Litterature Review

Reducing Sedentary Behavior for Software Engineers: Identified Performance Advantages and Disadvantages Using a Visual Programming Language Inside Virtual Reality

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INFORMATION

The literature review is divided into different areas that can be found as titles in this paper.

Keywords
Visual Programming Language, Virtual Reality, Performance, Health.

SEDENTARY BEHAVIOR

VISUAL PROGRAMMING LANGUAGE

VIRTUAL REALITY

Performance

Typing

One issue with VR is the text-input Performance. The reason is that two hand controllers are usually used with a VR headset. This results in limited movement. One study explore select base typing as an allternetive to keyboard input [4]

Motion Sickness

Simulation Sickness

There is a lot of research in to motion sickness, also called simulation sickness. This ocurred when the person is stationary in the physical world, but is moving in the virtual one.

Accommodation-Vergence Mismatch

Retinal cues of disparity and blur makes the eyes change accommodation and vergence in order to create one clear image [3]. Accommodation is when the eyes change its focus to create a clear image of what is looked at. If the accommodation fails, the object that is looked at is going to be perceived blurry. Vergence is when the eyes converge or diverge from each other to create a singel image. If vergence fails, visual disparity is perceived, making the object that is looked at appear twice. Accommodation and vergence have been found to be influencing each other, meaning that when accommodation changes, vergence also changes as a reflex, and vice versa [5]. Because of this, it is difficult only change accommodation or vergence without changing the other.

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In the context of virtual reality headsets, there is a phenomenon called accommodation-vergence mismatch, also called accommodation-vergence conflict [2]. This causes objects to close to the viewer to be blurry or to appear twice. The reson for this is that most VR headsets uses fixed lenses, resulting in a fixed focal length of the viewed content. This means that the user do not need to change their accommodation when using VR. However, the viewer need to alter their vergence due to VR using stereoscopic displays that creates the illusion of 3D. Requiring the viewier to have a fixed accommodation while changing their vergence can cause a accommodation-vergence mismatch. For viewing objects far away, the mismatch is at a level that it is not noticeable for the viewer. However, when object are closer than one meter, the mismatch is at a level that the vision either becomes blurry or have disparity [1]. This can lead to eye-strain, headache or nausea. For this reason, the viewable content in VR should be placed a a distance such that it minimize accommodation-vergence mismatch.

VPL IN VR

Existing VPL designed for VR

HackVR

HackVR is an Object Oriented Programming VPL inside VR. It is design around teaching OOP for new programmings by having challenges that can be solved. It focuses primarily to create a gameification

Design

The size of the blocks is determine on multiple factors. One factor is the screen resolution... Another is the focal length of the lenses, as accomodation-vergence conflict can occure if objects are to close. And third, is the distace which the input system can reach. Using a raycast method allows the user to interact with objects at any distance, but may increase the errors rates such as selecting a block on mistake.

COGNITIVE DIMENSIONS

TODO: Explain briefly about what cognitive dimensions are.

One paper by Robert Holwerda and Felienne Hermans explored the potential of using a block based VPL in a professional context. This is in contrast for what block base VPL are usually design for, which is eduction and learnability. The study uses some aspects of cognitive dimensions to evaluated a VPL. The following findings can be of relevance for a VPL in VR.

Role-Expressiveness

Role-expressiveness is the ability of a program to convey the role or function of a curtain visual element to the user. In Blockly, for example, the blocks are design as puzzles pieces to convey that the blocks are to be connected to each other. Moreover, the shape of the puzzles pieces also give information about what blocks can be connected together.

The study by Holwerda and Hermans found two issues with role-expressiveness for their VPL prototype. For one, there was some complaints about the labeling on some of the blocks. Secondly, the participants did not take any use of the comment feature that exited in the VPL. This even after being instructed about the commenting feature. The reasons behind these two issues were not specified in the study. However, some suggested improvements were mentioned. Adding better features for secondary notations were one such suggestion. This could include better commenting, allowing to group blocks, and to add variables and procedures. Having more of these secondary notation would result in better role-expressiveness for the VPL application.

Having a three dimensional environment can potentially contribute to an increased role-expressiveness. For example, comments, labels, or other notation could be shown behind the block it references without obscuring other blocks. The user can then glance behind the block in order to see the different blocks role in the application. However, when the code grows in size, there is a chance that this implementation litter the code space with notation. Making it more confusing instead of increasing role-expressiveness.

Role-Expressiveness

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One study found that, in terms of role-expressiveness, that screen space was an issue. That block cluster got large enough to

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