Architecture for Modern transportation
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Abstract

One’s way of travel dictates one’s perception of the surroundings. People’s mode of transportation has also evolved greatly throughout the ages. From foot traffic to carriages, to cars and trains, people tend to travel in faster paces, on increasingly linear paths, and with less freedom to wander. In my opinion, it is starting to become difficult to appeal to this emerging group of moving spectators with traditional ways of building. In the thesis, I explored ways to design buildings that focus on creating perspectival images for the moving spectators who are traveling on modern transportation.

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1.1 Architecture and the Virtual: Towards a New Materiality | Modern Transportation

Technology has changed the world of architecture, as driving automobiles had changed the urban experiences. Agreeing with Picon’s point of view, characters of modern transportation were analyzed in comparison to the traditional way of transporting, walking.

Comparing to walking, modern transportation can be characterized as:
1. Moving at a much faster speed and observing from more angles.
2. Traveling on a more linear path.
3. Having less freedom (to wander).

The findings are illustrated in the following diagrams.
In the article, Eisenstein discussed two ways to perceive space and depth - either through the movement of eyes or through the movement of bodies. This explained the following two studies on perspectives. The studies on the oil paintings investigated ways to construct senses of depth on canvas, or in other words, through movement of the viewers’ eyes. The studies of the parallel walls investigated how space and depth are perceived through the viewers’ bodily movement.
Comparing the oil paintings with the diagrams in section 1.1, one could relate the drawings here to the images perceived by the walking pedestrians as shown in section 1.1. As the pedestrians move slowly, their views of the surrounding objects appear rather static, similar to how one perceives an oil painting. As the paintings, constructed with implied senses of depth, appeal to their observer, decorated facades suit the eyes of a static spectator in a similar way.

Understood the static spectators. In the next section, the focus shifts to the fast moving spectators.

The oil paintings were reconstructed, being stripped down to their most basic geometry forms. Several techniques were utilized by the artists to construct senses of space and depth on canvas (and any two dimensional surfaces.) Similar techniques are also utilized in architecture to construct certain architectural gestures, to define space and to emphasize depth, as noted in Gordon Cullen’s “Townscape.”
When the spectator starts to move quickly, the implied sense of depth and space created through the likes of oil paintings soon loses its value. Since, as one moves quickly and sees the object from different perspectives, the observer understands the space better and will look beyond the constructed frame, shifting his focus from the details on the surface to the totality of the perceived objects.

A spatial configuration is shown in the diagrams on this page. As the point of view pans through the model, the parallel walls response to the observer’s movement through revealing and hiding different parts of them. As a result, from various perspectives, different images are projected into the viewers eyes.
1.3 Montage and Architecture

Architecture expressed through a series of scenes

As with the Acropolis, a building complex could still appear balanced and symmetrical although its plan suggested otherwise. In the case of the Acropolis, such impressions are formed through carefully placed buildings, which appear as balanced scenes in perspectives. In fact, the entire building complex was designed with focus on the perpectival view from several designated vantage points. The consistency among the series of scenes further enhances the complex’s symmetrical impression.

Similar design principles in the Sonsbeek Pavilion by Aldo Van Eyck. The diagrams in the following pages documented studies of these projects.
1.4 A complete reading list

1. Townscape, Gordon Cullen
2. The nature and art of motion, Gyorgy Kepes
3. Architecture Oriented Otherwise, Sergei M. Eisenstein | The Law of Meander
4. Montage and Architecture, Sergei M. Eisenstein | Introduction by Yve-Alain Bois,
5. Architecture and the Virtual: Towards a New Materiality, Antoine Picon
To better explore the relationship between architecture and the moving spectators, the site of the thesis project was chosen to be in the state of Texas, which is known for its heavy dependence on vehicular traffic. More precisely, the site is a plot of land located in the Museum District of Houston, TX, sitting right next to a major freeway, and between two light rail tracks. The site provides suitable conditions for the study of the thesis topic, as it is surrounded by moving spectators traveling on different types of modern transportations. Since there are only few low-rise buildings constructed nearby, the potential building on the site is also easily perceivable by the passing spectators. The exact location of the site is the plot of land bounded by the Blodgett St, San Jacinto St, Wentworth St and Fannin St.

Fig.11
On the left side are the site photos that’s viewing the site from the freeway; viewing the site from the opposite street corner. The construction of the concrete site model put the dimensions and relative sizes of the surrounding elements into perspective, as well as clarifying the traffic situation around the site.
2.2 Program overview

After trials and errors, taking the traffic condition of the site as well as the project's relation to the thesis topic into consideration, the thesis project was set to be a mixed-use building. With the majority of the building functioning as a parking garage, the ground floor accommodated a light rail station and some retail spaces while a car dealership was built on the top of the building. The project can also be understood as a transportation hub sitting on the edge of the Museum District in Houston, TX.
Supportive research

Researches on several topics that were critical to the design of the thesis project were conducted: the general dimension guidelines for the garage design, the typical configurations of parking garages and the exact dimensions of Urbos LRV, which is the exact model of train that runs on the light rails through the site.

Houston MetroRail facts:

Name: CAF - Houston LRV / Urbos LRV
Width: 8 feet 8 inches
Length: 96.5 feet
Height (pantograph down): 12 feet 8 inches
Maximum speed: 58 miles per hour
Maximum capacity: 242

Technical Details:

Circulation:

Reference:
The initial idea on the form was as simple as externalizing the ramp, which is typically located toward the center of the garage buildings. There are three benefits for this. Firstly, by moving the ramps to the exterior, the circulation between the floors (cars moving up or down the ramps) are separated from the circulation within the floor (cars circling for parking spots), and thus it reduces traffic stress and potential congestions. Secondly, the exterior ramps, when strategically oriented towards the exit and the entrance of the freeway, indicate the entrances and exits of the parking garage. Thirdly, if the function of the building transformed in the future, the exterior ramp will have much potential value than the typical zigzagging ramps inside the building.

The form of the building is also tweaked to give more space to the residences in the East. To avoid confusion and maximize the path-finding function of the ramps, a part of the exiting ramp is also hidden beneath the entering ramp.
3.2 Earlier structure and case studies

The building has a concrete post and beam structure system. The structure layout in this project is crucial since it also dictates the layout of the parking spaces, the route for cars and most importantly, it is the part of the building that is the most responsive to the spectator’s movement.

The fields of columns, while being viewed from afar, appear in different configurations. From certain perspectives, as the columns line up towards the viewer, they even appear similar to the parallel walls from the study model, creating pockets of spaces throughout the floors. As the spectator moves, the columns will appear in disorder again, and rearranging themselves into “walls” again when viewed at from certain vantage points.

A example of the condition discussed above is shown in the next page, along with a plan of the earlier structural layout.

However, the earlier layout had certain defects in it. Firstly and foremost, the columns are located at the end of each parking spot, which made it difficult for cars to park. Secondly and more importantly, since the floors aren't perfectly rectangular, some columns were aligned to the tilted edge of the floor, breaking the order in the fields of columns. As a result, the columns can only line up and appear similar to parallel walls at very few restrictive angles.
Several case studies revealed how the structures were integrated into the parking garages. Projects studied were the Veterans Memorial Coliseum in New Haven, Panhous Am Bollwerksturm in Heilbronn, Germany and the Car-Park Rotunda in Hamburg. In these cases, the structures were treated as a part of the parking facility instead of a separate system. For instance, in the Veteran Memorial Coliseum, the architect left enough space between the steel members in the floor-to-ceiling tall truss, so that although the truss was built right in the middle of the floor, cars can still drive through it, leaving the car route unobstructed. In the car park Rotunda, the architect designed the beam to be thicker towards the end and thinner towards the middle of each span, addressing the conflict between structural integrity and height requirement for parking spaces.
Learning from the case studies, the finalized structure was a simple but effective solution to the problems in the earlier structural plan. In this plan, all the columns are sitting on a 31’ by 31’ rectangular grid without any exception. The grid lines are 31’ apart because they perfectly fit a two way car lane, which is 24’ wide, and two 3’ set backs for the parking spots. The column itself is 1’ by 1’. However, the columns give ways to the car lane at some spots, and the beams at those locations will be deeper to compensate the structure. In other cases, the parking spaces yield to the columns. Under this layout, the columns will line up and appear as parallel walls if viewed from as many as eight directions, as shown on the next page. Some of the supportive columns under the ramps were also extruded into “fins” to form forced perspectives, further strengthening the sense of depth perceived.

Fig. 23
The ground-floor spaces are programmed for efficiency and openness. As shown in the next three diagrams, towards the residential neighborhood (green), a space for public use is carved out from the building. The train station sits between the two light rail tracks so that it can serve commuters traveling in both directions. The retail area (blue) is placed in proximity to both the train station and the retail stores across the street, so that it benefits from the passenger flow, and the connections to more stores.

The ramp structure, the roof and the retail area were later revised, while the overall programming and circulation remained unchanged.
Plan, section and details

The drawing on the next page documents the roof and how it functions spatially, its corresponding section; floor plan for the retail area on the ground floor; details on the post and beam structure and the suspended part of the floor.

The complete site plan, ground floor plan and section are followed.
The complete set of floor plans are also superimposed with reflected ceiling plans on each level, which further explains the concrete post and beam structural system.
The renderings show the perspective view of the building from several vintage points. The location of the point of view is illustrated on the plan next to each rendering.
3.7 Photographs of model

Some photographs of the model help to better understand the interactions between light and spaces in this project.

Model scale 1/8": 1'.

3.7

The cut-outs on the structural walls that support the ramps allow more light to enter the parking garage and they also allow people to look out. More importantly, they are negative spaces that also imply columns, further emphasizing the verticality.

The cut-outs located on the corners of the building allow people to look out for passing trains before crossing the train track.
Photo above: Looking over the retail area from the light rail station. As shown in this photo, the ground floor is designed to achieve openness. From certain vintage points, one could see directly through the space, connecting the ground floor to the streets outside.

Photo on the left side: A 3’ gap set apart the ramps from the building. The gap allow more light to enter and creates some interesting lighting conditions.
Conclusion

Reading a building’s facade, as one stands still or moves slowly, is similar to perceiving the sense of depth and space in an oil painting through the movement of one’s eyes. The relationship between the spectator and the object is static in this case. However, as one travel faster on modern transportation, the individual tend to view the world in motion, and the relationship between the observer and the surroundings are now dynamic. In the thesis study, I demonstrated a way for architecture to appeal to the moving spectators, and that is through reducing the building facade and revealing more of the interior space of the building. As space and depth appear differently from varied perspectives, the building reacts to the spectators’ movement as they project itself differently into the viewer’s eyes. Depending on the configuration of the revealed parts, even more could be achieved. In my thesis project, the structure of the parking garage can be read as a field of columns on a rectangular grid. As the spectator pan through the...
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