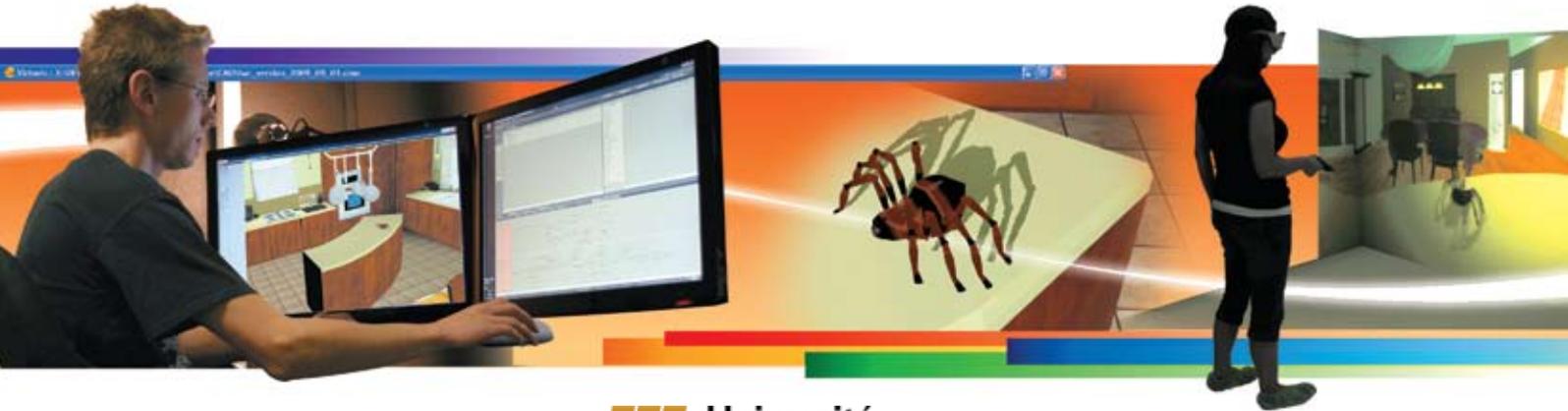


# Université du Québec

Treating phobias in virtual reality with 3DVIA Virtools and Microsoft



## Overview

### ■ Challenge

*Université du Québec cyberpsychology researchers needed technology to quickly and easily create and deploy effective treatment scenarios in virtual reality.*

### ■ Solution

*The team chose 3DVIA Virtools on Microsoft®.NET Framework and the Windows® Operating system for its user-friendliness, speed of development and effective translation of applications into VR environments.*

### ■ Benefits

*The combination of 3DVIA Virtools and Microsoft has allowed university staff and students to quickly develop stable, reliable virtual environments and use them effectively in treating patients.*



“With 3DVIA Virtools, we knew we would be able to quickly and easily create any virtual environment and have it work on any multiple display system.”

Dr. Stephane Bouchard, Director,  
Canada Research Chair in Clinical  
Cyberpsychology, Université du Québec

### Helping patients face their fears virtually

Patients with anxiety disorders must face their fears to conquer them. But putting patients in close proximity to what they fear can be difficult. Patients who fear flying, for example, cannot change their minds about a flight once the plane is airborne – unless their experience is a virtual one.

That is why researchers in the Cyberpsychology Lab and the Canada Research Chair in Clinical Cyberpsychology at the Université du Québec en Outaouais (UQO) in Gatineau, Canada, are leveraging virtual reality (VR) environments developed with Dassault Systèmes' 3DVIA Virtools on Windows XP Professional and the 64-bit edition of Windows Vista and customized with Microsoft® Visual Studio® to help patients with anxiety disorders face and manage their fears in a safe, controlled environment.

Immersive treatment conditions are created by projecting the virtual environments on the walls, floor and ceiling of a “CAVE-like” room, or by using special 3D goggles referred to as

head-mounted displays (HMD). Everywhere the patient looks, the environment surrounds them, changing as they react to the scenarios – much as a video game changes based on the choices players make. The applications are being utilized to treat patients with conditions ranging from phobias and Alzheimer's disease to addictions. The success rate with virtual reality is equivalent to that for traditional treatments – around 75%.

“With 3DVIA Virtools operating on the Microsoft platform, our researchers can focus on developing applications, rather than trying to figure out how to develop them, and can do so quickly and connect easily with a VR environment,” says Dr. Stephane Bouchard, director of the Canada Research Chair in Clinical Cyberpsychology at UQO.

In addition to treating patients, the environments can be used to research anxiety disorders. UQO researchers also are working to commercialize the environments, making them available to clinical psychologists worldwide for state-of-the-art, localized patient treatment.



**Microsoft®**



“If we did everything from scratch, it would take many years to get to the level that 3DVIA Virtools gives us right out of the box.”

Christian Villemaire, Computer Section Team Leader, Cyberpsychology Lab, Université du Québec

### Seamless and realistic

Although phobias and anxiety disorders can be treated effectively using traditional approaches, virtual reality environments offer a more practical approach in a clinical setting. It may not be possible for every clinic to keep spiders, snakes, high places, tight spaces and other common fear-inducers on hand to treat patients – but they can all be made available in VR.

With limited funds for development, Dr. Bouchard’s researchers initially modified computer games to help patients deal with phobias such as fear of heights and enclosed spaces. But getting the source code needed to modify the games for use in more complex anxiety disorder simulations proved difficult and expensive.

The team then tried software developed specifically for creating virtual environments, but found it difficult to build scenarios quickly due to the tools’ complexity. The challenges became even greater when the team tried to synchronize images on six surfaces to create a seamless, CAVE-like environment that would appear realistic to patients.

“With the development software we tried to use initially, it took forever to make the environments,” Bouchard says. “And it was very cumbersome to align the projections where the edges of the walls meet. We had gaps or overlaps, and both of those interfere with creating a realistic, believable environment.”

VR environments don’t have to be flawless to be effective in treating patients. But Bouchard says a high degree of realism helps convince both funding agencies and psychologists of the technology’s effectiveness, which helps build on existing research and create acceptance of VR among therapists as a treatment option.

### Virtools: out-of-the-box ease

With a grant for infrastructure development, the team finally acquired the development solution it had wanted from the start: 3DVIA Virtools, which gives life to 3D objects and allows control in real time. 3DVIA Virtools was the best choice, Dr. Bouchard said, because it is quick and easy to learn, supports rapid development of new environments, and allows us to use our environments both on the CAVE-like and HMD platforms.

“Implementing 3DVIA Virtools has enabled our team to rapidly create virtual environments that can be deployed either in the six-sided room or with the HMD (Head-Mounted Display) without investing the time that other software packages require to move from one to the other,” Bouchard says. “Our goal is not to develop our own software. It’s to build virtual environments that help patients and advance cyberpsychology research and development. The fact we can do all that in a familiar and cost-effective 64-bit Microsoft Windows environment only adds to our productivity.”



To create virtual reality environments, the first step is to develop assets or 3D objects in a specialized DCC (digital content creation) or CAD software. Once models are optimized for 3D Real Time, they are imported into 3DVIA Virtools to create a full real-time 3D application. Finally, with the 3DVIA Virtools VR library, users can easily publish applications in different types of Virtual Reality environments. 3DVIA Virtools' use of VRPN, an open source protocol, allows its environments to be projected or displayed using virtually any hardware on the market.

"3DVIA Virtools allowed us to buy the huge amount of hardware we needed and to know we would be able to create any virtual environment and have it work on any multiple display system," Bouchard says. "All of the hardware is already compatible with 3DVIA Virtools, so we can just buy a piece of equipment and plug it in. The building blocks are already done."

The VR Library component of 3DVIA Virtools links between the application running on the "master" PC and the cluster of six computers that project images to the cave-like VR environment, ensuring the image is seamless where different surfaces meet. Once the geometry of the room has been inputted into the system, 3DVIA Virtools makes all of the necessary adjustments. With perspective matrixes, 3DVIA Virtools changes the point of view or stretches the image to show it properly as images are distributed on the surfaces of the room, saving months during design.

"If we did everything from scratch, it would take many years to get to the level that 3DVIA Virtools gives us right out of the box," says Christian Villemaire, programmer and computer section team leader for Bouchard's research group.

#### **Customization with Microsoft**

Villemaire says 3DVIA Virtools was chosen for its ease of use, and it has not disappointed. "3DVIA Virtools is flexible, allowing the team to use the building blocks section for adding more functions and creating new building blocks," Villemaire says. "Or we use Microsoft's Visual Studio.NET to alter the code of existing building blocks in 3DVIA Virtools." Visual Studio.NET gives the lab the power to modify standard blocks of source code in 3DVIA Virtools to create customized objects quickly and easily. Blocks can be written in popular C++ code, compiled and debugged to modify the properties of objects or create new ones.

The lab runs 3DVIA Virtools on the popular Microsoft Windows XP Professional operating system, which Villemaire says makes it easy to find technical workers skilled in its maintenance. The team's new development workstations feature Windows Vista 64-bit technology, which delivers the high levels of random access memory (RAM) needed to create more powerful scenarios, launch multiple applications simultaneously, and handle large VR environments. The Cyberpsychology Lab also uses the 2007 Microsoft Office® System for documentation and basic administrative tasks.

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With 3DVIA Virtools operating on the Microsoft platform, Bouchard says his researchers can focus on developing applications rather than trying to learn complex software. Applications also can be developed quickly, and 3DVIA Virtools and Microsoft make it quick and easy to connect with a wide variety of VR environments.

### Speed and dependability

“Because we are funded by research grants, if we needed to spend three years just to develop the backbone and all of the codes for the virtual environment, we would be out of cash,” Bouchard says. “Speed is absolutely key, and showing forward progress on our research is important for securing the next round of funding. With 3DVIA Virtools and Microsoft, once it’s deployed and working you don’t need to change it all the time. You also can test everything directly in 3DVIA Virtools. If it works in 3DVIA Virtools, it will work in the VR environment.”

The less time spent creating individual scenarios, Bouchard says, the more scenarios his team can create. “We can develop several virtual environments within a year and have been able to go from start to finish on a new research environment that worked both in our CAVE-like system and in an fMRI (brain scanner) in less than three months. The key argument for 3DVIA Virtools is the speed at which you can develop environments and the fact that you know they will work.”

Villemaire agrees and says 3DVIA Virtools’ ease of use is one of its big strengths. “It allows small teams to achieve big things and gives them incredible capabilities and advantages.”

Bouchard says 3DVIA Virtools is the dream solution for a research environment. “We’re the ninth cave-like environment in the world and the only one dedicated to mental health, and it’s because we’re using 3DVIA Virtools,” he says. “We wouldn’t be able to do it otherwise.”

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Christian Villemaire, Computer Section Team Leader, Cyberpsychology Lab, Université du Québec



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