

## **Questions about VR (08/03/2010) – From IEEE VR 2010**

### **Motivation:**

We have been struggling with the following questions and are seeking community feedback:

- \* Over time, the equipment and topics in VR have changed, but has its nature?
- \* Has the definition of VR faded or has it become more entrenched?
- \* Has the breadth of topics included in VR's borders expanded or contracted as diverse communities adopt its practices?
- \* What about AR, MR, UbiComp, Tangible Interaction, Reality-Based Interfaces, Multitouch, Sketching, Mobile Computing, Wearables, Brain Controlled Computing, Virtual Worlds, MMORPGs, Virtual Humans, Systems and Standards, Haptics, 1st Person Shooters?
- \* What is VR?

Because of this, we have created a panel that brings together a disparate group of active VR leaders to discuss and answer introspective questions. However, this discussion is larger than the available time. As such...

- \* We invite the community to provide feedback and questions. Reply to this message!
- \* Stoke the conversation.
- \* What questions need to be asked?
- \* What are your positions?

We have a feeling this will be lively and informative. We have a feeling that many will be surprised on how poor our terminology is to discuss the work we do.

Panel: Reconceptualizing “Virtual Reality”: What is VR?

Where: IEEE Virtual Reality 2010

When: March 22, 2010 3:45PM - 5:45PM

### **Organizers:**

- \* Jeffrey Jacobson, PublicVR
- \* Chadwick A. Wingrave, University of Central Florida

### **Panelists:**

- \* Doug Bowman, Virginia Tech
- \* Fred Brooks, University of North Carolina
- \* Robert Jacobs, Tufts University
- \* Eric Klopfer, Massachusetts Institute of Technology
- \* Joe LaViola, University of Central Florida
- \* Skip Rizzo, University of Southern California

Chad Wingrave

## **Opinions from the community:**

What I love about VR is that integration of technologies & techniques applied to a core concept of a virtual world. As researchers we can really use our imagination to experiment and develop concepts for visualization and interaction in this world that are not possible elsewhere. What we often struggle with is finding widespread applications for these virtual worlds, but what we learn and publish often takes hold in technologies that are finding more widespread use. Entertainment and AR come to mind immediately.

My questions are:

What do you think of VR as a breeding and proving ground for new visualization and interaction? Where and how can the lessons of VR research be applied today? Mobile Phone AR, Enter/Edu-tainment, Large Display Interaction, Heads Up Displays? What can be done to encourage this development and transfer?

- John Lucas

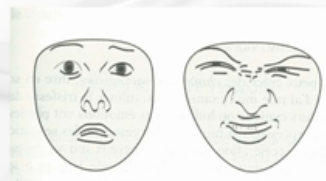
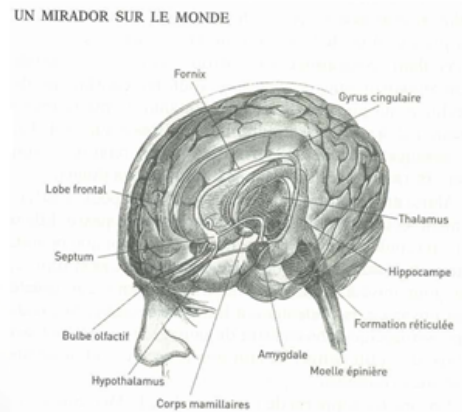
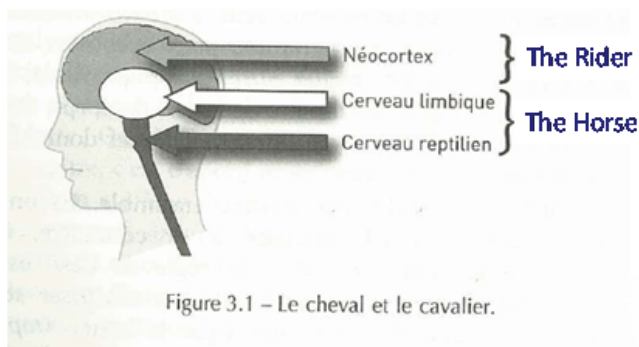
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Thanks Chadwick for the link from Mel Slater

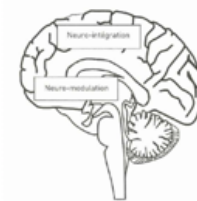
I'll re-read it, but in first approximation, I'm still for using the word presence in my phrasing (great discussions in perspective !!)

I'm adding also this slide, which I also use to complement the first, which more or less says that we (Immersive Virtuality people) are mostly talking to the inner part of the user's brain (the horse as says Roland Jouvent).

## From – « Le Cerveau Magicien », Roland Jouvent



« le cheval » nous connecte au réel



But don't make me wrong, I know, as Philippe Fuchs ([http://books.google.fr/books?id=kKBH-C1jFo4C&pg=PA13&lpg=PA13&dq=fuchs+traité+schema&source=bl&ots=aCcZ0NBsbQ&sig=N1Ry6\\_3m1RJnar4t2JAKGjLFPPA&hl=fr&ei=WI-OS5uFNY-X\\_Qb5jMTwDA&sa=X&oi=book\\_result&ct=result&resnum=1&ved=0CAYQ6AEwAA#v=onepage&q=&f=false](http://books.google.fr/books?id=kKBH-C1jFo4C&pg=PA13&lpg=PA13&dq=fuchs+traité+schema&source=bl&ots=aCcZ0NBsbQ&sig=N1Ry6_3m1RJnar4t2JAKGjLFPPA&hl=fr&ei=WI-OS5uFNY-X_Qb5jMTwDA&sa=X&oi=book_result&ct=result&resnum=1&ved=0CAYQ6AEwAA#v=onepage&q=&f=false)) and other says, that we are creating “functional immersion”, which is a link of sensori-motor immersion (“the horse”) and cognitive immersion (“the rider”)

Cheers  
David Nahon.

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Mel Slater has a more recent paper where he describes his latest findings and definitions about immersion, presence etc.

I've summarized it here: <http://cb.nowan.net/blog/2009/09/18/immersion-place-illusion-and-plausibility/>

### **Immersion**

*Immersion is a technical capability of a VR system and nothing else. (...)*

*“We describe immersion not by displays plus tracking, but as a property of the valid actions that are possible within the system. Generally, system A is at a higher level of immersion than system B if the valid actions of B form a proper subset of those of*

A." (...)

### **Place Illusion**

*Place Illusion is the sense of 'being there' (and nothing else), often called 'presence'. (...) If you're physically moving and your perception of the virtual environment changes (because the system has updated the rendering to your new position), PI is maintained.*

*[this could be called perceptive immersion, or "the horse" as David calls it]*

### **Plausibility Illusion**

*Plausibility Illusion is the illusion that what is apparently happening is really happening. This results from a sense that your actions have effects on the VE, that other events of the VE affect your sensations, and that these events are credible.*

*[this could be called cognitive immersion, or "the rider"]*

Time for some polemic :)

For me iVR (immersive VR or iV as David calls it) means presence (or Place Illusion + Plausibility Illusion ). As is stated in the article:

Can PI occur in computer games as used on desktop systems? To what extent can you have a feeling of 'being there' with respect to a desktop virtual reality system? (...) The answer is 'you cannot'. (...)

In the case of a desktop system the situation is quite different, the feeling reported as 'being there' if it comes at all is after much greater exposure, requires deliberate attention, and is not automatic – it is not simply a function of how the perceptual system normally works, but is something that essentially needs to be learned (...) PI may still be reported, but this is as a consequence of additional creative mental processing. It does not refer to the same qualia as for the first order systems.

This rules out any kind of desktop metaverse (like second life) as immersive virtual reality.

We've had long discussions with David to try to know if AR can indeed provide presence, and I'm not sure I agree that it does.

Moreover I think the term Virtual Reality was created to described a combination of metaverse + iVR.

So neither of these fields should be called VR :)

AR, multitouch, tangible interfaces are tools for more natural interactions, which help with the cognitive immersion. Do they help or break perceptive immersion?

So what is IEEE VR really about? Should it be called IEEE Immersive VR? Or something else?

It could be about presence and interactions *\*in\** a 3d world. Interactions *\*with\** a 3d world is broader and doesn't necessarily precludes presence. For me it is the subject of 3DUI.

<troll> I have to say I'm surprised to have a keynote speak about Second Life since it doesn't have much perceptive immersion and not so much 3DUI. </troll>

Thanks for the discussion ;)  
Sébastien Kunz

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Very interesting topic indeed. My 2 cents below...

> \* Over time, the equipment and topics in VR have changed,  
> but has its nature?

As in many maturing fields, research in VR has specialized over time, but maybe too much. At the beginning, its main achievements were related to novel hardware setups and devices, which show how senses could be stimulated by these engineering achievements. However, few real applications were developed, where VR techniques could shine.

Currently, new devices are still created, although most noticeable advances come now from the game industry, where resilient and sturdy solutions are a must. I believe VR is now concentrating on what is really challenging: In which applications VR can really create advantages. VR applications for training, fear treatment, design, and data analysis have shown advantages of this technology. Some challenges are still daunting, such as the real transfer of skills from VR to a real situation, but I believe these make VR an interesting field to do research in.

Several fields have been born from VR: AR, 3D gaming, 3D online communities, 3DUIs, to name just a few. They are considered nowadays independent fields on their own, some of them much larger than what the actual VR is. However, I believe it is difficult to define their borders and techniques as their own, and there are risks in this separation: VR research doesn't necessarily address main issues in those communities, these communities tend to consider VR results as outside of their scope, and it is difficult for VR researchers to build on top of results from these other communities.

> \* Has the definition of VR faded or has it become more  
> entrenched?

I believe it has become more entrenched... For example, if we consider VR and simulation, it is difficult to build on top of previous results from areas such as gaming in order to get desired results. Sometimes this is due to special

requirements that weren't considered in the game engine at hand, but since VR feedback is mainly visual, it is difficult to show the benefits of a VR application with graphics below the standards in games.

- > \* Has the breadth of topics included in VR's borders
- > expanded or contracted as diverse communities adopt its practices?

What we may consider "hard core" VR has contracted, due to emerging fields. I don't think this is necessarily negative, although the risk is not be able to build on top of results from other fields, in particular games due to its mainstream nature.

- > \* What about AR, MR, UbiComp, Tangible Interaction,
- > Reality-Based Interfaces, Multitouch, Sketching, Mobile
- > Computing, Wearables, Brain Controlled Computing, Virtual
- > Worlds, MMORPGs, Virtual Humans, Systems and Standards, Haptics,
- > 1st Person Shooters?

Again, VR proudly have birth to many of these, but for me they are like teenagers trying to forget their roots. VR is even becoming a bad father that doesn't want to know about its children (or maybe they are just citizens of Asimov's Solaria, where it is not fashionable to remember your roots... ;) Or maybe it is just too difficult to keep track of all research in all these fields, and try to make sense of the big picture.

- > \* What is VR?

For me, VR is the field that uses 3D graphics, other feedback modalities, and special devices in order to allow users to manipulate and interact with 3D information. There are VR applications in several fields, although some receive particular names, apart from their VR nature (i.e. 3D games).

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Maybe these questions: How we can unite again these communities and see how they can benefit from each other? and make them care about that? For example, 3D gaming is so mainstream that they may not be interested in facilitating the development of applications with goals other than entertainment. Or some VR researchers may be too busy in their own field that they miss potential

opportunities in others... Building common knowledge is becoming difficult even in VR...

Good luck!  
Pablo Figueroa

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As I see it, new technologies are creating new experiences and new cultural artifacts, which are complex and need names. Making up new names that stick takes time, a process of social negotiation, and it usually begins with overloading existing terms. That has certainly happened with "Virtual Reality"!

Whether we like it or not, serious researchers in education, media, and the arts regularly refer to online 3D environments (e.g. Second Life) as "virtual reality". In fact, a large subgroup of practitioners refer to it as Immersive Virtual Reality. See: <http://immersivededucation.org/>

Now, I don't care what anything is called, as long as the naming works, but the confusion is daunting. I would love to be able to write a VR paper without having to use up two full paragraphs just defining the basic terms. Maybe we should stop trying to come up with names for different interface packages (VR, AR, etc.) and focus on the fundamentals.

For example, I "embodiment" means (to me) that the user has a clear sense of his or her body in the 3D world. In true VR this is done through first-person perspective, haptics, etc. In something like Second Life, you actually see your avatar in the environment from a third-person point of view. Both strategies have unique advantages, but they have a common effect of letting you know that you have a body "there" and what it's like.

Then, maybe, we could list the terms for the principles our applications employ. Like, "first-person embodied, visually immersive, etc."

-- Jeff

Jeffrey Jacobson, Ph.D.  
Director, PublicVR <http://publicvr.org>

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Hi Jeff, Good to "see you" here!

I agree with you, embodiment is key for immersion and presence, and this is what true VR is about.

This is why I believe AR based on a mirror metaphor is part of our VR field. When I see myself with a cereal pack into which I see a perfectly registered magic world (to take an example I have worked on and that we will show on

3DVIA booth at the conference) this world is very present to me, it is plausible and spatially colocated with my body, which is very close to Mel Slatters' place illusion.

About Second Life and other avatar-based 3D worlds, I do not want to call it VR, unless the Avatar is actually driven by the user's body, like in a Wii game (especially with the wii motion plus)

So my keywords are:

Body in a closed and fast loop with the computer experience, perceptual illusion, spatial coherence between virtual and real world

Cheers

David Nahon

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Hey Pablo,

Very nice post Pablo and very similar to how I view the nature of the field generally.

I see Virtual Reality as an organizing principle that is characterized by the integration of a variety of technologies that provide opportunities for various degrees of immersion and/or interactivity that support the creation of a user experience. I often talk about the creation of Virtual Realities of different types using various levels of technology that can generate or stimulate a user experience for some defined purpose. So with game apps. I can say that World of Warcraft, even though it can be played with a modest WIMP interface on a small flatscreen monitor, is still essentially a virtual environment that stimulates a user to experientially engage in a Virtual Reality....

Of course this opens up the idea that a user generates a virtual reality experience when they read an engaging novel, but it gets across the aim of creating a user experience through the use of a range of technologies (printed words on paper as opposed to graphics on a digital display)...so the virtual reality actually only exists in the users brain in reaction to some orchestration of stimuli that we manipulate. What we do is to create various tools that manipulate the known physics of reality, using the level of technology that is available to us, to foster an experience, whether it is for game play, data visualization, education, therapy, or some other defined purpose.

I also use the term VR as a general short hand principle and as an adjective as in "virtual reality technologies" for many of the spawned technology "children" (3D user interface, games, display tech, etc) that are in fact focal areas of their own fields in this quest to create user experiences. So a 3D capable TV can become a display tool for delivering stimuli to promote the creation of a Virtual Reality.



While simply watching a movie on it can create a virtual reality for the observer, we can support a more engaging virtual reality with the use of 3D user interface devices that allow the user to interact with 3D content in natural or magical ways.

Some may say that I may have set the VR bar too low by letting passive viewing (watching TV/reading a book) enter the room here, but I feel that human perception and cognition are NEVER passive. So the act of sitting for 3 hours watching Avatar at a 3D IMAX, would qualify as an "activity" interacting with external stimuli, that created a virtual reality experience for me even without my lifting a finger to interact with it. Now should I draw the line with watching Avatar in 2D on a small monitor? Nope. If ya buy that the user experience of the content is what creates the experience of a virtual reality, then just like the folks who allegedly ran out of the theatre during the first film that showed an oncoming train heading towards them, the user experience was a constructed mental virtual reality based on the interaction of the users and the novel technology of the day. What about viewing a still image of a Navi--is that a tool for creating a Virtual Reality? Well, just like viewing the The Nightwatch by Rembrandt (who used painting technology to create virtual realities), the user experience of the stimuli is where the virtual reality happens!

So just like film makers, writers, painters, photographers and game designers, we are the architects and "implementers" of technologies to create virtual realities that foster a user experience for some purpose. However, where my argument starts to really break down though, is with oral storytelling....one can create a virtual reality in a user's (listener's) brain with a great story around a campfire, with no tech involved at all.... Oh well, I still have two weeks til the panel to sort that one out! ;-)

Hope to see ya all at IEEE VR!  
Best Regards,  
Skip Rizzo

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\* What about AR, MR, UbiComp, Tangible Interaction, Reality-Based Interfaces, Multitouch, Sketching, Mobile Computing, Wearables, Brain Controlled Computing, Virtual Worlds, MMORPGs, Virtual Humans, Systems and Standards, Haptics, 1st Person Shooters?

I really like Skip's definition of VR as an organizing principle, but not just in technology, but as an organizing principle for the VR community. We, as VR researchers, refuse to exclude any one of these topics. I think that the field of VR can be defined by the researchers who are concerned with all of the above, "towards creating more effective experiences for user(s)". If an application does not have a user experience in mind, I find it hard to classify that application as VR. The more and more the various technologies and approaches above are integrated together to form cohesive user experiences, the more I consider the application VR. How much integration and user experience do you need for an

application/research to be VR? I think that the line should be drawn year to year, about at 25% of the submissions after hours of debate :-)

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The University of Georgia  
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My favorite definition of VR is still Jesse Schell's from CMU:

Multiple Interconnected Systems Failing Simultaneously

The definition is particularly applicable in the five minutes before someone walks into your lab for a demo.

:^)

Mark Mine

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2 cents worth

It is easy to get lost in the details of technologies when technology is the focus of interest. One way of avoiding such problems of delineation is to take a larger view. In the Constructivist view every experience is more or less a construction of the human mind. Contributions to the constructions of human minds may come from any source that is perceptible to sensory systems, broadly defined.

Minds, as experience-constructing entities, appear able to accommodate for many sources of input some of which are \*natural\*, some from mixed sources (\*natural\* and \*technology\* mediated) while yet others are entirely technology mediated. People can still choose, more or less, what to attend to among an increasingly variety of sources of input.

The current discussion could be viewed as dynamically placing labels on a continuum of four dimensions: temporal change, source (natural\* technology), intensity of experience in the moment, consequential interaction effects on human minds and the generating-source environments.

Where 'virtual reality' is placed on the 4D continuum is changing and that is appropriate.

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I remember Dr. Brooks saying (and I'm poorly paraphrasing here) that Virtual Reality is really a term of hubris. We aren't even close to creating "reality". That's why he liked Virtual Environments. I'd go further. I think that when we care more about the "environment" (and I take that to be things like the graphics, the tracking, the audio, etc.) we can get too cubby holed into a yes/no of membership into VR-icity.

I personally like Virtual Experiences or perhaps Interactive Experiences. This changes the emphasis on the equipment to the user. Look at the "VR" apps that are the most successful (cybertherapy, vehicle sims) - don't work for everyone, rather they work for certain people. This isn't because the equipment was different for the soldier or the person w/ the fear of heights, but rather the experience for the person themselves.

So I'm all for including papers/technologies/etc. that improve the creation of virtual experiences. That being said, I'm not so much for non-interactive experiences as being a part of what we study. Perhaps the idea of presence is a superset of both interactive and non-interactive experiences, as clearly presence is there for non-interactive experiences such as movies, books, art, etc.

Ben

Benjamin Lok  
Associate Professor  
CISE  
University of Florida

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Dealing with the applied side of VR in an architectural environment, we are starting to move more away from even the term 'virtual', as any Building Information Modeling work is suddenly labeled with the header of 'virtual design' or 'virtual...'. From the perspective of communications, we are starting to see more emphasis on Simulation or Environment as an understand description, and anything 'virtual' is simply being applied for marketing purposes and is often becoming overused.

Corrie E. Messinger Senior Associate  
NBBJ 130 Sutter Street Second Floor SAN FRANCISCO CA 94104

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Here are a few of my thoughts about "What is VR", adding to what Skip, Robert and others said before.

To me there are two things: "VR technology" and "creating a "Virtual Reality"".

"VR technology" is like a big toolbox for creating user experiences and crafting new interface paradigms. VR technology advances the field and contributes to the broader field of HCI with a focus on immersing people. It is a (tool in a) multidisciplinary quest for advancing knowledge about how to support people with computers at the edge of technology.

We have the tools at hand to creatively try out new concepts that other fields cannot do, because we have the technology. From this point of view, all other mentioned fields pick their niche, topic, sub-quest and proceed from there plus enrich it with their specific context and tools.

VR as opposed to for example "high-performance computing" is always connected to a user. Why build yet another VR system, graphics tweak, interaction technique, if not for being better able to create "the research experiment", "the demo" or "the experience" we always wanted to create (for another user or us) - and were not yet able to easily, quickly, sufficiently do this with what we currently can do.

VR also somehow always has to do with immersing users into an experience. Technology is only one of the means to help doing this.

To me the term "Virtual Reality" as in "creating a VR" is "enriching" reality by providing stimuli, place, reaction, interaction, behavior, story, ... delivered through technology-never forgetting that the story itself, the actual experience of what is provided, only arises in the mind of the user (see Robert already explained the constructivists view)

The term "virtual" is awkward from a constructivist point of view to reality, as boundaries between "virtual" and "real" blurr. In that sense, everything is "virtual" as there is not "fact" reality. Our reality arises personally and differently in the mind of every single person/user - no matter if the stimuli comes from "reality", VR technology or solely from your own mind.

Therefore, "virtual" in VR simply means playing with means of (a lot of) technology to provide additional input to people...! and see, if they buy it, how they react to it, ... (So we could as well rephrase it to ER: Enriching Reality ;-)) - Whatever people do with this input: consciously, sub-consciously, not at all processing it - we can only provide FOR and experience, not THE experience. (see the panel on tuesday "Design for experience?! at VR 2010)

Therefore, in my opinion we have the two sides to VR:

- the technology side - being on the edge of technology means advancing the technology including interaction, enaction in the field.
- the "application" side - that tries to provide something for people and learn about people: a fully immersive environment, psychological experiments, entertainment, learning teaching environments and so on.

Both fields are highly interdisciplinary, drawing from many disciplines. In a sense, I very much agree with the opinion that VR is an umbrella for all this and - like CHI for the general HCI fields - the IEEE VR conference could best act as platform to bring all the diverse sides of "VR" together.

Just a few thought, I look forward to the discussion tomorrow!

Steffi

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For one Physicist's View of VR see:

<http://brianwhitworth.com/2008-BW-VRT1.pdf>

Related references found associated with Whitworth's article include:

[References]

- [1] The Physical World as a Virtual Reality by Brian Whitworth src
- [2] \*My Big Toe\* by Tom Campbell src
- [3] The Monroe Institute src
- [4] The Theory of Virtuality by Sergey Datsyuk src
- [5] Multiverse Theory' Holds That the Universe is a Virtual Reality  
Matrix Sydney Morning Herald | July 22 2004 src
- [6] \*ARE YOU LIVING IN A COMPUTER SIMULATION?\* BY NICK BOSTROM,  
Department of Philosophy, Oxford University src
- [7] Our Virtual Reality Universe Written by Ian O'Neill Universe Today  
src
- [8] Our world may be a giant hologram 15 January 2009 by Marcus Chown  
src

original source papers from:

<http://www.abovetopsecret.com/forum/thread539572/pg1>

much, but not all, of this material is highly speculative, to say the least.  
More grist to the discussion mill than anything else.

Steffi's point about stuff (tools and technologies) and experience is well made.

Regards,  
Bob

Dr Robert H Barbour  
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