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The Peachtree Cultural Center is a new museum for contemporary culture sited at the current Peachtree Marta Station in Downtown Atlanta, Georgia. The design is a formal representation of today’s current climate. Taking an optimistic approach, the design seeks to represent the trial and tribulations of today’s technological advancement and the current political and social landscape through the constant twist the occurs through the gallery spaces.

The vertical aesthetic seeks to represent today’s aspirations for peace and progress despite today’s conflict. The sculptural design is achieved through computational design methods and CAD software. Initial schematic designs were developed through Grasshopper and then refined in RhinoScript. The parti models were then transferred to Revit for full on BIM construction. Stacking diagrams determined to the functional relationships of spaces and careful site analysis determined the proper twist for the building. The overall design is accomplished one-way slab and slanted columns with a reinforced concrete core. The Peachtree Cultural Center is a modern twist on this prominent block.
Cultural Museum

Computational Form Finding

Stacking  Rotation  Twist  Smoothing
Section of Marta Station and Art Museum

- Structural Curtain Wall
- Floor to Ceiling Truss
- 36" Slanted Concrete Columns
- 24" Floor Slab
- Steel Framing
- Reinforced Concrete Core
- Concrete Roof
- Space Frame Roof Truss
- Floor to Ceiling Truss
BELMONT DEVILLIERS COMMUNITY CENTER

This project aims to design a Multi-Functional Community and Wellness Center in Pensacola, Florida’s Belmont DeVilliers neighborhood. This center will cater to the social, educational, and physical needs of those in the neighborhood. The program for the building will include a gym, multiple meetings rooms, a multipurpose dining area, and multiple gardening areas. These facilities will serve as the unifying center of the community, one must design with the expansion adaptation to the present needs unswerving to those desires of the past or future. Consequently, the community center will be designed to be multi-functional and adaptive to serve the many facets of the community members and their needs. Through this Community Center, the neighborhood looks to expand towards the future, to create a dense urban portion of Pensacola, FL.
Architecture has the power to redefine and shape our environment. In disadvantaged communities this component of architecture is extremely important. The design of the facade re-aligns itself with the neighborhood vernacular by using custom clay tiles to match the existing surrounding brick buildings. Using parametric modeling one can embed the design vernacular of the neighborhood as an unifying element. The name of the neighborhood, BELMONT DEVILLIERS, is spelled out in the facade of the building by composing an attractor point script and combining it with an brick tesselation script. This results in an unique and memorable design for this historic neighborhood.
TIMBER TERRACES

Timber in the City
Gable, McNeal, Sampson
Queens, NY

Timber Terraces re-imagines a vacant waterfront site in Queens, New York as a vibrant and vanguard model of healthy, biophilic living for the future of the city. The project considers a site in Queens, just south of the Queensborough/Ed Koch Bridge. Overlooking the east river, with views to Roosevelt Island and Manhattan, the vacant site can be understood as a segment within a larger chain of mixed-use waterfront development in the Borough, including the Hunters Point and Annabel Basin projects underway to the south, and stretching south to Brooklyn and north to the Bronx.

These new approaches to affordable housing stand in contrast to the NYCHA Queensbridge Housing Development to the north. Constructed in 1939, it is one of the largest public housing complexes in North America. Along with the adjacent Queensbridge Park, it reflects nearly century-old ideals of living, construction, affordable housing, and landscape which will be reconsidered and re-imagined in this competition. This site has a unique mixed-use zoning designation and an ample allowable FAR. The competition program does not maximize this FAR. Instead, it is to be considered the first of a phased development of this significant site. We were required to anticipate the future phased build-out of this site to utilize the full FAR as a condition of the competition design. All things considered we design an interconnected community for Queens.
Phase 1
1. Early Childhood Education
2. Wellness Center
3. Residential

Phase 2 - Mixed Use 900,000 Sqft.
1. Parking
2. Museum
3. Retail
4. Restaurant
5. Office

Phase 3 - Mixed Use Tower 2
1. Early Childhood Education
2. Wellness Center
3. Residential

Program FAR Diagrams

Programmatic Section A-A

Programmatic Section B-B

Site Plan

Phase Plan

Program FAR Diagrams

Phase 1 Site Plan
Phase 2 Site Plan
Phase 3 Site Plan
Final Development

Phase 1 Site Plan
Phase 2 Site Plan
Phase 3 Site Plan
Final Development

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3D-Wall Section

Green Roof Comprising Plants in Permanent 5.5" Soil With Steel Angle Profile
Feeding Wall Drainage Mat; Roof-Rapell
and Membrane Protective 5/16" Faber
Divider Double Wateproofing 16 / 12"
Bat Insulation Membrane 1 1/2" Reinforced
Concrete Edge

Shaped 1/8" Sheet Aluminum With
Anchoring Structure, Waterproofing,
Membrane Double 1 3/8" Plywood Panel
Shaped Board Insulation

Full Height Continuous
Glazed Facade Comprising 5/16" - 3/8" - 5/16" Double Glazing Units And Structural
Silicone Sealant, Frame Of 2 5/8 X 7 1/4
Studs

2"X12" Glulam Joists 24" O.C.
10 1/2"X 49 1/2" Glulam Beam

Treated Concrete Floor; 9 7/8" Reinforced
Concrete Slab

Concrete Edge

Structural Diagram

3D-Wall Section
SAND PRINTING

MIT Self-Assembly Lab
Tibbits, Kernizan, Sampson, Rustom
Cambridge, MA

Jammed Granular Matter is the study of the manipulation of loose aggregate materials into load bearing architectural structures. Because of its availability and size, sand is an excellent granular material for scaled, reversible structures in construction. Sand forms to a mold when wet, but cannot hold its form or support a load without a mold. By incorporating the concept of mechanically stabilized earth—the placement of fibrous reinforcement in horizontal layers to strengthen soil during construction—the wet sand is structurally reinforced. The result is a load bearing structure, using sand as a compressive granular material, and natural fibers as the tensile reinforcement.

Jammed granular structures involves less preparation, is instantly solid, and completely reversible. “Sand Printing” has a noticeable increase in efficiency. Concrete has a very low tensile strength but is strong in compression, which behaves similar to granular matter that is reinforced with fibers. Without horizontal layers of reinforcement combined with wet aggregate, the shear stress caused by the weight of the sand would be sufficient to cause a sliding failure of the structure.
Different ratios of sand to water were tested to determine the best solution for structural strength. Aggregate sizes of sand were tested. Fine aggregate structures do not last over time. Extremely course aggregate structures do not hold water. The graph to the right displays the ratios for sand and water for proper sand printed structures.
By incorporating the concept of mechanically stabilized earth, where fibrous reinforcement is placed in horizontal layers of earth to strengthen soil during construction, we can strengthen sand structures using layers of natural fibers between layers of sand and engineer them to be free standing. By using sand as the compressive granular material, and natural fibers as the tensile reinforcement we can “print” free standing sand structures. By creating a 5-square inch mold and layering sand and fibers in them, we tested loads up to 80 pounds on a small scale handmade sand structure and calculated failure due to Shear Stress. Systematic testing allowed us to understand the layer density of sand and fibers for the best results of our sand structure as well as what type of sand and fibers to use. We concluded that sand had to be wet to conform to the mold, but did not have to stay wet once the mold was removed. Overall tests were positive with the sand block supporting the load.
ROOMIEZ MOBILE APP

This mobile application streamlines applying for housing and choosing a roommate all in the palm of your hand. The housing application processes at colleges and universities are extremely antiquated, often times roommate selection and housing locations are left to chance for students. This mobile app removes the need for paper applications making the entire housing application process digital; the app incorporates existing user data and existing facilities. Users have the option to select a roommate based on the profile of their college and university and they are able to find a new roommate or select an established friend.

Users also have the ability to select the housing types they are looking for while receiving real-time data on the building. As a result, the application gives the user the ability to view available housing options, current prices for housing, location and amenities. The app allows for users to submit reviews, photos, and video tours of housing options. The app gives the power to the user to be able to be choose and plan their housing experience so students can look forward to successful and memorable semester.
HIVE TOY SET: MODULAR FABRICATION

This project employs minimum inventory, maximum diversity design strategies and additive & subtractive fabrication techniques to develop a proposal for a modular building kit. The building kit is to be used by 8 to 16-year-olds and can be assembled in multiple ways to simulate different environments with an emphasis on providing options for creative building experience, rapid installation, disassembling, and repackaging. The hive toy set is designed to expand on a equilateral hexagonal grid in all directions for kids to design and create their own buildings.

The building kit incorporates basic building elements, walls, windows, columns floors, and roofs, to engage in the user to create expansive environments. This prototype tested assembly for the building kit using an interlocking system for parts and pieces to slide in. Pieces within in the send slide and snap into place. With base grid pieces, one can use columns for the expansion and formation of the grid. Wall pieces inbetween the columns and the roof pieces snap in place above on columns and above the walls. Through the manipulation and arrangement of the pattern, children, and adults a like can configure various designs of their own hive.

Independent Research
Individual
Tuskegee, AL
Assembly Parts

Assembly Grid

Possible Assemblies
ALLSTON A/R RIVER WALK

Design Discovery Final Project
Zhang, Perryman, Sampson
Boston, MA

After analyzing the neighborhood of Allston in Boston, MA, we were tasked to design a waterfront development for an urban intervention. This however is tricky due to the controversial history within the site especially, between Harvard and the community of Lower Allston. Currently Harvard Business School is located at the top of Allston with access to the waterfront along the Charles River. Over time, affordable housing is now being dominated with student tenants and the cost of living is steadily rising in the community. Currently Harvard is proposing to expand their School of Engineering and Applied Science in lower Allston. With this expansion they plan to create a 500,000+ square foot complex will feature state-of-the-art classrooms, active learning labs, maker space, faculty labs, community space and a café. Additionally, Allston Community Task Force and Mass Dot Transit are planning to redesign 1-90 interchange soon.

With all these proposals considered we designed a waterfront development to alleviate these tensions while building off future institutional expansion proposals, future transit and mobility design, and existing policies. We proposed a series of art galleries and installations hosted by institutions inside and out of various neighborhoods in Boston to unite the long term and short-term residents. We incorporated an augmented reality application to supplement the installation experience by using the technology to connect the installations across the city by including it as a walking tour. Our goal is not just to alleviate tensions in Allston but to alleviate tensions between community members and institutions across Boston due to the similar issues that lie around those areas.
TRANSPORTATION

Residential New Walkable Development

Ten Minute Walking Radius

Institutions

Redline Subway

Bus Line

Blue Bike Stop

Bus Stop

Transportation Overhaul

Enterprise Expansion

Enterprise Expansion & Infrastructure Redevelopment

Additional Community Housing

Additional Infrastructure

River Walk Intervention

Phasing Diagram

Brownfield Area

Existing Site

Harvard SEAS 2021

Scheduled SEAS Expansion

Harvard SEAS 2030

Mobile Audio Experience

AR Guided Tour

Perspective of River Walk
264 LEXINGTON ST.

This project evaluates the feasibility of a new development at 264 Lexington St. in East Boston, MA. The project was the final deliverable for the Design, Development, and Practice Seminar at the MIT Center for Real Estate; the class introduced the concept of the architect as a developer. The project takes a worn-down two-story house and looks at opportunities to convert the house into a new condo development. Bound by zoning restrictions, the adjacent building buttling the house’s west elevation, and a real-world budget, our design uses Boston’s quintessential triple-decker archetype to create three spaces for lease. A wood trellis wraps around the building to create a privacy enclosure, restricting views from neighbors while letting in greenery and light.

Each space for lease has differing amenities. The first floor is a two-bedroom apartment with a small porch visible from the street. With the lowest amount of privacy, the first-floor condo has the lowest leasing price on the property. The second floor contains a two-story apartment with a large private balcony at the back of the building. The most expensive lease in the building is the third-floor apartment. It is a four-bedroom apartment containing a mezzanine level for entertaining guests and roof access hidden from the street. This upper-level steps back from the roadway to give inhabitants privacy and maintain the consistent building height level from lower views. This increased height limit exceeds zoning regulations, but a zoning variance is necessary to recoup costs and make a profit on the project. This project was an exciting experiment to run cost analysis on a design project for an actual client and provided me with the tools to analyze the cost of personal projects and act as a developer.
Working as an intern architect for Goodwyn, Mills, and Cawood, I was fortunate to design a project from scratch. The project is for the owner of DUH! Furniture Store, a popular store for contemporary furniture in Pensacola, FL. The building expands the client’s current showroom, called the barn, on a narrow adjacent lot just outside of the Pensacola Central Business District. The client wanted to build on the bucolic nature of the existing showroom in the new building. Designing the exterior with similar materials—board and batten and siding, and a corrugated metal roof—the design looks to play with the concept of a country porch as an opportunity to showcase outdoor furniture from the street.

Functionally, the building still needed to connect to the existing building, which is reinforced in the building’s two gables roofline, designed to match the exaggerated gable roof of the existing building. The extension on the porch typography occurs through the continuation roof over the porch, supported by angled columns and a formal stair. Through this, we set apart the new building from the existing structure while playfully calling patrons, passersby, and collectors to embrace the slow, easygoing nature of the rural lifestyle.
This project is a parody of the ubiquitous folding chair. The design method addresses the possibilities, constraints, and challenges of digital fabrication in the design process. After initial sketches, I found that the folding chair could be imagined as two interlocking parts. These interlocking parts can be separated for easy storage or additional functions. Building off African Tribal Chairs and their parody in the Finnish Designers Ilmari Chair, I looked to re-contextualize this design approach in contemporary design computing processes.

Through iterative sketching, modeling, and load testing, I developed a design that met the functional requirements of a chair, the constraints of applicable mechanical processes in the laser cutter and the CNC machine, and the design constraint of an interlocking joint. In the digital design process, I made careful attention to the tolerances to resolve the tectonics of design in the assembly process. In the design and prototyping processes, I tested various types of flat wood materials to handle the structural load in the design’s cantilever. And through this material approach, the form of the chair became refined and sophisticated.
Preliminary Sketches

Iterative Study Models

Congo Chair Precendent Studies

Formal Sketches
In the rural south, accommodations for modern living need to be re-evaluated. With technological advances, the archetypal shotgun house with wood frame construction will not cut it. What formal typologies can improve the housing stock in the rural south? With sustainability in mind, the reuse of shipping containers and wood pallets can create new forms of housing for Athens, Georgia. Current trends in housing in Athens, Georgia, show that there are around 10,000 housing units with many of the houses being five-bedroom units with a value greater than 50,000 and less than 100,000. With cost in mind, the design looks to give consumers in the area the best price possible.

The use of shipping containers as the base design allows for various configurations for a flat rate. The use of shipping containers as a building module allows for sustainable communities to develop while achieving cost savings through economies of scale. The design of this modular house combines shipping containers, standard stud construction, wood pallet finishes, and CLT to create a new approach to the modular shipping container home design. The design proposal is an open two-story home with a convertible second level for additional programming. This preliminary study in the modular design of houses set the stage for the research in the MIT Design-X backed start-up Re: Stacks.