**Visual Richness in Virtual Reality – Experiment**

Variables:

* **Independent Variable:** State of Visual Richness (States are defined on a table below)
* **Dependent Variable:** Performance of a user (measured in Time, second)

Aim:

To understand the relationship between the state of richness of the virtual environment with the performance of the users in doing object manipulations by using a virtual reality headset along with a motion controller in a simulator.

Hypothesis:

Richness in virtual environments may affect the performance of a user in doing object manipulation tasks.

Prediction:

As the state of richness advances, the time it takes for the user to successfully fitting in correct object through a series of randomized box increases. (Non-proportional)

Possible Experiments:

1. Fitting the right object through the corresponding shaped hole on the box cover.

**Procedures:**

* *The user can start the simulation by pressing the ‘Begin’ button.*
* *User is expected to search for the likely objects within the cluster of variety of objects in accordance to the hold visible on top.*
* *User is then expected to pick an object that he/she perceived to be the one and try fit it through the hole on the box.*
* *If user successfully able to fit the right object through the whole, the hole on the box is changed and the objects are randomized and re-clustered. The time taken for the user to fit the right object into the box is recorded.*
* *The procedure is repeat for every state of visual richness (in a random order rather than ascending)*
* *Time results are recorded onto the result table accordingly*

1. Packing objects into the corresponding boxes based on a given property. (i.e. base geometrical shape)

**Procedures:**

* *The user can start the simulation by pressing the ‘Begin’ button.*
* *User is expected to observe the 2 boxes of different shape categories and start searching for relevant objects to be put into corresponding box. (Objects that don’t fit to any categories can be left on the table)*
* *If the user successfully able to sort all objects into correct boxes, the user then proceed to another situation with different categories in the two boxes and a new cluster of objects. The time taken for the user to sort these objects are recorded.*
* *The procedure is repeat for every state of visual richness (in a random order rather than ascending)*
* *Time results are recorded onto the result table accordingly*

States of Visual Richness:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Factors** | **State of Richness** | | | |
| Full-Flat State | Flat-textured State | Depth-Textured State | Rich State |
|  |  |  |  |  |
| **Background** | *Flat single colour Background (Grey)* | *Flat soft textured Wallpaper* | *Soft textured Wallpaper with surface depth and shading. (Static Shading)* | *Soft textured Wallpaper with surface depth, shading and allow shadow castings. (Dynamic Shading)* |
|  |  |  |  |  |
| **Table** | *Simple square block with flat single colour (White)* | *Desk shaped block with white texture with flat details.* | *Desk shaped block with white texture including rendered depths of details* | *Full desk model (having visible parts such as drawers, wire holes, structure etc. although non-interact-able) with multi-shadings according to parts.* |
|  |  |  |  |  |
| **Movable Objects** | *Flat low polygon objects with flat single colour* | *Objects contain their corresponding texture without any depth. Medium Polygon* | *Objects contain their corresponding texture with depth to it. High Polygon* | *Objects can additionally cast shadows and reflections. Dynamic casting and shading.* |
|  |  |  |  |  |
| **Boxes** | *Flat colour box (Grey)* | *Flat colour box (grey) with flat details* | *Box (grey) with depth to details and static grey shading* | *Box contains metallic shading and additionally cast shadows and reflections. Dynamic casting and shading.* |
|  |  |  |  |  |

Result Table:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| User | Time to Finish the Task (in Seconds, s) | | | |
| Full-Flat State | Flat-Textured State | Depth-Textured State | Rich State |
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Constant Factor:

* Each user will be isolated in a room during the simulation, with a conductor who will remain silence unless help is needed by the user.
* Each user will be instructed about the procedures and briefly explained about the environment.
* Each user will only be allowed one run of the simulation (already containing series of repeats).
* User must be prevented from explaining the simulation experience to other users how soon will be taking the simulation.