

A Literature Review on 3D Menus

Manu Lam

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A list of processes used within our experiment

Think-Aloud

The think-aloud protocol is used to gather data in usability testing in product design and development. Think-aloud protocols involve participants thinking aloud as they are performing a set of specific tasks. The participant is asked to say whatever comes into their mind as they are doing the task. This gives the observers insight to the participant's cognitive processes (Feeling, Thinking, Doing)[2].

System Usability Scale (SUS)

The System Usability Scale (SUS) is a simple Likert scale[3] giving an overview of usability. It is measured by the product's effectiveness (can users successfully achieve their objectives), efficiency (how much effort and resource is expended in achieving those objectives) and satisfaction (was the experience satisfactory)[4]. SUS provides a type of high-level subjective view of usability and is often used in carrying out comparisons of usability between systems. It yields a single score on a scale of 0–100, this can be used to compare even systems that are not similar. This aspect of the SUS is both a benefit and a drawback, because the questionnaire is necessarily quite general.

Multimodal Menu Presentation and Selection[7]

This paper was really interesting to read. It talks about all the different types of Menus that are possible within an Immersive Virtual Environment. There are said to be 3 Menu Presentation styles such as World Fixed(WF): The menu system resides at a fixed location in a “strategic” world location. View Fixed(VF): The menu system is attached at and viewed from a fixed offset from the user (thus, it moves with the “head tracked” user). Object Fixed(OF): The menu system is attached at one or more “strategic” virtual objects (which may move in time).

Display styles such as Pull-down (PD): The usual pull-down menu that displays the highest level menu items, and shows its branches only during the selection task.

Pop-up (PU): The usual pop-up menu that disappears once the selection is made. The menu structure associated with the particular menu selection path is shown only on user's invocation.

Stack Menu: A menu system that persistently displays the selection path either at the top portion of the popup menu (disappears once the selection is done), thus called the Fixed Stack (FS), or at a separate location (e.g. at the corner of the screen), thus called the Basket Stack (BS). Only the menu options selectable at a given level are shown.

Object-Specific Menu: This menu system is a conglomerate of the pull-down/pop-up and object-fixed menu schemes. Each object contains a specific pulldown (OPD) or pop-up (OPU) menu applicable to that object class, thus the menu structure is distributed among the virtual objects in the scene.

Oblique/Layered (OL): This is a flat menu presentation displayed in an oblique fashion, or its structure organized and displayed by layers.

Following their experiments and conclusions, it is shown that the VF-FS and the VF-BS menus are the easiest to use (Faster Completion time, Positioning Time, Command Time).

For most of our own experiments, we had games that rarely needed a 2D Menu to be interacted with to achieve the task. I do not like these type of menus in a 3D space, mis-clicking could be an issue but these type of menu must always exist. I prefer ring menus over the aspect of 2D menus. I experimented within a few VR Games and I often mis-click within the 2D menu but not as often

with a ring menu.

Ring Menu[9]

Menu organised in a ring format can allow quick access to commands. The layout of the ring provides the user with a clear menu and allows the user to access the menu in a precise and swift manner.

Using a ring menu based on Liang's work[10]

It is used mainly because: It is easy to remember the position Rotating the wrist is fast and little movement is needed It is easier to maintain the position of orientation

This layout provides excellent speed ratings for use. If the center option within the menu is needed, the user can instantly click it without interruptions. If the two side buttons are needed, the user can rotate their wrist to the edge (it should lock on). Giving the user best access at the center and two edges. A novice user or even an experienced user can achieve the same output at the same pace. An extra touch to the Ring Menu is by adding more layers of rings, so that the user can have a wider choice of options further on the game.

Design and Evaluation of Menu Systems for Immersive Virtual Environments[11]

This paper is fairly interesting to look at, it provides the user with a entire different menu system known as a Pinch Glove Menu System(TULIP). By wearing a certain pair of modified gloves, each finger would have a different function. The experiments performed were mainly within drawing games, these gloves provides the user with an easy access of options provided they remember the function of each finger. The Pinch glove were compared with a pen and tablet menu, while the pen and tablet menu was found to be significantly faster, users had a preference for TULIP .The TULIP interfaces showed less discomfort than the pen and tablet interfaces, which preferred for longer usage. From comparing the gloves and the HTC Vive controller personally, These gloves would perform better in option menus within a drawing game according to the statistics recorded. The gloves would not suit other sort of games since it is needs a delicate hand to operate.

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