Street_Lighting_7

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Unreal Engine 4.27.2

Street Lighting Game 2.3

Experiment procedure:

The participants are asked to fill a consent form explaining the purpose of the experiment. They are free to stop at any time. Then the participants are equipped with the VR headset to start the experiment (see Fig. 1). The experience consists of multiple periods of 15 seconds in which we lit the scene with a random light intensity selected from an array of preset values. When the time has elapsed, we switch to a completely dark scene and show an image with a question asking the participant “How safe do you feel?” with a Likert scale going from 1 to 10. From 1 to 5 the indication “not safe” was written on the image, from 6 to 10 the indication “safe” was written. The experimenter writes the answer and proceeds with the experiment.

As we want to reduce light intensity, we chose rather low values in order to find the specific area in which we observe a shift in the perceived safety. With that in mind, we made an array of six intensities expressed in Lumens: [100, 400, 800, 1500, 3000, 5000]. These values were carefully selected based on the literature and on pretest. It is not necessary to test with higher values of intensity as it will be too strong. Temperature for the light was chosen based on previous research also. In addition, Brest metropole staff told us that there is a law that limits the temperature of the luminaire to 3000 Kelvin. Each intensity is shown in a randomized order four different times to prevent any influence of any particular sequence. So each participant saw a total of 24 scenes. At the end of the experiment, the participants are asked to fill a questionnaire on the technical quality of the simulation, and a short interview was done.

Fig. 1. Example of a participant testing the simulation

Experimenter's insights

The program to run is located in the Street Lighting Game folder. It is called Street_Lighting_7.exe. Make sure you already have the VR headset connected so you don't get any launch errors.

Before running the program, you can configure certain text files to perform different simulations

- data.txt : This text file is used to modify the intensities shown in the scene. It does not matter how many values of intensity are entered but the format in which they are entered. The format to follow is as follows: xxx,xxx,xxx,xxx
  (Do not place spaces between commas or at the beginning or end of the text file)

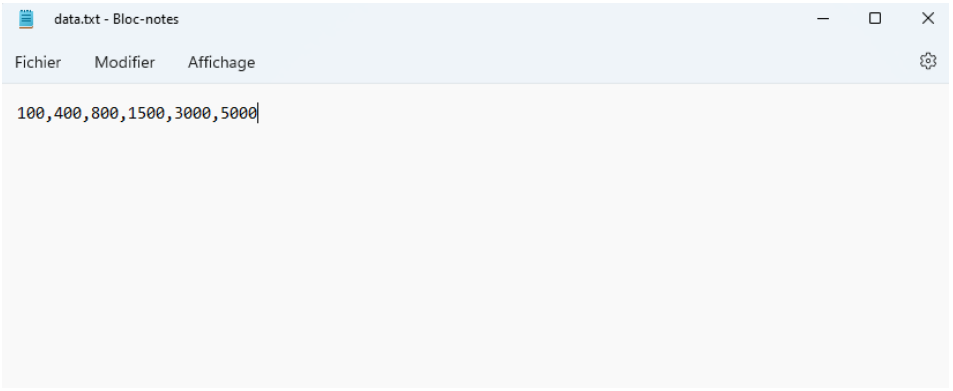


Fig. 2. Data text file example.

  It is recommended not to set values above 5000.

- iter.txt : This text file is used to modify the number of times each intensity is displayed. The format followed to enter the value is the same as in the data.txt file.

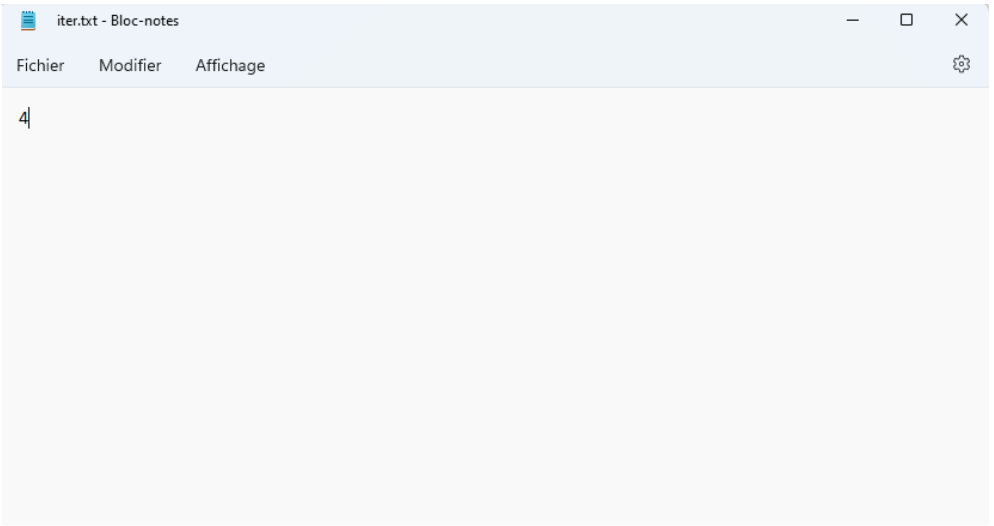


Fig. 3. Number of iterations text file example.

While running the program, the commands that can be entered by keyboard are as follows:

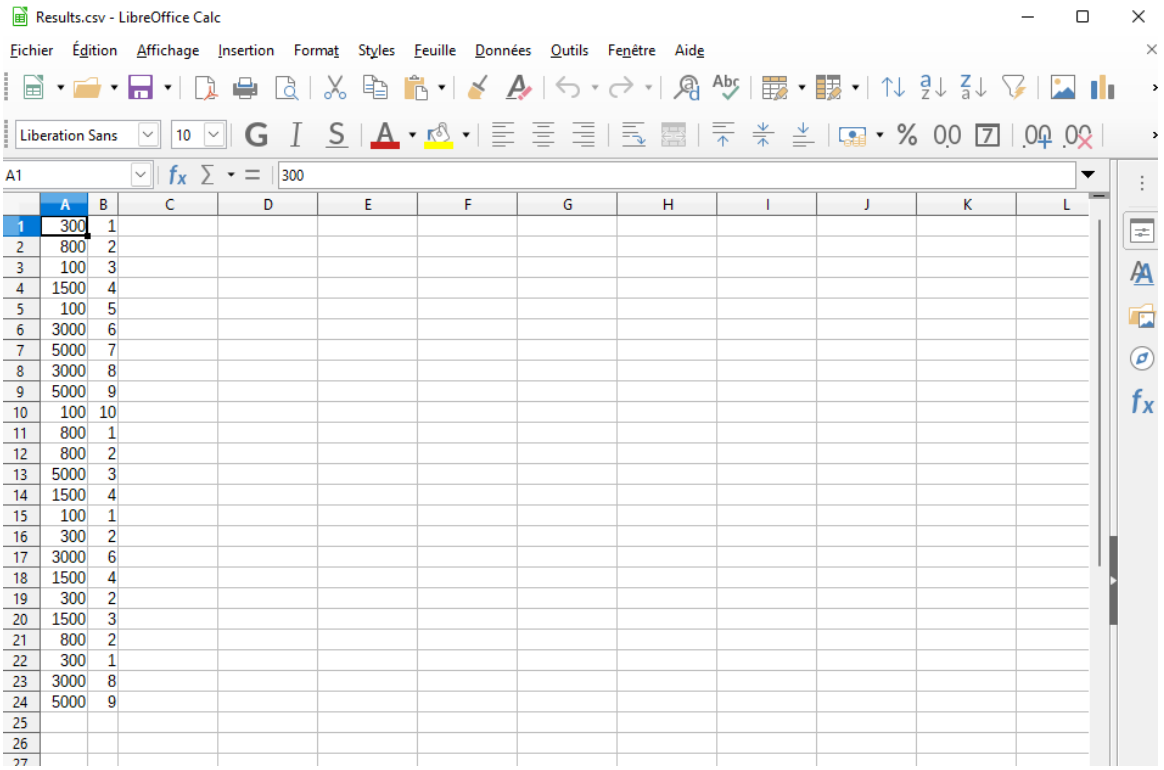
- *X* : Each time this key is pressed, the intensity of light will change following a randomized order until there are no more intensities to show. For example, if you entered 6 different values of intensities and showed them 4 times each, after you pressed the X key 24 times, lights will not change anymore and will rest turned off.
- *A* : Each time this key is pressed, all the lights will go out and the question will appear in front of the participant's view.
- *U* : Teleport the participant to a preset location.
- *I* : Teleport the participant to a preset location.
- *O* : Teleport the participant to a preset location.
- *Up button*: change the value of temperature. It increases the temperature 100 at each press. The value is shown on the screen.
- *Down button*: change the value of temperature. It decreases the temperature 100 at each press. The value is shown on the screen.
- *Esc* : Press this key to exit the simulation game.

Experimental

- *Numbers 0 to 9 (only in keyboards with numerical keyboard)* : These keys can be used to enter the response of the participant in each scene, the only thing to care about is that the values of the question range from 1 to 10 and the numbers from 0 to 9, so for the 10, the 0 key should be pressed.

Key	Excel Value
Num 1	1
Num 2	2
Num 3	3
Num 4	4
Num 5	5
Num 6	6
Num 7	7
Num 8	8
Num 9	9
Num 0	10

After running the program, in the .../Street_Lighting_X folder, a Results.csv file is created which contains the order in which the intensities were displayed and next to it the response value (if the numbers were used).



	A	B	C	D	E	F	G	H	I	J	K	L
1	300	1										
2	800	2										
3	100	3										
4	1500	4										
5	100	5										
6	3000	6										
7	5000	7										
8	3000	8										
9	5000	9										
10	100	10										
11	800	1										
12	800	2										
13	5000	3										
14	1500	4										
15	100	1										
16	300	2										
17	3000	6										
18	1500	4										
19	300	2										
20	1500	3										
21	800	2										
22	300	1										
23	3000	8										
24	5000	9										
25												
26												

Fig. 4. Excel table example

You have to copy these values and write them in another excel file apart because it is rewritten every time you run the program (for each participant).

Procedure during simulation - experimenter side:

Steps to follow:

1. Ensure that data.txt and iter.txt text files have been created and have valid values.
2. Connect virtual reality headset to computer
3. When the device has already been identified, run the program by double-clicking on the Street_Lighting_X.exe file.
4. The first scene shows an example light so that the participant can see the simulation beforehand (this should not last more than 15 seconds). Press the **A key** and the question appears so the participant can see where the image is and read it (all lights go out).
5. Then proceed by pressing the **X key** and after 15 seconds the **A key**. If you want to enter the response value (experimental) you must wait 1 second after **pressing on the number**, it may not load if you do not wait. Otherwise, you should write down the answers on paper and then enter them by hand.

   So the order to follows is:

   A , X (wait 15s), A, Number Press/Write (1-2s), …...

   **repeat the highlighted order until the intensities are finished (in this example 24 times)*

6. When all the lights have been turned off, press **R key** to generate the excel file and charge the list of intensities.
7. Finally, press the **Esc key** to exit the game and end the simulation.

If you want to **change the participant location** during the simulation, you can press at any time the **keys *U*, *I* and *O*** and the participant will teleport to another place in the scene. I recommend doing it after A press (all dark) but this is just a tip.