

UNIVERSITY OF TARTU
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Computer Science Curriculum

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Reduced Contrast in the Area of the Visual Field Where the Own Hand Is Moving: A Virtual Reality Study

Bachelor's Thesis (9 ECTS)

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Abstract: From an evolutionary standpoint, being able to quickly detect motion within the visual field is very important. However, when an agent is moving, a large part of motion consists of moving parts of the agent himself. The results of numerous studies suggest that the brain predicts the results of its movements and attenuates the sensory signals resulting from those movements. Using Oculus Rift virtual reality (VR) headset and a Leap Motion hand tracking device, we can study the aforementioned phenomenon. As a part of this thesis, a program was developed that enables to test whether self-generated hand movement affects the perceived contrast in the area of visual field where the hand is moving. We conducted a VR experiment where we monitored the hand positions during movements while the subjects had to perform a two-alternative forced choice task - they answered the side of the stimulus which seemed higher in contrast. The data gathered from 11 participants in the study did not provide enough evidence to confirm that the brain attenuates the apparent contrast of objects in the area of the visual field where the own hand is moving. It was concluded that further studies with slightly modified experimental design and more participants are necessary.

Keywords:

Oculus Rift, Leap Motion Controller, Unity, virtual reality, sensory attenuation

CERCS: P175, Informatics, systems theory

Kontrasti alanemine nägemisvälja osas, kus enda käsi liigub: katse virtuaalse reaalsusega

Lühikokkuvõte: Evolutsioonilisest seisukohast on liikumise kiire tuvastamine vaateväljas väga oluline. Samas, kui indiviid liigub, siis suur osa liikumisest tema vaateväljas on tema enda poolt tekitatud. Mitmete uurimuste tulemused viitavad sellele, et aju enustab enda liigutuste tulemusi ette ja pidurdab neist liigutustest tekkivaid sensoorseid signaale. Kasutades Oculus Rifti virtuaalreaalsusprille ja Leap Motion käe jälgimise seadet, saame me eelpoolnimetatud fenomeni uurida. Selle bakalaureusetöö raames valmis programm, mille abil saab leida vastust küsimusele, kuidas mõjutab enda käe liikumine tajutavat kontrasti nägemisvälja selles osas, kus käsi liigub. Me viisime läbi VR katsed, kus jälgisime katseisikute käe positsiooni sel ajal, kui nad sooritasid ülesannet, kus pidid raporteerima kahest stiimulist kontrastsemana näiva stiimuli poole. 11lt katseisikult kogutud andmete põhjal ei saa kindlalt väita, et objektid, mis asuvad nägemisvälja selles osas kus enda käsi liigub, tunduksid vähem kontrastsed. Katsete tulemuste põhjal järeldati, et täiendavad uuringud suurema valimi ja veidi modifitseeritud katse disainiga on vajalikud.

Võtmesõnad:

Oculus Rift, Leap Motion Controller, Unity, virtuaalreaalsus, sensoorne allasurumine

CERCS: P175, Informaatika, süsteemiteooria

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supervised by Jaan Aru, Kristjan-Julius Laak and Madis Vasser

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