The Visual Perception Through the Diffusion of Light

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Thesis Abstract

Statement of Issue

Human perception of the visual world is limited through the homogeneity of design and the standardization of materials. However, visual perception of light reflecting and refracting off of surfaces changes according to an observers location in relation to the surface. Using properties of ones eyes in relation to sensitivity, location, and light, the goal of this thesis is to engage one's perception of the visual world using properties of transparent materials to maximize the diffusion of light within a space.

Statement of Significance of Issue

Through the use of all senses, people are aware of their surrounding environments. This awareness is a result of human perception and is based on peripheral aspects of each sense. The senses of sight is composed of both focal vision, which beings information immediately into ones memory through the fovea, and peripheral vision, which draws attention to changes in the environment such as the movement of light and shadows. One's eyes also have the ability to adapt to spaces with different levels of light. If one enters a dark space, one's pupil enlarges and allows light to enter the eye, allowing lover levels of specular reflections of light to be visible. However, if one were viewing the same specular reflection in a bright space, the dimmer reflections would not be visible to the eye. Is it possible to construct an apparatus that has the ability to diffuse and change one's visual image of small amounts of light rays?

Method of Inquiry

Initial experiments will explore the interactions of light and transparent materials. Observations and results from each experiment will lead to the next experiments, which explores other relationships between light and transparent materials, which will range from liquids to solid mediums. The final experiments will be a construction of a lighting apparatus made of steel and thousands of transparent thread. Small amounts of light rays will be directed onto the apparatus and reflected and refracted multiple times, spreading light over a large area. After the construction is complete, several experiments will be conducted in both a bright and dark space. This will be done to observe the apparatus while an observer's pupils are smaller, in the bright space, and dilated, in the dark space. Results from this particular experiment will lead to the conclusion of this thesis.

Expected Outcome

By placing the apparatus in a dark space, light will spread over a large area through reflections and refractions of light in multiple directions. The dark space will also allow an observer's eyes to dilate and see more specular reflections that if the same tests were done in a bright space. Through the use of this apparatus, bright specular reflections that were once visible using an observer's focal vision will spread throughout the transparent threads, allowing the specular reflections to be seen through the observer's peripheral vision. Through the changing of an observer's perception of specular reflections in the apparatus, observers will be encouraged to participate within the space by moving to new locations and experiencing different specular reflections of light. Thus, a visual relationship could be made between one's physical position within a space and the resulting visual image seen through the diffusion of light in the apparatus.

Literature Review

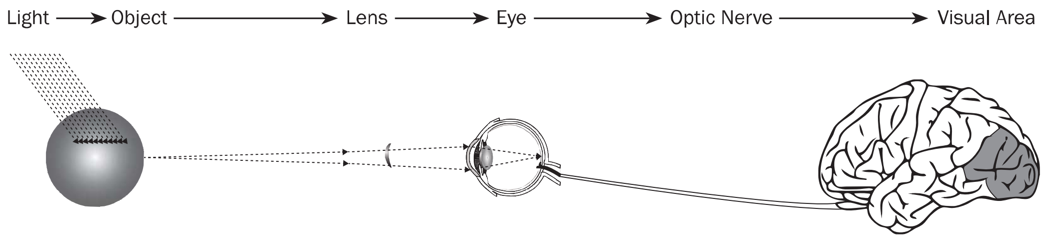


Figure 7 - The Process of Seeing by George Knox and Vincent Ellerbrock

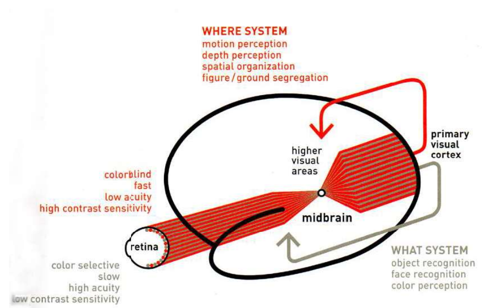


Figure 15 - Focal and peripheral vision. Diagram by Margaret S. Livingstone in Vision and Art: The Biology of Seeing

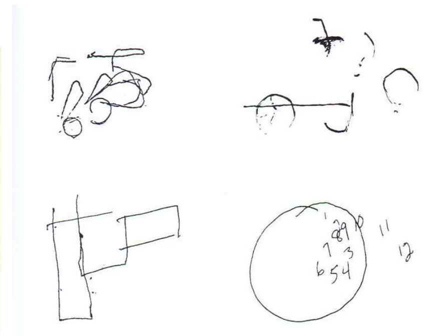


Figure 16 - Sketches from patients suffering from damages in their "where" system. Image from Margaret S. Livingstone

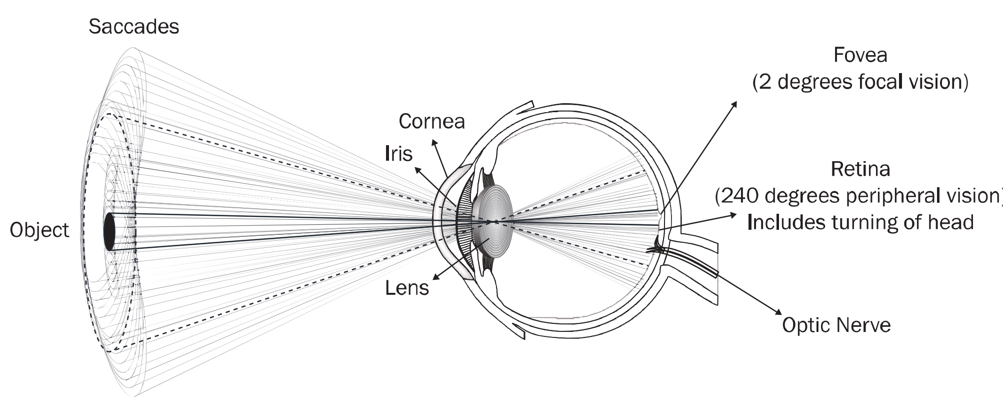


Figure 9 - Movements of the Eye by E. Llewellyn Thomas

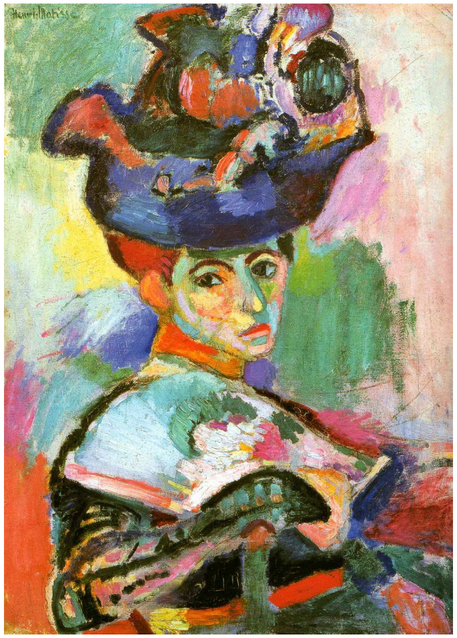


Figure 20 - La Femme Au Chapeau by Henri Matisse

Figure 21 - La Femme Au Chapeau in Black and White by Henri Matisse

Figure 22 - The Ice Floes by Claude Monet

Figure 23 - The Ice Floes by Claude Monet Black and White

Methods and Procedures

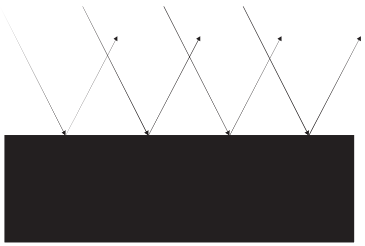


Figure 24 - Reflection off of smooth surface
Diagram by Richard Feynman in his book, QED

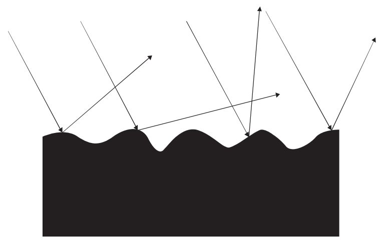


Figure 25 - Reflection off of matted surface

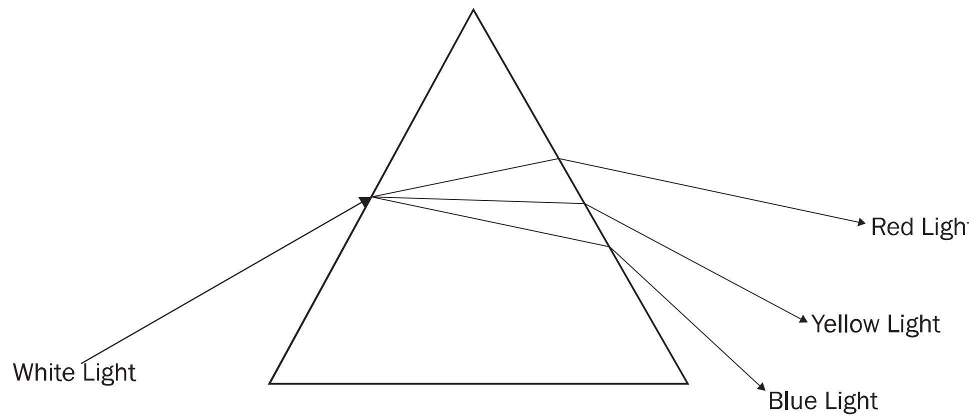


Figure 27 - Prismatic dispersion of light by George Knox and Vincent Ellerbrock

the surface of a body of water, an observer is able to see multiple reflections of objects.

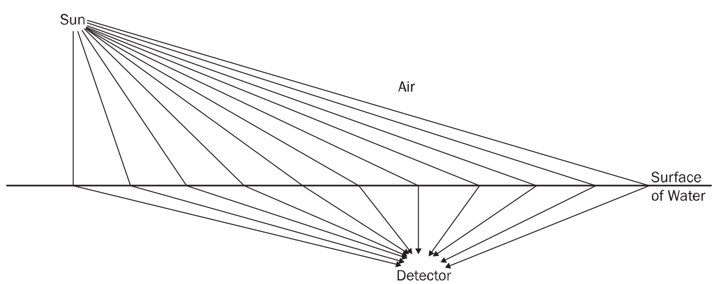


Figure 28 - Interaction of light and water. Diagram by Richard Feynman in his book, QED

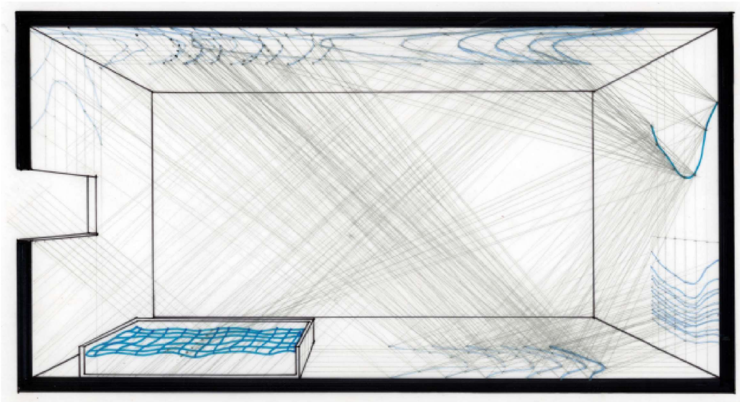


Figure 36 - Ray trace diagram of a section of the surface of water

Figure 136 - Aqua green reflection of light from the water prisms appears as a long and narrow form on the wall adjacent to the window

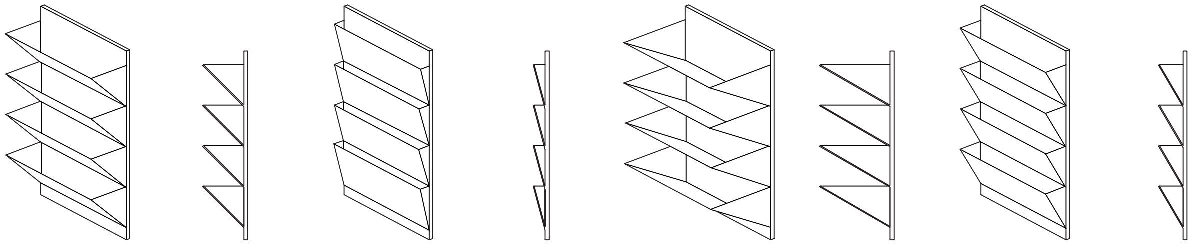
Figure 137 - Reflections of light on the ceiling of the space are a result of the mixture of refracted and reflected colored light

Figure 138 - Refractions of sunlight through the water prisms also create a visible color spectrum on the ceiling of the space

Figure 31 - Reflected white and blue light

Figure 33 - Reflected white, yellow, green, and blue light

Figure 35 - Mixture of light through all pools of colored water



45 Degree slope

15 Degree slope

60 Degree slope

30 Degree slope

Figure 126 - Water prism prototypes were constructed with differently angled surfaces

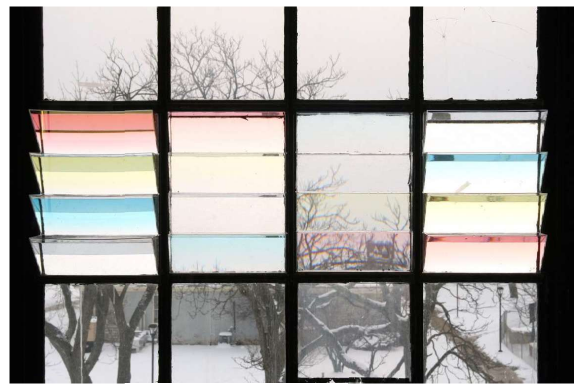


Figure 127 - Distortion of views through each prototype

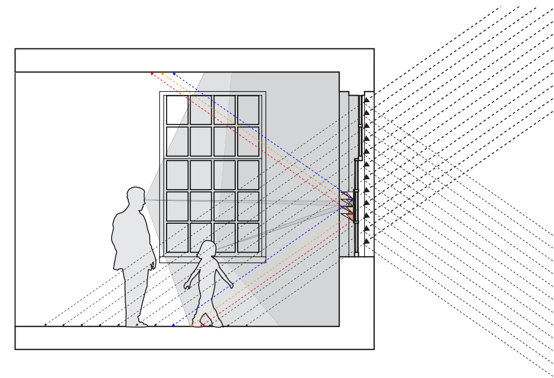


Figure 128 - Refraction and reflections of light in relation to vision

Figure 135 - Rippling the red water affects the reflection of red and orange light

Figure 134 - Rippling the yellow water affects the reflection of yellow and orange light

Results

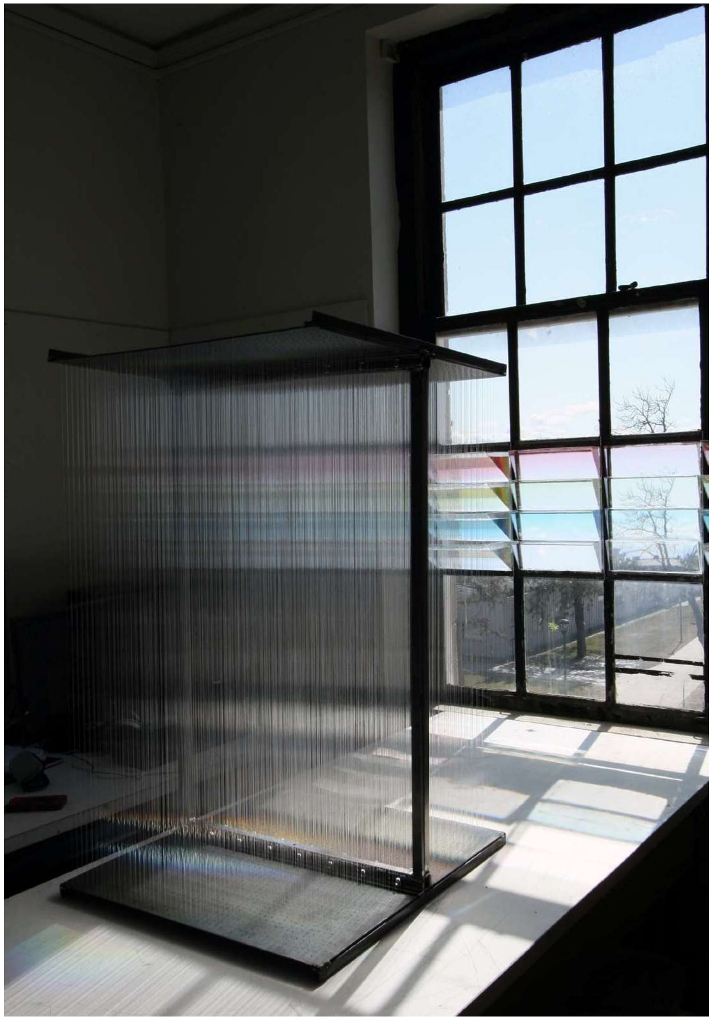


Figure 165 - Diffusion of light through the apparatus captures ranging levels of light

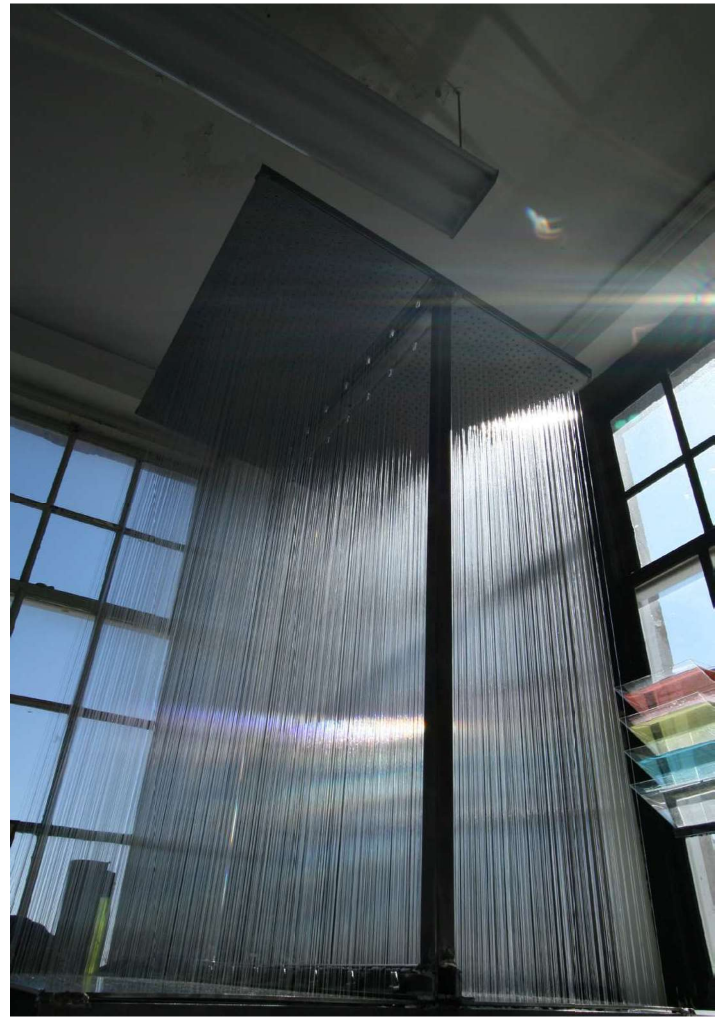


Figure 166 - Location effects the visible light seen through the apparatus