Virtual Reality study of the influence of environment color and luminosity in depth perception

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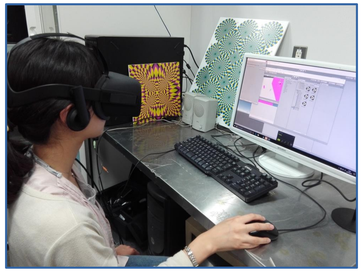
Does depth perception depends on rigid geometrical clues, stereo-vision and other “hard” factual things, or it is influenced also by other general environmental factors ?

We use a VR setup to try to answer to a special case of this question: global illumination.



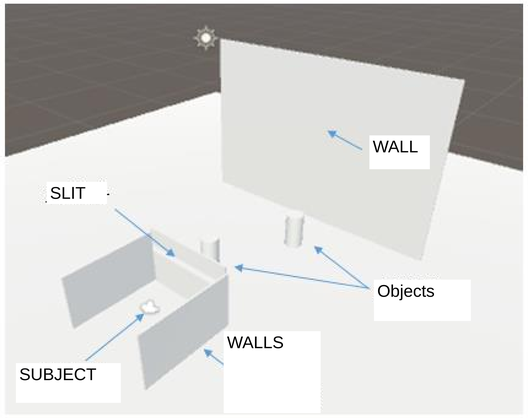
It is known that in the dark objects look closer than they are. Pilots at night mis-evaluate the altitude, soldiers could misunderstand the danger of a jump at night.

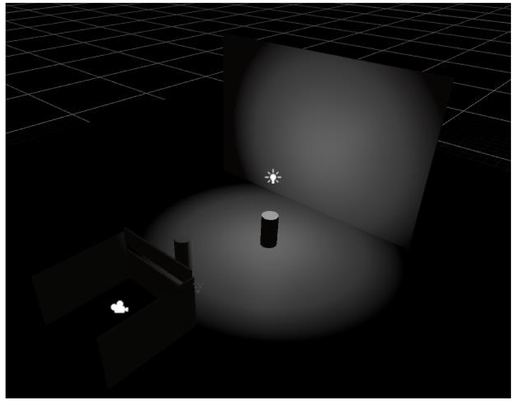
Pilots sometime call this effect the “black-hole” effect.

We used VR to try to reproduce this.

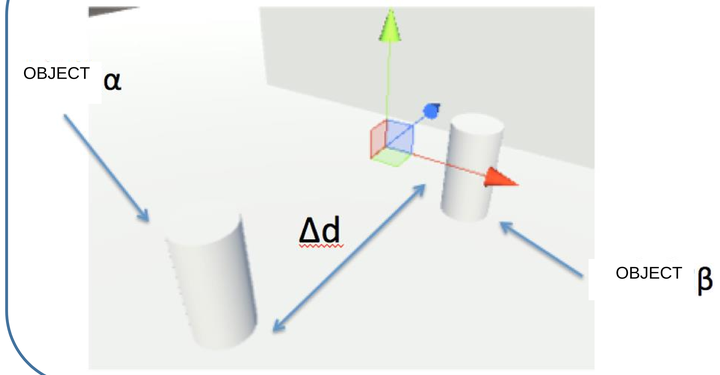
VR is used because we can re-create any environment good for perceptive experiment. The position of objects in VR is recorded precisely and also the position of the subject head is recorded.

A special test environment is created in VR. Subjects are placed in a virtual room where they can observe two cylinders from a slit.





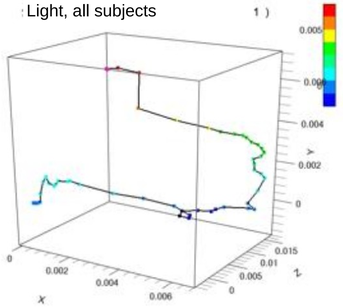
Subjects move two cylinders in VR under different global illumination conditions



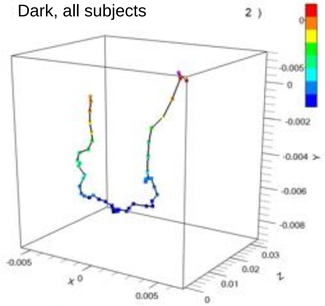
Δd				
Subjects	light	dark	t-test	Statistical validity
1	-0.035	-0.542	0.038	yes
2	-0.645	-2.366	0.018	yes
3	-0.572	-0.634	0.853	no
4	0.25	-0.12	0.032	yes
5	0.295	1.51	0.004	yes

Significant changes in head movements

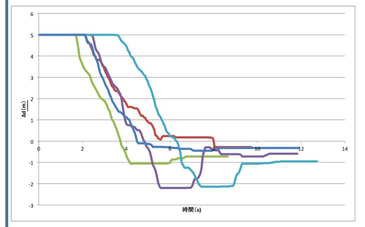
Light, all subjects



Dark, all subjects



Subject reaction time-profile



Significant changes in reaction time and profile