

# position

The Australasian magazine of surveying, mapping & geo-information

# AUGMENTED REALITY

exploring numerous possible futures

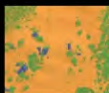
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The gamification  
of GIS



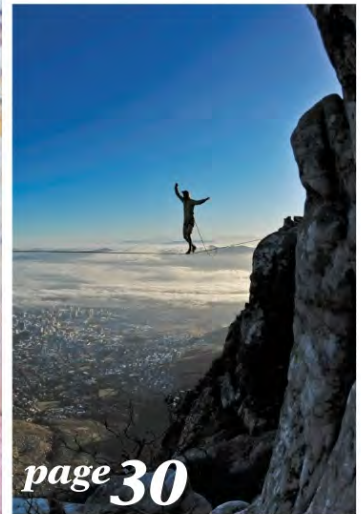
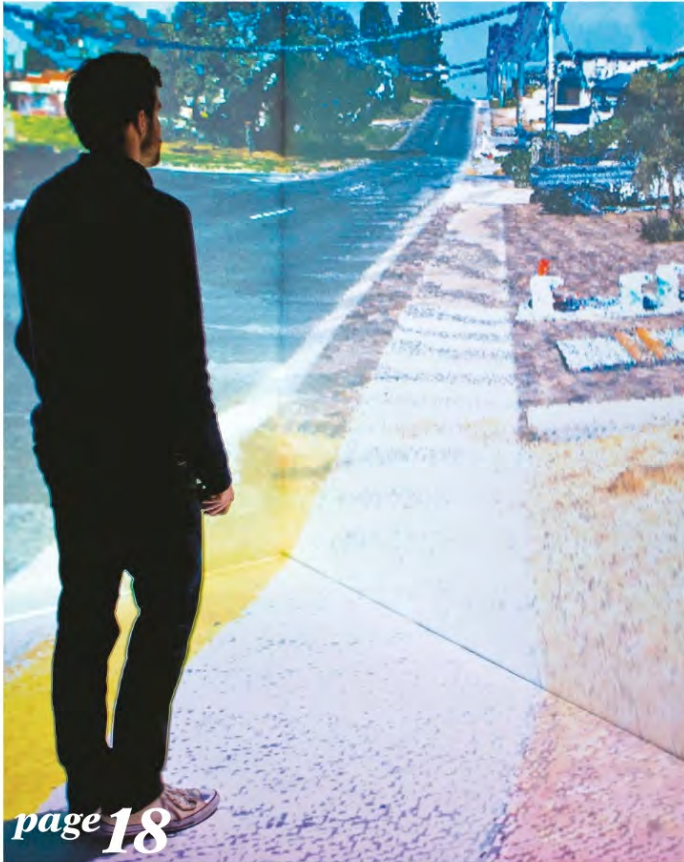
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# Augmented Survey Reality

A surveying firm in Western Australia is exploring the extents of the known Hologverse.

## ANTHONY WALLACE

Stepping into the hologram room of Western Australian surveying firm MNG Surveys, users don't just view 3D environments in a new way, they are given 'superpowers' and the ability to uncover otherwise unattainable insights. Equipped with tracked augmented reality glasses and immersed within a world supported by multiple 3D projectors, viewing experiences are no longer limited by physics or computing power, but only by human imagination.

The hologram room, or 'Hologverse' as it is known by MNG is based on an Australian augmented reality technology for viewing 3D laser scanned data and high-density point cloud data. In stark contrast to the hype and disappointment of 3D movies and televisions, MNG believes the Hologverse is different.

"The Hologverse provides users in different industries with real value," said John Nolan of MNG. "It is envisaged that its uptake will be rapid once hardware becomes mass produced and appropriate content is available."

## When data demands new directions

The concept of a hologram room is familiar to many, and over the last few decades many implementations of the mythical room have been attempted with little success. While across the board technology to implement such a room advances every year, until now the surveying applications have been, for the most part, disappointing.

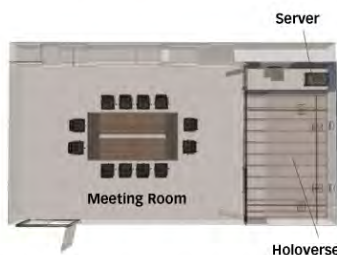
Simultaneously, the rapid advancement of scanning technologies and the introduction of mobile laser scanning has meant that even larger quantities of data can be collected – measured in 100's of gigabytes of data per day. The sheer quantity of data being collected makes it challenging to store and manipulate these datasets, and the need for new methods of visualisation even stronger.

In 2009 MNG were the first company to develop a mobile laser scanning system in Australia and went on to produce hundreds of terabytes of 3D point cloud data. Fellow Australian software company Euclidean had a product called Geoverse, a mass data manager that allowed point cloud visualisation for huge datasets such as that being produced regularly by MNG. Hence a relationship was established. When Euclidean started developing the

Hologram room using a spinoff of this technology, MNG were naturally attracted to using this technology to better communicate what had become their core product, scanned 3D data.

Euclidean was making some breakthroughs in augmented reality by looking to solve some gaming issues using a completely different method—using point clouds, rather than vector data. As a result, Euclidean's Bruce Dell had indirectly created a new point cloud viewing engine. But rather than selling the technology off, Euclidean has been able to bootstrap this success and find numerous areas where the technology can be applied.

Over the past 18 months, MNG Surveys and Euclidean have implemented one of the first Hologverses developed for commercial use. It is available exclusively for MNG in its Perth office and has been rapidly developed from a research and development concept to a commercial point of difference.



MNG's Hologverse consists of a viewing room equipped with 3D projectors, tracking domes, a server room and a meeting room with large screen for viewing.

## The Hologverse

MNG's Hologverse consists of a rectangular room, 4.2m x 2.1m and 2.4m high. On the ceiling and walls are six 3D projectors. Four projectors project onto the walls and two project onto the floor areas. In addition, there are tracking domes that detect the movement of the headset worn by the user. The headset contains a set of active 3D glasses and the user is also equipped with a gyroscopic wand to handle commands. All of this is controlled by Euclidean's software running on a server located in the room.

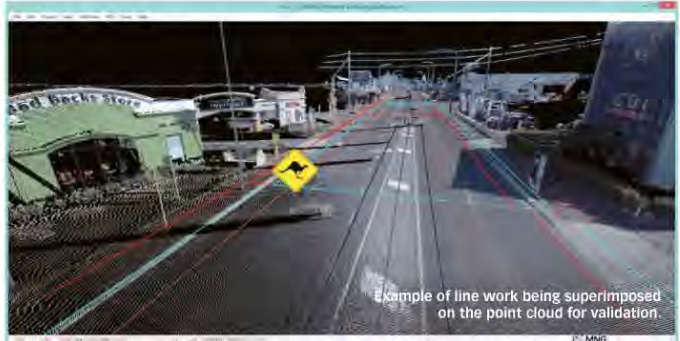
The glasses work by alternately blocking one eye then the other so rapidly that it cannot be detected by the human eye. The 3D projectors transmit two alternating images in synchronisation with the glasses - each one showing the view that would be obtained by the matching eye in the virtual world. If performed correctly, this provides the realistic 3D experience.

To create a true 3D experience, tracking domes map exactly where the user's head and eyes are oriented within the virtual world. As the user's head moves, the viewpoint in the virtual world changes to suit. In order for the scene to remain realistic, the data projected onto the world must be updated in real time. If this is done smoothly and accurately then the user immediately feels the power of virtual reality. If it is implemented poorly, the user can feel disorientated or even nauseous.

The Holoverse is unique in that it works directly with point clouds without any modelling required. In fact it is a paradox in that the standard industry requires point clouds to be modelled and transformed into polygons and vectors in order to display them. The Holoverse not only displays points directly, but it does the complete opposite and converts any traditional CAD models from textured polygons into points before displaying them. Additionally, scanning software Solidscan can be used to merge photographs and point clouds to create photo-realistic 3D models.

## The virtual world

In the virtual world, we don't just see different things; we see things *differently*. MNG describes this as having 'Superman-



Example of line work being superimposed on the point cloud for validation.



Taking a measurement in the Holoverse.

Nor is the Holoverse just an impressive copy of reality. Without the restrictions that the laws of physics limit us to, users can fly, teleport, time travel, move through walls and change scale. By pointing the controller and pushing a button users take off into the air like Superman might do. Speed is controlled by the user and either a new flight path chosen or a point of landing selected. The Holoverse also allows scaled movement,

from them. In the virtual world you can use the equivalent of a laser pointer to relate two points, extracting measurements and coordinates of any elements you choose.

## What's the use?

As a survey company heavily involved in laser scanning, MNG have discovered the usefulness of this tool for many applications, including the management of field surveys.

"If you are in the business of collecting point cloud data there is no better tool for appreciating the quality of the data you are collecting than by immersing yourself in the data set," said John Nolan.

"When traversing through your data in the Holoverse these varying point densities are clearly seen and any laminations, poles not aligning or holes in the data become apparent very quickly. The Holoverse is an excellent tool to visually inspect the accuracy, density and general quality of any point cloud data," he said.

On the client side, the most obvious application for the Holoverse is in visualisation and planning. MNG's first commercial application for the Holoverse was for a proposed development at the coastal suburb of Sorrento in Perth, Western Australia. The developers of the site were interested in building a multi-story building along the coast and were

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*"The Holoverse is unique in that it works directly with point clouds without any modelling required."*

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like powers' – the ability to fly through the cloud, walk through walls, view features from all angles, hover above points of interest and zoom in to inspect any feature in more detail.

This is not just video game level of immersion. Just as in the real world where we navigate by walking around, so too can users of the Holoverse. Using feet and eyes, users can navigate towards points of interest and engage with objects in what—naturally for humans—is a very intuitive interface for interacting with data.

so that one small step in the Holoverse can allow three steps in the virtual world.

And unlike the real world, users are not limited to space and time. By simply loading another model users are transported to a new location. Or by examining different scans of the same site, users travel through time and experience changes to environments. By engaging with new designs, users can also travel into the future, or, if there are many designs to examine, to numerous possible futures.

Finally, not only can you just see the models, you can acquire new knowledge



naturally concerned by the opinions of the neighbouring residents. To alleviate some of the fears of the residents, they wanted to provide an accurate view of the final structure to the councils, to enable them to make an informed decision that will be as fair as possible for all the stakeholders and the future of the area.

To facilitate this, MNG scanned the suburb from the air at a low density and also from the ground along the main streets at high accuracy. The low density aerial scan data efficiently covered sand dunes, marina and distant houses, while the high density mobile scan data provided the crucial extents of the houses and balconies of the effected residents. By incorporating the proposed development with the scan data, stakeholders could fully evaluate the effect on each resident in the most realistic way possible, and ultimately reach a more considered planning decision.

For smaller scale projects, the Holoverse could also be used to explore the impact of new development on shadowing, loss of views and the depreciation of real estate. MNG claim it is not hard to imagine that in the future every council responsible for such decisions will have a Holoverse and the capability to collect data for such decisions. The aim is to ensure that at the very least, decisions are made on real rather than perceived concerns.

### The user experience

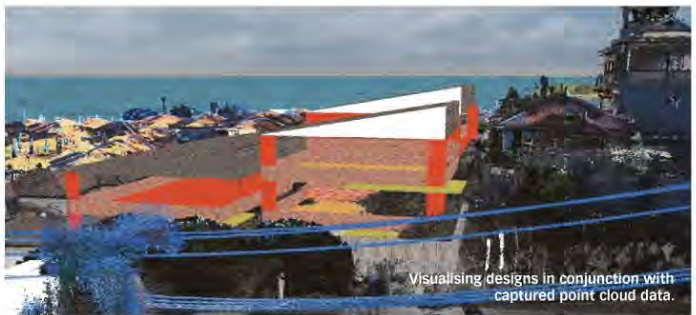
In a period when new methods of creating, viewing and sharing data are appearing daily, this warrants the question, 'is this really useful or just another gimmick?' Having explored this technology over the past 18 months, MNG Surveys have seen the stark contrast between reactions to viewing data in a traditional static 2D format and in the new interactive 3D format.

When sharing their work with clients, MNG will first display their models on a large format TV, before directly following up with the same model in the hologram room.

"While the reaction varies for each person," says John Nolan. "In some, the excitement is so great it shows that they possibly did not really visualise the model to the same level as us from the flat screen model. The difference is like seeing something on television compared to visiting the real thing."

"From the first use of the Holoverse, the most notable thing has been the 'realness' of the experience," he said.

Yet despite the progress that has been made, it appears augmented reality is not for everyone. MNG has had a few



Visualising designs in conjunction with captured point cloud data.

*"It is not hard to imagine that in the future every council responsible for such decisions will have a Holoverse and the capability to collect data."*

hundred people visit the room and claim approximately 95% come away excited from the experience. There is a small percentage who for some reason do not feel well or do not see 3D properly.

Another limitation is that the Holoverse only supports one person at a time. However, development is under way to be able to connect multiple rooms so that two people in different rooms can be connected and traverse the same virtual

world. A similar feature being considered is the ability to capture and display the user experience, allowing external groups to share experiences.

### Looking even further ahead

While MNG's Holoverse wasn't initially as impressive and there are developments underway, the collaboration with Euclidean sees the system continuing to evolve into a more robust product. If things continue to develop as they have over the last 18 months, MNG are confident it will not be long before they will also see widespread consumer applications of the Holoverse.

Much like in the 1990's with GPS, surveyors have been some of the first users of new augmented reality technology. However, few would have appreciated that 20 years after GPS was implemented, GNSS technology would be built into every person's mobile phone along with a camera. John Nolan sees a similar future for augmented reality and says that it is not too hard to see that over time the geospatial users will become a smaller part of the pie chart. While MNG intend to use the Holoverse for displaying

large scale resource projects and possibly even land subdivision proposals, the potential other applications, like gaming, entertainment, social media, shopping and real estate, are limited only by human imagination.

"It is unlikely that we will know the full extent of how this technology will be used in the future," said Nolan.

"All we can say for sure is that it will be in 3D." ■