Approaching VR 2.0: Creating and Sharing Open Source Virtual Environments for Health Care and Research

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http://www.neurovr.org

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http://www.cybertherapy.info
http://www.emergingcommunication.com
http://www.e-psychology.net

Summary

This presentation will focus on:

- VR in Health Care:
  - Research showed its potential in behavioral health and rehabilitation
  - But its real impact is minimal. Why?
- PC based VR
  - VR Hardware is now very cheap: **about 3000 US$/2400 €**
  - But the software is a problem: expensive, and difficult to develop and customize
- The NeuroVR Project
  - A virtual reality platform based on open-source software
  - **NeuroVR Editor** to customize 12 pre-developed scenes
  - **NeuroVR Player** for immersive 3D visualization
- Future perspectives
  - 3d animation and support for PDAs
  - Possible collaboration with us

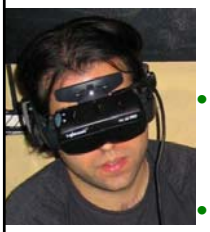
Is VR a promise or a reality in behavioral health?

Reality: VR in Health Care

Photograph by Susan Plageman

- 1989: First VR company (VPL Research) founded
- 1991: Virtuality Game System
- 1993: Suggested the use of VR in psychological treatment
- 1993: Suggested the use of VR in surgical simulation
- 1995: First research papers on VR in neuro-psychological assessment and treatment
- 1997: First research paper on VR in eating disorders
- 2007: more than 1600 papers in MedLine and 1300 in PsycInfo

Promise: VR in behavioral health



Research papers show that VR has come of age for **clinical and research applications**:

- *exposure therapy:* the patient is gradually confronted with the virtual simulation of feared stimuli while allowing the anxiety to attenuate
- pain distraction: VR reduces acute pain
- body image modification: VR modifies the bodily experience: it may be used in eating disorders

- *neuropsychological testing and rehabilitation:* VR allows to deliver interactive 3D stimuli in a variety of forms and sensory modalities*cognitive neuroscience:* researchers carry out experiments in an ecologically valid situation, while still maintaining control over all variables

Reality: VR is a research toy

- VR has the **potential** for being a poweful tool for behavioral health
- But its real **impact** in behavioral health is still low:
  - The penetration of VR in behavioral health care/research centers is minimal: around 0.5/1%
  - The penetration of VR between behavioral health professionals is even lower: less than 0.001%

WHY?

Is VR too expensive/difficult to use?

VR Hardware: No more problems

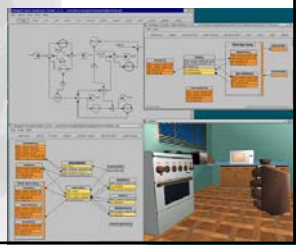
- For many years one of the main obstacles to the use of VR was the price of the equipment: a typical VR system in the early '90s required a costly Silicon Graphic workstation in the range of 250000 US$.
- The significant advances in PC hardware are transforming PC-based VR into a reality.
- A simple immersive VR system now may cost less than 2000 €; a professional one 3000/30000 €

Immersive 3D Hardware: less than 3000 US$

- Head Mounted Display with tracker Z800 3D Visor: **900 $**
- Intel Core 2 Duo PC with Nvidia GeForce 8800 GTX graphic card: **1900 $**
- Wireless joystick and/or P5 Glove: **100 $**

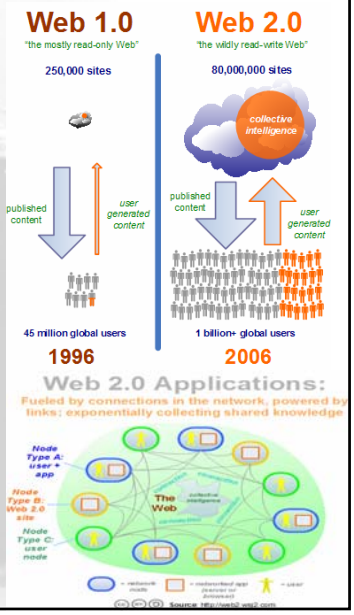
The real problem: software

- There is a **limited number of ready to use solutions** for behavioral health
- Their **price is higher than the hardware** one (5000-15000 US$)
- **Limited customization** possibilities
- Developing a **new VE is expensive and time consuming**
- **Exchange of VEs is problematic** (royalties, copyrights, runtimes)



A success story: Web 2.0

- **Easy to use**: A rich, interactive, user-friendly interface
- **Many different sources**: Innovation in assembly of system and sites composed by pulling together features from distributed, independent developers (a kind of "open source" development).
- **Network effect**: created by an architecture of participation that encourages users to add value to the application as they use it.



Towards VR 2.0: the NeuroVR project

Our solution: NeuroVR
http://www.neurovr.org

- Virtual reality platform based on open-source software
- Allows non-expert users to easily modify a VE and play it in immersive or non-immersive way
- Sharing of protocols and scenarios
- Video tutorials available online
- Free download

NeuroVR Editor

- Based on **Blender** (www.blender.org), a 3D open-source tool available on all major operating systems
- Icon-based interface (no programming skills required)
- Includes 12 generic virtual environments depicting typical daily-life situations: **apartment, restaurant, office, school, supermarket, swimming pool, etc**.
- 2D, 3D objects, and videos can be easily added to the environment to personalize them:

- *New objects can be added*
- *Objects can be scaled and rotated*
- *Timeline for objects and videos*
- *Editing performed in real time*
- *WYSIWYG Interface*

NeuroVR Player

- It allows to *navigate and interact* with the VEs developed using the NeuroVR Editor.

It is based on the **two major open-source projects** in the VR field:

- **Delta3D** (http://www.delta3d.org)
- **OpenSceneGraph** (http://www.openscenegraph.org).

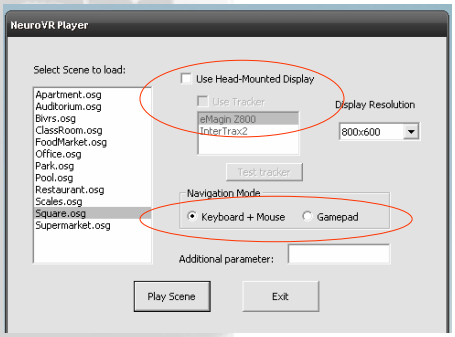
It supports collision detection, realistic walk-style motion, advanced lighting techniques and video streaming with transparency.

Immersion and 3D

Using the player is possible to visualize the VEs using a standard PC monitor or a head-mounted display The player can be configured for *two basic visualization modalities*: **immersive and non-immersive**.

– **Immersive:** the scene is visualized using an HMD with tracker (eMagin or Intertrax II) either in stereoscopy (3D) or in mono-mode;

– **Non-immersive:** the user can interact with the VE using either keyboard commands, a mouse or a joypad.



NeuroVR: A demo

See the video here: http://www.neurovr.org

Video taken on a standard **portable PC**:

- Pentium 4 1.7 mhz processor
- 512 MB Ram
- Nvidia 128Mb graphic card

Future developments

- Future releases of the NeuroVR Editor software may also include **interactive 3D animations**
- A **VRML/X3D** exporter and a player for PocketPC PDAs are planned Blender features
- API development for behavioral tracking tools (i.e. eye tracking) and psycho-physiological sensors (i.e. EEG signals)
- Creation of a **community of users** sharing VEs, objects and protocols

We need a community...

- Add new objects: 2D, 3D and video
- Add new VR environments: developed using the free Blender toolkit - http://www.blender.org
- Define new protocols for the use of NeuroVR in behavioral health care: addition, smoking, anxiety disorders, stress management, ecc.
- Test NeuroVR in single cases or controlled trials: we have ready to use protocols for obesity and eating disorders
- Tell friends and colleagues about NeuroVR: send them at our website - http://www.neurovr.org

Thank you for your attention

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