While indeed there has been widespread adoption of 3D modelling and 2D GIS in specialist areas such as mine planning and environmental management, the progress beyond those specific systems and those areas of application has been far less than expected. At the time, we predicted a maturing of such techniques due to the rise of portable systems and remote access to data, as well as improvements in real-time graphics generation, interaction and modelling, including the use of virtual reality and multimedia. Faced with similar situations of complexity and scale, other industries such as petroleum, aerospace and defence were already making active use of more advanced visualisation systems.

The adoption of virtual reality techniques, however, has been relatively slow across the board. Over the last 10 years there have been many papers presented on the use of virtual reality in mining, but other than a few niche applications in training simulation, it has not progressed very far. There are signs of an increased take-up due to further developments in software and hardware, driven by the use of such technology in the broader community, which is leading to greater capability at lower prices.

Virtual Reality is a computer generated environment that makes us think that we're in the real environment. This requires a virtual world created as a 3D model of the environment, often rendered with colour and textures to match reality as much as possible. Stereo sound is also an integral part of the experience. The use of high tech animation in movie making has helped drive developments in this area, through their drive to simulate reality as much as possible.

The simulations are made real by dynamic three dimensional rendering using high-end back-end servers, with massive parallel processing of multiple CPUs with large memory and disk storage systems. The simulations can also be supported within graphics accelerator cards on the PC client, so that the scenes can be refreshed fast enough to reflect a dynamically changing environment without the need for high bandwidth network connections and back-end super-computers. The main consumer application driving this client-end development is the video gaming industry.

In 1995, I co-authored a paper on “Graphical data analysis to aid decision making” that made the case for advanced visualisation and spatial analysis systems, such as 3D mine planning systems and geographical information systems (GIS). At that time it seemed clear that such techniques would become commonplace in the mining industry due to advances in computer software and hardware. Drivers for adoption would include the increasing availability of data, both in volume and variety, and the decreasing cycle time for operational decision making.
One interesting outcome of MMORPGs gaining attention in the business world, is the rapid collaborative learning and emerging leadership behaviour experienced by the gamers. Some virtual worlds, like SecondLife, are aimed directly at enabling virtual collaboration in a manner that encourages participation and learning. This proliferation of virtual worlds is an interesting convergence of the on-line gaming industry with social media applications like Facebook and MySpace and multimedia applications like video-conferencing and YouTube. A number of companies, including CSC, are experimenting with business applications of these virtual environments using virtual world development tools such as Qwaq, Forterra, SecondLife and Google.

Over the last 15 years, the use of virtual reality in mining has grown very slowly and most of the mining applications are related to safety training. A number of studies have shown that using simulations of safety scenarios is much more effective in training workers in safety procedures than almost any other method, particularly given the obvious problems with the traditional on-the-job training. The use of training simulators for heavy equipment is now becoming common in mining, as it has been in the airline industry and military for many years.

These simulators are direct analogues of systems built in the military for training on complex and expensive equipment and vehicles. For example CSC has built a simulated training ship for the US Navy that incorporates high-fidelity ship manoeuvring response models as well as scenarios developed to test a variety of situations that are otherwise difficult or expensive to reproduce in real life. Other simulators have included the operation of ship-borne cranes that need to simulate the dynamic operation of ship to ship transfer in heavy seas.

There are a number of research organisations building virtual mines, mostly underground coal mines, for the purposes of safety training. At the first international Future Mining Conference held at the University of NSW in November last year, there were five papers on the use of virtual environments and simulators for safety training. There are a number of facilities where you can gain an underground experience in the safety of a 3D immersive virtual environment. The theory of why these training environments are worth the effort can be summarised by the words of Aristotle: “For the things we have to learn before we can do them, we learn by doing them”.

Looking back at the 1995 paper, we thought that the major limitations holding back the use of such advanced visualisation and analysis systems were: islands of data, different approaches to spatial data, scalability and portability of systems, training and education, and network capacity. Despite significant advances in each of these areas, we think the same limitations exist today, so there is further progress to be made. The potential benefits to be gained, in the safety training area alone, will lead to an inevitable trend of increasing use of virtual reality in the mining industry. In addition, the very rapid increase in consumer applications over the internet will give this a very big kick along.

I’m now more confident that what we saw happening in the mid 1990s will come to pass very quickly. All it requires is a “Gen Y’er” in the workforce who has grown up using these collaborative practices and technologies as part of their every day life, and Second Life!
Worldwide CSC Headquarters

Australia
26 Talavera Road
Macquarie Park, NSW 2113
Australia
+61 (02) 9034 2408

The Americas
3170 Fairview Park Drive
Falls Church, Virginia 22042
United States
+0 703 876 1000

Europe, Middle East, Africa
Royal Pavilion
Wellesley Road
Aldershot, Hampshire GU11 1PZ
United Kingdom
+44 (0) 1252 534000

Asia
139 Cecil Street
#06-00 Cecil House
Singapore 069539
Republic of Singapore
+65 6221 9095

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