Mobile VR Amblyopia Trainer - A modern approach to Amblyopia

Amblyopia is a developmental disorder of the visual system which results from a blurred image of one eye (anisometropia) or a ocular misalignment (strabismus) in early childhood [1]. The brain suppresses the visual impression of the affected or amblyopic eye to avoid blurred vision (in case of anisometropia) or double vision (in case of strabismus). Thus, binocular depth perception is lost. Over decades the primary treatment to amblyopia was patching the healthy eye to force the amblyopic eye to see. In that way the amblyopic eye should be trained to increase visual performance again. However, patching has multiple drawbacks one of which is the poor binocular depth perception outcome after treatment.

We developed a novel binocular treatment using Virtual Reality (VR) technology in which the image quality of both eyes is balanced so that the patient sees binocularly. The balancing process consist of two parts: (1) Contrast reduction of the healthy eye to avoid suppression and (2) Strabismus compensation to avoid double vision and reestablish binocular depth perception. After that the patient can train and improve the visual performance and amblyopia is cured.

To increase the usability of the developed system, it must be available for home-monitoring scenarios. By now the system consists of a high-performance PC with a wired VR-Headset and additional tracking hardware. The aim of this work is to implement a fully functional, yet simplified version of the system that runs on stand-alone devices like the HTC Vive Focus Plus or Oculus Quest. The implementation will be tested against the already available system performing a usability study.

Requirements:

- Literature and patent research of relevant work.
- Get used to Unreal Engine 4.
- Implementation of mobile VR Amblyopia Trainer.
- Evaluation of the implemented mobile VR Amblyopia Trainer.

References
