users but all stakeholders. Clients can measure and assign a value to the potential savings through reduced physical mock-ups, cost impact of poor maintenance access or an environment that doesn't meet the end user's needs.

Also, in lieu of billing based on hours, firms should be remunerated based on a percentage of overall return on investment that the client expects from the technology and services. ■

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