Improving Housing Design for Livability and Safety

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Abstract

Improving housing design appertains to architects who are concerned with safety and suitability for the building's users. To reduce accidents, the improved design should demonstrate how dwellers operate in the everyday use of buildings and their movement inside their dwellings. To design we have to understand human behavior, which is complicated. The objective of this paper is to show how perception has anything to do with livability and safety. An understanding of the nature of perception's selectivity processes can lead to improving housing design. Safety and livability are dependent on perception. The role of the architect is to achieve a higher sense of safety and a higher quality of livability by understanding underlying psychological and physiological mechanisms of sensory perception.

Keywords*: selective perception, adaptation, habituation, redundancy.*

Introduction

Improving housing design appertains to architects who are concerned with safety and suitability for the building's users. To reduce accidents, the improved design should demonstrate how dwellers operate in the everyday use of buildings and their movement inside their dwellings. The objective of this paper is to show how perception has anything to do with livability and safety. Certainly, many accidents do not involve vision and considering that many of these accidents occur because residents fail to perceive the environment which surrounds them is overlooked. Much of livability has to do with comfort. Residents also feel secure when they believe that they are safe from intrusions and cannot be observed by foreigners. Safety and livability are dependent on perception. To design we have to understand human behavior which is complicated. For that we have to study and analyze their actions and the processes which accompany these actions. Such an analysis distinguishes between input sensation and perceiving through output cognition, thinking, and emotion, so that designers can apply these processes of perception.

The architect is concerned with producing certain effects and relies upon the perceptual mechanism to do it. He is more likely to be concerned with aesthetics, livability and peacefulness. He wants to know his design will be perceived. He is accumulating special solutions for each problem as it occurs. So there is no reason why the concerns of psychology should not mesh with and serve those of architecture, although the concerns are dissimilar. As psychology grew from philosophy, its concern with perception shifted as a result of two forces. One force was a trend toward science. The second force arose from the

influence of physiology. Psychologists are eager to collect data relevant to hypotheses based on newly discovered physiological mechanisms. In fact imagination has been treated but not as the study of perception.

The Perceptual Mechanism of the Eye

The information going up the optic nerve from the eye of man to his brain constitutes an input to the brain, but an output from his eye. Here perception is guided by sensory input but this does not include all kinds of processing. That is they overlap. The architect should understand of perception's workings that can be gained from examining the nature of the stimulus and the receptor. The stimulus comes to the nervous system in the form of energy such as light, sound and heat etc., which impinges on a receptor such as the eye, ear, and skin and so on. The stimulus is dependent upon some change and increase or decrease of the distribution of energy, as one glances from one place to another so that different scenes challenge the eye. Organs allow these energy changes to make contact with eye receptors. Thus, the eye focuses the rays of light onto the receptor cells namely the rods and cones located in the back of the eye surface. From the receptors, information is carried to the nervous system, thus processing occurs in this path. All awareness is only mediated through the central nervous system, and form an awareness and identification of objects and this is influenced by learning. If this system is disrupted, imbalances occur.

An understanding of the nature of perception's selectivity processes can lead to improving housing design. Consider that the eye is capable of discriminating ten millions colors, and these colors are distributed across the retina inside the eye which move constantly, the scene on the retina is constantly changing, and in addition the cense receptors are never turned off. A light coming on suddenly at full intensity is more attention getting than one which increases slowly. These stimulus affect us because our mechanisms of attention are sensitive to them. Our senses adapt to stimuli which are not too intense. The eye adapts to light over a wide range of intensities. Once the eyes have adapted, the level of illuminations appear neutral. When one first enters from bright light to dark light, one's eyes must adapt to the darkness. After that eyes have adjusted to the dark, details become apparent due to small brightness differences perceived within the low light. When one gets out to the bright light again, adaptation to the brightness occurs and detailed vision is reinstated. Dark light adaptation takes three minutes, but light-dark adaptations occur after 15 to 30 minutes. These characteristics must be observed especially when designing a movie theatre used in daylight.

In housing designs the architect must take into account this system of adaptation otherwise if one is entering a building when coming from bright sunlit outdoors, one may be so blinded as to be unable to see the stairs and where each step begins. Also, large differences in illumination between adjacent rooms in a building should be avoided.

Design for livability and safety

The decrease in perception's efficiency produced by extremes of high or low arousal affect the reliability of a person's performance. Steps should be taken to avoid environments which induce such extremes. It is possible that an unusual person could be disturbed greatly by a home which feels too safe. This is true if safeguards which seem superfluous can be ignored by those who wish to take risks. However perceived safety should be maximized.

Habituation

Habituation is not like adaptation, it has to do with the decrease in the novelty of a stimulus with repeated presentations. People seek novelty of a stimulus, when stimuli are repeated over and over they lose their arousing properties and become boring. Habituation has implications for safety and livability. Warnings in the length of time fade and lose their power to affect behavior and no longer seem dangerous, so precautions are ignored. Unexpected occurrences would surprise and carry more information by virtue of its improbability. The eyes and ears are capable of taking much information than the brain can use. The nervous system in the case of very high information inputs loses its efficiency, thereby creating errors and inappropriate behavior. Unless there is a way to discriminate relevant from irrelevant information, the selection process may become more of a hindrance than help. Repetition of the same information in a different form also involves redundancy. Redundancy is important for without it, reliable communication will be possible, because any interference could destroy some essential part of a message, and interferences are commonplace.

The arousing properties of the view down from high buildings are common enough to unwarranted attention. High sills and sturdy appearing guard rails in the upper floors of tall buildings must be used; the floor may be extended out far enough beyond the railing or the window so that the view directly below is obscured. The emphasis here is on the appearance of safety and the absence of fear stimuli. Unobstructed exits must be well lighted. Emergency shut-offs for plumbing, electrical distribution systems, and gas should be accessible, clearly marked and easy to use. The designer must remember that he is communicating with a resident under high arousal, who is not processing information at an optimum level. For example, warning labels and emergency information should stand out from their surroundings so that their function as emergency communicators is clear, and that the repetition of the same information in different forms. Color coding is an effective warning signs. If a sign is red, meaning fire, danger, or stop and the sign reads danger, flammable materials it is stating the same thing twice for quick clear communication.

Privacy

People want privacy, but they do not want to feel isolated, yet too quiet an environment may drive them to distraction. This contributes to the problem involved in selecting appropriate brightness, colors, room sizes, ambient sound levels. A fundamental notion underlying many

theories of behavior is that people act to avoid pain and to obtain pleasure, whether or not this pain pleasure paradigm can provide the basis for a complete analysis of all human behavior. We build or rent houses to escape the pain of exposure and insecurity, and to gain the pleasure of comfort and beauty. Dwellings are evaluated in terms of the extent to which they provide pleasure and prevent pain, and that performance attributes of dwellings could be organized around these guiding concepts.

Achieving privacy has been of increasing concern to people because crowding has become more severe in urban areas. Two major aspects should be distinguished; one is privacy from external observation, the other is privacy from one another for individuals living together. Both are important, controllable but not imposed. The architect cannot begin to design an interior which provides the appropriate stimulation for different people and for different situations. But he can provide an interior which can be modified by the occupants.

Recreation is an important function and at least one room in a family dwelling should include recreation features such as a room that is as indestructible as it is feasible to make it so that children can indulge in free, uninhibited play. The dwelling should also be such that the occupants are proud, and not ashamed, to have guests inside. Design features of a dwelling must not make a person feel inadequate and not deny him his individuality.

Safety

Architectural design must prevent accidents, injury or death. Obeying the laws of chance or probability, an examination of safety accidents should include probability of events which can happen. People are willing to pay to achieve safety. However, the casual factors involved in the accident must be recognized. Decisions must be made as to whether a problem is severe enough to warrant the attention of designers to do something about it. It might appear that some type of accident is caused by human error, but if a great many people are making the error, then it must be considered human nature to behave that way and design should take such characteristics into consideration.

Built elements should not present exposed hazards to the user, like uneven floors, or projections from the wall at eye level. Noises which cause ear damage, or mask auditory signals, and glare which could hide the edge of a ditch or a drop off. So measures must be taken to prevent their adversely affecting the user, and should not encourage the user to bring himself into contact with other hazards.

In building for dwelling, the architect must create stimuli and conditions which can have a major impact on the habits of the people who will occupy it. It was observed that when children do use built elements designed for adults, accidents may occur. The architect cannot be expected to design for the most infirm, the result would be inappropriate for the healthy adult. The use of ordinary dwellings by the infirm will entail risks. To give an example of an instance that depends on culture: people relocated from rural and slum areas may have little

idea of how to use modern design features and appliances. They may have little understanding of the dangers of electricity. Accidents from this source will continue to occur.

Stairs

Stairs should be set back from a door by at least one tread length. For safety all stair nosing should be marked in fluorescent colors. At the bottom some more distance should be allowed so that people can stand at floor level while opening the door. Stairs should not possess sharp edges. Railing should not have features which could catch clothing or feet. Railings should be close enough or far enough from walls so that children cannot get their heads caught between railing and wall.

Illumination in stairways should not differ dramatically from that in areas immediately below or above stairs. Stairs with fewer than three steps should be clearly marked. From below short stairways do not intrude into the visual field unless fixation is directed downward. From above, the parallax and perspective cues to depth are relatively weak for a short flight of stairs and may not compel attention. This makes stumbling a highly probable event. When three or fewer steps cannot be avoided, the upper and lower floors should contrast in at least two visual dimensions, to help draw attention to the hazardous discontinuity in floor elevation.

When a person climbs or descends stairs, he sets up a rhythm and forms expectations about subsequent steps. Unequal dimensions interrupt this rhythm and violate the expectations; thereby missteps will be the result. Railings should be comfortable and afford a secure grip. If railings are rough and unpleasant to touch, they will be avoided. Open risers in stairs are not permitted in housing design. A visual indication of the beginning and end of a stairway should be provided at eye level, and observable with peripheral vision.

Natural Lighting

Natural lighting is important in architecture. A room can be made to give very different impressions by changing the size and location of its openings. Moving the window from the middle of a wall to a corner will transform the character of the room especial in countries with warm climates. Good lighting usually translates to a need for much light. If one do not see a thing well, one simply demands more light. However, very often one finds that it does not help, because the quantity of light is not as important as its quality. Too many houses nowadays are filled with light coming from all directions without any artistic purpose and creating only intolerable glare. A window in the middle of a vertical wall is the worst solution. To avoid this kind of glare, the window is better located on the side of the wall near the adjacent perpendicular wall in order to be lighted by it and accordingly light the window wall to reduce glare.

For good quality of day lighting in a room the ratio of the distributions should be 1:0.30:0.10. The ratio 1 in the area near the center of the window opening, 0.30 in the middle of the room, and the ratio 0.10 near the rear wall, all measured along the axis that is perpendicular to the center of this opening. It will not help to change these ratios even though the quantity of light is increased. When light falls on a relief at right angle, there will be a minimum shadow and therefore a plastic effect. The textural effect will also be poor, simply because perception of texture depends on minute of differences in relief. If the lighted parts are too light the form on that side is killed, and if the parts in shadow are too dark no form will be seen there. If the object is moved from front light to a place where the light falls on it from the side it will be possible to find a spot which gives a particularly good impression.

The quality of light is much important than its quantity, and the ratios indicated above must be observed to obtain livable spaces. Sky lighting is not usually a good lighting because the light is much too diffused to produce the shadows necessary to see form and texture clearly and easily. In schoolroom design, for example, a problem arises of how to provide even natural lighting for all the desks in the room. The best solution is to provide light from one or more sources falling in the same direction, the best configuration in which to see form and texture. At the same time such a configuration emphasizes the closed character of the room.

Conclusion

The objective of this paper was to show that safety and livability are dependent on the mechanism and sequence of perception. The role of the architect is to achieve, through improved housing designs, a higher sense of safety and a higher quality of livability by understanding underlying psychological and physiological mechanisms of sensory perception, especially auditory, visual, thermal, kinesthetic and tactile perceptions as well as thresholds of adaptation of sensory organs to perceptual transitions and psychological mechanism of screening and filtering stimuli. An understanding of the nature of perception's selectivity processes can lead to improving housing design. Such an understanding requires the architect to strike the correct balance between adaptations of senses to arousal by external stimuli and habituation of users to their lived spaces. It also involves determination of the position, shape, form, color, and texture of building elements such as stairs, partitions, windows, and organization of spaces in such a way that elements are distinctively and harmoniously perceived in order to avoid ambiguity or imbalances while at the same time providing aesthetic stimuli to the senses through novelty of designs and suitability to developing behaviors of residents.