

[UN]CHECKED EMERGENCE: INFUSING THE HUMAN ELEMENT INTO ALGORITHMIC DESIGN

by

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ABSTRACT

Architecture is defined as the art and science of building. Experience within a built space can be deliberately heightened or diminished as a result of conscious decisions by the architect. With the addition of intent, the designer can transform a building into architecture. It is intent and emotional engagement that reveals beauty, love, and interest to the occupant.

New methods of conceptual design have materialized with the advancement of computer technology. Complex theories of organization and emergence have caught the eye of architects because of their capabilities of mathematically producing radical physical representations. These manifestations have great “wow factor” because of their dramatic interpretation of shape, and have been subsequently lauded as beautiful and innovative architecture. As computer technology and three-dimensional modeling systems have proliferated, so has the scale and ambition of these experimental forms.

However, there is a vital component missing from pure computational design methods. Without the implementation of human elements and experiences to the design of built space, computational architecture is nothing more than eye candy. Since so much of our lives are spent in built environments,

we cannot rely on design methods that fail to take this critical component into account.

This thesis will describe the current condition of computer simulations and virtual environments in our culture, how they relate to the field of architecture, and what elements of human experience are missing from them. This thesis will explore and document a design methodology that infuses generative computational design processes with the essential human elements of love, mortality, and responsibility. This methodology will lead to the design of a live music performance center in downtown Austin, Texas. The human elements of love, mortality, and responsibility must remain embedded in the computational design process.

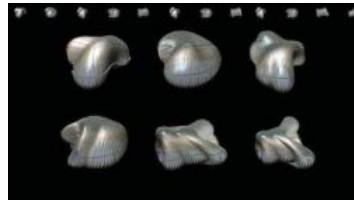


Image 1 - Embryological Housing, Greg Lynn. The form is described as, “a strategy for the invention of domestic space that engages contemporary issues of brand identity and variation, customization and continuity, flexible manufacturing and assembly, an most importantly an unapologetic investment in the contemporary beauty an voluptuous aesthetics of undulating surfaces rendered vividly in iridescent and opalescent colors.”

A photograph of a modern staircase. The railing is made of glass panels held in a silver metal frame. The wall to the right is made of light-colored wood panels. The floor is a dark, textured material. The text "THEORETICAL POSITION" is overlaid in white, bold, sans-serif font in the lower right quadrant.

**THEORETICAL
POSITION**



Kimbell Art Museum, Fort Worth, Texas

ROME, 1981

The day was uncomfortably hot. The sun beat down upon the sidewalk, silently splitting the grey concrete beneath my small feet. Tired and hungry, I was shuffling along behind my mother, alternately staring down at the pavement and up at the crowd passing by. A cacophony of voices echoed in my young ears, a smattering of phrases that I could not piece together. The melodies of the city blended together with a chorus of shrill horns and the smells of food and garbage. I glanced up to see my father as he turned around sharply to remind me to keep up. I quickened my step as my family moved down the busy street.

We rounded a shaded corner and there, in front of me, was the largest ruin I had ever seen. Framed against the blue Italian sky, it seemed inconceivable. I stopped and stared at the repetition of arches and colonnades. The rows curved back in a circle of worn stones and tiny carvings, some dangling from dizzying heights.

I flinched hard from a sharp smack on the back of my head. It was my older brother. "Come on, we're crossing."

I could not fathom the age of this monumental icon. My brain was incapable of calculating what it would have been like to stand, motionless, for over a thousand years in relentless winds, driving

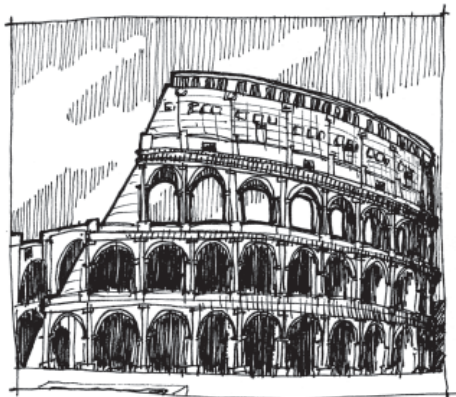


Image 2 - *Colosseo* (Colosseum).

rain, the cold of winter and the unbearable heat of summer. Fiat *Cinquecentos* grudgingly swerved to avoid our family as we scampered across the *Piazza del Colosseo*. As we took refuge on the sidewalk that encompassed the timeless structure, I gazed upward again, and reveled in its magnificence. At such a young age I knew nothing about architecture, construction, or materials, but I did know that this ruin had been here a long time, and it held deep meaning to the population that surrounded and guarded it. From this point, it looked even taller and much bigger. I tried to count the stories, but they scalloped away into the sky out of my sight.

We flanked the main entrance as my father shepherded the family together. We all stared up in awe. The busyness of the street still surrounded us from a distance, but the tree-lined ellipse held us safe next to the old sage. We were protected here. As we moved across the parking lot and towards the main entrance, the anticipation mounted. We moved closer to the stone walls, and suddenly the sweltering heat of the day dropped to a cool comfort. The massive stones were slow to change temperature, and even in the scorching heat of the day they emitted a fresh, damp sensation. My hand instinctively rose to touch the old monument, and there, in the shade of its splendor, the tactility of the ancient civilization pulsed into my skin.

I moved inside, through the shadows. It was going to be a good day.

DEFINITION

For this thesis, the term computational architecture is defined as a built structure whose initial form was derived by logical mathematical algorithms or emergent software. An algorithm is a step-by-step procedure for solving a problem, usually with the help of a computer. Algorithms can also be described as sets of rules that determine a shape through repeated calculation.

Software for generating computational architecture, emergent systems, and simulations are widely available today. Autodesk 3ds Max includes the physics engine Reactor, which determines interactions between 3D objects using collision detection, particle systems, and other simulations. Other 3D software, such as Rhinoceros 3D and Catia, can create NURB (non-uniform rational b-spline) surfaces quickly and accurately. Several other proprietary software engines are available for two-dimensional and three-dimensional emergent systems analysis and can export the results to one of the packages listed above.

MODERN FLUIDITY

Computational and algorithmic architecture can produce extremely fluid surfaces. These nebulous shapes can vary in curvature as to seem organic and unnatural. This thesis challenges the design process that generates exceedingly curvilinear,

non-representational “blob” forms that so many structures have become.

We are in the closing years of the Age of the Blobject, a period that began in the 1980s, when everything from the Ford Taurus to the Sony Walkman to the Tylenol caplet was designed with curved contours and swoopy silhouettes. (Albrecht, Lupton and Holt 24)

In the past, these radical shapes were considered unsolvable and unbuildable because of the limits of material and manufacturing. Modern methods of prototyping have changed this outlook, and as a result, many architects depend on these calculated designs in hopes of creating something both monumental and epic. But both the field of architecture and society aren't so sure. Daniel Willis questions this computational obsession in *The Emerald City*:

It is now feasible for architects to design shapes that, due to their irregularity and complexity, would have been nearly impossible to draw just a few decades ago. The computer has been widely hailed for granting us this new freedom. However, is the ability to create an ever-wider variety of novel shapes as valuable as the architectural media and CAD marketing hype would have us believe? (Willis 282)

CIRCUMSTANCE

I have been playing SimCity for almost 20 years.

Not continuously of course, since that would probably have left me with social, mental and physical shortcomings. No, what I mean is that I have followed the course of the SimCity game for 20 years. I've bought every new version, from its first inception back in 1988 through its current version available today. And with every version, the underlying principle that results in immense satisfaction and intense frustration is always the same.

It's a game you cannot win.

This concept throws a mighty wrench into the gears of traditional thought about games. One college professor threw up his arms in frustration during a conversation about it. "My son is obsessed with this stupid game!" It is true that the inability to win or lose, or to achieve a tangible goal, makes certain personality types cringe. There has to be an end result; there has to be a goal.

Computer gaming is, by the nature of its design, an experience designed to lead the player through interaction, emotion, frustration, strategy, and ultimately, victory. Computer programmers know this, and as a result each new piece of software becomes a more intense and realistic experience for

the player. But SimCity is different. The joy of playing SimCity is in the process, not in the end result. In real life, designing a city is a slow progression, and it can take decades, if not centuries, to see the result of a decision made today. SimCity accelerates this process by an incredible time scale, and the player has to only wait a few seconds to see the results.



Image 3 - "Growing" a city from established rules in SimCity 4.

SimCity has been labeled an emergent system because the player nudges the "rules" of the city, not the actual city itself. Much like real life, this nudging changes the entire city as the simulation runs, and sometimes with disastrous results. For example, in a dense residential area, the SimCity player may add a public park to increase land value and raise property values. But these higher property values may cause traffic gridlock near some dense condos, and because they are no longer accessible, the buildings deteriorate, causing people to move out.

This residential exodus causes nearby property values to plummet. Soon the neighborhood is run down, unsafe, and breeding crime. A police station is added to combat the crime, causing the city to increase funding for the additional officers in this area. Industry suffers from the increase in funding, and manufacturing jobs are lost. As the progression continues, the player soon loses sight of the fact that this fiasco of urban planning was all caused by good intentions: a small city park.

The experience of seeing a positive condition evolve into a negative experience can be a harsh lesson for the player. The gamer has learned that adding green space to a dense area is not always a good thing, and will choose his next move more carefully. In real life this would be an incredibly costly blunder for the architect, urban planner, or city official who proposed it and it would take years to realize the mistake. But without a physical responsibility or a real city to worry about, the SimCity player can simply start over and try again.

The use of simulations and emergent systems in the world of games has stirred new ideas in the world of architecture. With the advancement of these tools for the design process, architects have posed the question: Using these same principles, can the computer “emerge” a perfect environment for human habitation? Is it possible for architects to define a set of rules that allow a building to be “grown” instead of “designed”? The idea that the

computer can take responsibility for designing a building is very tempting.

Something is missing from this idea. The computer is a seemingly ignorant collection of binary codes, running at hypersonic speed, through a processing unit. Without the capabilities to reason, experience, and make determinations on its own, the computer is still only accelerating whatever we program into it.

The computer is not a brain. Machine intelligence might best be described as that of mindless connections. When connecting multiple variables, the computer simply connects them, it does not think critically about how it connects. (Lynn 17)

The computer is not coming up with anything new; it is only accelerating our natural real-time processes. In fact, the term “real-time” is actually no longer applicable, as time is hyper-accelerated by technology.



Image 4 - Technology.

QUANDARY

In modern society, simulation is enticing us from every direction with the prospect of instant gratification, safe decisions, and ultimately, an easier life. But like SimCity, dependence upon simulated realities means playing a game we cannot hope to win. Society is so inundated with simulation and representation that it is forgetting the key essences of human existence. Thoughts, feelings, and emotions cannot be effectively represented in a simulated world. As a result, these life experiences are slowly being anesthetized by the organization, rationalization, and categorization of the computerized world.

The recent flocking towards simulation and virtual reality exposes a bigger problem with society: a push for perfection and protection. We strive toward a flawless image of humanity, and filter out negatives while we underscore positives. 'Perfect' media pervades our society, with flawless images that drone away as a background noise. And as a result, we pamper ourselves and rationalize the harsh realities—technology has advanced, and we have matured beyond the rough edges. Simulation is moving society towards a less permanent existence and into a world of escapism, and we are accepting it without questioning its legitimacy.

PROTECTION THROUGH SIMULATION

Simulations are the pinnacle dehumanized realities. Virtual objects have no significance: By definition they are unnatural and intangible. The computer calculates the collisions, and we reap the benefits of an imaginary interaction. Godlike, we can observe the event with computer flythroughs and a billion camera angles replayed at will. But we never actually touch those objects. We only see thousands of dots on a computer screen, and lose the actual experience. There is no claustrophobia in a space that is too small. The looming immensity of a brick wall is missing. And that impersonality, that lack of immediacy, stunts our perceptions.

Maurice Merleau-Ponty defines an object as "...a system of properties which present themselves to our various senses and which are united by an act of intellectual synthesis." (Merleau-Ponty 59) Humans cannot accurately perceive virtual environments because four out of five senses are not engaged, and the fifth (visual) is being "tricked" into believing. We cannot touch a three dimensional environment, smell it, taste it, or hear it. If a simulated environment does not provide data to all of our senses, how can we accurately perceive it, and thus, how can we accurately experience it?

GRASPING AT PERFECTION

We strive for perfection in a simulated environment

because it is much more difficult to attain in real life. We exploit the computer to generate perfect appearances and flawless images. We no longer practice the restraint of the physical world because it no longer exists in virtual reality. There are no barriers to surmount, no restrictions to respect, and no confrontations to avoid.

Jean Baudrillard hints at perfection as a social aspiration in America: that idealized environments are simulating the perfection to which we can never achieve. For example, "Disneyland is presented as imaginary in order to make us believe that the rest is real, when in fact Los Angeles and the America surrounding it are no longer real, but of the order of the hyperreal and of simulation." (Baudrillard 68) The concept of a perfect environment like Disneyland in the midst of a more real environment like Los Angeles shows the true effects of a simulation: an escape from a true condition.

ESCAPISM

Escapism is a response to a negative situation where an individual leaves an undesirable condition or environment for a more desirable one. Humans practice escapism to flee the mental difficulties of uncomfortable or stressful circumstances. Modern society practices escapism within the new digital medium.

Escapism is essentially an ego-driven or

hedonistic activity, and as such can be quite irresponsible, since responsibility is not its goal. It can ignore reality, others' feelings and needs, and personal duties and obligations. It can rank personal pleasure above practical issues that need attention, thereby ignoring one's conscience or inner censor. It is probably at the opposite pole to willpower. (Evans 68)

Our culture strives to achieve virtually what it cannot accomplish physically. We tell the computer what to calculate for us, how to respond to us, what we want to experience, and what we want it to mean. As a result, our simulated environments are models of protection and perfection that escape from the truths of reality.

PERCEPTION & SYMBOLISM

I touch, I feel, I smell, I breathe; these are givens in almost every person's life. It is our perception of the world that defines who we are, what we are, and how we act and react throughout our lives. These senses interact with the real world and are constantly feeding information into our consciousness as to the state of our environment. The objects we sense have mass, surface, and density.

The reality of our world is defined as that which we touch with the largest organ of our body, the skin.

Our skin is a massive sensory conduit between objects in the outside world and how our mind interprets them. A blade of grass on the arm, the warmth of a wood stove, a blast of cold air in the face...we perceive these things on a daily basis, and use the memory of common experiences to "complete the effect" of an experience. "The things of the world are not simply neutral objects which stand before us for our contemplation. Each one of them symbolizes or recalls a particular way of behaving, provoking in us reaction which are either favorable or unfavorable." (Merleau-Ponty 63)

When senses are missing from the equation, however, we lose the ability and basis for comparison. What is the warmth of light? How cold is an icy blast of air from a freezer? Does the smell of a flower have a color? Without some sort of touchstone for each individual sense, we can't fully perceive the environment. We need another standard to serve as a benchmark for what we perceive.

For example, anyone who has had to choose carpets for a flat will know that a particular mood emanates from each colour, making it sad or happy, depressing or fortifying. Because the same is true of sounds and tactile data, it may be said that each colour is the equivalent of a particular sound or temperature. (Merleau-Ponty 60)

In other words, each sense can overlap others, and even emphasize or diminish them. A bright room becomes unbearable with too much natural light, leaving the occupant too hot and unable to see. A room with hard, flat, reflective surfaces feels cold and uninviting, while reflective sounds in the space diminishes the ability to communicate and hear effectively. We cannot effectively perceive one sense without the others.

In his short story "Signs and Symbols," Vladimir Nabakov describes "referential mania," an extreme condition of man's need to derive meaning from his environment. "...The patient imagines that everything happening around him is a veiled reference to his personality and existence...great mountains of unbearable solidity and height sum up in terms of granite and groaning firs the ultimate truth of his being." (Nabakov) Michael Benedikt tones it down a bit, but spins the same idea into architecture, arguing that the world holds meaning simply because we wish it to.

We seem to fear that unless we keep talking and calling upon the world to talk, we will be overcome by the dread muteness of objects and by the heedlessness of nature, that we might awaken to our 'true' condition as 'strangers in a strange land.' (Benedikt 10)

Humans derive meaning from their physical world,

and tend to hold certain experiences and objects in high regard because of that meaning.

Without the capability to totally sense our environment, it remains nothing more than representational. Images that do not relate to experience are simply that: images. They are no more than pictures, icons, and placeholders for what we truly desire to see, touch, feel, and embrace: the hard, physical qualities of form. An image of a grassy field does nothing for the person who has not slumbered an afternoon away in the warmth of the sun, the summer wind caressing the face, and hearing the sounds of nature drumming in the background. "Such phenomena as orientation and site selection can function efficiently only if animals can recognize not only the objects they see, the sounds they hear, the textures they touch, the odors they smell, and so on, but also their ulterior significance." (Appleton 7)

Simulations and virtual reality only feed our visual sense when portrayed on a computer screen. Since imagery and representation is no match for experience and presence, we cannot effectively perceive simulated environments, and therefore cannot truly experience them. John Locke reminds us that "no man's knowledge here can go beyond his experience." (Locke 138) Humans need all the elements of perception to guide our senses and allow us to relate to our surroundings.

APPLICATION TO ARCHITECTURE

Architecture is a beautiful and technically challenging practice. Architects have historically been revered by society; architecture is one of the last remaining professions held in high regard by the public. Over four hundred years ago, Leon Battista Alberti described architects as near god-like scholars and artists.

A great matter is architecture, nor can everyone undertake it. He must be of the greatest ability, the keenest enthusiasm, the highest learning, the widest experience, and, above all, serious, of sound judgment and counsel, who would presume to call himself an architect. (Alberti 315)

Architects have always been interpreters of two very different but necessary disciplines. In *Understanding Architecture*, Leland Roth defines architecture as "the science and the art of building." (Roth 5) Two essential components that have to fit together in this formula are "art" and "science", and historically, architects have followed this formula with great success. Philosophers, poets, and critics can argue *ad nauseam* which of these is most important in our built environment, but as designers, we have a responsibility to include both in the design process.

It would be a great mistake to believe that in architecture only mechanics are

involved, that it is confined to digging out foundations and raising walls, all according to rules which, becoming a routine, only require eyes accustomed to judge a plumbline and hands fit to handle a trowel. (Laugier 7)

The science of architecture is the technical aspect of the design process. Calculations, computations, and logical methods of deriving hard data are the physical components of design that turn abstract expression into built space.

Logical analysis can be used in testing the effectiveness of a design with reference to a given parameter, and it is possible to use an explanation structured in this way to show why a particular design would work well if it were built, but it is not possible to produce [a] design simply by means of logical analysis—there must also be an imaginative leap at some stage. (Ballantyne 32)

In the past, these quantitative tasks were passed to engineers and scientists for testing and validation. However, with the recent advancements in computerized design methods, architects are now experimenting with the sciences of architecture like never before. “There can be little doubt that the advent of computer-aided visualization has allowed architects to explore calculus-based forms for the

first time.” (Lynn 16) The novelty of technical design is proliferating.

If computation and calculus represents the science of architecture, the art of architecture is exemplified by the elements of humanity: social history, past experiences, and visual interpretation. “Architecture is the art of living, and is at its most successful when it seems to give expression to the life that inhabits it.” (Ballantyne 2) The art of living defines our character as humans, and how we interpret our environment. “We forget that love and death, pleasure and pain are inextricably linked through our embodied consciousness.” (Pérez-Gómez 5) The human species has the unique gift of expressing its emotions and experiences through artistic interpretation, and architectural space and its effect upon our existence has been documented throughout the course of history. Louis Kahn recognized that “...The language of man is art. It stems from something which grows out of the needing, of the desire to be, to express, and the evidence of the promise of the material to do it.” (Kahn 237) The art and science of architecture are present in timeless structures—light, for example, both in the quantity of its illumination and the quality of its warmth and feel, or the movement of air through a room—its speed and temperature, as well as the effect it has upon our senses.

Embracing simulation and technology while disregarding human experience causes us to lose

sight of the true reason of design, resulting in a blemish of the noble image Alberti described. Using the computer, and subsequently pushing the idea of architecture entirely into the realm of science, many computational architects have lost focus of the true nature of design. The human element of architecture has been replaced with the synthesized physical forms of a scientific design method. Computational architecture removes the human experience, downgrading us to baby sitters for the computer and its logical processes. Proponents of this method argue that programming the computer to derive these structures is an art form in itself, as Frank Gehry's own biography notes: "Gehry's work, full of genius, does not beg any fundamental questions for art. It is simply beautiful in the old-fashioned way and there is no doubt as to who the artist is." (architecture + process 32) But there is nothing old-fashioned in computational architecture. We are taking ideas of human habitation and aesthetics and relying on a computer to abstract to determine them for us. To effectively communicate human experiences in architecture, our designs must mirror all of life's pleasures and pains, not just an aesthetic novelty.

Computational architecture is escapism as well: We forfeit the human influence when we ignore our obligations as architects. Relying on formulas to design shapes—shapes that are otherwise the product of our art—removes the value and importance of our profession. We can marvel at the fact that a machine can design a building, and we

can even pat ourselves on the back for teaching a machine to create. But in doing so we are stepping backwards from the artistic process, because the computer's decisions were not our own. If we ignore reality, the true meaning of architecture and design, and what it means to us as humans, we are doing a disservice to the profession and to those who still hold architecture in high regard.

THE HUMAN ELEMENTS

Computational design methodology should not be eliminated completely. The technological advances in micro processing are a snapshot of our society in human history; ignoring this progress completely would be irrational and unjustified. But we must be sure to retain the human elements that define our existence as a species. Specifically, we need to keep love, mortality, and responsibility at the forefront of our designs.

LOVE

Humanity has always struggled with the concept of love. Every language has its own definition of love, and every culture has its own interpretation. Ancient philosophers like Plato held love in high esteem but could do little to explain it in concrete terms. For him, love was

...a mighty god, and wonderful among gods and men, but especially wonderful in his birth. For he is the eldest of the gods, which is an honour to him; and a proof of his claim to this honour is, that of his parents there is no memorial; neither poet nor prose-writer has ever affirmed that he had any. (Plato)

Plato's definition is impressive, but doesn't contribute much to a rational understanding of the concept.

Centuries later, Søren Kierkegaard, while best known for forming the foundations of existentialism, took an oblique approach to the idea: "When one has once fully entered the realm of love, the world—no matter how imperfect—becomes rich and beautiful, it consists solely of opportunities for love." (Kierkegaard 86) Both philosophers have attempted to pin down an amorphous, vague concept that all human beings agree exists, but few can adequately explain. Louis Kahn believed that natural light was synonymous with love. "The spaces of architecture in their light make me want to compose a kind of music, imagining a truth from the sense of a fusion of the disciplines and their orders. No space, architecturally, is a space unless it has natural light." (Kahn 255) Music is frequently paralleled to architecture because of the emotional stimulus felt by the two. "...I call architecture 'petrified music.' Really there is something in this; the tone of mind produced by architecture approaches the effect of music." (Goethe, Eckermann and Soret 378)

The bond between love and architecture is incredibly strong. Most of our lives are spent in a built environment, and a structure that lacks love is just as obvious as one that exemplifies it. "Architecture is the unavoidable art. Every moment, awake or asleep, we are in buildings, around buildings, or in landscapes shaped by human artifice." (Roth 1) Our affection for buildings is common among all humans. Elevated and brightly lit spaces, harmony of materials and structure, well-proportioned spaces,

and comfortable, pleasing temperatures all evoke feelings of love. However, love in architecture is not simply an impersonal attachment to the physical building. It is also the ability of the space to elevate our senses and open our eyes to its presence, revealing the beauty of the outside world. Love in architecture is what the building does to us, as occupants, vividly enhancing our feelings and awareness while inside it.



Image 5 - The experience of love.

It would be easy to stop there, claiming that love is a reaction that humans have in a built space. But love is proactive, and for this thesis, is defined as the experiences, emotions, and feelings that are used to determine the shape and form of a building. These experiences and feelings are personal to the designer and help mold the initial shape of the building and its spaces.

Architecture must be rooted in love—the “realm of love” that Kierkegaard described—if it will allow us to experience that common emotion and the world we inhabit. But if we reassign that core and substitute the empty formulas of computational architecture, which has no love to offer, we lose the crucial component of architecture—our shared emotions. The ability of past life experiences to shape future designs must remain at the core of architecture, allowing the end product to be part of our human experience.

MORTALITY

“First you have to give up, first you have to know—not fear, know—that someday, you’re going to die.” (Palahnuik 136)

Inasmuch as love is a common human experience, death is another experience we all must face. We age and we die. Our buildings crumble and deteriorate. But our experiences and loves, in the form of architecture, live as long as society allows them to testify to our existence.

As humans we are attracted to the beauty in nature, people and life. These principles elevate humanity, and since the inception of our species we have respected creativity, beauty and perfection. We use those ideals to propel us beyond our mundane lives, to a higher level of being. Life thrills our senses, and vibrates in our being. And when we look deeper



Image 6 - The looming fear of mortality.

into life, and create something meaningful, we lift ourselves to that higher level.

But the converse of those experiences also fascinates us, and knowing that one day we must die is at once horrifying, titillating and enthralling. Maya Lin asserted that death is inevitable. "We have to face it. If we can't face death, then we'll never overcome it...you have to look it straight in the eye. Then you can turn around and walk back out into the light." (Lin) Impending death is something we actively avoid, just as every other living organism knows to fight for its existence. But the lure and fascination is something we can't deny. And by corollary, we all seek to escape the inexorable pull of mortality, what F. Scott Fitzgerald called the "ceaseless current." (Fitzgerald 115)

Architecture expresses mortality on a level that is deeper than simply the aging of materials and

surfaces. We measure our own limited existence by the timelessness of great structures and the poetry they speak to us. "Part of what we love about poetry is the fact that it seems ancient, that it has an authority of ancient language and ancient form, and that it's timeless, that it reaches back." (West) It is the link to the past that validates our existence in the present. Old buildings seem eternal, and subconsciously help soothe our fear of death by reminding us of our own mortality.

Simulations are one way of teasing ourselves with the illusion of eternity: When we escape to a virtual realm, we grant ourselves a weak permanence in a world that has no real consequences. Simulated worlds are, in and of themselves, a great human creation. Now we can entertain ourselves by escaping to a world free of tangible pain, sadness and even death. But can a virtual world form the architecture of the future? Possibly. But the end result is not without a price. The cost is the loss of shared feelings — the things we love, that we aspire to, and even that we fear when a creation speaks to us.

RESPONSIBILITY

One impulse from a vernal wood

May teach you more of man,

Of moral evil and of good,

Than all the sages can.

Sweet is the lore which Nature brings;

Our meddling intellect

Mis-shapes the beautiful forms of things:—

We murder to dissect. (Wordsworth and Morley)

Because of the personal nature of love and mortality, responsibility becomes undeniable and in effect, unavoidable. It is the backbone of what we design because it is, in its purest form, intent. As architects, we make concrete decisions regarding the permanence of surroundings, and as a result, take responsibility for those decisions. Once an object is intended and manufactured, it becomes permanent. Although destructive, the nature of this process is necessary for our built environment.

Material is already a product of human hands which have removed it from its natural location, either killing a life process, as in the case of tree which must be destroyed in order to provide wood, or interrupting one of nature's slower processes, as in the case of iron, stone, or marble torn out of the womb of the earth. (Ahrendt 139)

We destroy the natural components of our environment in order to build the physical components of our existence.

We take responsibility by making the decision

that materials of our built environments are more important than the role they played in nature. We have consciously determined that a piece of marble as a cornerstone of a brownstone is more essential to human existence than the same marble buried under the earth. Because we have made that decision, we are more apt to take responsibility and defend it, since the decision was made by a human for the purpose of human existence. Benedikt sums it up by saying, "a building with presence, for example, is not apologetic, but asserts itself as architecture, having a right to be here, to bump off a few trees (and defer to others), to take up its position as a new entity in the physical world." (Benedikt 34)

Responsibility in architecture is paramount; we have to take ownership of what we are designing. We cannot discard the fundamentals of design in favor of an algorithm that defines our existence for us. Computational architecture assumes no

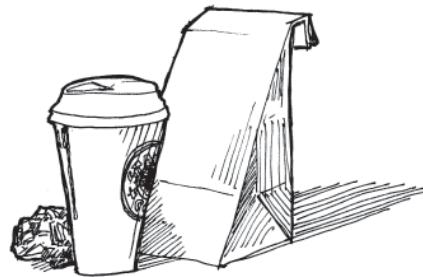


Image 7 - Disposability everywhere.

responsibility because it is not human in nature—it has no inherent human qualities. The human element must remain embedded in the design process, and allowing the design to develop into a natural aesthetic that represents our entire history, not just our present technology.



Image 8 - Our commodity-driven culture.

PRÉCIS

As humans, we need our world to relate to us. Visual representation, interaction, and symbolism, as well as our responses to them, such as love and a sense of mortality, complete the effect. Responsibility, not only to our physical environment but ourselves, allows us to validate our existence on this planet. Abandoning these vital human elements in favor of logical and calculated algorithms is no substitute for the joie de vivre of our being.

As humans, our greatest gift is love, and we are invariably called to respond to it. Despite our suspicions, architecture has been and must continue to be built upon love... the built environment will not follow [this foundation] if it is based on premises drawn from normative disciplines or abstract logical systems. (Pérez-Gómez 3)

In the growing world of computational architecture and simulation, we have lost sight of the fundamental processes which brought us here. We seem headed for a course of virtual reality and free form generation in architecture, throwing caution to the wind in the interest of exploration of style. Remember the old tenet, "form follows function"? With the explosion of computational design methods since the adolescence of the computer age, form now follows nothing. It is a whimsical expression of third-order splines on a widescreen monitor. The

fundamentals of architecture, as well as the beauty of Euclidian geometry, now seem absurd to many modern architects. "Architects and builders who wish to produce architecture must guard against applying technical logic disproportionately to their endeavors." (Willis 272)

Architecture is human experience. Built form has to be synthesized from the consideration of human comfort, emotion, thought, and poetry. Designed spaces have to have intent of the material and how it is applied. As technological and scientific a species as we are, we still need the human experience to be an essential element of architectural design, lest we eventually become as practical, calculated, and methodical as the computerized systems we create.

METHODOLOGY

This thesis will create a design process that implements both the art and science of architecture to create a cultural center in downtown Austin, Texas. This project will exemplify the world-famous live music culture and society in Austin, as well as the eclectic worlds of central Texas art and independent film.

The design process will incorporate both computational design methods (science) and traditional human element methods (art). By infusing the two ideologies together, this process should produce architecture that not only relates to our technological advances, but also our ethical and aesthetic values as well. One method of interpreting this human experience data is by mapping *stim* and *dross*, or heightened and diminished occurrences of the Austin urban environment. By identifying which components of the city induce a heightened experience and which ones diminish this experience, it should be possible to interpret the “rules” of the computational system directly.

The terms *stim* and *dross* are analogous with experiences in the modern city. These terms are defined in the book *Snooze* by the team at Studio Sputnik:

Lerup defines *stim* as a situation in the city where something special happens, such

as a party or sports tournament... ‘*dross*’ is the word for waste or impurities formed on the surface of molten steel, but also means worthless stuff, dregs. Here *dross* represents the lifeless, inactivity. If nothing happens in the city then it is ‘*dross*’ there. (Studio Sputnik 62)

With this initial data in place, the next step will be to evaluate specific methods of computational design, such as testing basic emergent systems and simulation software. Is it possible to qualitatively assign the human elements of love, mortality, and responsibility to an emergent system? Can a mapped “*stim*” generate a specific component in the system, such as an orientation, a material, or an adjacency? Or is the emergent system more suited for only determining program rather than building form? Is it possible to literally infuse these human experiences in the computational system, or simply identify them as perceived elements of the final shape?

Documentation of the process is important. This will be a learning experience as well as a journal of design decisions made along the way. Every choice, variable, equation, and result will be shown. At the end of the design process, the steps made along the way can be scrutinized and evaluated.

At the conclusion of project development, the live music performance center should achieve three

goals:

1. The incorporation of the elements of human existence into a computation design form. The building should clearly evoke feelings of love, mortality, and responsibility.
2. The final structure should belong to Austin, suggesting presence, sense of place, and adaptation to the future.
3. The building should acknowledge its natural and built environment using as many sustainable technologies and building methods as possible.



SITE ANALYSIS



Congress Street Bridge, Austin, Texas

SITE EXPERIENCE

SUNDAY, OCTOBER 21, 2007

I am at the east end of Lady Bird Lake (formerly Town Lake) at around 3:00PM. It's hot, 88 degrees and moderately humid. I start by walking west towards Congress. This wooded green space is thick with scrub brush, undergrowth, some garbage, and wildlife such as squirrels, fish in ponds, birds, and flies. The tree cover keeps the oppressive sun off my head. As I walk, I notice that I am stepping aside for bikes, scores of them, as they zoom past. I never noticed this trail when I lived here in 2001. Maybe I never was really here. I was always up north, in suburbia, living in melancholy and hating life. As I progress down the path, it makes a hard turn to the right and also forks left. I turn right, follow the Waller Creek Trail until it dead-ends, twice. I return



Image 9 - Rabies alert along the trail.

to the original fork, cross the bridge, and keep going. I pass the Austin Rowing Club and the bat sign. It explains why bats have been so popular on the Congress Avenue Bridge. There are two tourists reading the board, so I snap a quick photo and move on. As I come up out of the park area at Congress Avenue, I move up a set of steps, by the Radisson hotel. There is a golf conference going on, with old people standing beside the pool, discussing places they have been, courses played, dropping names and exotic locations. They do not venture past the pool fence but stare out over the lake. I move past, onto Congress Avenue.

It's 4:15PM, and I'm on Congress and Cesar Chavez Boulevard. The street is moderately busy. I cross Cesar Chavez and head north. On the right is a beautiful sculptured garden, with perfect angles and trees placed at regularly spaced intervals. As I walk further north, the glass skyscrapers reflect the intense sun back into my eyes. The street level is a mix of old limestone structures with eclectic themes: sushi bars, a pot store, banks, fine dining. Several cars go by with Latino/Tejano music blasting from them. I see a homeless person here and there, but mostly college types and tourists. It is Sunday, so the city is relatively dead. As I move closer to 6th Street, home of Austin's party scene, I see new construction lots that expose old buildings. The new exposes the old, and with that, the old becomes new. Live oaks and Russian olive trees line the streets. Austin is grinning, like a wise old man in a

new Ferrari. Austin is alive, and knows it is cool, but does not brag. It just subtly smiles to itself and buys everybody another round.



Image 10 - Old & new construction along Congress.

After leaving Starbucks I head east on 6th Street. The scene is different here; the buildings are shorter, older, and more historic. Trash is more frequent. It is still dead, but the tourists are more prevalent, as are the homeless. Many of the buildings have historic markers in the windows. I pass a bar, then an Irish pub, then a novelty store. I duck into the Liquid Lounge and peruse the selection. I pick out 2 T-shirts, pay, and then snap a photo of the woman working the counter. The colors are pastel southwest with knickknacks and novelties everywhere. I head back out onto 6th and realize that I am nearly at Interstate 35. I turn around and head back towards Congress. I hear the constant roar of the traffic behind me; this stretch of interstate is always crowded because it is so

poorly designed. A scraggly individual asks if I have money for smokes, calling me "Big Man." I tell him no, but smile inside. I pass under Buffalo Billiards, where I spent the evening of 12/31/1999 and barely remember any of it. Back towards the Starbucks, I cross Congress.



Image 11 - The irony of the obvious: Sixth Street.

On the west side of Congress, everything changes. No more squatty drinking establishments, ruffians, or music joints. The first building is a bank, and then a Ruth's Chris steak house. I keep moving and realize that Congress has divided this street into a more professional business environment. I move on, and the restaurants are more upscale, the bars more lavish. When I arrive at Guadalupe Street, I decide to head back to Lady Bird Lake. Turning left, I head south, passing more buildings, and suddenly at 4th street, back to bars and drinking establishments.

Directly across from these is a state office building. I walk all the way to Cesar Chavez Street.

Upon my return to Cesar Chavez and Congress, I make the decision to stay and wait for the bats. I was unaware of the fact that the Congress Avenue bridge is home of the world's largest bat colony, and to not experience it would be a waste of a trip. So I set up along the guardrail with hundreds of other tourists, and wait. It's about 6:45PM, and everything that I have read about the bats indicates that they will take flight between sundown and 30 minutes after sundown. As the sun slowly lowers over the horizon I wait patiently. Several tourists are near me, and one is text-messaging her boyfriend. Her friend giggles impatiently. A woman from Michigan strikes up a conversation with a Korean girl next to her. I wait longer. My new digital camera has a manual setting, so I play with the adjustments and take photos of



Image 12 - Waiting for the bats, near the Radisson Hotel on Congress & Cesar Chavez.

the cars driving by. The camaraderie on the bridge is inspiring, as people make predictions as to when the bats will actually emerge. I get tired of shooting pictures and stare at Lady Bird Lake below.

Suddenly, a quick flicker below me grabs my attention.

Someone shouts to my left, "there's one!" Everyone cranes their necks to see. However, it is almost completely dark, and only the bridge streetlights provide any illumination. Excited tourists are abuzz with the thought that more bats are on their way.

Another quick flash, and another. I can only see them for a split second before they fly out of the area of illumination. A minute goes by, then two more. It is 45 minutes after sundown, and the bats are coming out sporadically. My long trip combined with my first day of walking leaves little room for patience, and I start to wonder if this is worth the wait. Another bat flies out from the bridge below me, then a few seconds later, another. I check my watch. It's almost 8:00PM. I want to go back to my hotel, rest, and watch TV. Three more bats emerge. The tourists are leaning over the bridge railing, craning to see more bats; a long line of human rear ends points at the cars driving by. I smile. The bats have stolen the show, and all the gorgeous skyscrapers, beautiful scenery, and feelings of autumn have taken back stage to an engineering accident that is now one of the biggest tourist attractions in the state.

I turn and slowly walk back to my car. The wind has picked up.

MONDAY, OCTOBER 22, 2007

Last night I dreamed I was back in Montana, standing at the small rise on the Boulder Cutoff Road. In my dream it was windy, and I suddenly wake to hear the wind outside the air conditioning unit in my hotel room. Last night was such a comfortable evening that I can't imagine that it would be raining out, but a quick pull of the window shades reveal a sight that I am all-too familiar with: a hard wind and thick clouds dumping rain on the windows. I smile; weather like this is usually reserved for a late December day in Texas.

After messing around on the computer for a while, I realize that I have missed breakfast. This is my cue to get up and get out, as it is 10:00AM. Clint should be returning today, and I need to get my site analysis done before he returns. So I head out and drive around a bit. It's still raining, so I head north on the Mopac, towards my old place of employment.

The arboretum area is the same as I remember it. Not much more has been added in this area, and the traffic, buildings, and people are all the same: unpleasant. I stop at the Starbucks I used to visit when I lived here. The baristas were cool and unflinching as they went through the motions of serving drinks for impatient customers. I drink

a hot tea for a minute, when my lack of breakfast reminds me that I need to eat something. I head back out, and craving a chicken sandwich from Chili's, I drive over. I sit in the back, eating my sandwich and thinking of what to do if the rain keeps up. The waitress is cute, and she stops to look at my sketches and notes. After examining them for a moment, she smiles and says, "nice," and keeps moving. Time to head out.

Miraculously, the rain has stopped and the clouds are slowly breaking up. I head towards downtown, and get a phone call from Clint. He is in town but has some errands to do before tonight. I tell him no problem and ask for directions to the University of Texas. He says I'm close, and if I turn left from Lamar on 24th, I should be right there. I make the turn, and after a few blocks, I am there.

Talk about a massive school. When I initially applied here in 2002 I had no idea what it was like. I was not accepted back then and in hindsight, I'm glad I wasn't. The buildings are a maze of four- and five-story structures, with the same dirty limestone façades. The students walk the streets of campus, heads down, hardly speaking. The overcast and humid air helps drench the campus in an air of melancholy and indifference. The campus bookstore has more UT paraphernalia than I have ever seen. I can't even find any books...it's all t-shirts, sweatshirts, key chains, coffee mugs, and window stickers. I visit the art store, buy two Micron

pens and a paintbrush, and head out. After returning through the maze that is the UT campus, I find my car and depart, almost without my sanity.

I head back downtown, at least there I felt slightly normal. I cross the Congress Avenue bridge once again. This afternoon I will explore south Congress, the eclectic area south of Lady Bird Lake. I park my rental in a free parking space near the Texas School for the Deaf. What immediately catches my attention is the urban architecture. The buildings are low, short, one or two stories. There is a lot of new development, but for the most part, this is still reminiscent of a small town downtown without the small town around it.

I snap pictures as I walk up Congress towards Oltorf. The buildings are almost broadcasting themselves, in an attempt to not let the traveler pass by without noticing. This reminds me of Wall Drug in South Dakota or "The Thing" in New Mexico. Texas flair is mixed with roadside advertising. The Allen Boots store has a massive boot on top of it. The Yard Dog art museum beckons pedestrians and motorists to take a deep look (but it was closed when I walked by). The six-lanes of Congress Avenue are intimidating, so it's not a place to wander across the street like Sixth. But it does hold itself well. I cross the street near East Mary, and head back down towards my car. The wind is blowing hard now, and I see more of the same style on the other side of the street. A large Airstream trailer with a cupcake

on it. An art gallery and music store. An automotive garage, painted in bright colors like a Luis Barragán residence. The wind is really whipping me around, so I head into the Starbucks across the street from my car.

I

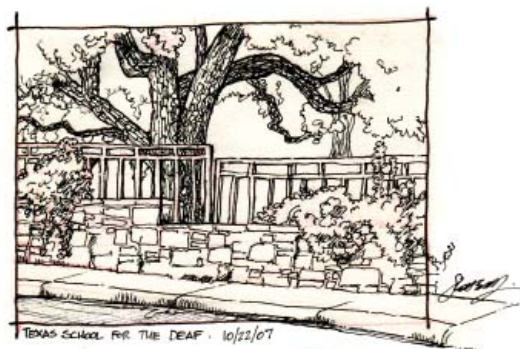


Image 13 - The Texas School for the Deaf.

order another tea and sit down to take a rest. As I sit for a moment, I remember that I am directly across the street from the Texas School for the Deaf, and at a table in front of me is a small deaf girl and her teacher going over some homework. The interaction is beautiful, and the girl watches her professor's sign language with intent and wonder. The teacher points at the paper, then at her eyes, then at the paper once more. The girl nods and begins writing. After working for a second, she proudly shows her work to her teacher, who smiles and nods approvingly. The

girl's face changes from intensity to pride, smiling as her answer was right. I smile too, click a subtle photo from the table, and sip my tea.



Image 14 - Deaf student and teacher at Starbucks.

I get a call from Clint, reporting that he is home and ready to visit. So I gather my half-finished drawing and collect my jackets. The wind blasts me again as I leave the shop and I dangerously cross Congress to my car. I head through town to Clint's house, park the car, and ring the doorbell. Mr. Clint Welden himself answers, and it's a happy reunion. After a few drinks and a fine steak dinner at Sullivan's, the rest of the evening becomes a happy blur.

TUESDAY, OCTOBER 23, 2007

I have that sick hung-over feeling. Last night's partying is this morning's headache. I pop two ibuprofen and jump in the shower. After getting

dressed and packing my bags, I say bye to Clint and jump in the Mazda 6. Within seconds I am roaring up the Mopac towards Dallas.

I follow the Mopac past Research Blvd. and keep going. Realizing that this is a toll road, I jump off the "Last Free Exit" and follow the frontage road up to Wells Branch. This is my cutoff to the interstate. As soon as I turn right, a car waiting to cross Wells Branch doesn't see me and starts to cross. I lock up the brakes, lay on the horn, and come within 3 feet of a collision. My heart is racing and I am now very awake, so I yell obscenities to myself and accelerate away from the near catastrophe. I make it back to I-35 without any further incident.

I zone out all the way up I-35 to Fort Worth. Soon I'm passing Hillsboro (home of one of the largest outlet malls in the state) and make the left hand split towards Fort Worth. I see a 65MPH speed limit sign, so I slow it down and cruise the 35 miles into town.

I turn onto 121 and then 183. The rental car gets a full tank in Euless so Hertz will not bill me for the used gas. The trip into D/FW was uneventful, and I pass through security and head to my gate. At E13 I decide to get some food, since the muffin I had in Austin was long gone through my digestion.

And there it is. Like magic, like an old friend who showed up without notice, like a surprise birthday party that everyone knows about, there, in all its glory,

is Dickey's Barbecue Pit. My most favorite restaurant in all of Texas, the reason why Texas barbecue is world famous, has a small satellite franchise right next to my gate.

Life is good.

Back at the gate, in a sated stupor, I wait for my plane. I can't wait to board. Once the doors are closed and the plane is pressurized, I fall asleep. Visions of the Lone Star State are still swirling around my head, but with the hectic pace I have maintained over the past four days, they all blend together, the crescendo slowly fading into a quiet white noise.

God Bless Texas.

PHYSICAL ANALYSIS

SITE

Austin, Texas 78701 - Capital of Texas, Travis County Seat

PHYSICAL LOCATION OF SITE

Center of site is approximately located at:

30°16'00.83"N (30.266897°N)

97°44'28.60"W (97.741278°W)

GENERAL LOCATION

The site is two small lots on the northeast corner of 5th Street and Brazos Street. One lot is the existing Prosperity Bank, while the other is a large parking lot. The site is one block from Congress and ½ block from Sixth Street; these two streets are identified as the "cultural arteries" that intersect the city.

BOUNDARIES

The north boundary is an alleyway halfway between 5th and 6th streets. The south boundary is 5th Street, while the east and west boundaries are the Bank of America building and Brazos Street, respectively.



Image 15 - Map of the city of Austin.



Image 16 - Site location in downtown Austin.

PHYSICAL SITE DIMENSIONS

The site is 200 ft. long x 126.5 ft. wide, with a calculated area of 25,780 square feet.

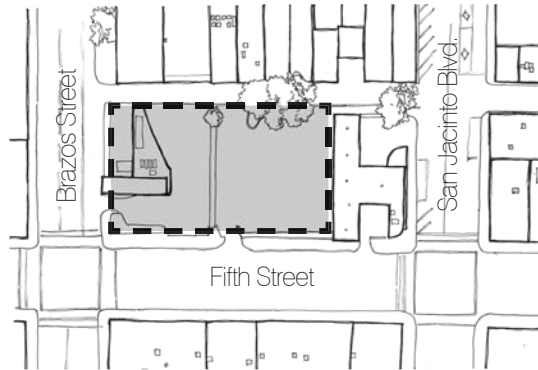


Image 17 - Site map.

ZONING

Entire area zoned as Central Business District (CBD). There is no height limitation and no lot size requirement. In other words, it's fair game.

Compatibility Standards of the Austin City Code do not apply.

Source: Section §13-2-661; Ord. 990225-70; Ord. 031211-11, City of Austin Zoning Department.

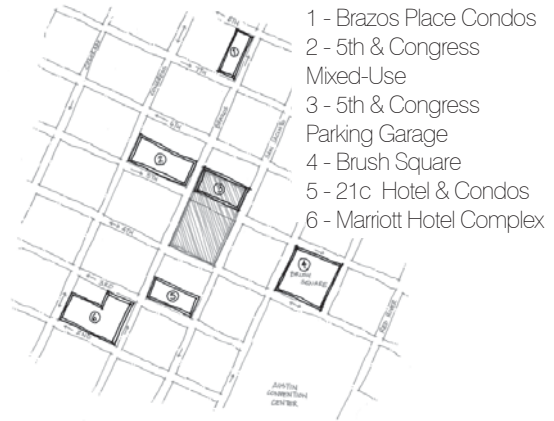


Image 18 - Future construction projects in downtown Austin.

VIEWS FROM SITE

The first two or three stories are surrounded by other buildings of the same height, so the views would be to these areas. But above this three-story range, the views begin to open up. The most desirable views are to the south and east, where the surrounding countryside and city can be seen. To the south is Lady Bird Lake, where ample green space and the city stretch even further.

SUN CHART

Solar orientation is skewed slightly from true north. The sun, however, will be almost straight overhead in summer months, at on the summer solstice

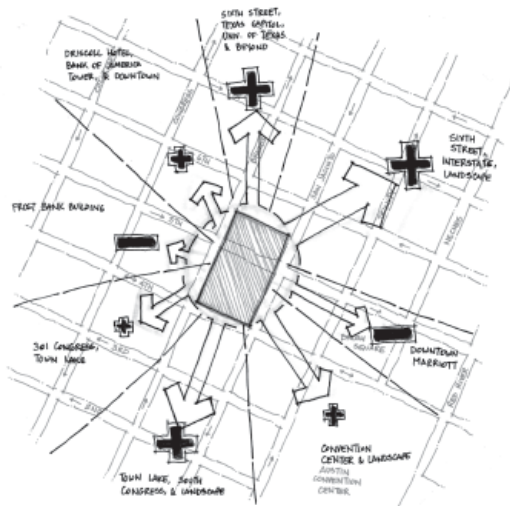


Image 19 - Upper-level views from the site.

(June 21) the sun peaks at an altitude angle of 84° from horizontal. Sunrise on the same day is almost exactly at an azimuth of 60° from true north, while the sun finally sets at an azimuth of 300° from true north. On the winter solstice, the angles are significantly lower. The sun peaks at an altitude angle of 36° from horizontal, rises at a compass azimuth of 120° , and sets at 150° .

HUMAN COMFORT

Without a doubt, Texas can get very hot. Summer temperatures routinely soar into the 100 degree range and higher. As a result, cooling is essential

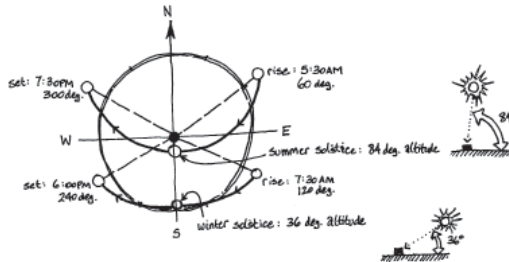


Image 20 - Sun angles chart.

for any structure, not only to reduce the temperature but also to reduce the humidity. Heating is also important, because high humidity levels and low temperatures can make this area rather chilly. But during the winter snow is very rare; rain is much more common. Because of the infrequent freezing temperatures, hearty temperate plants could survive.

NOISE

This is an urban area, so there is a constant background noise most of the time. Most originates from vehicle traffic, predominantly on Interstate 35, which is located to the east of the site, running in a north-south direction. During the day, this interstate is constantly congested, as is Congress Avenue to the west, so the sound of cars and horns rings throughout the historic city. Fifth and Sixth Streets are primary arteries across the downtown area, but these streets are not as congested as Congress, as they are one-way routes. But during morning and

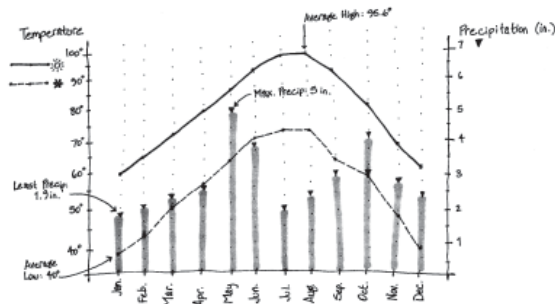


Image 24 - Temperature and annual precipitation

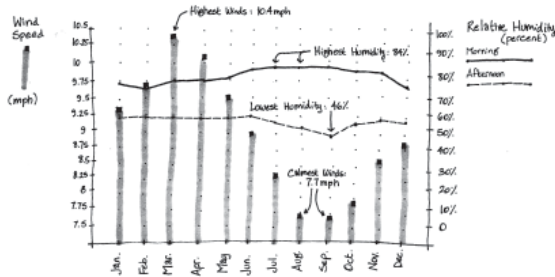


Image 21 - Wind speed & relative humidity.

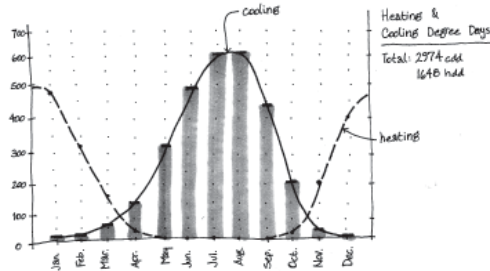


Image 22 - Heating & cooling degree days.

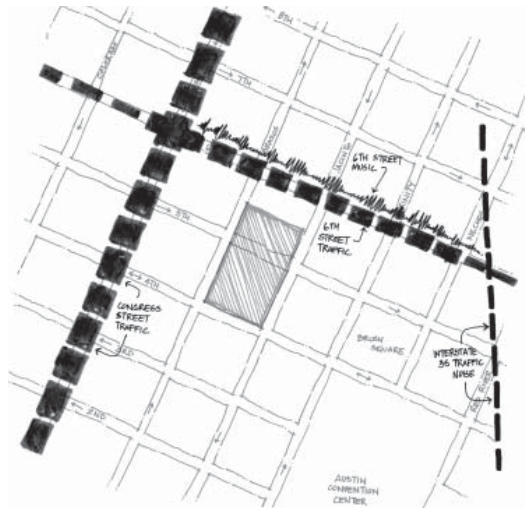


Image 23 - Excessive noise in downtown Austin. evening commute times, these streets can be busy with idling cars and impatient drivers.

Sixth Street is home to Austin's live music scene, and is a favorite tourist hangout for younger adventurers. As a result, Sixth Street comes alive at night, and is particularly raucous on weekends.

VEHICULAR TRAFFIC

Without exception, Congress Avenue, Fifth Street, and Sixth Street are the busiest streets in the area. These arteries through the central core are routinely packed, and travel times are long during the weekdays. Most of the vehicle traffic along Congress

Avenue is headed south towards the residential area of South Austin, and north to Fifth and Sixth Streets. These streets carry commuters out of the downtown area east to Interstate 35 or west to the Mopac Expressway. Congress Avenue is terminated by the Texas state capitol complex to the north, so vehicles headed through to the University of Texas skirt around the capitol grounds. But travel destinations beyond UT require use of the freeways, because although congested at rush hour, they are still faster than the stop-and-go traffic lights through the city.

PEDESTRIAN TRAFFIC

Pedestrians love to walk in Austin and as a result, sidewalks are plenty and historic views are everywhere. But just like vehicle traffic, pedestrians are usually headed for a particular landmark, not simply walking around town. Congress Avenue is a popular street for tourists headed for either the capitol or the bridge, where the bats are watched almost every day of the summer. The sidewalks on Congress are wide and landscaped, and the intersections have crosswalks with ample time to scurry across.



Image 25 - Routes of vehicular traffic.

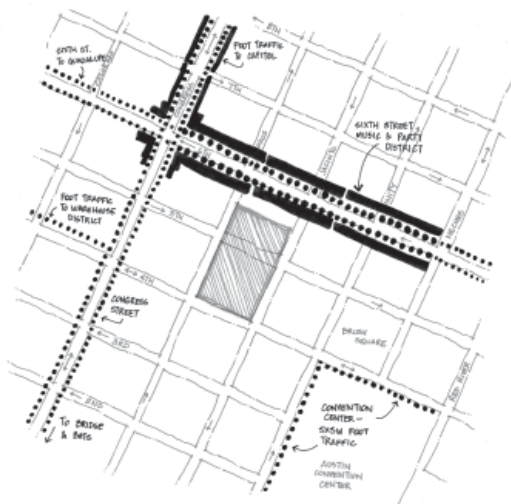


Image 26 - Routes of pedestrian traffic.

Sixth Street is a pedestrian haven, and tourists and college students are on it during most times of the day. But the intense pedestrian traffic on Sixth is limited to the section between Trinity and Congress. Beyond this, the pedestrians choose to drive, and the density of bodies on the street is the same as the rest of Austin.

The Austin warehouse district is another popular pedestrian spot for the twenty- and thirty-something crowd, and Fourth Street is a popular route to get there. Recent construction has closed the sidewalks in this area, however, and more visitors are choosing to drive. But this setback is only temporary, and once the massive amount of growth slows in Austin, the sidewalks will be open again.

BUILDING HEIGHTS/CITYSCAPE PROFILE

Although Austin is an urban area, its downtown core is relatively small. The largest and tallest buildings are grouped in a 30 square block area, concentrated around the strip of Congress Avenue between Second and Eighth Streets. Beyond this area the buildings return to their historic three- and four-story heights. A few exceptions are the Marriott near Interstate 35 and the Hyatt Regency on the south shores of Lady Bird Lake. Most of the historic buildings in downtown Austin are no more than three or four stories.

INTERPRETATION

In traveling around in downtown Austin, I noticed a few things of interest. First, even on a week day, such as Monday at noon, the downtown area was not an overwhelming, bustling environment. The downtown was moderately busy, but about the same density as San Francisco at night or Seattle near Pike's Market. It was very relaxed, and people seemed to be going to and from work, but they did not seem to be rushed, angry, or upset. By the same token, they were not unusually friendly, either. They were working, or walking, or conducting business, but they were not happy, talking, and excited.

The next thing I noticed was Sixth Street and South Congress intermixed with an urban environment. Granted that Austin is not a large city (680,000 people in the city limits) but it still has bad traffic, busy streets, a mass transit system, and all the amenities of an urban space. But the cultural character of Sixth Street seems to lacerate the



Image 27 - Homeless on Sixth Street.

side of the urban pattern like a dagger. If one were to map out the layout of Austin, UT and the "drag" would sit nicely at the top of downtown, quietly, and without opposition. But you can sense the impact of Sixth Street into the downtown urban experience, almost uncomfortably. Sixth Street is more for adolescents, tourists, and the homeless. By comparison, Fourth Street is a more mature crowd that attempts to offer its own piece of the party, but on the other side of the downtown area.

South Congress (SoCo) is another smaller, but still important area of Austin. The area did not seem to boast an intense party lifestyle on Sunday and Monday, but still had more interesting and personalized building façades than Sixth Street.

South Congress bustles with eclectic style, hippie roots, and a new sense of urban revitalization. The district boasts less entertainment and intense excitement than Sixth, but still maintains a dignity of its own. I sat in a Starbucks close to downtown on Congress and it was busy, but not bustling like the downtown one was.

Austin felt muggy, old, and well used. It felt confident

and trendy, but not over-glamorous. If Jennifer Aniston or Bill Clinton were around, I didn't know about it. It seems a place for the cool and stylish to kick back and relax for a while without being made a fuss. The old buildings seemed to happily expose their age. Maybe that's why it's so attractive. Dallas has a very proper, busy, money-oriented feeling, as if it's not who you are, but who you know. Houston oozes work, labor, and oppression, being so close to Louisiana and the gulf. San Antonio is the big decorated Mexican low-rider, cruising down the block with Tejano music blasting from all its open windows. And El Paso, belonging more to New Mexico more than Texas, seems too far removed, like the kid trailing behind the crowd but never quite catching up. But Austin is like a central spoke that holds all these other distinguished and massive metropolitans at a respectful arms length. It says, "you be yourselves, I'll just sit here and watch." And as a result, it has attracted watchers from all over. Musicians, movie stars, and politicians, who just want to relax without falling into the social sinkholes of other major cities, call Austin home. It just seems right.

It took a while for me to realize this, however. Austin at first seemed too difficult to get to know. It didn't welcome me with open arms, put on a show, or help me move into my apartment. It stood there respectfully, like a monument that you quietly circle in the hot sun, not sure what to make of it. To be yourself in Austin requires you to actually be yourself,

not to try to impress, or be something else, or flash money around. When we went to dinner on Monday night it was obvious who was from town and who was not, because Sullivan's was just that: a place for out-of-townies to congregate, because they got lost trying to navigate the rich history and true local flair of Austin. There are hundreds of franchise restaurants that an out-of-town visitor would visit because they are similar to the ones in their neighborhoods back home: in their strip malls in La Jolla, California or Gary, Indiana. But to really visit Austin's local flair is to lose yourself and your globalized mind frame and actually allow Austin to do what it does best: being unique.



Image 28 - The Yard Dog art museum on South Congress.



**PROGRAMMING &
CODE**



The Modern Art Museum of Fort Worth, Texas

QUALITATIVE PROGRAM

This facility will be a cultural arts center for the art, music, and film arts of Austin. The facility will have three main parts: a local artist museum, a live music lounge, and a independent film theater. These areas will be exclusively dedicated to the showcasing of Austin talent. The cultural arts center will be close to the two cultural “arteries” in the city: Congress Avenue and Sixth Street. Sixth Street is very popular for live music and nightlife, while Congress is popular for culture, history, arts, and entertainment. As a result, the building will provide a visual and auditory showcase of the downtown Austin area.

Currently Austin has more than enough live music and arts venues around town. The South by Southwest Film Festival is held at the Austin Convention Center, two blocks from the site. But these facilities are scattered around town and are difficult to cohesively unite in one location. The cultural arts center will be a starting point for visitors interested in getting a “big picture” of what it means to be an artist, musician, or filmmaker in Austin without having to search around the downtown area.

There are two theaters in downtown Austin with historical significance: the Paramount and the State. The State is currently under renovation, while the Paramount, immediately next door, is the premiere center for performing arts, such as theater and dance. The cultural arts center would supplement

these existing performance centers as well as the University of Texas and other local performance halls.

QUANTITATIVE PROGRAM

PERFORMANCE ART AREAS

Description	Qty.	Area (ea.)	Total Area
<i>Live Music Venues</i>			<i>3,500 sf</i>
Seating/Lounge for 300	1	2,000 sf	2,000 sf
Staging/Sound/Equipment Room	1	200 sf	200 sf
Bar Area	1	200 sf	200 sf
Lounge Grill (Kitchen)	1	700 sf	700 sf
Refrigerated Storage	1	400 sf	400 sf
<i>Flexible Theater</i>			<i>2,600 sf</i>
Theater Seating for 200	1	2,200 sf	2,200 sf
Projection Room	1	200 sf	200 sf
Main Equipment/AV Storage	1	200 sf	200 sf
<i>Art Gallery</i>			<i>3,000 sf</i>
Flexible Gallery Space	1	3,000 sf	3,000 sf
<i>Lobby/Circulation/Restrooms</i>			<i>5,150 sf</i>
Lobby/Box Office	1	4,000 sf	4,000 sf
Coat Check	1	150 sf	150 sf
M/F Restrooms	2	500 sf	1,000 sf
Total			14,250 sf

OFFICES

Description	Qty.	Area (ea.)	Total Area
Director's Office	1	300 sf	300 sf
Management Offices (Curator, Film Critic, Music Director)	3	150 sf	450 sf
Support Staff Offices	3	100 sf	300 sf
Conference Room	1	600 sf	600 sf
Administrative/Copier/Storage	1	400 sf	400 sf
Break Room	1	100 sf	100 sf
Staff M/F Restrooms	1	200 sf	200 sf
Total			2,350 sf

MISCELLANEOUS

Description	Qty.	Area (ea.)	Total Area
Mechanical Room	1	1,000 sf	1,000 sf
Electrical & Networking Room	1	200 sf	200 sf
Loading Dock/Work Area	1	1,000 sf	1,000 sf
Janitor's Closets w/ Utility Sink	2	100 sf	200 sf
Total			2,400 sf

SUBTOTAL		19,000 sf
Circulation (+15% of Subtotal)		2,850 sf
Parking Garage for 100 vehicles		18,000 sf

TOTAL BUILDING AREA		39,850 sf
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CODE COMPLIANCE

SECTION 300 - OCCUPANCY CLASSIFICATION

Common Name	Area	Occupancy	Notes
Theater (Seating)	2,275 sf	A-1	Assembly with fixed seating
Art & Display Gallery	2,648 sf	A-3	
Lounge/Bar	2,509 sf	A-2	
Administrative Offices	3,100 sf	B	
Lounge Grill (Kitchen)	689 sf	A-2	
Parking Structure (non-occupied)	18,000 sf	--	
Mech. Room	658 sf	S-2	

Intended method (302.3.2): *Separated uses*. Each portion of the building shall be individually classified as to use and shall be completely separated from adjacent areas by fire barrier walls or horizontal assemblies or both having a fire-resistance rating determined in accordance with Table 302.3.2 for uses being separated.

All occupancies require *2 hour separation* from each other.

SECTION 400 - SPECIAL REQUIREMENTS BASED ON OCCUPANCY

At this time, I am anticipating a *motion picture projection room* with applicable codes from Section 409.

SECTION 500 - BUILDING HEIGHTS AND AREAS

Because of the nature of the structure and the size, building will be equipped with an *automatic sprinkler system*.

Construction type should be *Type I - A construction*, made of noncombustible materials.

<i>Occupancy Type</i>	<i>Construction Type</i>	<i>Max. Height</i>	<i>Max. Area per Floor</i>	<i>Max. Stories</i>
All except H-1, H-2, & H-5	I - A	Unlimited	Unlimited	Unlimited

SECTION 600 - TYPES OF CONSTRUCTION

Building Element	Fire Rating	Notes
Structural Frame	3 hour	Roof elements are permitted to be 2 hour.
Bearing Walls - Exterior	3 hour	Roof elements are permitted to be 2 hour.
Bearing Walls - Interior	3 hour	
Nonbearing Walls - Exterior	1 hour (0 - 30 ft.)	Greater than 30 ft. of separation requires no fire rating.
Nonbearing Walls - Interior	None	
Floor Construction	2 hour	
Roof Construction	1.5 hour	Fire protection of structural members is not required. Heavy timber is not allowed. Fire-retardant wood is permitted if roof is 20ft. above floor.

SECTION 1000 - MEANS OF EGRESS

Named Area	Area	Type	Occupancy	OLF	Total	Stair Width	Other Width
Theater (Seating)	2,275 sf	A-1	Assembly w/ Fixed Seats	--	182	36 in.	27 in.
Art & Display Gallery	2,648 sf	A-3	Assembly: Standing Space	5	530	106 in.	80 in.
Lounge/Bar	2,509 sf	A-2	Assembly: Unconcentrated	15	168	34 in.	25 in.
Administrative Offices	3,100 sf	B	Business Areas	100	31	6 in.	5 in.
Lounge Grill (Kitchen)	689 sf	A-2	Kitchens: Commercial	200	4	1 in.	1 in.

Parking Structure (non-occupied)	0 sf	--	Parking Garages	0	0	0 in.	0 in.
Mech. Room	658 sf	S-2	Storage & Mech. Rooms	300	3	1 in.	1 in.
Total Occupant Load				2108			

Means of egress shall not have a ceiling height lower than 7 feet.

Handrails can only protrude 4.5" from the wall.

Egress widths cannot decrease along the direction of travel.

Travel Distances

Stairway widths must be at least 44" (3'-8") wide.

Minimum headroom of 80" (6'-8") on all stairs.

Stair landings will not exceed 12'-0" of vertical rise.

Ramps shall not exceed 1:12 slope.

Ramps will not exceed 30'-0" between landings.

Occupancy Type	Max. Travel Dist. (No Sprinkler)	Max. Travel Dist. (Sprinkler)
A, E, F-1, I-1, M, R, S-1	200 ft.	250 ft.
B	200 ft.	300 ft.
F-2, S-2, U	300 ft.	400 ft.

SECTION 1100 - ACCESSIBILITY

Number of Seats in Assembly	Minimum Req'd. Wheelchair Spaces	Minimum Req'd. Companion Spaces	Notes
186	4	4	For main theater

Accessibility Rule	Qty.
At least one unisex toilet room is required if there are more than 6 toilets in the assembly areas.	0
5 percent (but at least one) of the sinks should be accessible per toilet room.	1
50 percent (but at least one) of the drinking fountains per floor should be accessible.	3

SECTION 2900 - PLUMBING FIXTURES

Occupancy	Water Closets*		Lavatories*		Drinking Fountains	Service Sinks
	M	F	M	F		
Theater (A-1)	1	2	1	1	1	1
Lounge/Nightclub (A-2)	3	3	2	2	1	1
Art Gallery (A-3)	3	5	2	2	2	1
Associate Offices (B)	1	1	1	1	1	1
Total Fixtures	8	11	6	6	5	4

* All Male & Female calculations assumed half of total occupancy (OL/2)

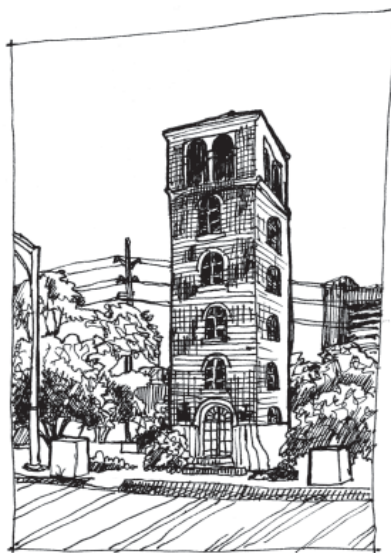



Image 29 - Buford fire tower, downtown Austin.

A photograph of a modern architectural interior. The ceiling is white and features a prominent, angular, recessed section. A bright yellow light fixture is visible in the upper right corner. The overall lighting is warm and soft. The text "PRECEDENT STUDIES" is overlaid in white, bold, sans-serif font at the bottom center of the image.

PRECEDENT STUDIES

The image captures the interior of the Denver Art Museum's atrium. The architecture is characterized by large, light-colored, angular panels that create a dynamic, geometric space. The ceiling is a prominent feature, with several small, circular recessed lights. A bright, triangular opening in the ceiling allows natural light to filter through, where a few people can be seen standing. In the foreground, the silhouettes of people are visible, including a large figure in the center-right, suggesting a busy public space. The overall atmosphere is modern and minimalist.

Denver Art Museum, Denver, Colorado

TALIESIN WEST

It's not that long drive of a drive from Tucson up to the Phoenix area, but it still seems like an eternity. Its two days after Christmas and the wind is howling across the desert with merciless fury; to escape from the monotony inside the car means exposing yourself to the wind outside. We drive for an hour up the freeway, and finally, after another half hour of winding through imposed suburbia, we arrive at the parking lot. The wind has stopped. Settling my gaze on the circus of clay-red angles and blobbed concrete walls formed over desert rock, I become conscious of the fact that this place speaks volumes about its existence, like the comfortable old grandfather corralling the children around the warm fire for a bedtime story.

The structure appears flawed, disproportional, aging, and uncomfortable, but that's not what the intention is. It is the deliberate grace, the poignant testimonial, the gut-wrenching agony and the timeless splendor that speak volumes here. The joints crack and weather elegantly as the desert silently but abrasively massages the building over time. A bell is framed like a sentry against a cool desert sky. Small square blocks of wood, notched into an overhang near my head, split along the grain and silently fall away. This safe haven, celebrating human subsistence in such a harsh environment, feels right. It moves with grace and passion through the comedy and tragedy of man and his environment.



Image 31 - Roof detail, inside meeting room.

Architect: Frank Lloyd Wright
Location: Scottsdale, Arizona
Year of Completion: 1937
Function: School and private residence



Image 30 - Exterior detail near entrance.

KIMBELL ART MUSEUM

I can't find the Kimbell. It should be right in this area, but all I see along Camp Bowie are some thick trees and a few shops on the left side. Luckily a sign directs me right, into the trees, and I almost overlook an uninteresting vaulted concrete structure tucked within the foliage. After parking, I walk up to it and a sense of awe begins to creep over me before I even pass through the lower doors. The bright Texas sun grows dimmer, hidden by the dense concrete. My eyes adjust momentarily as I step inside and face the polite security guard and reception desk. Two brightly lit staircases ascend symmetrically on either side of the reception desk, but in this entry area it is rather dark. Accent pendant lights remind you that you are below grade in this area, but the illuminated staircases beckon to you. Craving the light, I move upstairs, and suddenly the main museum floor is

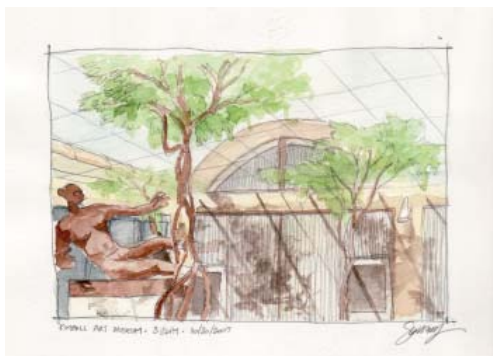


Image 32 - Atrium space in the center of the museum.

bathed in diffused, natural sunlight. The grey metal armatures above me are surreal; these have to be man-made fixtures. The precise dispersion of illumination has to be mechanical, there's no other explanation. The barrel vaults of solid concrete are aglow with light, and the brightness fades along the circular sections as the eye dances lower towards the intersecting walls. The vaults run lengthwise overhead. Electric spotlights randomly illuminate specific pieces of art, but it is the diffused sunlight that defines the overall enclosure of the gallery. The art is unimportant, insignificant, and substandard. It is the light and atmosphere that is truly on display. I feel at ease here. I am in a comfortable afternoon living room with nothing to do but to sit and bathe in visual splendor. The light is spiritual in nature — it is what I have been longing for, and have been rewarded with, in my melancholy passage through this mechanized world.

Architect: Louis Kahn
Location: Fort Worth, Texas
Year of Completion: 1972
Function: Art museum

THE MODERN ART MUSEUM OF FORT WORTH

I walk into the front of the “Modern” and slowly draw my gaze upward. The mullions and glass frame this entryway reach overhead to infinity; it is beyond the scale of my physical being. This open space has an entirely different illumination and feel than the Kimbell, because the natural light streams in through the expansive side curtain walls, not through slits carved in the roof. But the more noticeable aspect of this space is that the transparency draws the eye outside, where the structure makes the surreal connection with the earth. By placing the massive glazed panels mere inches above the reflecting pool, I have the sense of floating on water. It seems that at any moment the massive structure could sink. Even with the stiff breeze blowing outside, the water has only tiny ripples across its surface, which speaks to the tiny imperfections of the otherwise flawless concrete walls inside. These stark, pure forms are abstractions of the modern art inside; Cartesian lines and angles that accentuate the simplicity of their shapes. The light, the forms, and the timeless character of this refuge whispers unapologetic tranquility to me.

I respond with unapologetic resolve. I exist, I am real, and I cannot sacrifice my inherent persona to fit a role that is not really me. I will not alter my perception of truth because it holds the promise of a brighter future, or a better life. I will not become



Image 33 - Outside pool area.

devoid of sense and experience, submersing myself in an alternate existence, because I am afraid of the consequences of this existence. The Modern echoes this same resolve, it stoically presents itself to the perceptions one has in this space; they are the concrete and definite reality. And with this blatant and shameless presence, it stands firm. It holds itself to the best of its ability, and when I dance over its corners, drift through its transparencies, and march along its perimeter in my mind, I will never wish it to be anything but the timeless monolith that I experienced.

Architect: Tadao Ando
Location: Fort Worth, Texas
Year of Completion: 2002
Function: Art museum

SAN FRANCISCO MUSEUM OF MODERN ART (SFMOMA)

It has been a long day. The sounds of the city are everywhere, and after my first few days in San Francisco I long for silence, peacefulness, and tranquility to help absorb the wonders of this place. Even Yerba Buena feels busy. I cannot breathe without tasting the abrasive grime and history. Yet I am intoxicated by the barrage of movement, noise, velocity, and persistence. The life of the city is overwhelming. Final determined steps whisk me into the front lobby of the SFMOMA, and the cacophony of audible warfare instantly drops to a quiet hum. For a brief moment, I emotionally rest in the dark vestibule.

Suddenly, I instinctively duck. Something just flew over me, within a foot of my head. My eyes have not adjusted to the illumination difference, so I can only make out a dark circular object whirling around above me, framed against a circle of natural light many stories above. It is a simple fan mounted on an obscenely long rope, swirling in a wide elliptical path above the lobby, with the Doppler Effect causing the pitch of its humming blades to rise and fall around its orbit. I stop. I cannot comprehend this thing.

I know that these halls hold countless paintings, photographs, sculptures, and expressions of art, but I am paralyzed, staring at this object. Forcing

myself to look away, my eyes become more adjusted after several seconds and the room begins to open up. I see the reception desk and the tall columns reaching skyward, gracefully nodding to the large circular skylight above. Tall stairs frolic up three stories. This logical interior harmonizes my senses. The transition is peaceful. I agree with the proportions and acknowledge the lines. The SFMOMA quietly calms me into a gentle lullaby, while keeping the intensity of the city at bay.

Then that damn fan swings back around, and again I duck.

Architect: Mario Botta

Location: San Francisco, California

Year of Completion: 1995

Function: Art museum

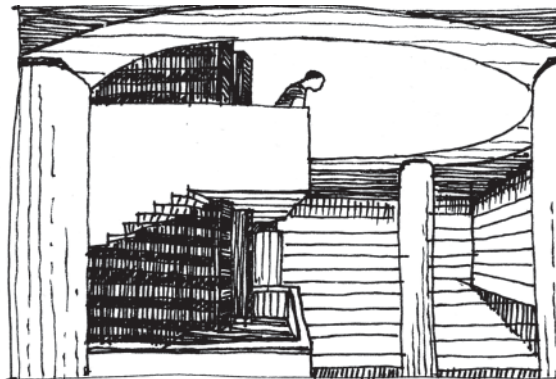


Image 34 - The main stairway inside the entrance.

DENVER ART MUSEUM (FREDERIC C. HAMILTON BUILDING)

The December sun begins its slow descent towards the Front Range, but just before touching mountains, it is suddenly blocked by the cold edge of a large faceted crystal, stuck into the ground near 13th Street in downtown Denver. Clad in sheets of titanium and making a mockery of the idea of human occupancy, this oversize mass of chaotic angles sashays against an elegant modern skyline. I shrug my shoulders and move inside. Jill follows behind me, staring at the behemoth in her own curious way.

The building makes no apologies for its appearance. Surely there will be some semblance of order inside. The stock revolving door gets my hopes up, but once inside, the walls, stairs, and ceilings again attack my sense of right-angle familiarity. The interior seems to be competing against itself. The ticket counter seems misplaced against a backdrop of slanted drywall and random LED light fixtures. The stairs slope menacingly away from the front desk, and the treads and risers seem to be swallowed by the sloped wall they are attached to. Looking up through the stairs, the four-story atrium fades in a jumble of lines and planes.

As humans, we inherently have an accurate sense



Image 35 - Outside view of the north leading edge.

of right angles. Since the birth of construction methods, we have been building in mostly vertical and horizontal planes, and for good reason. "Humans are the only mammals that walk about constantly on their hind legs. . . we are unique in being totally bipedal—and have to wonder why." (Watson 130) We spend their lives upright on two legs. As such, we are creatures of balance, constantly fighting to remain in a vertical orientation, while our eyes naturally scan our horizon in a left-right motion. As a result, our architecture has followed suit, constantly reinforcing that sense of up-down-left-right. But the Denver Art Museum seems to abandon this principle in favor of visual interest.

In praising the right angle, Ozenfant and Le Corbusier suggested an interdependence between architecture and gravity that is akin to the sailboat's dependence on the wind. If we thoughtlessly abandon this dependence, simply because a new tool has made doing so suddenly efficient, we may be perpetrating the equivalent of bringing an engine on a sailboat. . . we may have a proliferation of unusually shaped buildings, but this technique will not produce architecture. (Willis 283)

I agree with Daniel Willis. This museum disrupts my sense of balance and gives me a slight headache.

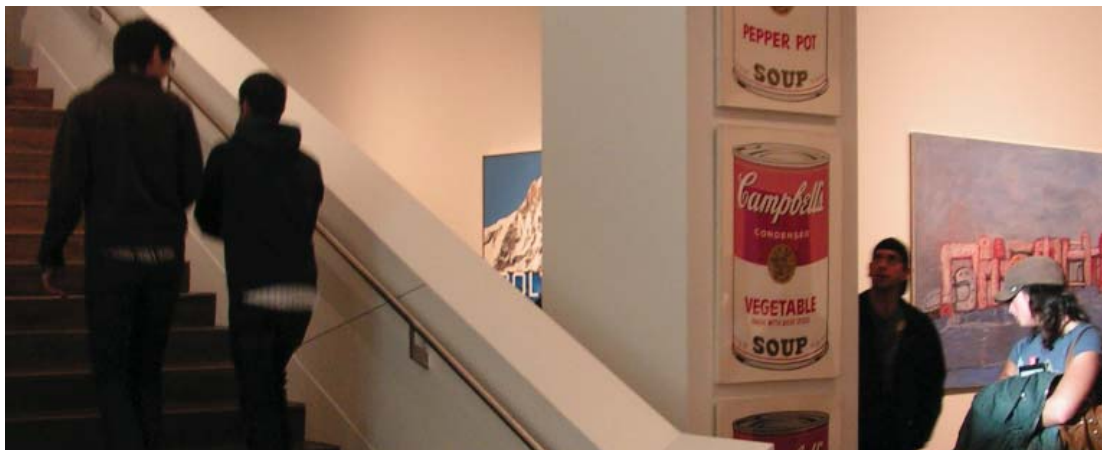


Image 36 - Andy Warhol classics tacked to a column.

In the Clyfford Still gallery, two oblique sloping walls meet in a dark corner, where the angled ceiling slopes down to within 3 feet of the ground. There is no art in this corner, no people, light fixtures, doors or windows; it is lifeless. Understandably—very few people would even fit in this space. Even more profane is the admirable attempts of the curators to accommodate these unconventional surfaces for the modern art. Manets, Lichtensteins, Warhols, and Smithsons are precariously hung with makeshift frames and fasteners; Andy Warhol's famous Campbell Soup collection is displayed on a column, suggesting that the curator simply gave up and resigned the art to the most convenient place possible.

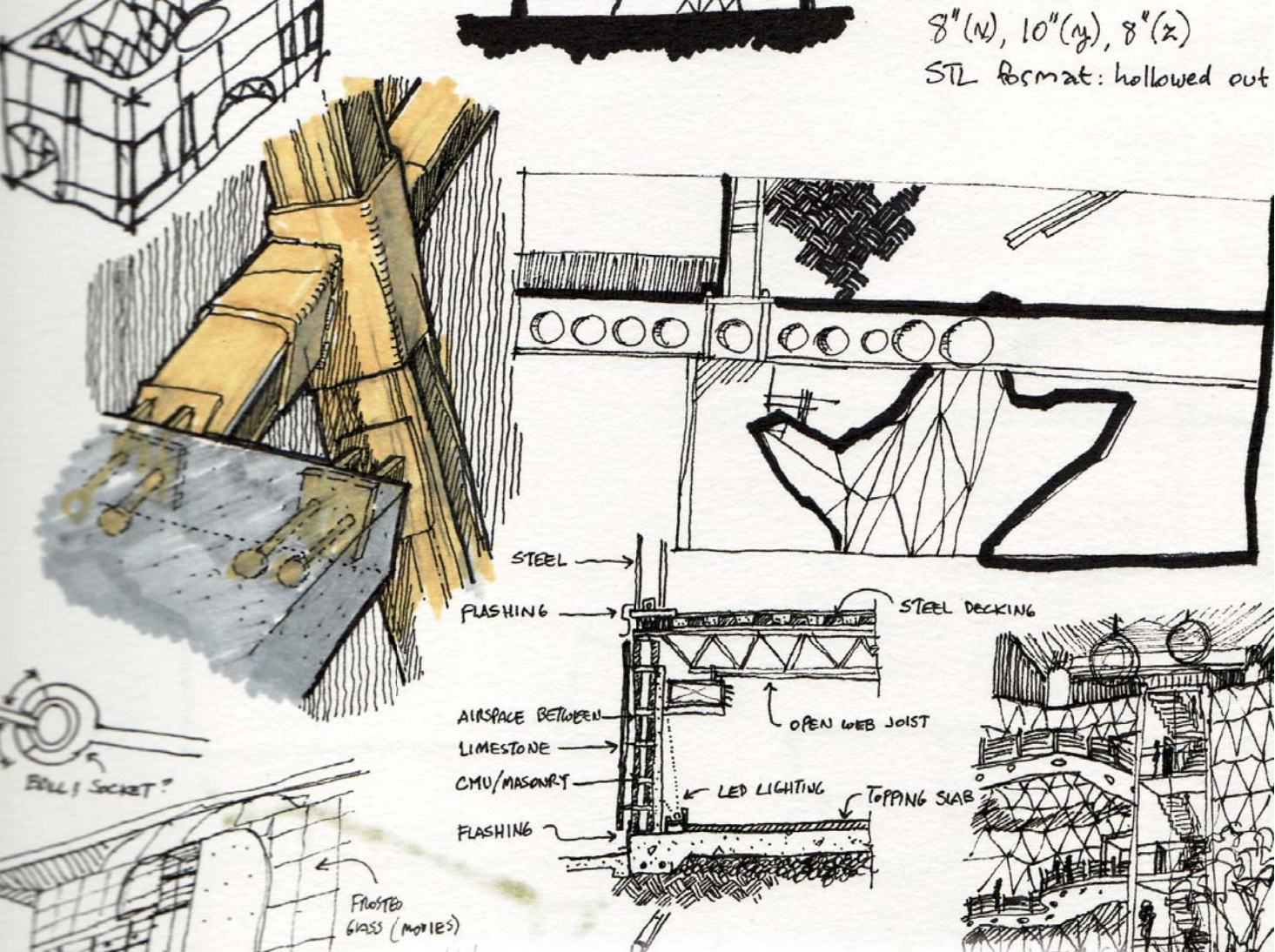
Architecture cannot simply be a random collection of odd angles and shapes. It has to relate to humanity, expressing our experiences and ideas. In my mind, the Denver Art Museum does not live up to this criterion because it visually does not care, and subsequently, neither do I. One nod to Jill indicates that she is thinking the same thing. We turn and thankfully walk out the familiar revolving door.

Architect: Daniel Libeskind
Location: Denver, Colorado
Year of Completion: 2006
Function: Art museum



Image 37 - Looking up through the stairway atrium.

8" (W), 10" (H), 8" (Z)
STL format: hollowed out



STEEL

FLASHING

STEEL DECKING

AIRSPACE BETWEEN

LIMESTONE

CMU/MASONRY

FLASHING

OPEN WEB JOIST

LED LIGHTING

TOPPING SLAB

FLOATED
GLASS (MOVIES)

BULL SECT?

CONC

STEEL

VESTIBULE - 6'-0"

ROUND CORNERS

OPEN

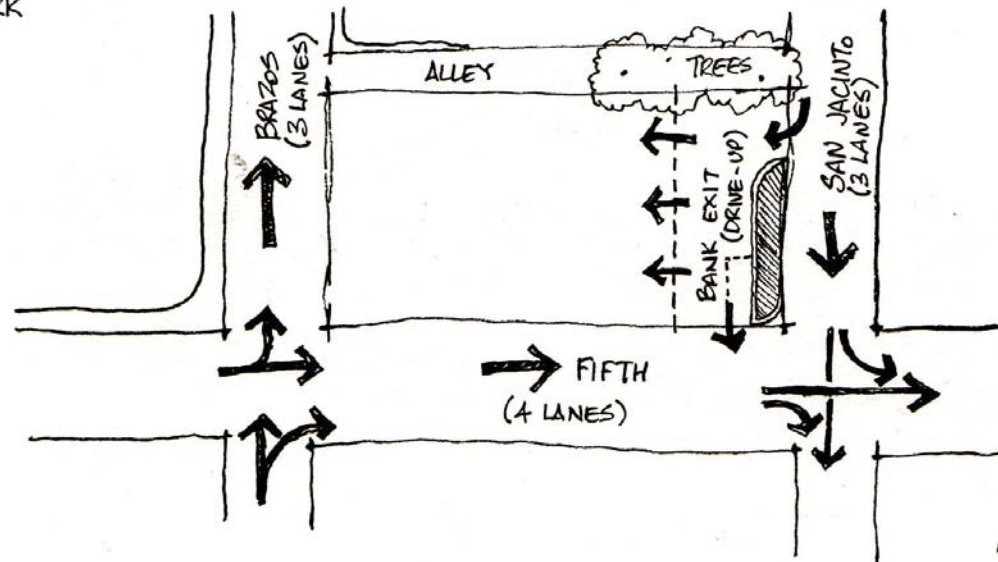
DESIGN PROCESS

STARK

SLIGHT

SLIGHT

STRANGENESS



(2/5/08) SPENT THE DAY SPACE ADJACENCIES AND STUDIES. PRINTED SUBJECT AND SITE. DETERMINED SQ AND SIZES. IF SITE IS 3 STORIES, PROBABLY MORE

(2/8/08) IF I HAVE SEVERAL STUDIES, BUT THEY ARE A MUSEUMS, MAYBE I SHOULD W "PRECEDENT EXPERIENCES" AN STUDY 3 MORE; 2 LIVE MUSK AND A THEATRE, OR SOME GO

SIXTH STREET IS A BLEND OF SKINNY, LONG, 1 OR 2 STORY BUILDINGS IN A ROW. MAYBE THE PLAN OF THE BUILDING SHOULD SOMEHOW FOLLOW SUIT. REFER TO GOETZ COLLECTION, MUNICH, JACQUES HERZOG 1992.

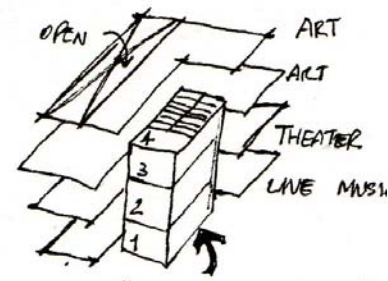
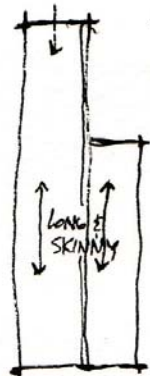
- 4 ART/DISPLAYS
- 3 THEATER
- 2 MUSIC VENUE
- 1 ENTRY/LOADING/RESTROOMS

* MUSIC VENUE NEEDS TO BE CLOSE TO THE GROUND, FOR PEOPLE TO EXIT.

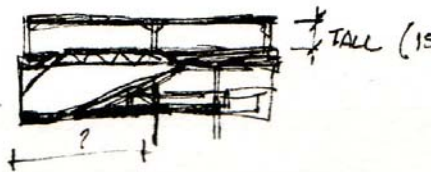
* ART CAN BE ON TOP.

* NOISE FROM THEATER AND MUSIC SEPARATED, AND SEP. FROM ART.

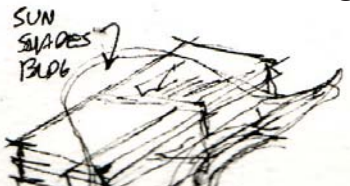
* "CENTRAL STAIR" THEME LIKE SFMOMA



"CENTRAL STAIRCASE"



Sketchbook images by the author



PART ONE: IDEAS, COLLECTION, AND TESTING

The following journal is a complete record of the design process that began at the beginning of the spring semester. I decided to write down almost every step, every thought, and every idea, in order to make sure nothing was omitted. Admittedly, it is sometimes hard to follow, but that is because the entire process was so new to me...and as a result, created an architectural form that was totally unexpected.

1/23/08

So it begins. It is time to start designing this building.

For the start of this process, I tried to determine the square footages for the theater and the art gallery. They both seem really huge from my previous program, so I read some books in Creative Arts Library about them. It seems that most theaters are about 10-15sf per person, with 300 people = 3000-4500 sf. The code says that, "the occupant load shall not be less than the number of seats based on one person for each 18 inches of seating length." So for each 1.5 feet of seating length, the occupant load is at least 1 per seat per person. So if there are 20 feet of seating length, the occupant load would be $20 / 1.5 = 13$. That makes sense. So if there are 13 seats, then there are 13 people.

I found lots of information on art galleries and performance spaces. I have determined that my building will be made up of three parts: an art gallery, a two live music lounge spaces, and a performance/film space. A parallel can be drawn from the three parts vs. the three components of love, mortality, and responsibility. But I don't think I can match them in a 1:1 comparison, so love = live music, mortality = art, and responsibility = film. That's too literal.

So the site will also be just the parking lot on the north side of the existing block, so I can demolish the two banks in that parking lot. I am still undecided about putting a parking garage in there, because I could use the space. But if the auditorium will fit in a smaller area, maybe I can build up a few stories, and have the parking garage either beside it or underneath it. I have to fix the program first.

1/24/08

Not much happened today, but I did check out some theater spaces from my books and determined that about 600 people would be good for the space I am looking at. That would give me about 8000 sf of space to work with.

1/25/08

First and foremost, I finished my programming. The building is now about 44,000 sf without a parking garage, which I might add later. The theater and the art gallery were great. I made a PDF and sent it to

the advisors. The second thing I realized was that my site analysis, although thorough, did not detail enough about the physical confines of the site itself, on a close-up level. It was still several blocks in size. So I decided that once and for all, the site needed to be in the half-block north of 5th street and Brazos. No more 1 ½ city blocks, it's down to 60,000 sf. Some other things I realized when I did this: first, the BofA drive-up teller machines are heading right into the parking lot I'm going to take over, so I better address that. Second, the site is slightly larger than the program, which means with a parking garage and landscaping, it's probably going to be at least 2 stories, maybe more. But that's OK, because it will fit into the cityscape better if it is a little taller. Third, I need to get a detailed site map, which I did, using Microsoft Virtual Earth. The images and quality are hundreds of times better than Google Earth. I inked in the site and scanned it, and am now ready to fix the final part of the book, the site analysis.

2/1/08

An interesting thing happened today. I met with my advisor about some troubles I was having in determining how to go about factoring love and the other components into a physical manifestation. It seems that I was thinking that I should interpret love, mortality, and responsibility as shapes or forms to try to generate from computational analysis. But she reminded me that this is about the design process, not the actual form itself. Love, mortality,

responsibility, and other human essences should be interpreted through actions and decisions regarding the design, not just trying to make literal interpretations about them. For example, if I determine that a certain material evokes a more beautiful look to a building, or that I want the light to be diffused on the south side of the building. That is a sense of love. If I want the roof to be green, or sustainable, that is a responsibility decision. I have to remember that I am interpreting these decisions through personal and computational methods, not literal shapes.

2/2/08

Today I took a bigger step towards initial ideas. I decided to interpret some part ideas from images of Austin itself. I loaded up Flickr.com, and searched for the "Austin" tag. There came up a multitude of images, at least 100 or more on one screen. Looking at the thumbnails, I started to extract meanings, impressions, and thoughts from them. One image showed a girl on roller skates with striped socks. Another of a girl on a bike, with a homeless cross-dressing man named Leslie. A third showed a stucco wall with an iron gate.

So I decided to start writing down the words that came to mind as I looked at these pictures. Just like tagged fields, some were larger; some were smaller, but none were in any order. I discovered that they all were adjectives, describing Austin and how it relates

to me.

The next step was to break out the watercolors, and to do some abstract images that I felt responded to the words of Austin. This step was similar to ARCH 457, except instead of using our own photos, I used words from other photos. This meant that I was making a connection with not only my impressions of Austin, but also of what others have thought. I was incorporating the impressions of more than just myself. This seems to hold some importance to me, although I cannot define what it is yet. Am I making a connection with a realm of people I don't even know?

Finally, I wrote some of the words from the first part directly onto the paintings of the second part. This seemed to reinforce those ideas into the abstract images. Sort of like reaffirming my ideas back to the images, in an indirect way.

2/5/08

Today I spent the day doing space adjacencies and more site analysis. I realized that my space adjacencies, regardless of the tedious boredom of filling in little boxes and squares, really do say a lot about the spaces and how they need to go together. Ed White's diagrams came in helpful again, and I realized something. If the museum needs to get

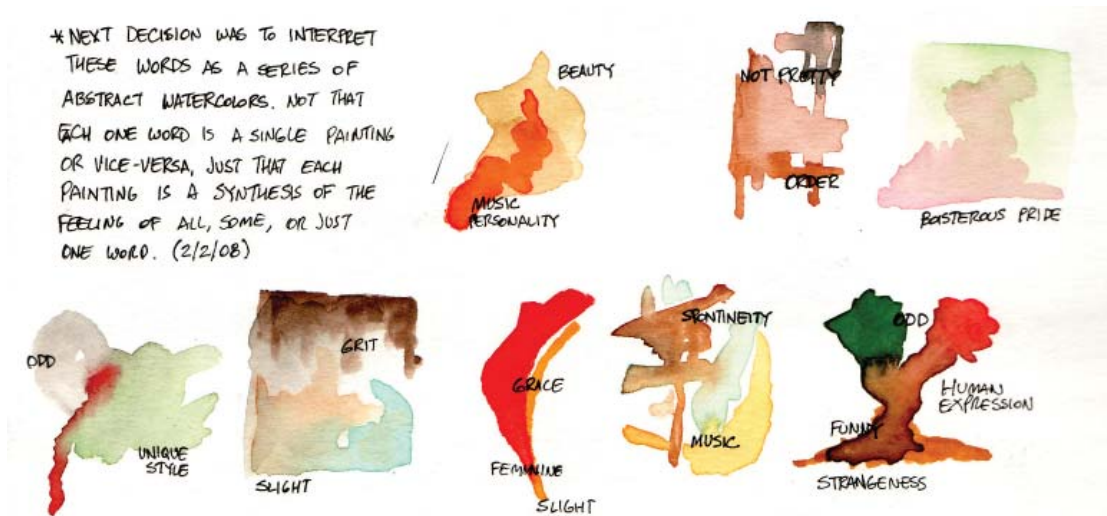


Image 38 - Initial watercolors with adjectives.

deliveries or other large shipments in, or the bar needs drinks, they have to come through a loading dock. Because of the orientation of the site, any trucks coming from I-35 will have to go down 6th (or 4th) into town, pass my site, turn onto Congress to get to 5th, come down 5th, turn left on Brazos, then right into the alley. This will be a screwy location for trucks. And I think the Bank of America next door dumps its drive-up teller lanes onto my site.

The site is 25,000 sf (125 ft x 200 ft). This means that my program will be at least 3 stories if I used the entire area. But I'm not going to use the entire area. So it will be four or five stories.

Before the day ended, I printed my Subjectivities Map in full color along with my downtown Austin aerial photo. Pinned them both up and for the first time realized what a maze of buildings this area is.

- How can a building maintain a cultural identity, let alone a physical presence, in such a dense environment?
- How do I make it feel like it "belongs" in Austin, or even Texas, without making it look "Texan"?
- Should I do material subjectivities? What I like and don't like about materials?

2/8/08

One of the things I was brooding is that I have several precedent studies, but they are all about

museums. Since art museum is just a part of my program, maybe I should label them "precedent experiences" for their intrinsic ideas and abstract thoughts, and then do three more studies: 2 live music venues and a theater, or some combination of that. Having this spread of studies can back up my decisions better with precedents that are successful.

Also I was thinking that Sixth Street is a mixture of skinny, long buildings that are all mashed together. The rest of the city is not necessarily like this, but maybe my building should mirror that idea.

More revelations from this day:

- The music venue needs to be close to the ground, for people to exit from.
- The art display can be on top, to access the natural light.
- Noise from the theater and live music areas need to be buffered for the art gallery.
- A central stair idea (similar to SFMOMA) can be implemented.
- Higher up means more exclusive, keep that in mind when designing.
- Can a sunshade work on the building for the really hot summer months?

I made more sketches and diagrams in my sketchbook.

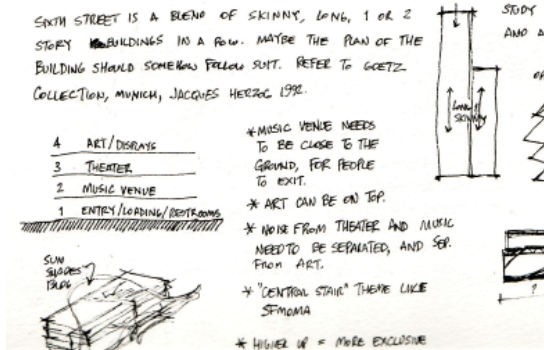


Image 39 - Additional sketches regarding program.

2/11/08 – Starbucks at Colfax & Krameria, Denver

Some initial things to follow up on:

- I need to research sustainability for Texas. This would help answer the sunshade question from above.
- The structural will be steel framing with bracing. No moment frames here. Can this be “fat pipes”? See sketchbook.

I put together a quick sketch of the building filling up the entire site. Stacking according to the ideas from Friday, 2/8. I realized that this can be interesting, but right now, in a square box, is rather boring. Still, it is harder to get a square box to look good than a crazy curve.

I suddenly realized that the Live Music venue should

be on the top, because open-air nightclubs are very popular in Austin and Texas. That takes care of ventilation, heating, etc. Buffer the noise through the floor (or put administrative below it) and the art and film is on the bottom floor, where more masses during the day will use them. Maybe the staircase should be outside, so that the nightclub patrons can exit without tearing up the other venues...

I also realized today that I haven't done much in the way of computational. If this is about infusing computational architecture with the human element, then I better start computing.

2/14/08

I worked on building models today. The models needed to be abstracted 3-dimensional shapes from the watercolors that I did several days ago. They were a good first step to getting these ideas into a solid form. But they are still designed elements by me, a human. I still need to get the computer rolling.

2/16/08

I did a quick Reactor tutorial of a box crashing into some other boxes. How do I get this to work properly, and even more interesting, what variables do I plug into it?

What if I broke it up this way:

1. Set up the boundaries of the site (similar to what Winchester did in 3rd year)
2. Break the visitors up into quarters: $\frac{1}{4}$ are for the film, $\frac{1}{4}$ for the art, $\frac{1}{4}$ for the live music, and the rest are just there to observe and check things out ($\frac{1}{4}$ are "floaters").
3. Intersperse throughout the site. (*what if I put them on the sidewalks?)
4. Launch sim to see where they end up.

I needed to extrapolate a shape from the Subjectivities Map. A blob that is attracted to, and recedes, from the subjectivities. Can this be a simulation or Reactor object? (This is acted upon later)

2/17/08

I began RhinoScripting today. At first it was rather confusing. The scripting manual that I was reading was more of a primer for beginning programming, and not geared towards different ways of expressing geometry. It was tough to thoroughly get a hold of, and I had to read and re-read it several times. But I did start to get some things mastered. My first output was a group of points, and using each point to be the center of a sphere. It explained the function calls well. My next script was to trace a series of points along a curve. These two examples helped understand the nature of scripting, but they did little more than cloud my mental picture

of how I would tackle this idea of "computational architecture". I read some information on <http://www.reconstructivism.net>, which is a Danish guy who deals a lot with Rhino Scripting. But what are the parameters of his scripts? How do you associate a numeric value with architectural elements? And at what point does "computational" relinquish control from human design?

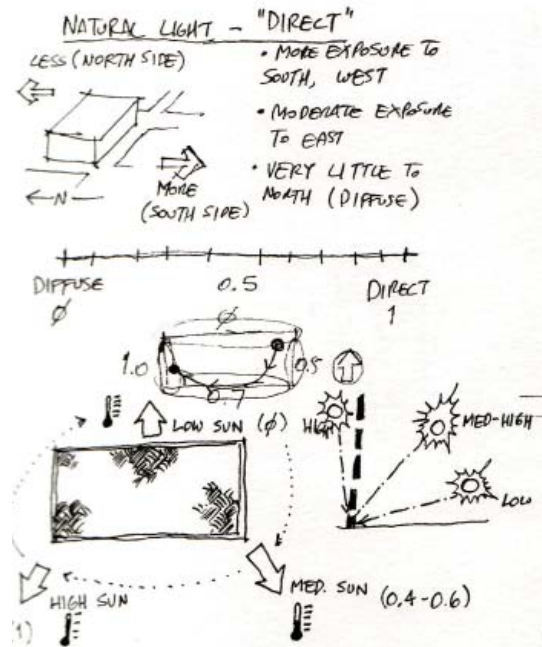


Image 40 - Assign a numeric value to architectural elements?

This boils down to another question that I have had for a long time. If emergence and complex systems can help “grow” architecture, how does the designer start the process? Take, for example, the big bang theory. Once micro particle of condensed matter suddenly expanded in an instant to fill the entire universe, and is still growing. But it took billions of years to get to this point. In other words, if any condition of that expansion was different than it was, we would probably not be here. All the sequences were “correct” for this existence. So how, as a designer, do I determine what the correct conditions are for my building? I cannot, because I do not have the luxury of time. I cannot sit and test emergent patterns without having some effect on the initial conditions. To put it simply, *I do not have time to tweak the seed in order to grow the tree I want. I must shape the tree itself.*



Image 41 - Downtown Austin, on San Jacinto Blvd.

2/19/08

I had my first thesis meeting today with my advisors. I felt like I was stuck, and needed some direction as to whether what I was doing was the right track. They had a bunch of suggestions, and ideas for further development. But the major overlaying theme was that it seemed like I was “jabbing at things in the dark,” as if I was just trying random ideas to generate interesting forms. I need to take a step back and understand the context of everything that I had come up with. I need to realize that my goal is to design a building that is my thesis. This is a design process that explores computational architecture and the human elements of love, mortality, and responsibility. And that every step should be moving closer to that goal. I need to do an experiment, evaluate the results, evaluate what those results mean to me, and then move on to the next experiment.

First, I have to accept that I am designing. I have reasons for doing things. So I don’t have to question every single decision, just understand why that decision was made and defend it.

Second, I have to remain computational. The hand models and abstract watercolors are good if they mean something towards my thesis, but they were just stabs in the dark; old design processes that were not part of my thesis statement. I should be setting up computational experiments in 3ds Max that use things like actual site dimensions, space

warps, and other influential components. For example, use a wind Reactor to determine how a shape will be affected by the wind. Or particles to shape the “flow” of an object. If I filled a box that represented my site with boxes, and then deformed the box, how do those boxes deform? What does the deformation represent? What does the result mean? And after that, what is the next step? I need to have reasons for deciding the shape, and those reasons can be direction and strength. If a putrid alley has a direction and strength, then it can begin to shape how the building responds to it.

Finally, utilize the subjectivities more specifically. How does this massive blob shape deform (to scale) based on external subjectivities? Then, how does it deform based on internal ones? Can the theater, artwork, and music all be incorporated together? No need to try to separate them into different levels. The question was posed, “why would people want to come to my building versus anything else in Austin?” The reason is because it is unique, exciting, and engaging. So I need to stop thinking about this methodically and start thinking of it as a blend of the three components together. And by blending them together, I can start to address the overall point of the thesis: to blend the computational and the love, mortality, and responsibility. I will use values for natural light, texture, smell, audible, in a space, and decide how they work together.

Another idea from my advisors is to use material to

decide how to deform the building. For example, maybe the building is not a blob on its own, but the blob-diagram shows what areas need to be different materials, such as masonry block on the interstate side, wood and glass on the pedestrian side, and so forth.

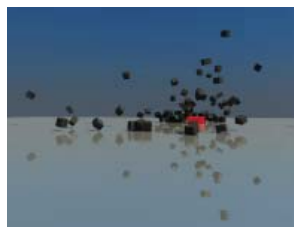
2/25/08

The past days have seen lots of progress. I want the building shape to react to the subjectivities, not be directly moved by me. I want this to be as much of an emergent system as possible without actually programming a series of rules. So I decided to begin testing the capabilities of the Reactor software from 3ds Max. Although not truly an emergent system, it can generate reactions and unpredictable results from a series of “rules”, such as mass, friction, and damping strength.

INITIAL REACTOR TESTS

Test 01 – Crashing Blocks

Hypothesis: Simple, to see how Reactor worked.

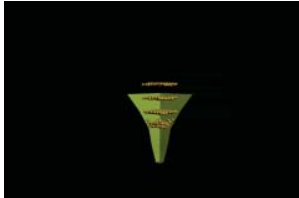


Experiment: This was a simple Reactor tutorial to see how the dynamics engine worked. I used a tutorial online to watch one block,

which was unyielding, crash into other blocks.

Conclusion: Reactor seems to work nicely with solid objects. But instead of something crashing into blocks, can the blocks form a shape?

Test 02 – Spheres in a Container



Hypothesis: Spheres placed in a container can be re-shuffled and re-organized when the edges move in or out.

Experiment: Generate 100 spheres; let them fall into a box. Then move one of the edges of the box inwards, and the spheres will re-shuffle around. Animate the edge sub-object to cause the insides to shrink.

Results: Reactor will not allow sub-objects (such as edges) to be animated. Therefore, nothing happened.

Conclusion: Animating the shape of an object will not allow re-adjustment of spheres. Test failed. So the next step is to cause outside forces to deform the edges of the contained objects.

Test 03 – Cloth Simulation

Hypothesis: A cloth object will change its shape,

allowing outside forces to shape it.

Experiment: A simple cloth tutorial with no gravity to see if the cloth will react to outside forces.



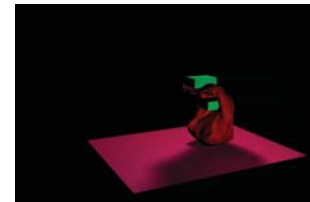
Results: First, the cloth normals have to be facing the normals of the reactive object to work. Otherwise the reactive object passes right through the cloth. Second, the deformation worked nicely, but still looked very cloth-like.

Conclusion: The cloth material may work properly, but it would be very loose and might have to be re-interpreted. More work on this before more conclusions can be made.

Test 04 – Cloth Simulation 2

Hypothesis: None. This project is testing two objects colliding with a cloth object that has zero gravity.

Experiment: Two boxes that are unyielding shear in opposite directions a box that is made of cloth.



Results: The deformation worked great again. The cloth sheared properly, although the triangulation was a little rough.

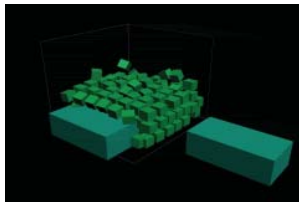
Conclusion: Again, an internal cloth deformation will need to be experimented upon.

Test 05 – Smashing Boxes

Hypothesis: Two boxes that push into another box, filled with cubes, will cause the cubes to deform internally.

Experiment: A box filled with cubes is placed in a scene. Two other boxes move in at 90 degree angles and compress the cubes.

Results: When the boxes moved into the larger cube-filled box, the cubes were not displaced

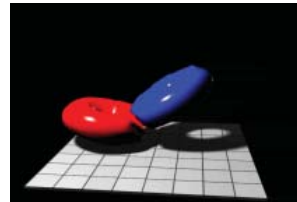


violently, but instead shuffled around. Some were pressed through the walls of the larger box and fell off into space.

Conclusion: The flatness of all the sides probably caused Reactor to calculate improperly. For further testing, spheres should be used to minimize this direct action-reaction.

Test 06 – Soft Body Dynamics

Hypothesis: None, simply a tutorial in soft body systems instead of cloth.



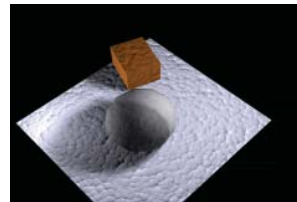
Experiment: Drop two soft-body tori onto a surface.

Results: The objects bounced into each other, and one remained on the plane while the other fell off.

Conclusion: Soft body dynamics are promising.

Test 07 – Soft Body Dynamics with Fixed Vertices

Hypothesis: That a soft-body object will remain fixed in place using the “Fix Vertices” command.



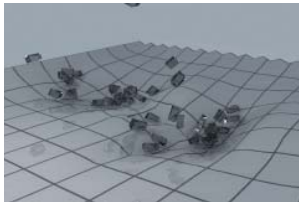
Experiment: A sphere, as a soft body object, with a rectangular block falling on it. The base of the sphere is fixed into place, like the stem of a balloon taped to a desk.

Results: The block fell onto the sphere, deformed it momentarily, and then fell off to the side.

Immediately, the deformed sphere returned to its original shape.

Conclusion: This experiment is the most promising of the Reactor tests. It shows that an object can be deformed by outside forces. If the subjectivities (rigid geometry) are pushed into the site (soft body geometry), the resultant shape is a direct interpretation of a shape.

Test 08– Multiple Soft Body Dynamics



Hypothesis: That soft body objects can deform other soft body objects.

Experiment: A pyramid of soft

body cubes on top of a soft body plane, similar to a trampoline.

Results: There was an error in the geometry somewhere, as the pyramid simply exploded and the blocks fell into the soft body plane.

Conclusion: The limitations of Reactor are apparent here, and I am going to try another physics engine. I have several ideas that I will explore with particle systems and crowd simulation. If I were to continue on this path, I would have large sphere that deform a soft body "site".

Test 09 – Crowd Simulation 1

Hypothesis: Crowd objects will seek out a goal.

Experiment: 10 "delegates" scattered randomly will avoid certain objects and seek out others.

Results: The delegates sought out the box, then continued past it, only to turn and seek it out again.

Conclusion: My initial thoughts are that crowd simulation might be more applicable to objects seeking out spaces

within a space, not to determine it. But maybe adding several targets will help determine a solution.



Test 10 – Crowd Simulation 2

Hypothesis: Crowd objects will break into groups to seek out multiple goals.

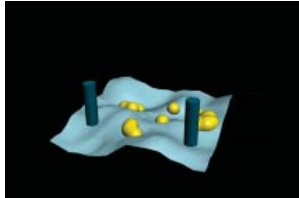


Experiment: Same as above, but with multiple goals.

Results: The delegates did seek out the multiple goals, but then moved into an orbital pattern, like planes at an airport.

Conclusion: Further reinforcement of the Crowd Simulation 1 conclusion.

Test 11 – Crowd Simulation 3



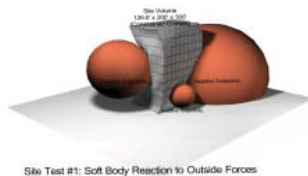
This experiment was simply an experiment of the blob mesh object attached to wandering crowds. There was no further experimentation with crowds after this.

Test 12 – Soft Body External Reaction

Hypothesis: Large spheres can “crush” a soft body object, similar to subjectivities that cause a mesh to deform.

Experiment: Move three large spheres of varying sizes into the “site”, which is a soft body object.

Results: The spheres caused the soft body to deform nicely.



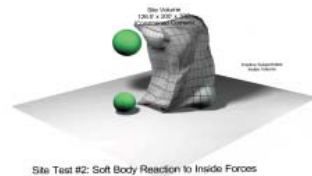
Next experiment will try external deformation.

Test 13 – Soft Body Internal Reaction

Hypothesis: Smaller spheres (to avoid interpenetration) moving away from the center of a soft body object will cause it to deform, bulging outwards.

Experiment: Four smaller spheres move away from center mass of a soft body object.

Results: Happily, the “skin” of the soft body stretches and pulls, until it is at maximum tension, at which point it snaps back into place.



Conclusion: Internal and external sphere reactions can cause a soft body to deform, only to the point before it loses equilibrium and snaps back into place. Perhaps the point just before it deforms in the optimal shape?

* * *

After this process was complete, I met with my advisors again to discuss the results. It was an exciting review as most of the comments were positive. Some of the next steps are to scale the building height to the correct size, move the subjectivities so that they “roll” into place, and start working on physical models. I think the physical models will have to wait until later.

02/28/08

I worked on a few more experiments today. The first was a test of how a direct interpretation of the subjectivities as control points on a b-spline could shape the plan. Since I could not get the subjectivities to respond as large spheres in 3ds Max (they wouldn't "scale" properly), I tried a new avenue with Rhino. I mapped the subjectivities map into the top viewport, centered the site on the origin (0,0,0) point, and then drew lines from each subjectivity to the zero point. This made a large star-like pattern in the center.

The next step was to draw a curve that interpolated its points through the ends of the lines. However, this large flower-looking shape was winding its way through the city. So I then scaled it down so it just sat within the confines of the site.

I did a quick rendering and animation in 3ds Max, then returned to Rhino. Again I drew another curve, but this one was through the outside points instead of interpolating them. Realizing that this was very similar to the other curve, I knew I had to come up with something different.

Looking at the site in Rhino, I thought for a long time. I had some ideas.

- The building cannot extend beyond the site at ground level. Therefore, positive subjectivities cannot extend beyond the site lines, so no

pushing with positives.

- Negative subjectivities, however, can be pulled in away from the site boundaries. So at ground level, the building shape can dent inward.
- How much should each dent occur? If a subjectivity is strong (such as the noise of the interstate), then it would dent in quite a bit. But if it was weak (such as the lofts across the street), there would be a slight dent. Since everything above a 5 was positive, those points would be pushed to the edge of the site.
- The physical distance of each dent was determined by the smallest distance from the center to the edge of the site, which was in the middle, 100 ft from the corner along the 200 ft side. At this point, the center is $\frac{1}{2}$ of 126.5 ft from the edge, or 63.25 ft. Rounding to 60 ft and not wanting to dent in too far, 4 @ 10 ft

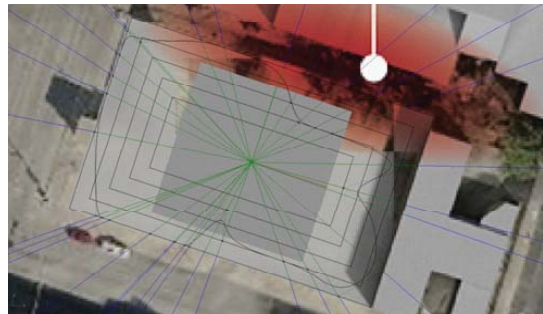


Image 42 - Initial movement of spline shape handles.

increments were offset from the outside edge of the boundary. If a subjectivity was strongly negative (1), its control vertex would sit on the innermost 10 ft offset. If it was weak (4), it would sit on the first 10 ft offset. A neutral one (5) would not move from the outside perimeter and anything above 5 cannot extend from the site anyway.

This established a set of rules for the base of the building. This is only a form generation set of rules. At higher elevations, the building could extend over the site (like the Denver art museum). So those ideas would be:

1. Negative subjectivities would have to be classified by elevation. For example, interstate noise would be present at all elevations, so at the top of the structure, it would still dent in by the greatest factor. But a putrid alleyway would recede over elevation, because the inhabitants are no longer confronted by it.
2. Positive subjectivities can now extend over the building. So offsetting by the same increments will allow certain portions to extend over sidewalks and roads. (Need to check to make sure this is OK.)
3. The resulting shape will be a loft extrusion from the base to the top. Top will be established at 75 ft.

So to continue on from the Rhino interpretation above, I think I can safely show that resulting shape from the subjectivities extruded over the sidewalks.

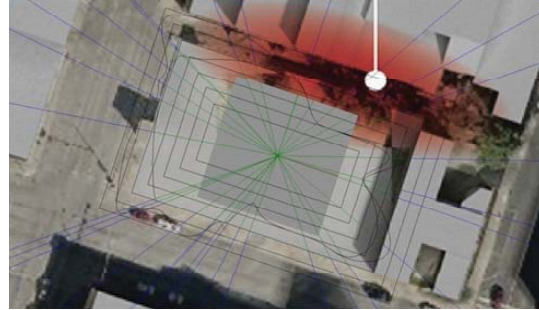


Image 43 - Shape handles over sidewalks.

I then moved the extruded shape up by 75 feet (the estimated height of the site), lofted the two curves, and got this shape:

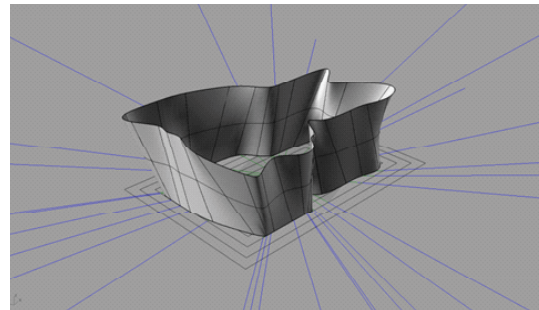


Image 44 - Lofted curves.

I felt that this was a successful first step. It actually worked! This first method can be summarized into

the following process:

1. Visit site and document subjectivities. Rate heightened experiences by assigning a numeric value (I used 0-9).
2. Generate a subjectivities map, noting the approximate location and intensity of the experience.
3. Draw lines from the subjectivities back to the center of the site.
4. Using the site boundaries as an outside edge, shrink the negative subjectivities in from the boundaries by a factor that relates to the subjectivities' intensity (i.e. a very strong negative would move the control point back a large amount, while a slight negative will only shrink back a small amount).
5. Moving up to the top of the site boundaries (I used square footage / site square footage * 15 ft per floor), expand the positive subjectivities out from the site over the sidewalks by a similar scale factor.
6. Loft the two curves to generate the shape.

This is a great first step, but there is more to be done. For example, what about the program? How is that interpreted?

I had a slight deviation after this process. The idea was to divide the site volume into regions using a

series of sliding parameters to determine location and quality of spaces. I wanted to use SketchUp to subdivide a block of the site, and then used the subdivided block to show program areas.

The method to go about this was to categorize all the spaces in this building. For the most part, all the space qualities could be assigned values from 0 to 1. These qualities were amount of light, unification, public access control, and proximity to the ground. Each space, when compared to these qualities, got rated.

I wanted to see if there was a way to determine programmatically where these spaces should be on the site. I decided to assign them values, based on common parameters, for where they should sit. These parameters were:

- Proximity to Ground
- Interwovenness
- Light Attraction
- Access to Public

These parameters should range from Unimportant (0) to Essential (1). Proximity to Ground, using this scale would range from 0 (Close to Ground) to 1 (Far From Ground). Interwovenness would range from Scattered to One Whole Area. Light Availability, 0 (Dark/Away from Light) to 1 (All Light). Access to Public from 0 (Controlled) to 1 (Open to Public).

Space	Parameters			
	Proximity to Ground	Interwovenness	Light Attraction	Access to Public
Art Gallery	0.5	0.8	0.8	0.3
Live Music Lounge	1	0.3	1	1
Independent Film Theater	0.5	0	0	0.5
Parking Structure	0	0	0.5	0.5

I knew that the art spaces wanted natural light but not direct light. They would have limited access but could be interwoven. Parking needed to be close

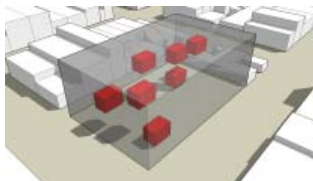
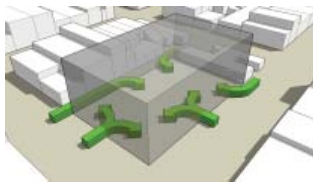
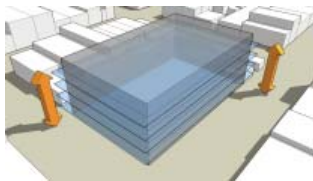


Image 45 - Parameters of spaces.

to the ground, doesn't care about natural light, and open access to the public. The theater would not want light at all, have limited access, and not be interwoven at all. Finally, the live music venue must be on the very top (all natural light), open access to the public, and can be interwoven between spaces.

Programming the

first part, verticality or Proximity to Ground, was easy. If the site height was 300 ft. tall, then the range from top to bottom was 0 to 300. If it had to have natural light (1), then it would be at the 300 ft. mark. If it did not want light, it would be at the zero (0) mark. If it was undecided (say 0.75), then the formula could be $300 \text{ ft.} \times 0.75 = 225 \text{ ft.}$

As I progressed on this idea, it didn't seem right, particularly since I was (a) setting the heights myself by assigning them a number, and (b) not allowing anything to react (the computational side?). I finally decided to abandon this idea, but still keep the values for solar proximity and ground proximity for a later test.

03/02/08

I had a great meeting with my primary advisor this afternoon. We discussed where I was in regards to the project, and she looked at the things I had done in regards to Rhino. Not bad, but there should be more to it, she said, and I agree. So when I got back I decided to write down what was meant by the love,

mortality, and responsibility of this computational design process. What exactly do these terms mean? After brainstorming with her and thinking about it later, I decided upon the following:

LOVE: This is the responses to the subjectivities of the area. If computational architecture is simply applying a set of rules and allowing a form to emerge, it cannot be considered love, as it does not take into consideration the human element, or the qualities of being human. Computational architecture that does not interpret the intangible human experience is not love. Love is allowing our emotions, fears, and desires to have an effect on the final form. When I see a putrid alley or a street with trees, I respond accordingly. As I interpret those responses as computational methods, I begin to infuse an art, a human "art" into the science and mathematics of three-dimensional design.

RESPONSIBILITY: Responsibility in this design will be two things. First, the appropriate material selection and sustainable strategies that have to be part of "environmental design" must be upheld. LEED certification (or just following LEED guidelines) must be implemented in the core of the design. Making sure the building does not suck energy, allows its inhabitants to be happy, and conserve the environment are all part of environmental responsibility. But there is also a programmatic responsibility. If the program becomes shifted through the manipulations above, such that

adjacencies and code is no longer correct, I have a responsibility to correct it. I must adhere to my role as designer, not observer, of this process. I cannot accept that if the computer made it, it must be so... then I am no longer a designer. So I allow the computer its ramblings and computations, but then "fix" any problems that aren't quite right.

MORTALITY: This is any part of the building that has to do with the passage of time. Materials are an obvious first choice, because they (after people) are most affected by time. Mortality must be expressed in materials that are unique to not only this place, but this time period. I cannot sheathe my building in titanium panels because they do not belong to this place. But I can sheathe my building in limestone panels, wood louvers, or sandstone cladding that has been treated to erode over time. By allowing the materials to not only age, but define this time period, I am showing that humans as well designed this structure during a time period, and the passage of time can be marked, and then subsequently remembered.

PART TWO: SHAPE GENERATION

Armed with the knowledge of what it was I wanted to achieve, I set out to figure out the shape of this building. It seemed that the tests in Rhino 3D created the shape I wanted, but I needed to refine the method a little further.

Test 14 – Spheres Moving In & Out

I started with the subjectivities again, drawing lines from the locations to the center of the site. Knowing that the limitations of the software prevent



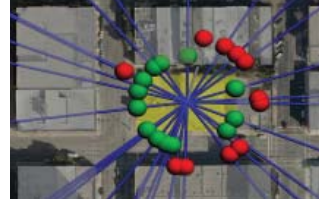
me from doing anything but moving objects, I made red and green spheres again, placing them at either the start of the lines (green) or the end of the lines (red). Red, or negative, spheres will move into the site over the period of the animation. Green, or positive, spheres will move out from the site to their locations. The logic is that red spheres push into the surface, deforming it in, while green spheres push out from the site, stretching it out.

The problem with this experiment is that when the spheres reach the site, some are moving rapidly while others are hardly moving at all. This means that a subjectivity that is strong may not have any affect if it is moving slowly, while a fast moving, but weak,

subjectivity may have a dramatic effect.

Test 15 – Spheres in a Circle Moving In & Out

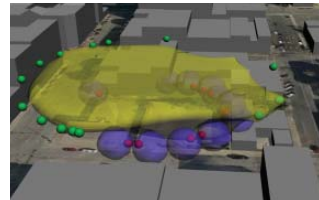
I had to make sure no sphere had a different velocity than any others. I drew a circle around the site and placed the red spheres at the points where their subjectivity lines intersected the circle. I then set up the animation so that the greens would move outward only to the circle, while the reds would move inward. All should be moving at the same velocity.



This one animated great, so the next step was to get some interaction.

Test 16 – Spheres with Soft Body Deformations

In this test, the site is now a cloth deformable object. This will prevent it from sliding back into place after it is deformed. But I did attach soft body spheres to the red spheres, so that they are dented into the form but still wiggle and move. I also moved the greens to the top of the form, because the form can be stretched out over the site, but the



bottom cannot. This also prevented the greens from ripping the soft body spheres away from the reds. Finally, the greens are mostly positive views and experiences, so these would be more prevalent at a higher elevation than at ground level.

This also worked great, and deformed the cloth substantially. A few problems: The greens "punctured" the cloth skin quickly and all the spheres are the same radius, which means they are all equal. The next test will fix that.

Test 17 – Weighted Spheres with Soft Body Deformations

This final test boosted the radius of each sphere by a number that was related to its subjectivity strength. For the reds (negatives), I disregarded 5 (because it represented neutral) and used 5 – (1 through 4) multiplied by 5 ft. A subjectivity rating (S_{red}) of 5 yielded a sphere radius (R_{red}) of 20 feet. I used 5 ft as a baseline because most people (children included) average about 5 feet tall. In hindsight, using a human scale was not exactly right in the equation, but it was a good number that actually meant something.

$$R_{red} = 5 \times (S_{red} - 1)$$

For the greens (positives) I again disregarded 5 and used (6 – 9) – 4 multiplied by 5 feet. This inherently made the greens a little bigger, which was fine. A subjectivity rating (S_{green}) of 6 had a radius (R_{green}) of

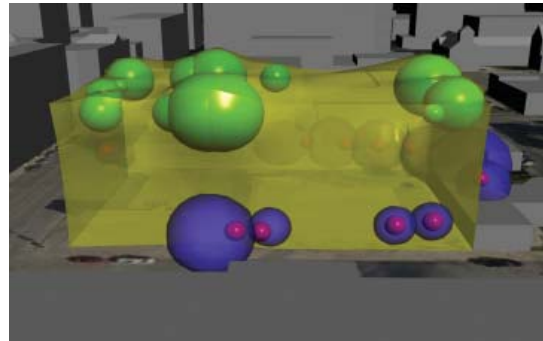
10 ft, while a 9 had a radius of 25 feet.

$$R_{green} = 5 \times (S_{green} - 4)$$

This gave me subjectivities that were large for lower numbers (strong negatives), grew smaller towards the middle (neutral – no effect), and then grew larger for higher numbers (strong positives).

The unexpected thing was that the red spheres dragged their soft body components along with them, allowing for more interesting deformation than just a solid sphere. The greens, on the other hand, were more solid spheres to prevent them from punching through.

This had a great result. The final shape was tapered from top to bottom, with unpredictable dents and divots. I don't think this is the final shape (cue responsibility here) but it is a place to start designing.



03/04/08

I spent some time getting walls and blob spaces into my building. The new shape that I derived still seems like it's missing something, but I'm not sure what. I do know for a fact that it is not the final form (like I mentioned above) but it is a start. The question is will that start be approved by my thesis meeting Thursday morning?

I think I have the ground floor worked out, because it works itself out. On the north side is the loading dock into the alley, because it's the only place to get semis into. The west side is the main entrance, and the south side is green space with an additional entrance. So I've got that covered.

03/07/08 – 04/05/08

I took a little bit of a break from journaling, which means I should recap the next stages of the design process, since I missed about a month. So the next stage was to work on the programming of spaces. Since I had a quantitative program as well as a space adjacency diagram, I decided to start there and see what I could come up with.

I remember initially trying several different software products in the attempt to get random, but controlled results. My first look was at Generative Components by Bentley Systems. Or I should say, wanted to try it. Unfortunately, after 3 e-mails and digging around in their incredible unhelpful web site, I found nothing.

This sucks because I actually went to the two-day class and even told them I wanted to use it for my thesis. But Dr. Aish and Henry Farnier choose not to answer e-mails anymore. Oh well.

The next thing I thought of was Dassault Systemes' Catia. I had that available, and I knew how to program simple relationships with formulas, but that was about it. It was a cause-effect type of relationship with the formulas...you entered what you wanted to change to value to and it responded with the result. Besides, Catia, in its simplest (and most understandable) form, is for solids modeling, like machining parts and assemblies. Sure, it can do more complex stuff, but the fact that very few architecture firms are using it for that says that it's not quite geared towards the workflow of architecture, more for engineering and mechanics. Anyway, to keep from having to spend the entire semester fine-tuning Catia (this is a thesis, not an elective), I decided not to pursue it.

Next on the list was Rhinoceros 3D. I knew that Rhino could do RhinoScripting, which was an integration of Visual Basic (VB) commands into the Rhino shell. But this would also involve a steep learning curve. I am admit that I am a very basic level programmer, and can understand functions and subroutines, testing conditions such as FOR/NEXT, IF/THEN, and so on, but beyond that it is tough stuff. Besides, programming would defeat the fundamental purpose of computational and

emergent design, because I would have to code in specific functions. I wanted to define rules that a system would react to, not a series of controlled loops.

But I did give RhinoScripting the benefit of the doubt, read a tutorial or two, and tried to do some sample codes. I was able to draw a star-shaped object with points on it. Big deal. (See Page 5 for more on my RhinoScripting adventures). Since I wasn't about to get anything positive anytime soon, I decided to push for something more easy to work with.

This led to 3ds Max and Reactor. Now granted, I would not have picked Reactor as my first choice, but it was attractive to let reactions based on natural physics happen. Plus, the gravity could be set to zero to prevent things from "falling". So I plugged away with it.




		
Dassault Systems CATIA	McNeel & Associates Rhino3D	Autodesk 3dsMax
Solids-based modeling system Used primarily for industrial design and modeling Parametric engine allows for formula-based relationships Difficult learning curve Precision-oriented	NURBS & Mesh-based modeling system Best choice for non-uniform curves and free form surfaces RhinoScripting language allows for interactive programming Requires knowledge of VisualBasic programming	Broadcast-quality animation and design system Extensive animation and modeling capabilities Reactor physics engine allows for real-world interaction systems Very little programming knowledge required

Image 46 - Software comparisons.

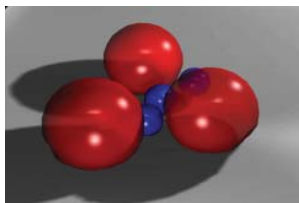
PART THREE: SPACE ADJACENCY DETERMINATION



Image 47 - Spheres mashed together.

The next step was to figure out how to “emerge” the program spaces. Since I had a shape to work with, I wanted to extend the idea of complex systems and computational architecture to generating the program. This meant that I had to figure out a way for the areas within the building to determine themselves, without me cramming them in and around the blob shape generated earlier.

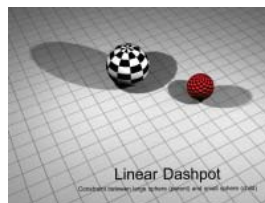
Test 01: Soft-body Spheres in a Bowl



The first thing I tried was a suggestion by my advisor about “spheres in a bowl”. He suggested applying gravity to soft-body spheres and seeing how they lined up in a curved bowl-shaped surface, because the gravity would naturally pull them together. Heavier spheres would move towards the center, while lighter spheres would be shuffled out towards the periphery. The result was

fun to watch and had potential, as the soft-body blobs rolled around and eventually came to rest at the center of the bowl. But it seemed like gravity was the problem—there was no three-dimensionality. The soft-body spheres were aligned to the curved plane, and could not move above or below each other. So the next step was to get the spheres to react to each other in three dimensions, not just two.

Test 02: Linear Dashpots



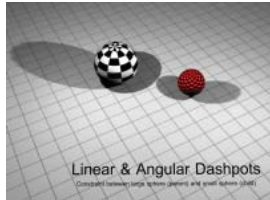
I was stuck on this for a few days. I could easily key frame the movement of a soft-body sphere in the Z axis, but that would defeat the idea of

emergence and reactive forces. I was still stuck until an intense conversation with Sean Winchester about a device called a “dashpot” in Reactor. I decided to experiment with it to see how it worked. After doing some reading in help files and online, I found out that a dashpot is, specifically, “approximated mechanically by a plunger in a cylinder of air or liquid, analogous to a shock absorber for a car.” (Smith) Simply put, it tries to maintain a fixed relationship between two objects and always attempts to move them back together to equilibrium. I ran a test to see how this would work. The results were impressive. Two spheres with a linear dashpot applied caused the second sphere to stay close to the first sphere

as it moved along, and friction caused it to twist slightly as it moved.

Test 03: Angular Dashpots and Test 04: Both Dashpots

Sean had mentioned another dashpot, called an angular dashpot, which he used in the third year project. I ran a similar test to see how this relationship worked. The smaller sphere did not move, but it rotated on its own axis to match the rotation of the larger sphere. This also seemed



This also seemed promising, but since I was using spheres, I could not see how rotation would help things out. (Why did I use spheres? Boxes seemed to have

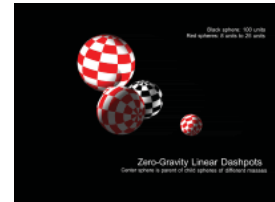
problems later on, because in 3D space they would snag on corners and edges instead of flowing freely around. This, as Steve noted, could have been interesting, but it seemed counter-productive to what I thought I wanted to accomplish.) A third test confirmed that when used together, a secondary object could match both position and angle of a primary.

Test 05: Eliminating Gravity

I next tried to remove the gravity factor of the simulation, because it seemed that the plane that

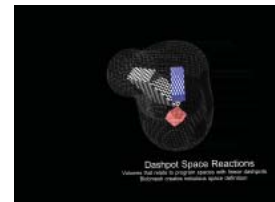
these spheres were resting on was causing frictional drag on the spheres and was preventing them from moving in three dimensions. So I set up a zero-gravity dashpot relationship and learned something else. If the initial position of the dashpots is changed at the start of the simulation, they will immediately move back to their "neutral position" as set in the parameters (strength).

This was apparent as all four spheres started clustering around a central sphere. This was very promising, as I started to envision programmatic spaces clustering around each other. But I had to refine the dashpot system and try to understand it better.

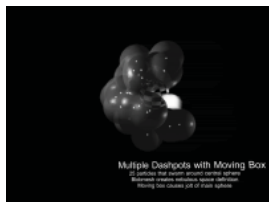


Test 06: Boxes vs. Spheres

The next test was with boxes, as I mentioned. It is easy to see the edges getting caught on each other. But I did define a blob mesh space around the boxes, and to my surprise, as the host objects orbited around each other, the blob mesh updated in real time. This was interesting...could the blob mesh be used to define the skin of the building?



Test 07: Dashpot Swarms



Next I tested a swarm of dashpot-linked boxes around a central sphere. As the simulation starts, the tiny boxes swarm around a checkered sphere, and a blob

moves with them. This seemed a little stagnant, so I added another box that flies past, bashing into the central sphere with a jolt. This causes an immediate reaction in the boxes, which then re-swarm around the sphere in new positions. After this I thought, first, that the blob mesh needed to go away...it wasn't doing anything for me. The second thing was that I needed to get a bunch of spheres linked by dashpots to move around, next to each other, into a determined position. But what was that relationship?

After a good night's sleep, I suddenly realized what that relationship was: it was the space adjacency. This space adjacency was, for all practical purposes, a series of spheres linked with linear dashpots. If one sphere moved away, the others would follow in a loose, but unpredictable, arrangement. I had to try it.

The first step was to figure out what each sphere was going to look like. No use just using simple blocks or dots, because the relationship of each sphere was dependent upon its size. So I decided

to use the volume of the space for the size. Each program space was roughly calculated by square footage from my quantitative program. Not knowing the exact shape, I set my floor-to-floor heights at 15ft, so the volume (V_{space}) would be the square footage (sf_{space}) * 15ft.

$$V_{space} = sf_{space} \times 15$$

The resultant number would then have to be turned into a sphere volume, so I used the formula

$$V_{space} = 4/3 \pi r^3$$

I needed the radius (r), so after some reverse solving, my resultant formula was

$$r = \sqrt[3]{(3 \times V_{space}) / 4\pi}$$

In Microsoft Excel, which was where I was determining the radius, this equation came out to be

$$=POWER((A1*3)/(PI()*4),1/3)$$

What this meant was that a box with a volume of 90,000 cubic feet would equal a sphere with a radius of 27.8 feet. I needed this radius value because in 3ds Max, a sphere size is defined by its radius, so if I was going to have spheres that were of the correct relationship to each other, I would have to set their radii to the correct sizes. I needed to get all of these spaces into 3ds Max, so for initial positions I decided upon a layout similar to my space adjacency

diagram, with some adjustments for some spaces that were not initially planned out.

The next step was the dashpot connections. How

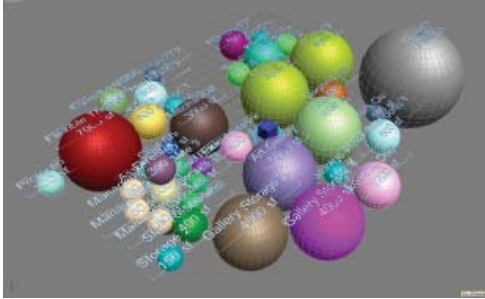


Image 48 - Setting up the spheres.

these played together was a little trickier. I had to make some decisions regarding how they interacted with each other, because a dashpot has a Parent-Child relationship, where the child will follow the parent—even if the child is moved, the parent will grudgingly follow until the dashpot is in equilibrium.

So who was the parent and who was the child? The parent, I decided, would be the larger space in each of the three main areas: film, art, and music. For film, the parent would be the theater space. For art, the parent would be the gallery space, and for music, it would be the two lounge spaces, which would be linked together with a dashpot themselves. Each child space would be linked to these larger parent spaces with a dashpot as well. And the larger spaces would be linked to a central null object called

the System Anchor, which was a placeholder with very little mass and only used to keep everything together.

The strength of each dashpot was different as well. I used strength values of 1, 2, 3, 5, 10, 20, and 50 (higher numbers = stronger pull). Numbers with 1, 2 or 3 strength were less likely to snap hard back into place, and instead just float towards each other at leisure. Numbers of 5, 10, and 20 were more rigid, keeping things aligned tightly to each other. Strength of 50 was so strong that it was used for the larger program areas linked to the System Anchor, so that even massive spaces such as the parking area were moved along with the system.

The final factor was the mass of each sphere. Because numbers like the volume were too large for the Reactor engine and the radii were too small, I decided to use the square footage values for the mass of each sphere. Now this may not seem logical, but it in my mind, it was more important to get the relationships between the spheres than to compute an actual mass. I wanted to know that a small 100sf space would move freely around a huge 7000sf space.

Final checks in the Reactor engine were to turn off gravity completely (I didn't want them to be affected by any outside forces), set the friction of each object to almost none (0.05) so they could move around each other easily. Then I held my breath and ran the

simulation.

Nothing happened.

This perplexed me quite a bit, until I realized that all the dashpots had been set at their equilibrium state and therefore didn't need to move at all. So something had to move them away from equilibrium. I thought at first that this might be to just start the simulation with all the pieces randomly scattered across the 3D grid in 3ds Max. I couldn't find a command to randomly scatter the existing spheres, so I moved them myself. I ran the simulation, and to my surprise, everything worked fantastically...I had what looked like the electrons of an atom swarming around each other.

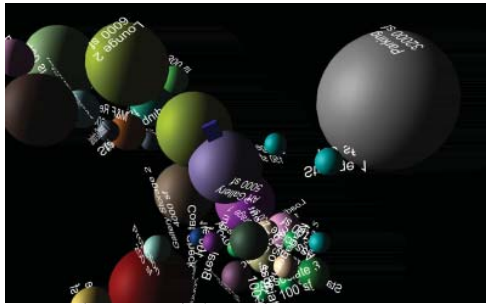


Image 49 - A cluster of program spaces.

I had a problem with how this worked. First, the spaces were so randomly scattered that the initial start point didn't mean anything. Second, where they ended up was just as random and had no

meaning, and no relationship with where they started. I decided to ponder more.

* * *

What was missing was a sense of where each sphere wants to be in 3d space. Having them randomly float around meant nothing, so I decided to utilize another mechanics object in Reactor: the spring. This is exactly what it sounds like, a device which wants to pull an object towards its parent until a "rest length" is reached. At first, it sounded exactly like a dashpot, but I found out later that dashpots are much stiffer than springs, which was good, because I wanted the adjacencies, defined by dashpots, to be most important, with attractiveness, defined by springs, as secondary.

I placed two new elements in the scene. These were icosahedrons (because they looked cool) that were fixed into place. A bright yellow one above the scene represented solar attraction (but not the actual sun) and a brown one below the scene represented ground attraction. Since I didn't want to have to place another 80 springs in the scene for each program, I decided to categorize each one by how attracted they were to solar or ground. The parking garage, obviously, wanted to be close to the ground, as did the loading dock and the art gallery storage. The lounges, being open-air, wanted to be close to the solar element, as did the administrative offices. The other spaces, however, didn't care.

The strength of the springs was constant this time, but the rest lengths were set at $\frac{1}{2}$ the distance from the start point, which would move them up and down without having the spheres cluster around the icosahedrons. This was perfect...after linking the springs to the major components, I ran the simulation again.



Image 50 - Spheres attracted to elements.

This created an interesting movement of the spheres towards the elements. Now the lounges were on top, where they wanted to be, and the parking and loading

dock were on the bottom. I again wrapped a blob mesh around this series to see how it would look but again I thought the blob as too amorphous and, well, blobby. I felt like I was nearing completion, but I was still missing something...the site!

I wasn't quite sure how to get the site implemented into this, so I first brought in the site volume I had estimated (200ft. x 126.5ft. x 80ft.) and watched how they moved in relationship to this box. What if I placed the spheres inside the box, made the box cloth, and let the spheres deform it? As it turned out, Reactor didn't like the cloth around the spheres and

kind of freaked out. It was apparent that the spheres would have to move within the confines of the site to establish their positions. This gave me an idea. Remembering the trash compactor scene from the original Star Wars movie, I decided to let the spheres roam around the "walls" of an expanded, open site, and then compress them into place. This proved to be a huge success. I also tried to compress them using the blob form from the first part of this process, but they kept flying outside the shape, probably due to some error with the Reactor engine.

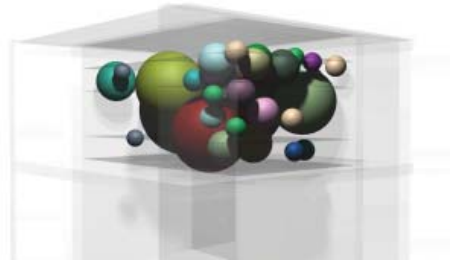


Image 51 - Compressing the spheres into the site.

The final step in this stage was to apply responsibility to the program spaces. Being an unpredictable reaction, there were many spaces that were not logically placed, i.e. the dashpots couldn't overcome the compression of the walls. This made for some interesting locations and a few elements that were placed inside others. So I turned the spheres back into blocks that represented their square footage sizes, moved them into place and separated the

duplicates. I would use my own judgment about how to put those elements into the blob shape from before.

The sticking point about all this was that nagging sense of place, of designing a building that fit into the landscape of Austin but was still creative and different. Dropping a giant blob into a 200x126ft site didn't seem responsible or loving...it seemed uncaring. It was exactly what I was against in the first place: nebulous blobs that do not relate to their surroundings. This was a major problem.

The answer came after an invigorating workout at the gym, when I lifted more than I had in quite some time. Feeling the sweat and burn while on the treadmill, I had a breakthrough. I had been thinking of the blob shape as positive space, but now I realized that it should be negative space. The pushing and pulling of a virtual "skin" did not have to be the form, but instead the absence of the form. I would make the void green space, in the middle of a very bulky, traditional shape. This seemed to work better, and after another advisor meeting, I was told that I would have to use my computational reactions one more time, but to displace the program with the blob, not try to contain it.

At last, I managed to get the blob shape to push the spheres out of the way as it inserted into the middle of the pack of spheres. They still were attached to the solar and ground elements, compressed by the

walls, and pushed aside by the void, all while still trying to maintain their dashpot relationships to each other. The animation shows this delicate interaction, but not without some unexpected results, such as the art gallery storage space moving outside the panels (another Reactor error) and many spaces becoming separated from each other. So once this was finished, I again applied adjacency "common sense" rules and moved the boxes into correct positions, even stretching them and scaling them to fit around the blob shape.

This method for determining the program seemed very logical: each space was linked to others based on space adjacency. This could not be determined without the initial human steps; Reactor had no idea which areas should be linked without my interaction. But the results were very unpredictable, and although not completely emergent, were definitely on the right track towards computational architecture.

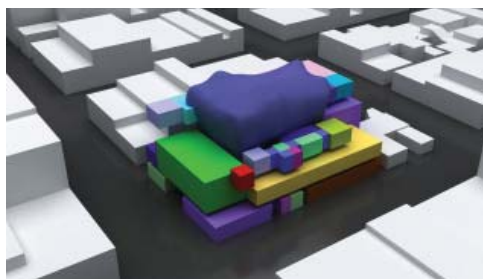


Image 52 - Final program result.

PART FOUR: MATERIAL SELECTION

The method for material selection is the only portion of this design process that did not involve 3ds Max or Reactor. Instead, I simply used a graphing technique with the subjectivities from part 1 to determine what kind of material would be in which location.

First, I did some research on sustainable materials in Austin. Consulting the Sustainable Sourcebook from Austin Energy, I picked several sustainable materials, including limestone, brick, and fly ash concrete. These materials would not only help the environment, but are also local to Austin and Texas—since many of these materials are harvested or manufactured locally, requiring less embodied energy. As to which of these would be used and in what location and context, my advisor helped by suggesting that they be linked to my subjectivities again, as responses (materially instead of form) to these conditions. So my first step was to bring out the subjectivities chart again and analyze it.

I discovered that each subjectivity had three major components: the sense it affected, its rating, what response to that sense the material should have, and where (vertically) that should occur. Using a 1 to 10 scale was appropriate for determining sphere sizes, but that seemed like too broad of a range for this application—what would distinguish a 3

from a 4? Rather, I decided to rate each subjective experience as either a plus, minus, or neutral. This would simplify things a little. The site plan would provide locations in the XY plane for each event, while the vertical height rating would provide the Z value. Each subjectivity affected one or more human senses, so I would provide a response as to what my building should do in return.

Rating the senses, reactions, elevations, and positive/negative values for each condition made for quite a jumble of materials and locations. If these results were simply applied to the building, the exterior would be a chaotic mass of materials on a very boxy shape... a very irresponsible move. To simplify things, I divided the site map into quadrants, with the corners of the site shooting out at 45° angles. The duplicates were removed (no sense is stating a material twice) and grouped in the quadrant that corresponded to that side of the building.



Image 53 - Locations of subjectivity responses.

This told me what each side of the building would have, what the qualities would be, and where it should be on that side.

The next step in this phase was to summarize all of the materials in these areas, where they would be applied, and how high up they were. Obviously, these were qualitative results that were subject to

interpretation later.

I knew that I wanted to use limestone, brick, and fly ash concrete, a double-skinned façade, and a few other materials, so I had to relate these specific decisions to the results of the mapping process.

This produced the following tables:

Acoustic Property	Material Type	Example
Absorptive	Heavy Cloth, Sound Barriers, Perforated Material	Acoustic Tile, Sound Wall
Reflective	Hard Surfaces, Nonporous	Stone, Brick, Glass

Visual Property	Material Type	Example
Transparent	Clear glass, Shading Devices	MecoShades, Louver Systems, Double-Skinned Façade
Opaque	Any	Stone, Brick, Steel, Concrete

Smell Property	Reaction
Unpleasant	Ventilate into and intake away from this area
Pleasant	Intake air in from this area

Environment Property	Reaction
Positive	Encourage circulation and presence in this area
Negative	Block occupants from this area

Using this breakdown of materials and locations, I have created a template of how the building will appear within the context of the city. Using the material palette I defined earlier, it would be a simple matter to determine the results. This concludes the emergent layout of the building, and the next step is to generate the structure, systems, and layout of this cultural center in downtown Austin.

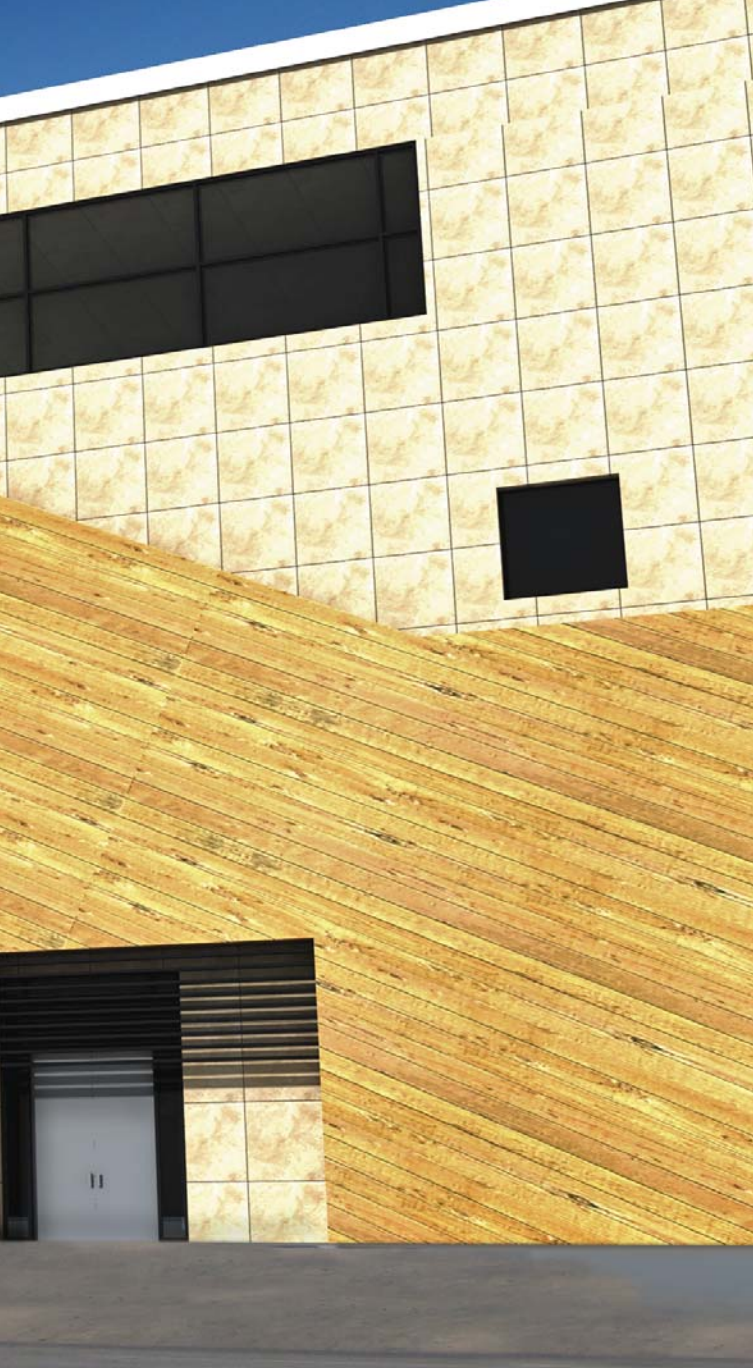


Image 54 - Template of material applications.



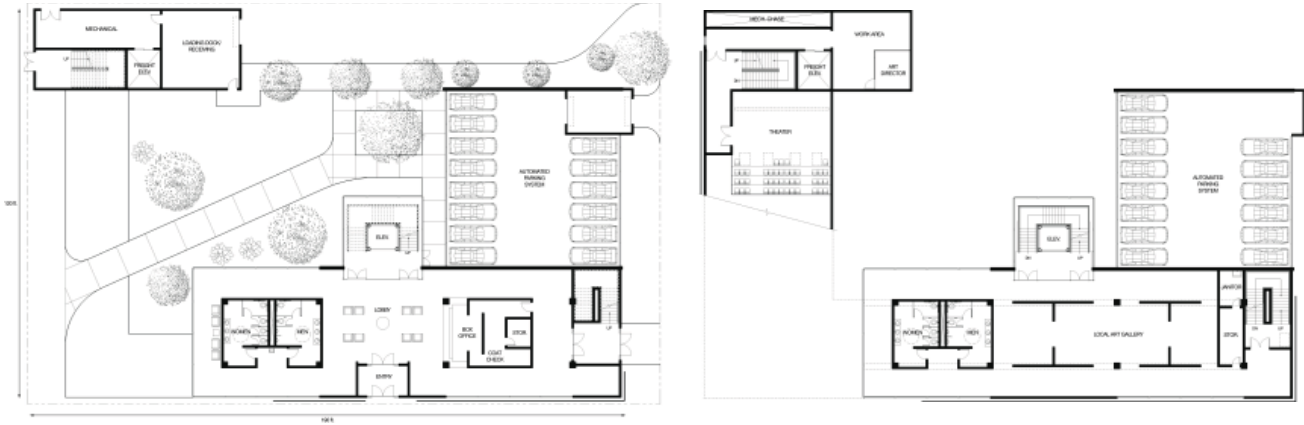
ARCHITECTURE



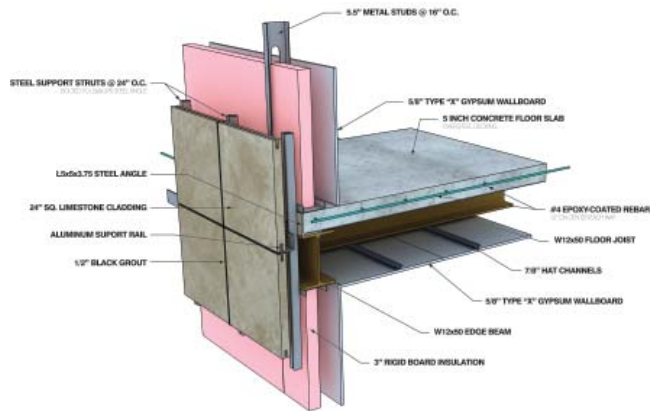


Previous page: Interior courtyard, looking up at
roof structure and lounge.

These pages: South perspective, looking
northwest toward Brazos Street.



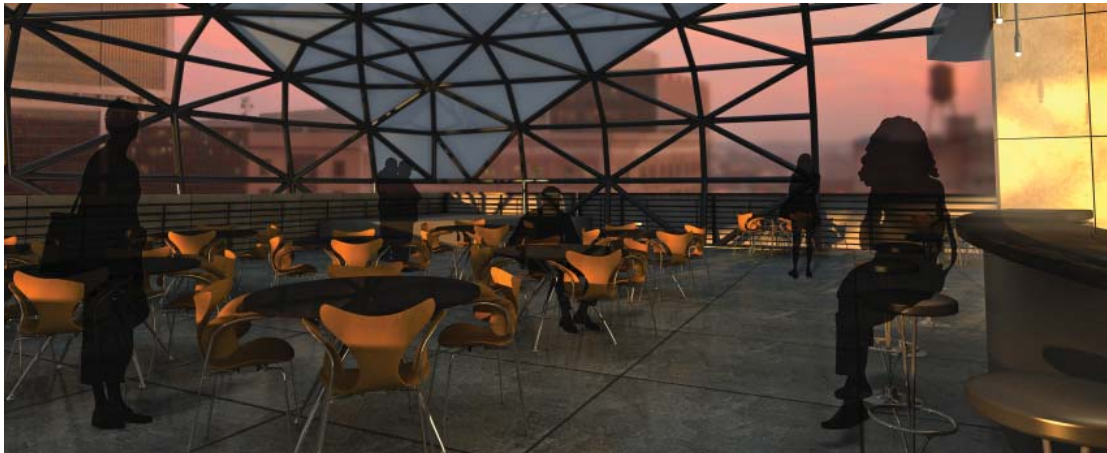
Above: First and second floors.
 Below: Limestone wall finish detail.

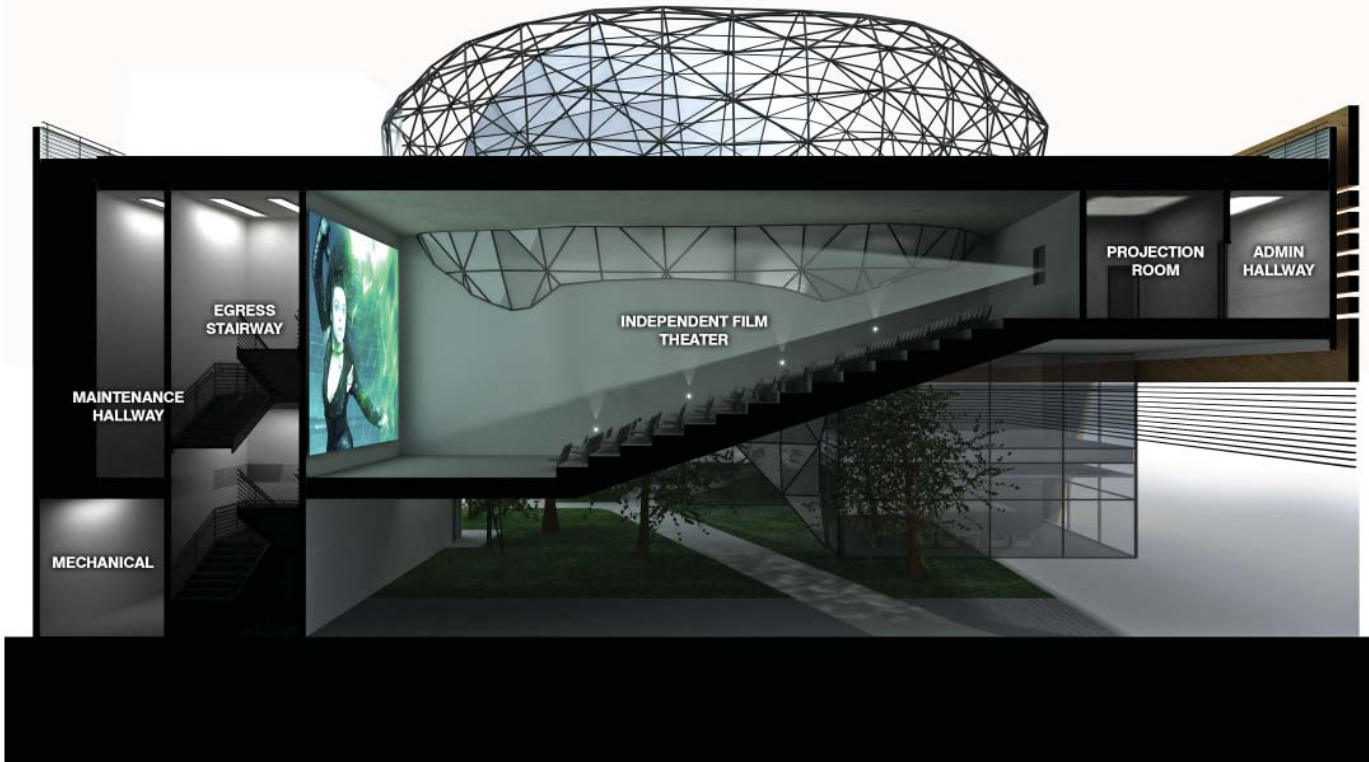




Above: Third and fourth floors.

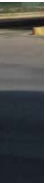
Below: Inside lounge at sunset.

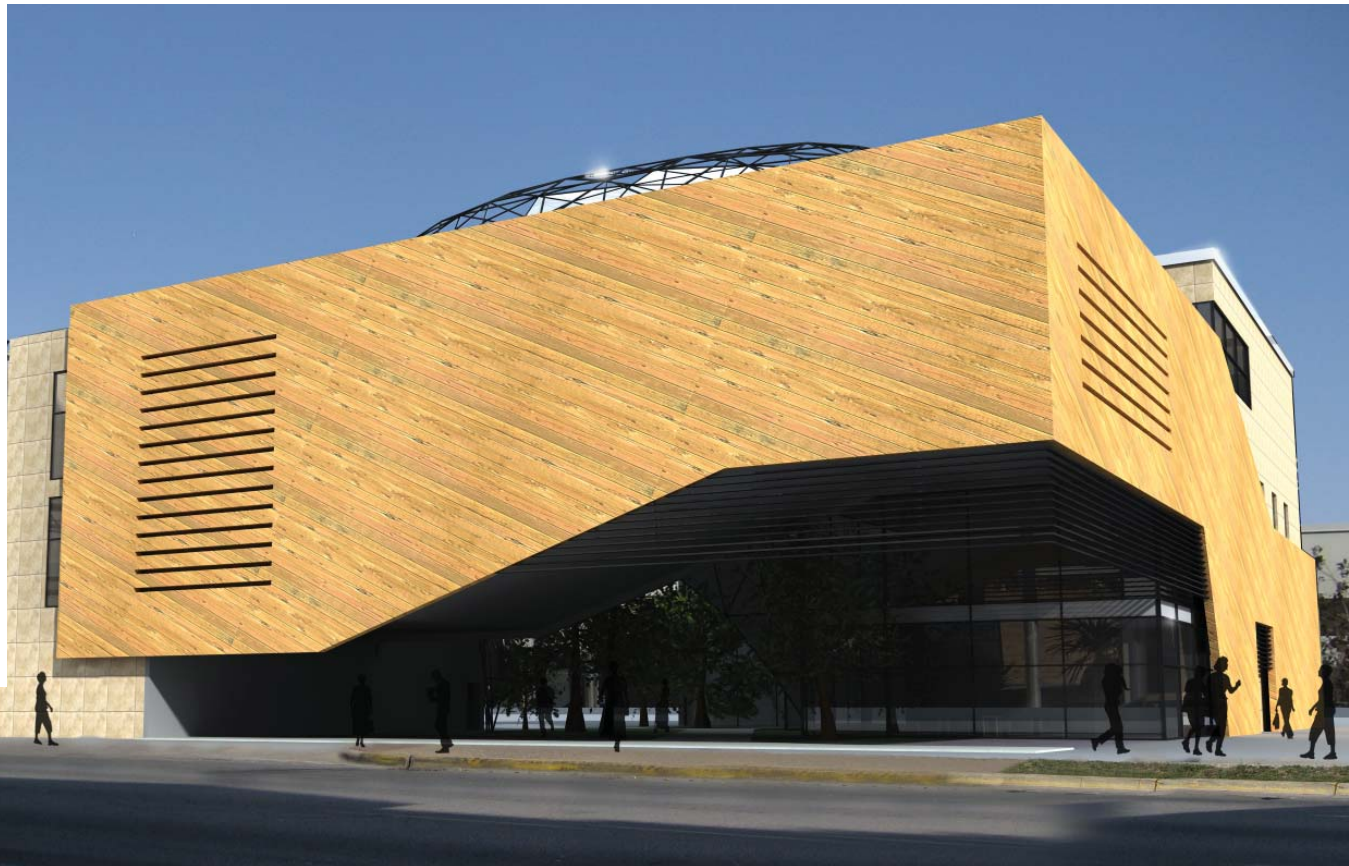




Above: Section perspective through theater.

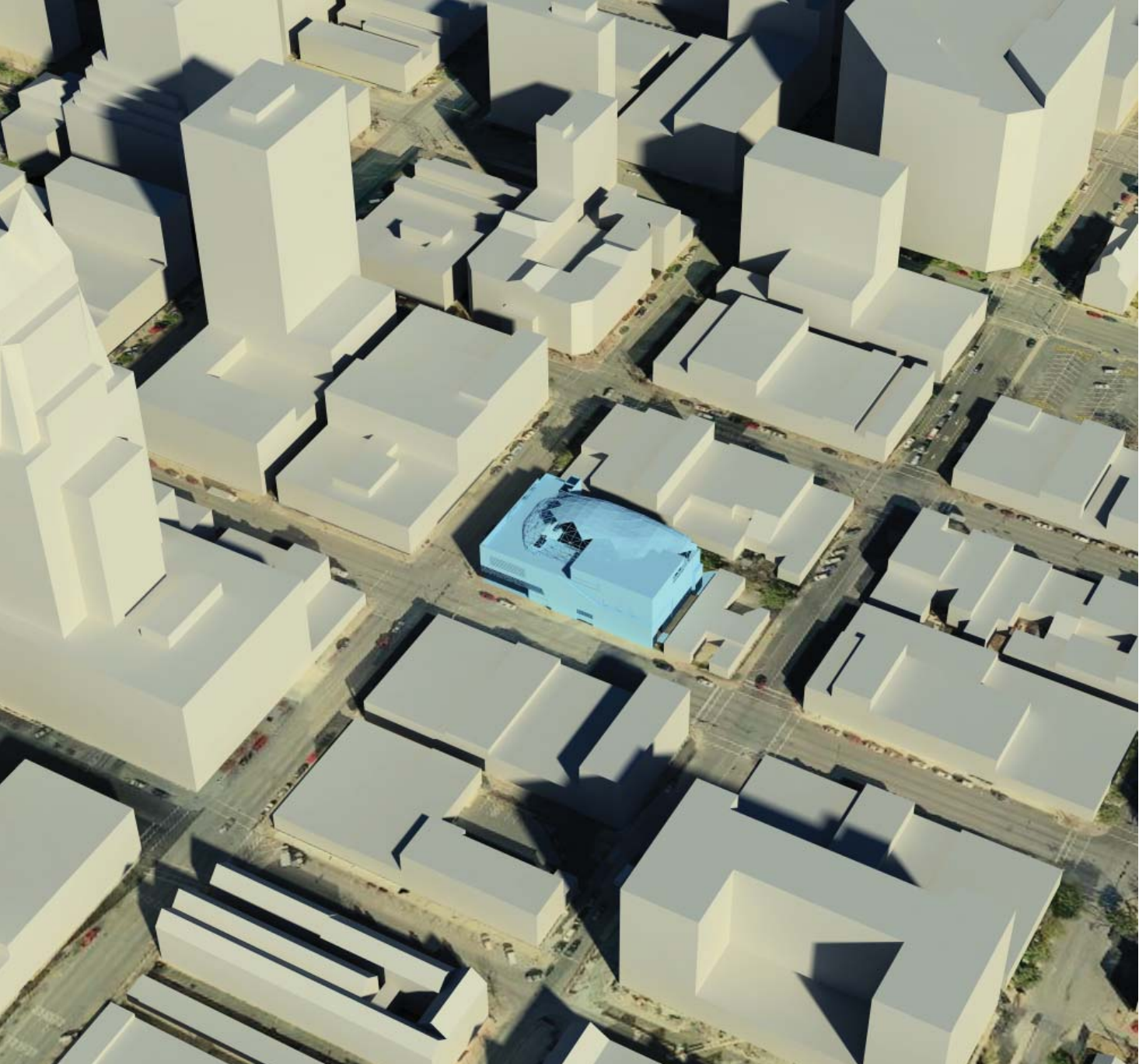
Below: Life safety plan at third floor.





This page: East perspective, looking west across Brazos Street.

Next page: Site plan, downtown Austin.



INFUSION OF HUMAN ELEMENTS

The idea behind this thesis is the infusion of human elements into computational architecture. I wanted to see how the end result would vary based on how love, mortality, and responsibility were implemented. Although originally thought to be a method using certain shapes or elements to represent these human experiences, things worked out a little differently.

INFUSION OF LOVE

In this thesis, love is described as using unique experiences and feelings to affect the outcome of architecture and built space. An uplifting and exciting visit to a beautiful museum, such as the Kimbell Art Museum, helps to shape the design of future projects. That would be a stim space, ranking high on the subjectivities map. A place that is uncomfortable, run-down, or unsafe would leave a lasting impression to not incorporate these types of spaces into a building; that is a dross space, which is low on the subjectivities map.

The use of these simple subjective ideas is synonymous with human nature: It's an attempt to enhance the positives and avoid the negatives. But the positives and negatives here are not simply stored into memory, only to be recalled and re-interpreted into qualitative spaces. In this design process, these stim/dross experiences in the city

of Austin directly push and pull a blank solid into a unique shape. This process is love in itself. It is no different than Louis Kahn shaping the roof of the Kimbell to accentuate the natural daylight. A negative experience in the city can be directly interpreted in the pushed-in shape of the building, while a positive one sees the shape "reaching out" towards it. For this thesis, love is defined as the experiences, emotions, and feelings that are used to determine the shape and form of a building. In this regard, the results can be claimed as a success, and shaping form by human experience is the "petrified music" that Goethe described.

INFUSION OF MORTALITY

Mortality is more than just the concept of death. It is the idea that we occupy our surroundings for limited amounts of time. Architecture can last much longer, because is more than just designing a built structure for this generation — it is designing it for all of the following generations. Mortality is the marking of time on the human clock, showing that we, as a culture, existed in this brief moment. The way our buildings show this to the future is the way we express our own mortality.

Mortality in this project was infused by using the materials, practices, and technology available in our time. The ideas of algorithmic architecture, complex systems theories, and emergence were probably not readily used in previous generations, but

were a driving force in this project. As technology progresses, our architecture progresses as well; it represents that which thrills our senses, vibrates our being, and shakes us with love and fear. Mortality in architecture is a monument of what we hold meaningful in our lives, a testament of love to every successive generation from this day forward.

INFUSION OF RESPONSIBILITY

Responsibility covered almost all areas of this project: decisions regarding site, program, and materials. Every decision was made using a sense of accountability for what is instinctively right in that situation. Many newer structures seem to be utilizing materials and techniques that are amorphous, that do not respond to the place or time that they are occurring in. This makes them irresponsible

by nature. In this design process, many of the results of reactive forces left the program scattered, and spaces that should have been adjacent to each other ended up scattered. To leave these areas in this undefined state and accepting the computational results without questioning the human condition of them smacks of irresponsibility as well. Responsibility should be incorporated into every stage of the architectural process; to simply accept the results of the computer is, in fact, irresponsible. We have to take ownership of what we are designing.

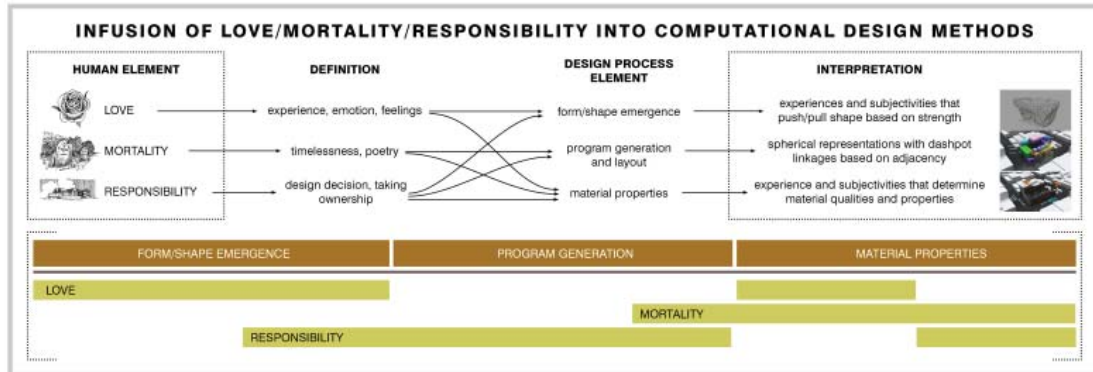


Image 55 - How it all comes together.

CONCLUSION

This thesis has evaluated a design process that attempted to infuse the elements of love, mortality, and responsibility into computational architecture. The process evaluated the shaping of form, the layout of program space, and the quality and selection of materials, with the attempt to minimizing the influence by the human designer. Site boundaries were morphed into a smooth, nebulous shape by pushing and pulling with stim/dross evaluations. Program spaces were linked together with physics simulation helpers in 3ds Max's Reactor engine. And using stim/dross subjectivities in relation to a site plan, material qualities were mapped onto the four sides of the site. These simulations and evaluations attempted to generate a structure that was a literal and logical response to the conditions and requirements of the city and the program.

The process was far from perfect, however. Subjective responses, using the capabilities of 3ds Max software, generated a form that was difficult to work with and did not relate well with the urban fabric of Austin. Sense of place—the idea that the building naturally belongs to a certain region or culture—could not be added to the process. Material qualities could only be identified as responses to the surroundings, but could not be specifically identified. What the process accomplished was only half the battle; making the leap to a finished product required

human intervention by the designer.

When that human intervention was applied, it sometimes proved more difficult to work with the computational results. Rooms that were supposed to be adjacent ended up in random locations, such as the staff bathrooms being two floors below all of the staff offices. One set of public bathrooms were tucked away behind the loading dock. The form that was generated was not without its problems, either: The shape was not conducive to the way the building should have naturally worked. In short, the results from the computational experiments became more of a hindrance than a help.

It was obvious that the building was not going to design itself, although that was never the intent. But the problems with the physics simulation required me to do more nudging than was anticipated, almost to the point of redesigning the building from scratch. Then I was faced with a different puzzle – how much of the computational results to keep, and how much to derive on my own. If I moved rooms around and changed the shape of the building, was I throwing away my previous efforts? Reactor had helped with the initial decisions—the template was in place. But the final product was several iterations beyond those initial simulation results. I had come full circle, as once again I was in control of the design process. So did the computational process really matter?

As architects, we cannot ignore our responsibility of designing a structure that works for its human occupants. Because of this responsibility, along with the multitude of requirements, codes, and historical precedents, we cannot leave the design of our buildings up to computational processes completely. We must constantly “nudge” the results to make sure the occupants are comfortable, safe, and happy. What was not apparent, however was that this nudging, shifting, changing, and re-designing is the infusion of the human elements into architecture, be it computational, traditional, or intuitive. We infuse love, mortality, and responsibility into every part of architectural design. It is the emotional, sensory, aesthetic art meshing with the logic, calculated science of a built structure.

Remember the Alberti quote from earlier: “A great matter is architecture, nor can everyone undertake it. He must be of the greatest ability, the keenest enthusiasm, the highest learning, the widest experience, and, above all, serious, of sound judgment and counsel, who would presume to call himself an architect.” (Alberti 315)

We should make sure we don’t let him down.

“And now here is my secret, a very simple secret: It is only with the heart that one can see rightly; what is essential is invisible to the eye.”

“What is essential is invisible to the eye,” the little prince repeated, so he would be sure to remember.

“It is the time you have wasted for your rose that makes your rose so important.”

“It is the time I have wasted for my rose—” said the little prince, so that he would be sure to remember.

“Men have forgotten this truth,” said the fox. “But you must not forget it. You became responsible, forever, for what you have tamed. You are responsible for your rose...”

“I am responsible for my rose,” the little prince repeated, so that he would be sure to remember.

— Antoine de Saint Exupéry, The Little Prince

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IMAGE SOURCES

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Image 1: Greg Lynn's Embryological Housing. Accessed 14 January 2008. <http://www.digischool.nl/ckv2/ckv3/kunstentechniek/lynn/greg_lynn_Embriological_Housing.jpg>.

Image 3: Screenshot of SimCity 4 game, PC version. Accessed 14 January 2008. <<http://www.deafgamers.com/04screenshots/simcity4deluxepic1.jpg>>.

Image 41: Photograph by Bruce Deitle. Used with permission.