RealiSM PROJECT

MIND AND BODY TRANSFER INTO REALITY

*Presentation of the **Reality Substitution Machine** project.*
EPFL – LNCO project in collaboration with WScience
(text version; March 2015)

As humans, we have always aspired to share our experiences with others. We don't only want to tell stories or share videos, we want to share the true experience of being in the places we visited, we want to immerse people into recorded moments of life, and be able to experience what happened to others.

All this is being made possible today. Communication, personal computing and display technologies offer the tools for the recording and real-time transmission of spatial audio, panoramic visual, and tactile information. But what will enable the Reality Substitution Machine (RealiSM) is its cognitive and neuro-scientific foundation. Through the understanding of what makes a conscious experience of reality, the RealiSM project is drawing the principles of how one perceives, thinks and feel being in the world. RealiSM is specifically designed and engineered to operate a subtle blending of reality-recorded and artificially generated elements in order to generate an immersive and personalized experience that can be shared.

Using RealiSM, therapists will be able create realistic simulations offering optimal conditions for the progress and rehabilitation of their patients. Teachers will build learning environments mixing reality and pedagogical content. Movie makers will record, edit and tell stories that people can live through. Professionals of tourism or media will open to the public the possibility of being in 'another person's boots' for visiting distant places or in order to make better decisions. Researchers in cognitive neurosciences will themselves benefit from the RealiSM for their research and experimentation, and will improve their knowledge of what makes a human experience of reality and of how to recreate and share it.

Recently, in a technological ecosystem dominated by consoles, smart phones and social media, VR made a sudden come back with the arrival of the Oculus Rift. However, what is presented is often based on 3D gaming principles which still suffer from two major drawbacks; the immersion principles are exclusively thought in terms of technological constraints (ignoring the human factor), and the creation of virtual environments is avoidably complex and tedious (3D computer world). RealiSM is designed and engineered in conjunction with neuroscience research to overcome these limitations thanks to its original approach based on the implementation of a **spherical capture and recording** system able to transfer panoramic multimedia experiences to immersive virtual reality devices, thus allowing people to **re-experience** any captured scene.

The RealiSM technology involves spherical capture and re-experiencing devices. **For capturing the scene**, several cameras and microphones are assembled to cover the entire sphere of perception around a viewpoint (over 360° horizontally and vertically, stereoscopic vision, binaural panoramic audio). RealiSM software then aggregates all data into a single high resolution panoramic audiovisual computer format (equivalent to more than 4 stereoscopic full HD movies). **For re-experiencing the scene**, virtual reality devices such as Head Mounted Displays are used to immerse subjects into the recording, and are coupled with stereoscopic depths cameras to capture the user body from a first person perspective. The resulting experience is like actually being in the world, seeing yourself (and not a 3D avatar) teleported into another place.

Finally, our latest developments now support **real-time interactive telepresence** at a distance location though internet. Interacting and being virtually with people faraway is not anymore limited to a video conference through a window. RealiSM is bringing to life the dream of telepresence evoked by Marvin Minsky in 1980.

Key ideas:

- Embodiment (see your own body) into a recorded environment or transported in a distance place in real time
- Create virtual reality easily, just like making a video, giving the true feeling of visiting a place
- Compose and blend multiple elements to generate mixed and augmented realities
- Our direct applications are for psychiatry and cognitive science research, but has the potential for entertainment, journalism, education, etc.

Key specs:
- Spherical video capture (16 GoPro cameras, at 2.7M pixel each, 60 fps) assembled together with stereoscopic (3D) vision
- Panoramic binaural audio capture (4 pairs of binaural 'ears') interpolated for 360 spatial audio experience
- High resolution off-line or medium resolution real-time capture
- Immersion with HMD (Occulus Rift DK2) and with integration of images of your body (Duo Camera).

BOARD

Dr Jamil El Imad

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TEAM

Dr Bruno Herbelin
VR specialist for years, he is deputy director at the EPFL Center for Neuroprosthetic. He was previously a researcher at the Laboratory of Cognitive Neuroscience and assistant professor at the department of Software and Media Technology of Aalborg University (Copenhaguen, Esbjerg DK). He received his PhD at EPFL in computer graphics and virtual reality in 2005 for his research work on the virtual reality exposure therapy for social phobia. His current research interests cover Virtual Reality, interactive systems and the application of new technologies for rehabilitation and neuroscience.

Robin Mange, MSc
Computer Scientist. He graduated in Computer Science at EPFL in 2008. He worked in a visualization company between 2006 and 2011 specializing himself into volumetric rendering, software architecture and parallelized computing. He then joined a CTI project at ETHZ aiming at the design of a visualization and simulation tool for the analysis of cells' signaling cascade at a molecular level.

Dr Elisa Canzoneri
Neuropsychology researcher, expert in body and space representations. She graduated in Neuropsychology at University of Bologna in 2009. She received the PhD in Cognitive Neuroscience at University of Bologna and University College of London in 2013 (JOINT International PhD program).

Dr Fosco Bernasconi,
Medical Biologist, expert in electrical neuroimaging. MSc in Medical Biology obtained at Lausanne University, in 2008 and, obtained a PhD in neuroscience at Lausanne University, faculty of Medicine & Biology, in 2011.

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SCIENCE FUND