Extreme Spatial Experience: Altering the Perception of Space

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Abstract
This paper focuses on the development of a method for promoting alternative perceptions of architectural space by exploring different ways of introducing computers in the space/occupant dynamic.

1 Perception of Space
Computation has influenced architecture and the experience of space by changing the classic notion that architecture is static. Challenging this assumption, the concept of dynamic space, its origins rooted in kinetic art and virtual environments, has slowly begun to filter into the physical realm. As the definition of architecture evolves and incorporates computation, the relationship between “space” and “occupant” begins to transform. Consequently, this new relationship engenders a new collective perception and understanding of space in which both the space and the occupant are viewed as dynamic. How do non-static architectural elements affect our perception of the space they create? For example, to what degree is the feeling of stability and security of a wall or a ceiling associated to the notion of “moveability”? More than ever now, through the use of sensors and actuators we are able to affect the way that a person relates to an environment. Computation allows us to control and adjust the feedback system between space and occupant so that it is bi-directional, in that not only the occupant responds to the space but vise versa. How will that adjust our understanding and perception of our environments?

Normally, the perception of space is forged through the analysis of sensory information gathered from our surroundings. Our position, orientation, proximity and other such relationships between us and the objects and people surrounding us, viewed in light of our cultural guidelines, from our understanding of the spaces we occupy. This “information flow” takes the form of a feedback system where the perception leads to adjustment of the space or the relationship to its parts, until a state of “comfort” is reached. A simple example of such behavior would be moving closer to a heater if one were cold or adjusting the light level in a room. There is a relative aspect to the perception of space as demonstrated by research done in the area of Proxemics. The term Proxemics was coined by researcher E.T. Hall, in 1963, when he investigated an individual’s use of personal space in contrast with “fixed” and “semi-fixed” feature space. Fixed feature space is characterized by unmovable boundaries (divisions within an office building) while semi-fixed feature space is defined by moveable boundaries such as furniture. As Hall describes it, informal space is characterized by a personal zone or “bubble” that varies for individuals and circumstances. This informal space is determined by cultural and social influences and is the area that humans control and use the most in the perception and adjustment of their space. For instance, the study of spatial territory for the purpose of communication uses four categories for informal space: the intimate distance for embracing or whispering (6-18 inches); the personal distance for conversations among good friends (1.5-4 feet); social distance for conversations among acquaintances (4-12 feet); and public distance used for public speaking (12 feet or more). What may be considered intimate in one culture might be public or personal in another culture. Generally speaking, these distance zones greatly affect how people use their senses to distinguish
between the relationships of other people, their environment, what activity they are involved in and, most importantly (for the purposes of this paper), their feelings.

Psychology is defined as the systematic study of behavior and mental processes. While behavior is directly observable and includes things such as talking, laughing, and eating, some things of interest to psychologists cannot be directly observed; for instance, thinking, dreaming, or physiological events such as heart rate. Physiological events can be studied using medical instruments, while thinking and dreaming can be studied through self-reports. In psychology, behaviors and mental processes are fundamentally interwoven. In order to understand a behavior, we must know something about additional mental processes— the emotion or emotions that underlie the behavior. Environmental psychology is a specialized area that studies the relationships between behavior and the environmental context in which it occurs. Behavior here includes both overt and covert acts, and includes thoughts, emotions, and so on. The environment refers to one’s physical surroundings. The most common and acceptable characteristic of environmental psychology is its emphasis on the interrelatedness of environment and behavior. The environment clearly provides varying options in some instances, and influences behavior more subtly at other times. However, people also cope by changing their environments. In a house, particular arrangement of space may affect residents’ interaction. Environment-behavior relationship is more or less in flux continuously. “Architecture as a built environment has an omnipresent and permanently increasing impact on people, structuring the spaces in which the main part of life in societies takes place. People not only passively adjust to their environment; they equally adapt their environment actively to their needs. They interact individually with their environment, leading to characteristic interaction effects which vary over time, situations and persons.”

2 Perception Under Influence

The environments around us influence our behavior and inform our understandings according to information gathered by our senses and the analysis of that information. Our senses gather the information and our analytical processes give the information meaning. Conceivably, one could get a differing perspective of space if one were to change either their process of gathering information or their analysis of that information. Many hallucinogenic drugs alter the perception of the environment. LSD, for instance, heightens the senses and makes sounds, textures, and colors much more vivid and pronounced. As a result, a person under the influence of LSD sees and hears the world in a different light and acquires access to a completely different set of information, which alters one’s perception of the surrounding environment. In a similar context, many eastern philosophies, “spiritual” teachings, and western self-help organizations, focus on adjusting the individual’s own analysis of the acquired information. In essence, these groups profess that one can control and adjust one’s own “mental” space to achieve the desired state of existence.

Throughout the world, spanning many cultures, there have been rituals and customs born of the desire to merge the two means of altering perception mentioned above: information input and information analysis. These practices are geared toward “enhancing” their view of the world by adjusting both the information gathering as well as the analysis phases of perception. The O-Kee-Pa (Sundance) ritual of the Plains Indians, the scarification customs of the West African tribes and the practices of the Modern Primitives of western societies are all examples where an intense and extreme situation is used to promote and altered state of being.

It is important to note that an “extreme” situation is merely one that is intense, uncommon and unfamiliar, but not necessarily painful. In most rituals, there is a period of intense preparation during which the participant mentally readies him/herself for the physical experience of the ritual. In the O-Kee-Pa (Sundance) ritual, by the time the knife pieces his skin the participant has undergone 3-5 days of chanting, singing and ritualistic dancing which has allowed him to transcend the limits of his everyday reality. By the time the knife cuts through his flesh s/he has prepared for and accepted the experience.

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To a much lesser degree, skydiving for the first time is an extreme situation, which requires mental preparation. Adequately prepared, an individual can undergo the experience without fear.

During rituals such as Sundance and the African scarifications, the subject is placed in an intense and completely unfamiliar situation, which by most standards conflicts with the instinctive human standards for survival and well-being. In these situations, one must re-evaluate the limitations and parameters of one’s physical as well as psychological existence. The calm acceptance of the normally traumatic event is indicative of the fact that one’s usual understanding and perception of the body is re-negotiated. In addition, the analysis of sensory information is also adjusted, hence the negation of pain that would have normally resulted from the experience. In the above example, the subjects radically adjust the way they acquire and process the information from their surroundings and, as a result, achieve an altered state of consciousness. There are speculations as to the reason why these changes occur within a person undergoing an extreme experience. There are some who believe the cause to be chemical fluctuations within the body and some who see psychological reasons as the cause. In either case, the cause is of no consequence for the purposes of this investigation. Rather, the important thing is the experiential reasons for these altered states of being.

3 Architectural Implications

The direct link between environmental psychology and design is continuing to develop in the form of design guidelines or programming documents, particularly for the design of specialized facilities. Major examples include low cost housing, housing for alternative living arrangements (e.g., co-housing), various medical facilities, facilities for people with special needs (e.g., Alzheimer’s disease, the physically disabled, victims of abuse, recovering drug abusers) and environments such a daycare and schools focused on healthy development among children. Research continues to mushroom on the role of different living arrangements for older people, ranging from micro features such as doorway design to macro issues like availability of the correct matrix of services.

Computation has afforded us other means of effecting the alternate perception of the spaces we occupy. From the notion that walls and ceilings can become dynamic and responsive to materials that change characteristics to suit specific needs we are faced with an entire set of possibilities that allow us to forge a closer connection and interaction between us and the environments we occupy. The use of computers in architecture is no longer limited to the area of production but also in how our architecture behaves and suits our needs. Dating back to the 1940’s architects and space planners have sought out means to make spaces adjustable and multifunctional. One of the earlier examples being the Murphy bed which converted the living room into a bedroom. In transforming out environments, today we are no longer limited to additions and readjustment of the constituents of a space but rather the reconfiguration and adjustment of the space itself.

Through the introduction of computation, mechanization, and other products of today’s technological society into the built environment, we have the opportunity to forge a closer connection between our selves and the architecture that surrounds us. As discussed earlier the interaction between space and occupant is bi-directional. Being that emotions are dynamic and fluctuate according to mood and goals, the ability of our environment to be responsive to these changes ensures a better relationship between a person and their environment, enhancing the quality of our lives. Through exploration of the different psychological and experiential factors that form our perception of architectural space, coupled with insight into the ways computers enhance architecture, there is a strong potential for developing a methodology for promoting alternative perceptions of space.
4 The E-SEA

The ESEA is a computer-controlled apparatus that allows one to change the dynamics of human-spatial interaction. Here we aim to understand and subsequently challenge key aspects of human / environment interaction. To do this we must first analyze significant factors in the relationship between space and occupant and then devise a means of adjusting those parameters.

The following are factors that influence our perception of space:

- **Orientation:** Under normal circumstances people stand upright in a vertical orientation. Gravity acts along the axis of the body and, holding normal posture, the eyes look towards the horizon.
- **Position:** In a normal setting, there is a continuous information feedback stream of external sensory information that the individual receives and uses to adjust one’s relationship with the constituents of the space to achieve optimal comfort. One’s position is adjusted at will.
- **Motion:** Under one’s own power, (and in a common spatial setting) motion is perpendicular to gravity, at the will of the individual, and based on external sensory information.

Much of the way we understand and perceive space is as a result of our relationship to its parts. The terms of that relationship, however, rarely change. The E-Sea allows us to drastically change the terms of our interaction with space and begin to occupy and understand space in new ways determined by our inner state of existence.

**Orientation:**
The Extreme Spatial Apparatus (E-Sea) incorporates 11 motors arranged in a cross formation. (fig. 1,2,3) Using straps and cables, each motor is connected to a joint of the body suspending the figure face-down in a horizontal position above the ground (fig. 4,5,6). In the E-Sea, the primary orientation of the body is horizontal and motion is parallel to gravity.

**Position:**
The body is also connected to a series of monitoring instruments that provide data such as pulse, breath, brain activity, and other such physiological information. This data is subsequently fed into a computer, which controls the motion of the motors connected to the body.

**Motion:**
The usual feedback system between the occupant’s senses and the environment is replaced by information about the person's physiological state determining the person's interaction within the space. Here the subject no longer has the choice of adjusting their relationship with the environment but instead movement is mandatory in a manner outside the subject’s external control.

5 The Physical / Virtual interface

All the motors of the ESEA are routed through a main motor control board and connected to a computer. The computer interface consists of two screens each allowing different types of functionality. In addition, sensors in the environment, as well as body function sensors are also connected to the computer and account for the input for determining motor movement. Screen 1 of the interface (fig. 8) depicts the motors in relation to the body. Here each motor can be individually controlled. To the left of the screen (as well as screen 2) there are “store” and “recall” buttons allowing the recording, and subsequent playback of six different motor / body positions.

Screen 2 (fig. 9) offers slightly more control and feedback in relation to screen 1. Here all motors connected to the body as well as an additional five motors can be controlled. The addition of motors not connected to the body allows the opportunity of controlling aspects of the environment as well as body
movement based on sensor input. In each screen there is the ability of tracking all motor positions and their relationship to each other. This information is what is used to determine the movement kinematics, which will govern the range of motion of the motors in relation to each other (safety guidelines).

6 The Objective

The objective of this research is to explore ways of altering one’s perception of space. Through controlled manipulation and adjustment of the body in space, as well as the introduction of other feedback systems into the space/occupant relationship, we seek to create an extreme spatial experience and provoke an altered perception of space. This extreme spatial experience will be created by the introduction of the uncommon and the unfamiliar into the space/occupant association through addressing spatial dynamics such as position, orientation, and motion.
Extreme Spatial Experience

Figure 7 - Wiring Schematics

Figure 8 - Interface Screen 1 (body control)
Notes

1 Frank Popper classified works, which employ 'virtual', or apparent movement within kinetic art, but
joined them by a dotted line to static art, that is to say, work whose motion or tempo only becomes
appreciable after an effort of concentration. See Frank Popper Origins and Development of


3 Annette Sommer; The Responsibility of Architecture for the Lack of Responsibility

4 Catlin, G. (1967) O-Kee-Pa, A Religious Ceremony, and Other Customs of the Mandans, Yale
Re/Search Publications, San Francisco.

5 The term Modern Primitive describes a wide group of people who engage in body manipulations and
other intensely painful practices. ModPrims believe in learning and knowing, through pain, which
they consider to be a process that modernity has forgotten. The Modern Primitive seeks to
achieve some form of higher learning through experiencing physical sensation.

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