

Abstract

Navigation is one of the most common forms of cognitive processing, which is natural for all animal species. But the neuroscientific inquiry into navigation in human subjects has been hindered by the requirements of monitoring methods, which usually require subjects to be completely still. Virtual environments allow scientists to study navigation even while the subject remains unmoving, and offer other benefits such as full control over the experimental procedures or precise behavioral recordings.

This thesis offers a basic overview of the biology of navigation and presents why navigation is an interesting cognitive process to investigate. It then presents virtual environments, explores how they can help neuroscientists to study navigation and outlines their limitations. Lastly, the literary review tries to address the question if navigation in virtual environments is comparable to navigation in the real world.

The empirical part presents five original studies of human navigation and virtual environments. These studies focus on differences of real world and virtual navigation, investigate neural pathways and brain regions involved in spatial processing, and offer examples of how virtual environments can help conduct studies otherwise impossible to do in the real world. One study provides an example of how studying navigation in a virtual environment can be interesting for psychiatry. Overall, this thesis demonstrates several benefits of VEs and the transferability of navigation results obtained in the VEs to the real world.

Keywords: virtual environments, virtual reality, navigation, spatial knowledge