TNC17 – Intelligent networks, cool edges?

**Title:** Sniffing "Mixed Reality": Shall NRENs Ignore It?
Author: Christoph Herzog (christoph.herzog@switch.ch)
Authors affiliation: SWITCH, Werdstrasse 2, P.O. Box , CH-8021 Zurich, Switzerland
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1) IT connects to our (human) interfaces

The term "mixed reality" describes the field between the real world and complete virtuality:

Mixed Reality (MR)

Real environment — Augmented reality — Augmented virtuality — Virtual environment
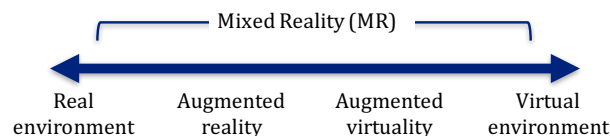
Mixed reality happens in the intersection between human, computer and environment. It has a certain history in areas like airplane pilot training, navigation or support of people with disabilities, and it became very popular with the game "Pokémon Go".

In October 2017, Microsoft and several hardware manufacturers announced "Windows Mixed Reality". Independent of this, market research by "marketsandmarkets" predicts the market for head-mounted displays to grow from USD 3.25 Billion in 2016 to USD 25 Billion in 2022. - Obviously, the subject of mixed reality seems to be finding a place in Information technology.

2) Digitization of education

Now we can ask ourselves if information technology and its trends are important for the education at all. There are at least some indications that this is the case:

- For Centuries, paper played a central role in education. Today, universities like the ZHAW are offering paperless studies.
- In 2008, our NREN started to capture first lectures together with two universities. Today, our academic video portal contains more than 50'000 video sequences
- Our traditional university "EPFL" has around 10'000 on-site students, buts its MOOC courses were attended by several *million* people.
- Our 2017 survey among Swiss universities showed that 80% of the institutions have already carried out e-exams.
- All (100%) of Switzerland's cantonal universities participate actively in the national e-learning community ("eduhub").
- eduroam statistics tell us that the average student brings more than 2 electronic devices to the campus.

Education can benefit from several attributes of information technology, for example:
- Multiplication and sharing is easy and cheap
- Possibility to improve (edit) and re-use artefacts without completely rewriting them
- Ability to replay or repeat at learner's own pace
- Data travels easier and greener than people and books (and occupies less space)
- Rich learning experience through new possibilities or blending of multiple formats
- Internet makes knowledge globally searchable and discoverable

3) Technical aspects of Mixed Reality

The eye is an <u>interface</u> with high processing speed and relevance to human thinking and feeling. That is why many hardware elements focus on optics - for example, screens, head-up displays, cameras or VR glasses. - Acoustics also play a role in the enrichment of reality or by the processing of the human voice. - Third, there is hardware that track movements or gestures, or provide mechanical feedback: In my previous work with partially paralyzed people, I saw various sensors that allow to transform their gestures into the movement of a wheelchair or into information for peers.

In addition to the hardware, it is crucial to be able to build on solid <u>software</u> frameworks. Otherwise the entry barriers for developers would be too high. - For this purpose, Microsoft has extended its Windows 10 with hardware drivers and basic "mixed reality" functionality last autumn. Additionally, they try to get developers started with a toolkit with the following components[1]:
- Input: Allows developers to include input in their apps, such as gestures, clickers, gaze, and voice commands.
- Sharing: Allows developers to make shared experiences. This allows many users to see and experience the same app together.
- Spatial Mapping: Tools to enable and use spatial mapping. This allows your application to interact with the physical environment, such as walls, floors, and objects nearby.
- Spatial Understanding: Allows your application to understand the physical environment. For example, it can differentiate between chairs, tables, and other common structures.
- Spatial Sound: Allows developers to include spatial sound capabilities, so that objects sound as if they are physically in your environment.

In addition to hardware and software frameworks, new interaction concepts will arise. Even with screen-based apps, we look back on a long learning curve. When creating touchscreen devices, it took some time for example to realize that the human being expects feedback on gestures - even if they are virtually pointless, like attempting to scroll after the end of a list.

4) A novice's first steps and impressions with "Mixed Reality"

It was the combination of some readings, curiosity and my pleasure in technology that made me buy a Mixed Reality Headset (I have to say that my professional activities are around "traditional" video and therefore privately acquired and studied these things). I then had to slightly adapt my computer's graphics processor and started the journey – first, as a user.

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[1] Source: Sean Ong, „Beginning Windows Mixed Reality Programming", Apress 2017

I cannot write much about my experiences when moving around in virtual rooms or visiting a city; I think you have to discover that yourself. The intensity of the experience was impressive, even slightly scary. The spatiality and the precise involvement of own movements made the experienced *much* more realistic for my brain than watching a movie.

In a second step, I worked through some tutorials and created a very, very basic app. I thereby wanted to get a feeling for the framework and elementary "Mixed Reality" concepts like three-dimensional objects and view, sound and gestures. (Remark: I foresee a small experimental "mixed reality" project before TNC18 and might include some words about this during the session, too).

5) Relevance for NRENs and options for action

From a pure *physical* perspective, several student activities could be easily integrated with "Mixed Reality": To listen, to watch, to relax, to read or to write. Other activities like discussing, socializing or jointly working on something may have less potential.

Digitization is part of today's education. We do not know whether Mixed Reality will meet education as well - but at least it's possible. *If* it turns out that MR makes the transfer of knowledge cheaper or more efficient, it will probably come. Economic considerations *do* play a role: Should I buy this book or better that video course? Will my supervisor approve this training? Should I start this study and wait another four years for my first salary?

The following drivers might motivate an NRENs to look at the trend of Mixed Reality:
- The "E" in NREN: It is our mission to be technical enablers of *education.*
- The "N": According to Helmut Fendt's "Theory of school", the four classical functions of a school are not only qualification and selection, but also socialization and loyalty/integration. Our education landscape is too valuable to be left to purely commercial training companies, being located just somewhere. Universities are a pillar of *national* interest.

There are two ideas on how an NREN might approach Mixed Reality:
- Get in touch with a Mixed Reality framework and share experiences with universities. Not only that it is interesting – it also may trigger good ideas.
- Start with video. Provide for example a "video backbone" for your universities, which makes it easier for them to focus on new learning scenarios. Video is kind of an evolutionary step towards Mixed Reality.

Author Biography

Christoph Herzog (B. Sc. IT / MBA University of Wales) has worked as a software engineer and team leader for 20 years. In 2013, he joined SWITCH as head of its collaboration solutions team.