Virtual Angkor Wat and other time travel trips coming to a VR headset near you soon

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In the cool of the morning virtual Angkorians are working hard fishing, fixing boats, tending gardens, carrying their masters and maintaining the walls in the grandest temple of the world's greatest empire.

Later, in the searing heat of midday, they'll seek out shade and take a long break until the sun's harshest rays have passed them by.

The quotidian rhythms of virtual Angkor Wat pulse away in real-time every day in a 3D world projected onto a wall at Monash University's Hargrave-Andrew library for an exhibition running until the end of June.

"We've got 25,000 what we call agents. They're little computer people who make very basic decisions about what they do every day," Thomas Chandler says, who is a senior lecturer in 3D modelling and has been building the virtual civilisation with his team for about a decade.

"So there'd be certain ways you'd animate modern day Americans or Italians, for instance, versus how Japanese people would interact with each other. And when you're looking at crowds of people, these subtle differences make a big change."

In the nascent art of virtual reality storytelling it's still very much an open book as to what types of experiences will captivate audiences and become defining works of the genre.

A period of great experimentation is underway though and one of the first areas developers are exploring in this new frontier medium is time travel.

Virtual Angkor takes users back about 1,000 years into a thriving community of 25,000 virtual Cambodians living inside a model of Angkor Wat, partially mapped using geometry generated by airborne laser surveys.

Another Australian project, Virtual Songlines, takes us ten times further back into the past to look at how different tribes of the first Australians lived in places like Warrane and Meanjin (better known today as Sydney Cove and Brisbane's CBD).
Brett Leavy, who created the latter work, is a multi-talented individual: Broadcaster, archaeological mapper, web designer and now 3D developer.

He's also a member of the Kooma clan from Queensland and a passionate promoter of storytelling who wants to put indigenous Australian history back in the picture, literally.

"It's, in a sense, an extension of dreamtime I suppose. The stories allow us to survive and prosper and have this continuous connection that we've had," Mr Leavy said.

"That's what I think songlines are, and in a sense Virtual Songlines is a digitisation of that in a three-dimensional space."

The world of Virtual Songlines is one constructed through a tricky balance between archaeological evidence derived from the scientific tradition and spoken histories passed down through different indigenous clans across the country.

The result thus far is a 32 square-kilometre world, including parts of Sydney and Brisbane that overlays landscapes and civilisations from up to 10,000 years in the past.

"We can eventually join them all up and walk from here, from say Brisbane, to Perth in a virtual world. Topographically correct, soil map correct, bio correct, animal correct," Mr Leavy says, adding he has generated terrain for Melbourne and Hobart too.

"And then what we do is fill it with people. And I'll go further, we can make that world change over time. We can move forwards and backwards in time, that's when it becomes a time machine — a virtual time machine."

Users explore bush foods and medicines, learn indigenous languages and craft weapons that they use to survive.

They will also experience events, such as the arrival of white settlers, the violence they inflicted on the indigenous population and acts of retaliation such as the spearing of Governor Phillip at Manly Cove in 1790.

"I really want to address and approach the frontier wars. I want to have the ballistics and the physics of a spear throw in the world, and of the musket gun, and have those in there as two weapons of a type," he says.

"The spear throw, I want to use for hunting and gathering. But if a spear can be thrown at a kangaroo or an emu or a wallaby, well, it can be thrown at a person too."

Virtual Songlines will be on display as a virtual reality experience at Brisbane Powerhouse in June, Sydney's Powerhouse Museum at the end of July and available in numerous libraries as a desktop computer experience around the same time, with a downloadable PC version expected in August.
Unlike a film or book though, both Virtual Songlines and Virtual Angkor are not being built as a final product but rather just one version of worlds that will continually evolve to reflect competing historical perspectives and new archaeological discoveries in what Dr Chandler has dubbed an “iterative dialogue”.

Some of the detail in Dr Chandler's world has been crafted through extraordinary archaeological diligence.

For instance, in order to accurately recreate flora, Dr Chandler's team had to first consult with experts on soil cores to verify which plants existed at that time, then flew over and photographed the trees before modelling and texturing the relatively geometrically complex objects.

For audio, he has travelled to remote villages to record ambient sound, a task that has become harder and harder as Cambodia develops and motorbikes, cell phones, and televisions become commonplace.

Highly detailed terrain maps have been gleaned from two helicopter borne laser surveys, known as LiDAR, that were conducted by a partnership including the University of Sydney called the Khmer Angkor Lidar Consortium at a cost of hundreds of thousands of dollars each.

Those same surveys revealed that the city of Angkor was about four times larger than previously thought. The main temple complex alone was supported by a population of around 125,000 people, while some 750,000 people occupied the area of Greater Angkor, it suggested.

With its ability to penetrate vegetation and measure terrain with extreme accuracy, the LiDAR also revealed paths, mounds and depressions that indicated a bustling society and gave archaeologists very clear clues where to find household sites for future excavation.

The findings, combined with evidence from Bas Reliefs on the temple walls, historical eyewitness accounts and other sources, also helped Dr Chandler divide his virtual Angkorians into four classes of people— residents, commuting workers, suppliers and visiting elites.

They perform different task according to these roles and in future iterations will perform interactions with one another according to their status.

Resources such as the Bas Reliefs were not particularly interested in the lives of the lower folk within these hierarchical relationships.

Detailed archaeological investigation into how the non-elites of this society functioned on a broad scale is still very much in its infancy with excavations of the wealth of sites revealed by LiDAR just now getting
As those excavations lead to new discoveries and hypotheses we can expect to see many changes at Virtual Angkor, which Dr Chandler also wants to convert into a VR experience.

"I think to try and create the entire city of Angkor is always a goal, but we don't want to overstretch ourselves and rush too much. It's a vast city, so these things need to be taken one step at a time."

"It all depends on the time and the computer power and how accurate the archaeological surveys could be."

New frontiers in immersive storytelling

Both Dr Chandler and Mr Leavy are also hoping to eventually have their works integrated into school curriculums, creating mesmerising experiences of study areas that presently can sometimes feel a little dull for students.

LiDAR surveys have also been conducted throughout the Yucatan in Central America to reveal more details of Mayan civilisation and use of the technology has been touted at Machu Picchu, data that could be employed to spark a virtual reality revolution in how history is taught and experienced.

Katrina Sedgwick, CEO of the Australian Centre for the Moving Image, says VR has a unique power to give audiences a sense of time and place that other mediums simply cannot match, especially when dealing with the past.

"To be able to understand that, that requires going to that place and being able to be in it, and being able to sense it and understand it and connect with it and whilst you can't do that physically, using VR you can do that virtually," she says.

Director Lynette Wallworth's 360 degree VR film Collisions, for instance, experienced by some 8,000 people at ACMI over three months, creates a moving and contemplative sensory connection to the Martu tribe in Western Australia and their experience of nuclear bomb tests in the 1950s.
A recently released video game called Revolution 1979: Black Friday, drops users into the Iranian revolution as a photojournalist, shooting pictures instead of the usual bullets. Though not VR, it’s indicative of a change in narrative focus to more serious topics sweeping the industry of 3D world development.

All sorts of fascinating experiments in VR are underway, Ms Sedgwick says, listing examples of worlds developed here in Australia where you hear the subconscious of the people you look at, or in which a theatrical set is integrated with a VR movie to create a simultaneously virtual and physical experience.

"It's such a kind of nascent, emerging industry — even though it's been around for a long time — but it does feel now that there's a meaningful momentum up and it could move into a sort of broader engagement," she says.

"What are the new ways of communicating ideas that this platform offers that nothing else does and what is that going to mean for art making in that context in the future and I think it's incredibly exciting."

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