



oMERO Project
an eu curriculumM for visual disabiliTiEs RehabilitatOrs

Designers' KIT
REALTER

Why and How to adopt the system in your training program

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What is REALTER?

The acquisition of rehabilitation techniques requires a strong immersion in the reality of daily life to understand how patients experience their low vision condition. If simulating absolute blindness is achievable with empirical methods, simulating low vision is much more complicated but fundamental for the accurate training of the rehabilitation operator. REALTER (wearable egocentric altered reality simulator) is a device that simulates, in real time, visual impairment in low vision conditions, to be used as a training tool for operators specialized in the rehabilitation of partially sighted subjects with particular emphasis on "orientation and mobility".

REALTER will provide an effective interface to experience the actual limitations and needs of visually impaired people (VIP), i.e., to orient themselves, manipulate objects and move around the environment on the basis of visual information accessible to a person with severe low vision.

Why could it contribute to your training program?

REALTER can extend the learning methods to innovative practical activities where the student can "experience" the impairments of disability first-hand, with a considerable reduction of time¹. For example, while currently applied methods require a teacher-student ratio of 1:2 (reducible to 1:3) for classroom and outdoor activities, a planned use of REALTER, during practical sessions led by a technician, should significantly reduce teaching time, especially for graduate students, and allow truly immersive training experiences. Moreover, collaborative study (i.e., couples of students with exchangeable trainer/trainee roles) or self-training approaches could be implemented. Specific lesson plans delivered by oMERO will support the effective planning of these learning experiences.

¹ Yet, depending on the number of systems that can be purchased within the teaching program.

User's perspective factsheet

The current version of the system can be used indoors to experience the performance of simple every-day tasks (such as reading, pouring water into a glass, preparing a sandwich, etc.) under simulated low vision conditions.

It does not necessarily require a dedicated fixed space, as the system is easily transportable. However, it would be preferable (and recommended) to have a dedicated working area (minimum 2 m x 1.5 m), where to mount the external base stations (see details in the following sections).

The current prototype integrates several commercial hardware components and uses a software package running on Windows. The installation, calibration and upgrading of the software will depend mainly on the support available for single commercial components.

Specifically, REALTER is composed of:

- a commercial head-mounted display (HTC Vive Pro Eye) typically used for gaming (goggles + base stations + controllers). The HMD has a fully integrated eye-tracking system, which plays a key role for gaze-contingent visual alterations;
- an external stereo camera rig that can be mounted on the HMD;
- a PC with the following features:

Component	Recommended system requirements	Minimum system requirements
Processor	Quad-core 3.0GHz or faster processor (e.g. Intel Core i7-9750H)	Quad-core 3.0GHz or faster processor
GPU	NVIDIA GeForce RTX 2070 or higher	NVIDIA GeForce GTX 1070 or higher
Memory	8 GB RAM or more	4 GB RAM or more
Video output	DisplayPort 1.2 or newer	DisplayPort 1.2 or newer
USB port	2x USB 3.0 or newer	2x USB 3.0 or newer
Operating system	Windows 10	Windows 7 SP1, Windows 8.1 or later, Windows 10

The HMD can be purchased directly from the manufacturers or distributors (see details in the following sections) at an average cost of 1800 Euros (VAT excluded).

The cost of the whole set of hardware components is around 3500 Euros.

A first release of the graphic software engines is available as a free executable code, together with a technical user guide for demonstration purposes with no specific support. A commercial software suite is under development by a local company.

The whole system is designed to be managed by any ICT technician without specific training.

How to use

System components

System requirements

Providers and costs

Software

Technical assistance requirements

System set-up

This section lists all the necessary steps to make the system work.

- 1) Purchase of system's components:



HTC Vive Pro Eye

The HDM comes with two base stations and two controllers

<https://www.vive.com/us/product/vive-pro-eye/overview/>



ZED mini

The ZED Mini comes with a 1.5m USB Type-C to Type-A cable, a 4m USB Type-C to Type-A cable, and a VR mount for Vive and Oculus headsets

<https://www.stereolabs.com/zed-mini/>



Personal Computer (desktop or laptop)

See previous section for minimum and recommended system's requirements

<https://www.dell.com/en-us/shop/desktop-computers/sr/desktops/alienware-desktops>

<https://www.dell.com/en-us/shop/dell-laptops/sr/laptops/vr-ready?appliedRefinements=9903>

<https://www.dell.com/en-us/shop/gaming-laptops/sr/game-laptops/alienware-laptops>

- 2) Define the working area according to the virtual boundaries depending on the VIVE Pro Eye features. The first prototype of REALTER is designed for room-scale setup, but you can also use it for standing and seated experiences.

Before choosing your setup, make sure that you have enough space. Room-scale setup² needs a minimum working area of 2 m x 1.5 m (6 ft 6 in x 5 ft). Seated and standing experiences do not have space requirements.

² Room-scale VR (room-scale virtual reality) is the use of a clear space to allow movement for someone using a VR application such as virtual reality gaming.
([https://whatis.techtarget.com/definition/room-scale-VR-room-scale-virtual-reality#:~:text=Room%2Dscale%20VR%20\(room%2Dscale%20virtual%20reality\)%20is,virtual%20environment%20seem%20more%20real](https://whatis.techtarget.com/definition/room-scale-VR-room-scale-virtual-reality#:~:text=Room%2Dscale%20VR%20(room%2Dscale%20virtual%20reality)%20is,virtual%20environment%20seem%20more%20real))

- Find a space that you will designate as the play area.
- Place your computer next to your play area. The headset cable extends approximately 5 m (16 ft 4 in) from your computer.
- Make sure that there are power outlets close to where you mount the base stations. Use 12V extension cords as needed.

Note: An upgraded version of REALTER is currently under development, it is expected to be used outdoor, avoiding the current working area limitations posed by base stations. When the upgraded version will have been released, these guidelines will be revised and integrated accordingly.

3) Before you can use REALTER, you will need to complete the VIVE Pro Eye setup process.

To start the setup process, you can:

- download the setup file on your computer from:
www.vive.com/setup/vive-pro;
- run the setup file and follow the instructions to complete the process;
Note: Once you have completed the room setup, you will need to run it again if you have moved or adjusted the angles of the base stations or if you transfer your VIVE Pro Eye VR system to a different room.
- download the eye tracking SRanipal Runtime file on your computer from:
<https://developer.vive.com/resources/vive-sense/eye-and-facial-tracking-sdk/download/latest/>
- run the setup file and follow the instructions to complete the process.

4) Other settings for the head-mounted display can be found in the VIVE Pro Eye User guide:
(https://developer.vive.com/documents/718/VIVE_Pro_Eye_user_guide.pdf)

5) The software graphic engine for administering the simulated visual alterations is provided as a free executable code for demonstration purposes.
Note: A commercial software through a joint venture between academic and industrial partners is currently under development.

Setting-up the whole system would require a couple of days of an ICT technician.

The presence of an ICT technician during the use of the system is suggested to promptly fix possible unexpected system faults (extremely rare, truthfully).