

Summary 2:

Self-motion illusions in immersive virtual reality environments

Motion is perceived differently in virtual environments (VE) and the real world. To resolve this issue, many methods, such as up/down scaling the environment or rotation in VE have been introduced. However, such approaches often distort space cognition and introduce discrepancies between the real and virtual environments. The paper proposes an alternative way to alter the user's self-motion perception in immersive VR by using optical flow manipulation in four ways to induce the illusion: Layered motion, Contour filtering, Change blindness, and Contrast inversion. Users were placed in a room with head mounted displays and instructed to walk 2m physically and asked to judge "Was the virtual movement smaller or larger than the physical movement?" Results showed that using such manipulation to the optical flow in the user's periphery vision could make users perceive that their self-motion in the VE matched their movements in the real world, although users noticed the visual illusions applied.

BibTeX:

```
@INPROCEEDINGS{5759434,  
  author={G. Bruder and F. Steinicke and P. Wieland},  
  booktitle={2011 IEEE Virtual Reality Conference},  
  title={Self-motion illusions in immersive virtual reality environments},  
  year={2011},  
  volume={},  
  number={},  
  pages={39-46},  
  abstract={Motion perception in immersive virtual reality environments significantly differs from the real world. For example, previous work has shown that users tend to underestimate travel distances in immersive virtual environments (VEs). As a solution to this problem, some researchers propose to scale the mapped virtual camera motion relative to the tracked real-world movement of a user until real and virtual motion appear to match, i. e., real-world movements could be mapped with a larger gain to the VE in order to compensate for the underestimation. Although this approach usually results in more accurate self-motion judgments by users, introducing discrepancies between real and virtual motion can become a problem, in particular, due to misalignments of both worlds and distorted space cognition. In this paper we describe a different approach that introduces apparent self-motion illusions by manipulating optic flow fields during movements in VEs. These manipulations can affect self-motion perception in VEs, but omit a quantitative discrepancy between real and virtual motions. We introduce four illusions and show in experiments that optic flow manipulation can significantly affect users' self-motion judgments. Furthermore, we show that with such manipulation of optic flow fields the underestimation of travel distances can be compensated.},  
  keywords={cameras;image sequences;motion estimation;virtual reality;visual perception;immersive virtual reality environments;mapped virtual camera motion;motion perception;optic flow field manipulation;self-motion illusions;self-motion
```

judgment;tracked real-world movement;travel distance underestimation;virtual motion;Blindness;Cameras;Detectors;Integrated optics;Optical distortion;Optical sensors;Visualization;Self-motion perception;optic flow;visual illusions},
doi={10.1109/VR.2011.5759434},
ISSN={1087-8270},
month={March},}

<http://ieeexplore.ieee.org/document/5759434/>