(SURFACE IS) MORETHANSKINDEEP*

*Given the disparate relationship that exists amongst architect, building and user experience, **the thesis proposes a framework for the (re)integration of component-based kinetics into architecture as an enabling tool for users to actively participate in sculpting architectural environments.** Users should be given opportunities to evaluate and adjust architecture parametrically and in real-time to better suit their functional and aesthetic needs. This will allow architects to better communicate the vision of architecture to its users; the building will act as a vehicle for communication of functional and aesthetic value between its creator and operator. In response to user interface, the physical nature of the architecture might be both functionally diverse and phenomenologically generative within the parameters of a specific geometric and/or material system. The relationship between architecture and its functional capacity would have the potential to be more like hardware and software, consecutively.



(SURFACE IS) MORETHANSKINDEEP*

*is a framework that leverages the potential of kinetic interaction **between human skin and building surface** as a symbiotic relationship for the generation of enhanced phenomenological and functional experience within architectural design.

BACKGROUND_

In the early 20th century, architects took interest in the idea of a non-static architecture as means of surpassing the functional abilities of building principles known to that day. Architectural icons like Buckminster Fuller, Archigram, Chernikov and others began to formulate thoughts and mock-ups of kinetic superstructures, walking cities and other devices that might change the impact of architecture on society at a large scale.

Later in the century, themes of kinetics became more systematically integrated into the practice of architecture. Architects such as Santiago Calatrava, Jean Nouvel and Thomas Heatherwick began to introduce mutable components that augmented and enhanced architectural experience at the scale of the building.

Today, in the contemporary world of architecture, the sustainable paradigm of adaptable kinetic facade is somehow the remains of a century of attempts to provide kinetic architecture with a clear position or agenda.

When designing sustainable facades, architects are primarily concerned with functional implications cost effectiveness, minimized energy utilization and FAR compliance - and secondarily concerned with aesthetic or experiential implications. After the most functional solution emerges within the design process, an experiential sensibility systematically emerges as a result of the tectonic and spatial needs of the facade.

The tangible outcome of this type of process usually exists as a handful of similar functional experiences and minimal variation in aesthetic sensibilities within the architecture. External architectural users might visualize some limited scope of facade mobility from the ground level of a building; internal architectural users might flip a few switches to enable the kinetics, stare at the facade through their office window, or simply ignore the existence of the architecture entirely due to its lack of experiential potential.

Other design fields such as interaction and communications design produce contemporary

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technologies that enable users to interface with products through real-time physical interactions that require kinetic interface and result in the mutable responses of virtual environments.



These products help people perform tasks at a higher rate and function more efficiently in their day-to-day lives. Unlike most architectural interfaces, oftentimes at these interactions are at the scale of the face, the hand or the fingertip. Contemporary UX design also offers the potential emergence of a symbiotic relationship between the technology and the user: as the user acquires new needs and more diverse functionality, the technology responds by automatically updating both its functional and aesthetic capabilities, all of which can be adjusted by the user parametrically.

ARGUMENT ABSTRACT_

Given the disparate relationship that exists amongst architect, building and user experience, the thesis proposes a framework for the (re)integration of component-based kinetics into architecture as an enabling tool for users to actively participate in sculpting architectural environments. Users should be given opportunities to evaluate and adjust architecture parametrically and in real-time to better suit their functional and aesthetic needs. This will allow architects to better communicate the vision of architecture to its users; the building will act as a vehicle for communication of functional and aesthetic value between its creator and operator. In response to user interface, the physical nature of the architecture might be both functionally diverse and phenomenologically generative within the parameters of a specific geometric and/or material system. The relationship between architecture and its functional capacity would have the potential to be more like hardware and software, consecutively.

ARGUMENT FRAMEWORK_

The thesis assumes the following as a framework towards the development of the argument for the use of kinetics as a new standard to be implanted within the architectural design process:

Architects are oftentimes (understandably) disconnected from the physical and tangible interaction between architectural users and the buildings they design.

The profession generally condones or ignores misuse of architecture and oftentimes does not have the ability to solve design problems after they are physically implemented in the built environment.

Architecture has the opportunity to become *more* than the definition of static space. It can become more functionally and aesthetically diverse than ever before.

The implementation of user-responsive, kinetic technologies into the formulation and implementation of architecture would stretch the limits of the architectural profession and make it more economical and competitive with technologies produced by other design fields.

As architects choose to implement kinetic, component-based paratonic systems into architecture, **users will better understand the breadth of functionality buildings can afford them** on a variety of scales.

It will also enable an array of phenomenological effects generated based on the mutability of interface rather than by any singular, a priori architectural intent.

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IV_A feedback loop can be established between architects, users and architecture via interactive paratonic surface design.

Architects will enable users a parametric framework for experience via paratonic systems with kinetic/ responsive components; users will learn and manipulate the proposed paratonic architectural system into personalized, hyper-functional architecture; the architecture will output performance data for the architect to update in the form of software and hardware solutions.

METHODOLOGY_

The thesis is reliant upon a research methodology that includes writing, drawing and making as the primary means for the development of the project. These modes of production will be applied to specific areas of architectural exploration that will act as a body of work towards proving the thesis argument.

The project will be divided into four phases:

- _Phase 1: Critical Knowledge base
- _Phase 2: Design and Prototyping
- _Phase 3: Architectural Design and Application
- _Phase 4: Documentation

Though these phases will have an impact on the chronological development of the thesis, it should be noted that the intent will be for each phase to be linked to the progress of the subsequent phases, and for each to be looped back into the project if necessary at any point in time. For example, only as the Critical Research phase comes to a close - including proposal scripting, reading and bibliography development, precedent and tectonic analyses, etc. - the Design and Prototyping phase can begin - including virtual design of geometric systems based off of typology and tectonics, modular component fabrication, composite surface fabrication, etc. Equally, the Documentation phase will be utilized throughout the entire breadth of the thesis project, and will become crucial in every step of the process.

framework illustrations I-IV

GRAPHIC COMING SOON how architecture is...

GRAPHIC COMING SOON

7_Typical relationship amongst architects, buildings and their users

how architecture could be

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GRAPHIC

COMING

SOON

Phases for the thesis methodology are defined as follows:

Phase 1_Critical Knowledgebase

1A_Reading and bibliography development **Description:** Reading and note-taking in order to get a strong grasp over the supporting ideas surrounding the thesis argument. **Tools:** N/A

Deliverables: Notes and bibliography

1B_Skillset development, hardware and software **Description:** Process of gaining developmental knowledge of the hardware and software platforms to be used later in the protoyping phase of the project. **Tools:** Arduino, Processing, Electronics

Deliverables: N/A

1C_Precedent analysis and synthesis of concept **Description:** Precedent analysis via 3D modeling, drawing and diagramming, writing.

Tools: Rhino, AutoCAD, Adobe Suite

Deliverables: Precedent Analysis portion of thesis book

1D_Early-stage drawing/diagramming of prototypes, inputs and outputs

Description: After research has been accumulated, synthesis should push towards drawings and diagrams of what will be made in Phase 2.

Tools: Rhino, Grasshopper, Adobe Suite

Deliverables: Drawings and diagrams towards mid-semester presentation of complete proposal

Phase 2_Design and Prototyping

2A_Geometric assimilation using computational/ parametric tools

Description: Grasshopper and drawings/diagrams of parametric geometry for skin systems based on use and tectonics. Testing the possibilities of geometry and how geometric implications can translate to functionality and understanding of use.

Tools: Rhino, Grasshopper, Adobe Suite **Deliverables:** Scripts, drawings/diagram section of thesis book related to geometry

2B_Modular design/component prototyping:

Description: Prototype development on the scale of a single actuator/unit. Representation of translation from geometry (2A) to form

Tools: Processing, Arduino, Physical Prototyping **Deliverables:** 3-4 modules using different actuator types to describe a full range of motion parameters towards use and functionality

2C_Use-diagrams and critical details:

Description: Synthesis of geometry assimilation and output of full paratonic systems drawings as well as function and use diagrams. Shows the full range of motion parameters of an entire skin as well as how the user can interact and interface with the overall field condition.

Tools: Rhino, Grasshopper, Adobe Suite

Deliverables: Diagrams and details of selected geometric systems fully integrated into an envelope assembly

2D_Composite paratonic surface design/prototyping: **Description:** Development of full scale prototypes of paratonic skin system with integrated, automated UX and electronics.

Tools: Processing, Arduino, Physical Prototyping **Deliverables:** (1) full scale prototype of paratonic skin system with integrated, automated UX and electronics (more if possible, or vignettes of some, depending on time frame)

Phase 3_Architectural Design and Application

3A_Concept - Adaptive Reuse/CoLab Live, Work

Description: Architectural application will focus on the redevelopment of an existing brownfield warehouse in Philadelphia as a collaborative use space including a recreational space, a lab/workshop space, and living areas for leaseholders. Intent is to keep program relatively small and latch onto the exist building's infrastructure as much as possible to focus almost solely on integration of paratonic, interactive skins.

Tools: Sketching, Drawing, Physical Modeling

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Deliverables: TBD

3B_Schematic

Description: Schematic design of the building, specifically focusing on the integration or juxtaposition of the paratonic systems with the architecture as a whole, defined geometrically and spatially.

Tools: Sketching, Drawing, Physical Modeling, Digital Modeling

Deliverables: TBD

3C_Design Development

Description: Development of critical details, drafting final documents, integrating speculative ideas into the architecture.

Tools: Sketching, Drawing, Physical Modeling, Digital Modeling

Deliverables: TBD

3D_Final Production **Description:** Final production of all materials, including

schedule/timeline for methodology

CoLab design and full scale prototypes, drawings and documentation

Tools: Sketching, Drawing, Physical Modeling, Digital Modeling

Deliverables: TBD

Phase 4_Documentation

1A_Continuing documentation

Description: Process documentation, in the form of website/ blog postings @ www.mjadler.com. **Tools:** N/A **Deliverables:** N/A

1B_Thesis book production

Description: Compilation of all thesis materials; one copy to be issued in the Fall semester and final in the Spring. **Tools:** N/A **Deliverables:** N/A

GRAPHIC COMING SOON

ADVISING TEAM*

Primary Advisors:

Dana Cupkova Jeremy Ficca Art Lubetz

Supporting Advisors:

Zach Ali Mary-Lou Arscott Eric Brockmeyer Josh Bard Dale Clifford Jacob Douenias Zack Jacobson-Weaver Madeline Gannon Pablo Garcia Ali Momeni

_TBD _TBD _TBD _TBD _TBD

DEFINITIONS

Coming soon.

INSPIRATION

Ned Kahn Yazdani Studio @ Cannon Design CASE (Center for Architecture Science and Ecology) Custom detailing work done on the CCLD at the USAFA while at SOM

"Nuit Blanche," a film by Arev Manoukian

PRECEDENT ANALYSIS_

A key part of the thesis will analyze a series of historical and contemporary precedents that have delved into the field of kinetics and/or paratonic surface design in architecture. This will give the project a strong foundation and a basis for evaluation of the body of work produced.

Listed below are these precedents, sorted alphabetically and not by relevance. Projects listed in bold are those that will be crucial to the precedent analysis sub phase.

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*Adivisors may vary; TBD based on confirmation of commitment to the project

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