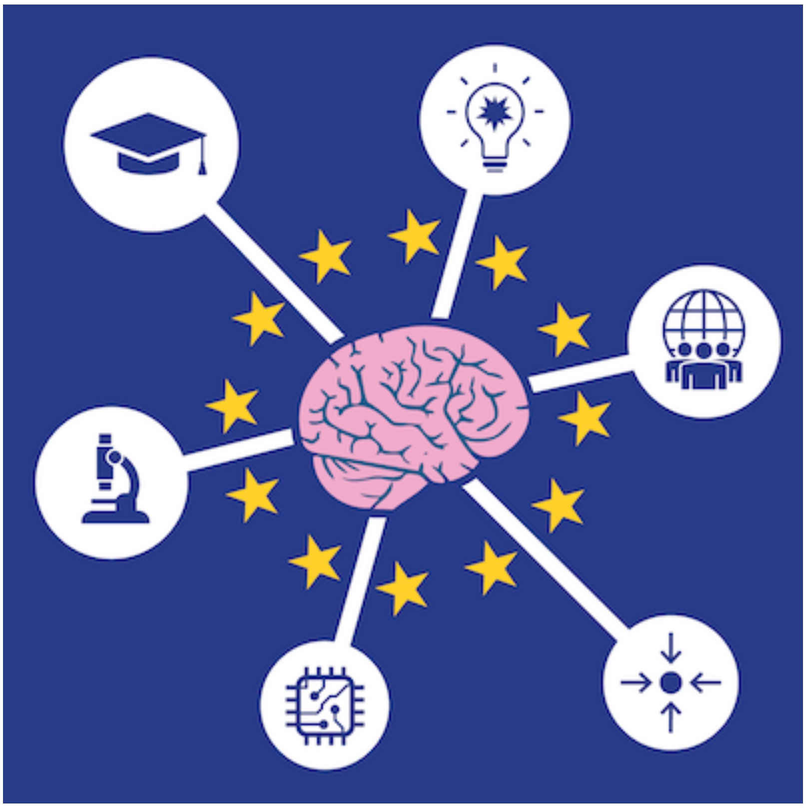
Neurotech^{EU}

The European University of Brain and Technology



[D8.2]
[Neurotech^{EU} Museum Corner]

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NeurotechEU Deliverable D8.2 – NeurotechEU Museum Corner

Introduction

NeurotechEU Deliverable 8.2: The NeurotechEU Museum Corner is part of the project to support the Dissemination strategy of NeurotechEU. The dissemination strategy aims to provide a modular and scalable organisation whose action plan could be implemented in and outside the academy. As described in this deliverable, a museum corner contributes to this aim by facilitating the organisation's actions outside the academy. This is one of the advantageous characteristics of the museum corner. Furthermore, the target group can (up to a certain extent) be fine-tuned by considering the location of the museum corner. A museum corner can thus be considered an important form of public outreach, which is relevant for neurotechnologies, an emerging field, and thus for NeurotechEU.

As NeurotechEU is an alliance represented in all European regions, it is important that the dissemination can be performed throughout Europe, preferably in local languages, to make it as inclusive as possible. Because of this, one thing that was taken into account for this deliverable was the ability of the museum corner to be as portable as possible. This allows having a museum corner in multiple locations over time. With the current design, the NTEU museum corner is able to travel to different partners at a time.

The eXperience Induction Machine (XIM)

The eXperience Induction Machine (XIM) was first described in literature in 2007, as an immersive room equipped with a number of sensors and effectors that has been constructed to conduct experiments in mixed reality [1]. It is designed as a general-purpose infrastructure to investigate human-artefact interaction. More specifically, the XIM installation could answer questions that include how spatial enclosure can affect and interact with its visitors, how humans can act, exist, and behave in both physical and virtual spaces, the construction of socially capable believable synthetic characters and the development of a framework for interactive narrators.

The XIM covers a defined set of dimensions (originally 5.5x5.0x4.0m) with high-end equipment installed on the inside. This includes the following devices:

- Cameras provide a “bird´s-eye view”, possibly combined with other sensory modalities to allow reliable and accurate tracking of the visitors.
- Microphones provide the system with auditory input. This allows visitor localisation and the recognition of specific sound events.
- Beamers allow projection inside the XIM installation in all vertical directions.
- A set of speakers (with supporting sound equipment) allows spatialised sounds within the XIM installation.
- An interactive floor, being a set of floor tiles that are individually programmable to support the experience.

The XIM is completely designed by a multidisciplinary team, including expertise ranging from Computer Science to Music & Arts. This altogether makes the installation one of the most advanced mixed-reality spaces that is available [2]. Figure 1 shows some representations of earlier versions of the XIM installation.

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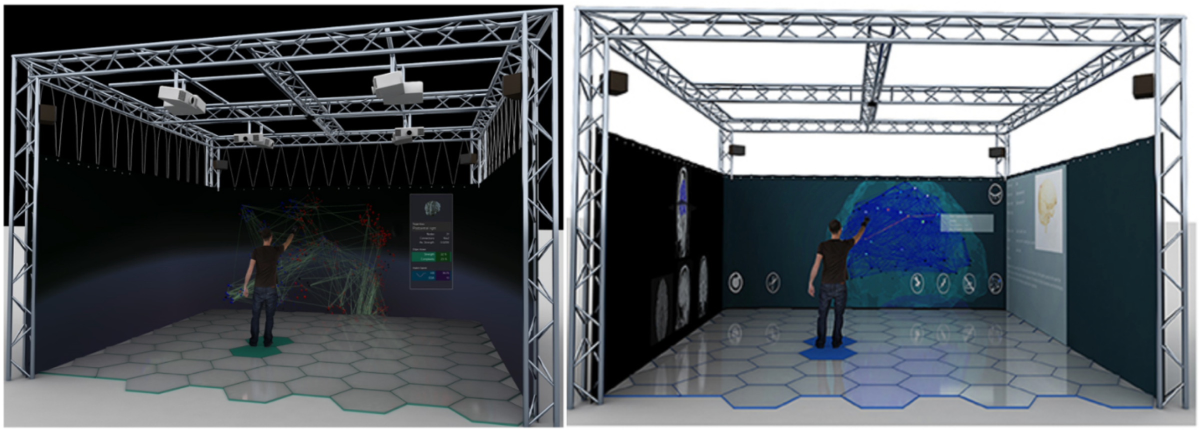

Figure 1 I An earlier version of the eXperience Induction Machine. The XIM installation consists of projection screens in all vertical directions, motion sensors, a sound installation, and an interactive floor.

The existing knowledge and technology from XIM were used for this deliverable. A new XIM installation, focussing on neurotechnologies, was designed and built with the help of Beurswand, an international expert in exhibition stands. This XIM installation is designed as a portable installation, which allows the installation to be placed all throughout Europe. This does thus mean that this NTEU Museum Corner can move to different locations, depending on its needs and interests. The visual design of the NTEU XIM installation can be seen in Figure 2.

Figure 2 I The design of the NTEU XIM installation. It is designed to be portable, so it can exhibit at all different NTEU partners.

On the inside of the NTEU XIM installation, there were a number of specifications that the designing company took into account, which can be observed in an overview in Figure 3. These specifications make the installation useable in a wide variety of settings and for many applications. These specifications include high-end laser projectors, speakers, and motion sensors.

The first version of the NTEU XIM Installation is now ready for exhibition. However, joint efforts are being continued with Beurswand. This includes for example how the interactive floor can be incorporated in the installation. Also, continuous efforts will

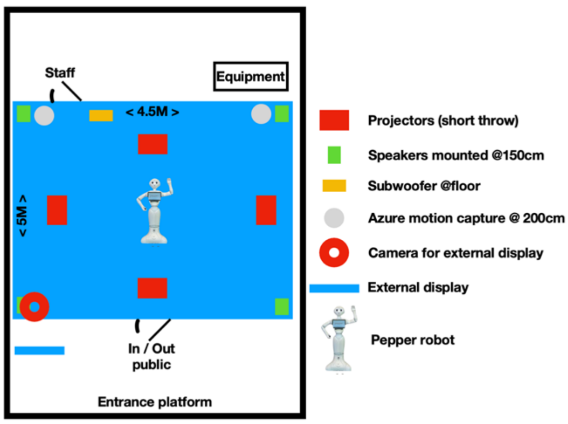

Figure 3 I The specifications of the NTEU XIM installation design. These elements have been considered to enlarge the usability of the installation.

be put into improving the quality of NTEU XIM, for example, the quality of projection or the quality of sound.

The installation premiered on October 1st at Radboud University, Nijmegen (see press release here). The premiere of the NTEU XIM installation was combined with the 65th anniversary of the Faculty of Science of Radboud University. The installation was part of an open house exhibition, where research groups and projects (like NeurotechEU) could show their state-of-the-art equipment and research. During the day, over 250 students, children and parents were guided in the NTEU XIM installation. For this edition, two scenarios were presented to the public.

The first scenario was BrainX3 (BX3). BX3 is an interactive way to move through the different layers of the brain. To enable real-time embodied interaction, Microsoft Kinects were used to track the user´s position in the XIM and map themselves to the virtual environment. One of the projection sides showed a 3D model of the brain, the second side information on a specific brain region, the third side a model of a spiking cortical network, and the fourth screen general information on the brain. The focus was primarily on the screen with the 3D model of the brain. The visitors could travel through the dataset by physically walking in the XIM space. The centre of the XIM constituted the starting point of navigation. The visitor could walk forward or backwards to rotate the brain clockwise and counterclockwise, respectively. Left or right movements could stop the rotation and select a brain area. Upon the selection of a brain area, the second side of projection changed content specifically for the selected brain region. Furthermore, the Pepper Robot would tell the visitors information on the selected brain region. In the future, there can be strived to convey these stories in local languages, to make it as inclusive and accessible as possible. The third side of projection showed a spiking cortical network of the selected brain region. The fourth projection screen (with general information on the brain) did not change content upon the selection of a different brain region.

The second scenario that was used during the premiere was a representation of a black hole. This scenario may be less directly related to neuroscience/tech, but it demonstrates the versatility of the portable museum corner. In this scenario, the different sides of the projection visualised space. Just like in BX3, there was one central screen that the visitors could use as their point of orientation and to navigate from that screen throughout space. A journey through the black hole could be initiated by standing in the centre of the XIM space. Again, by changing orientation in the XIM space, the direction on the screens changed.

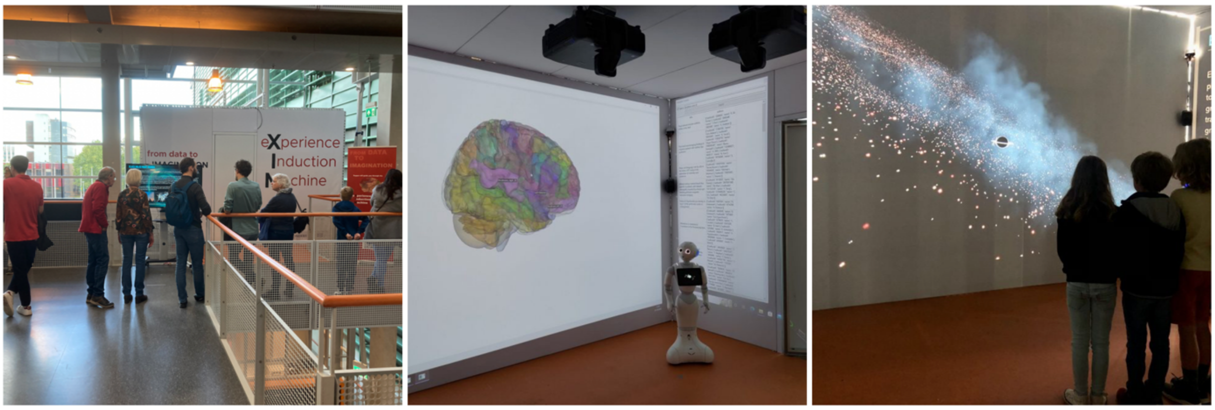

Figure 4 I An overview of the premier of the NTEU portable museum corner: The NeurotechEU eXperience Induction Machine (XIM). On the day of premiere, two scenarios were presented: BrainX3 (middle) and A Journey through the Black Hole (right).

The scenarios presented and described above are only a small selection of all possibilities that the NTEU XIM installation would be capable of performing. Its versatility and the fact that it is a *portable* museum corner allow the transfer of lots of knowledge to many people (in geographically different locations). The advantage of using this type of installation is that it has been proven before that it allows visitors to grasp the information better. Furthermore, visitors have been proven to be better able to memorise the transferred information [3].
Besides a museum corner, the installation can also be used for training purposes. As Virtual Reality serves as the basis for the installation, the installation can contribute to training students and lifelong learners by simulating different types of environments. An example of this would be the use of confocal/light sheath images to navigate through neurons. For the VR approach, software like Neurolucida 360 could likely be used.
Another application for which the XIM would be a potentially relevant solution is for (neuro)rehabilitation. It has been shown earlier that VR provides a safe and controlled environment for performing customised and engaging rehabilitation activities. These activities promote the learning of motor skills and are relevant for motor rehabilitation. Furthermore, as VR is considered to be a more enjoyable way of to participate in rehabilitation interventions, especially for children, XIM would be able to boost the effectiveness of VR-(neuro)rehabilitation [4].

References

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