

FUKSAS

RESEARCH LAB

FUTURE LIVING

Internship

Description Report

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MOVEMENT INFLUENCING ARCHITECTURE

Architecture is mostly perceived as a static entity. Spaces are of a fixed size and create the same or similar experience. Modern technology has however allowed architecture to find certain form of movement. Although limited and still in the infancy of its exploration, the practice of responsive/adaptive architecture has begun to break the static nature of architecture. Be it in the form of moving facades or floating structures, they are but an initial step opening a dimension of architecture that has not been explored. Movement is what I believe will be that one major component which will significantly impact architectural practice of the future. Thinking of Future Living and Working, moving forms will allow for flexibility which will constantly transform spaces, communities and the urban fabric of the city. The research intent was to establish such a mechanism where movement of a single entity would create different special conditions.

Why is Movement essential?

Everything around us constantly evolves. Nature by its inherent characteristic does not remain static. In 24 hours, we experience day and night with varying temperatures, solar exposure and other climatic factors. Over a year we experience different seasons to which we use different forms of clothing to keep ourselves warm in winter or cool in summers. With such changing patterns, it is only natural that the architecture we create is also adaptive to these changing conditions. And considering sustainable practice, inducing movement in architecture will allow it to adapt based on the varying external factors and reduce dependency on energy to create comfortable living conditions.

In addition, architectural spaces are also created for specific purposes. Large scale arenas, stadiums, concert halls are seldom fully occupied and large resources are consumed to build and maintain them for only a handful of events. A moving architectural form will allow such spaces to be transformative, converting large arenas for events on certain occasions into smaller scaled blocks that can be used outside of the primary intention of the space.

Context – Ripple & Oscillation

I found a water ripple/wave form as the ideal naturally occurring precedent that would allow me to study and generate the intended moving forms. I closely analysed the formation of the

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ripple and how the curvatures transform over time. The curvatures formed over varying timeframes were overlaid with the spacing between them being the time variable. The stacking of these sectional wave profiles generates a surface which becomes the primary derivative from which various types of movement are extracted.

The size of the surface form is dependant on the time variable and can thus expand or compress by varying the time. Stretching along other axis accentuates the deflection of the oscillations identified from the ripples. These variables were carefully explored creating expansion of the surface in two and three dimensions.

Particle Path – Identifying Movement over time

In order to identify the right sequence of the movement pattern, isocurves extracted from the ripple form surface reveal pathways that a given particle travels during the ripple oscillation. Particles closer to the centre of ripple formation exhibit more drastic vertical movements as compared to a particle which is further away which exhibits a more sideways movement. Overlaying all particle paths from a common starting point shows the range of movement of the particles. By dissecting the curves over the time, a series of sectional curves can be derived which transform at every interval resulting in varied types of spatial conditions.

Analysing the Spatial Matrix

The series of sectional profiles identified show a harmonious and a rhythmic sequence in which a seamless motion can occur. The key to this is the sequence in which they occur needs to be maintained, either forwards or backwards to create seamless movement pattern. This forms the matrix along with the criterial of sequential arrangement of the spatial forms that will come together to generate movement.

The curves having maximum and minimum deflections are highlighted and the series of curves that occur in between form the steps indicating the transformation of the spatial form from one extreme deflection to another. Once again, new information is derived upon overlaying these sectional matrix profiles. It can be observed that one end of the curves remains fixed while the other end induces movement such that the form undulates upwards and downwards on the central anchor. The curve form is rotated to allow for the spatial conditions to transform sideways of the fixed central point.

However, when the anchor points transfer after one cycle of movement, the entire spatial form shifts its location rather than just allowing movement over a fixed point. Such a movement closely mimics the movement of a human walk as each end becomes the anchor simultaneously while the other end moves.

In order for the changing forms to accommodate large scale transformations and allow for movement, it is essential that the sequence in which the different spatial matrix occur is upheld. The sequence can be reversed or a particular unit repeated several times. This allows

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for an endless series of expansion and compression along the tube-like form offering varying spatial conditions along the way.

Spatial Variations

The sequence of movement generated through the study of ripple forms allows spatial conditions for both public and private use. Large open spaces can be used by a large group of people while the smaller compartments become narrow cosy spaces for an individual. While providing these spatial variations, the entire form also shifts its location replicating a mode of transport. With no given start or end point, the curves can be repeated endlessly as long as the sequence in which they occur is maintained.

By using ripples in water as the context for my research to study movement, a form with transforming spatial properties is created. This induced movement provides great potential for multi-functional use of the space. These could be in the form of living spaces for a single individual or a collective group or as working spaces. Multiple modules of the same could simultaneously exist and move around the city. In conclusion, the ability to create movement of an architectural form and transform the use of space is essential for future living and work.