U | RAD LAB

UNIVERSITY OF MIAMI
SCHOOL OF ARCHITECTURE

The spatial nature of ubiquitous computing directly implicates and empowers architecture, landscape and urban design.

U|RAD LAB

RAD-UM is a research unit housed at UM SoA. RAD-UM provides resources and expertise for project-based research on the spatial ramifications of embedded technology and ubiquitous computing. The research is premised on the notion that every building or landscape component can be equipped with computational power.

Projects at RAD-UM are set up for multi-disciplinary collaboration and for potential development in partnership with industry.

Director **Rodolphe El-Khoury**

Research Associate **Indrit Alushani**

Team

UMSoA

Rodolphe El-Khoury

Dean
University of Miami School of Architecture

Rodolphe el-Khoury is Dean of the University of Miami School of Architecture. He was Canada Research Chair at the University of Toronto, Head of Architecture at California College of the Arts, and Associate Professor at Harvard Graduate School of Design. He also taught at Columbia University, Rhode Island School of Design, and Princeton University and has had Visiting Professor appointments at MIT, University of Hong Kong, and Rice University (Cullinen Visiting Chair).

El-Khoury was trained as a historian and as a practitioner and continues to divide his time between scholarship and design. His books on eighteenth-century European architecture include The Little House, an Architectural Seduction, and See Through Ledoux; Architecture Theatre, and the Pursuit of Transparency. Books on contemporary architecture and urbanism include Monolithic Architecture, Architecture in Fashion, and States of Architecture in the Twenty-first Century: New Directions from the Shanghai Expo.

El-Khoury is partner in Khoury Levit Fong (KLF). His award-winning projects include Beirut Martyrs' Square (AIA San Francisco), MOCAPE, Shenzhen (AIA Cleveland), Market Square, Stratford (Boston Society of Architects). In 2012 KLF won international design competitions for a planning exhibition hall in Changzhi, China, and for the revitalization of Copley Square in Boston.

Indrit Alushani

Research Associate/RAD Lab Supervisor/Adjunct Professor
University of Miami School of Architecture

Indrit has completed his Masters in Architecture at the University of Toronto. His previous education was in Architectural Design, Fine Arts and Languages at the University of Toronto. Indrit has extensive experience in architectural design, construction and site management while expanding his skills in programming. He takes interest in finding creative ways to bridge art, architecture, and programming to create exciting experiences and further incite new areas for research. Indrit has been responsible for being a runner up of several international competitions such as: VModern Furniture Design, Young Architects Competition, Burning Man Black Rock City Honoraria. He has been responsible for the design and implementation of prominent projects both local and internationally, some noteworthy ones being: The Well and Eglinton Corsstown LRT (Toronto), Miami Beach Pedestrian Bridge and Five Park. He has worked at a number of different Architecture firms; in Toronto (Urban Strategies, NORR, Adamson Associates Architects) as well as in Miami (Arquitectonica International). Currently, Indrit works at the University of Miami's School of Architecture as Lecturer and Supervisor for RAD-UM.

Donnie Garcia-Navarro

Adjunct Professor/Researcher
University of Miami School of Architecture

Donnie Garcia-Navarro is a lecturer, researcher, and architectural designer who received his Bachelor of Architecture and Master of Science in Architecture from the University of Miami. Garcia-Navarro's academic training and research interests has led him to focus on healthcare and design, looking forward to how technology can bridge gaps in pressing everyday problems of our built environment. Given his three roles: lecturer, researcher, and architectural designer; he strives to blend the world of design and academia.

Through his projects and interdisciplinary approach to research and design he aims at creating new, innovative, technology embedded spaces while teaching and exposing students to new roles in architecture. Garcia-Navarro has numerous award-winning projects including Thesis of the Year Award for his project Atomized Hospital, the Medical Media Wall, a Kuala Lumpur high-rise tower, and a Student of the Year Award from AIA Miami. His interests in design have taken many paths from working in research projects for NASA/FSGC, AIA/AAH, being a designer at Bostwick Design Partnership, Array Architects, and 10 Design to being designer and researcher for RAD-UM.

Computing is migrating from dedicated static appliances to mobile devices, objects of everyday life, and physical environments thanks to increasingly proliferating microchips and ever-expanding information networks.

Research Affiliates

Esber Andiroglu
Lecturer SoA, CoE

Carmen Guerrero
Associate Dean of Strategic + Physical Planning SoA

Christopher Mader
Director, Software Engineering CCS

Landolf Rhode-Barbarigos
Assistant Professor CoE

Veruska Vasconez
Lecturer SoA

Joel Zysman
Director, Advanced Computing CCS

Yasmine Zeghar
Lecturer SoA

Max Jarosz
Fabrication Manager SoA

Research Assistants "2015-Present"

Claudia Aguado
Cristian Arrieta
Evan Bobo
Yanbin Chen
Stefani Fachini
Zhengrong Hu
Samantha Jimenez
Lorena Knezevic
Clarisse Lopez
Nika Miraffie
Flavia Macchiavello
Olha Khymytsia
Alexandra Nicole Dreybus
Pedro Ramos-Nieves
Pratyush Rustagi
Sheng Qian
Dylan Rzepka
Melodie Sanchez
Jack Shao
Conor Stuhrcke
Kelsey Wang
Hongyang Wang
Haochi Zhang
Peiyang Sang
Sophia Bachas-Daunert

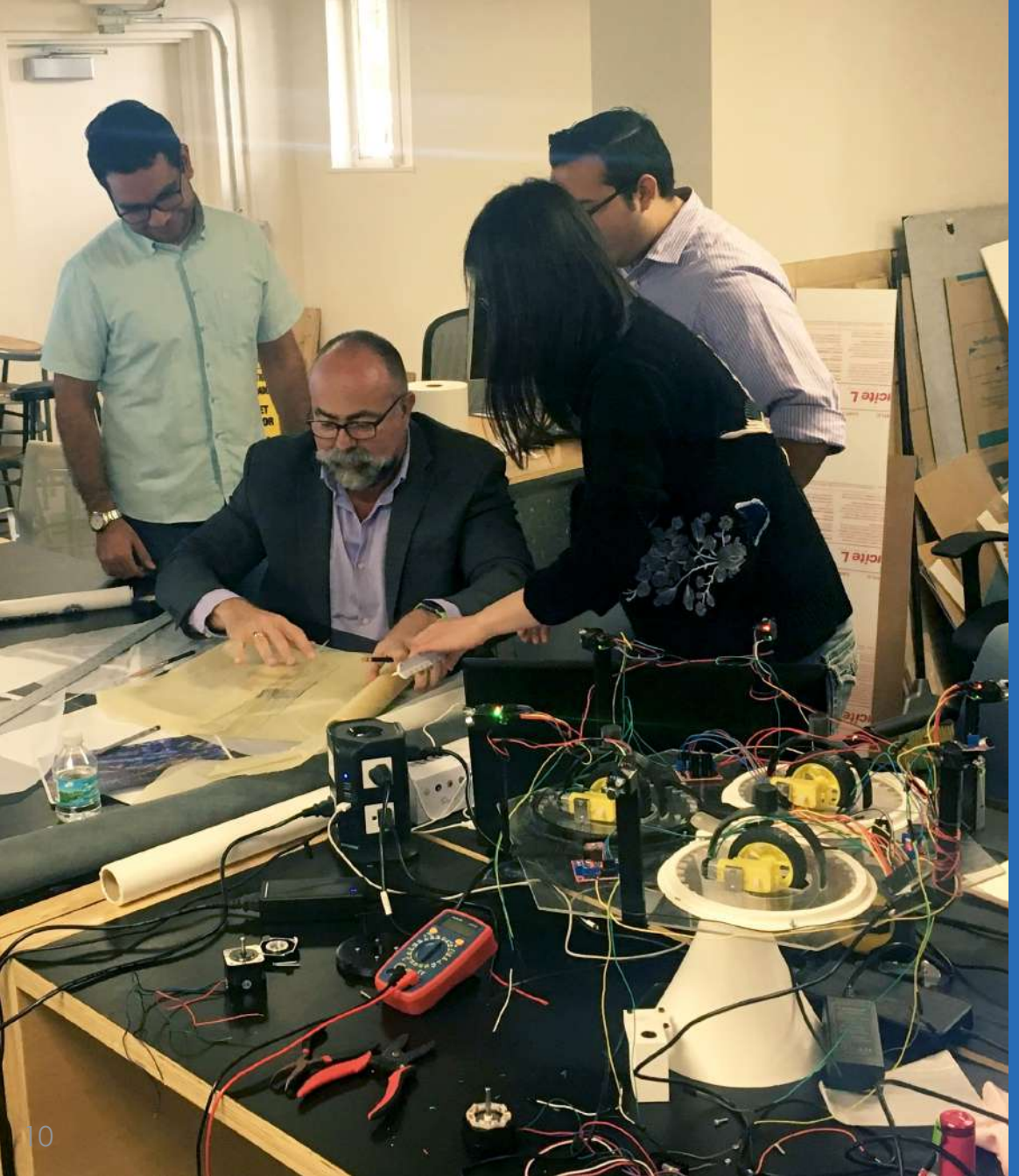
UMSoA

The UMSoA student team is a diverse group of students, which seeks to represent and embody the school's commitment to community engagement, propagate environmentally and socially responsible design, and further the positive growth of Miami's built environment and design community. The cultural and geographical diversity of the team's members is not only a representation of Miami's unique social landscape but it also brings a multitude of skills and aptitudes to the development of the interactive, immersive, technology-conscious, and forward-thinking Art Basel 2015 installation.

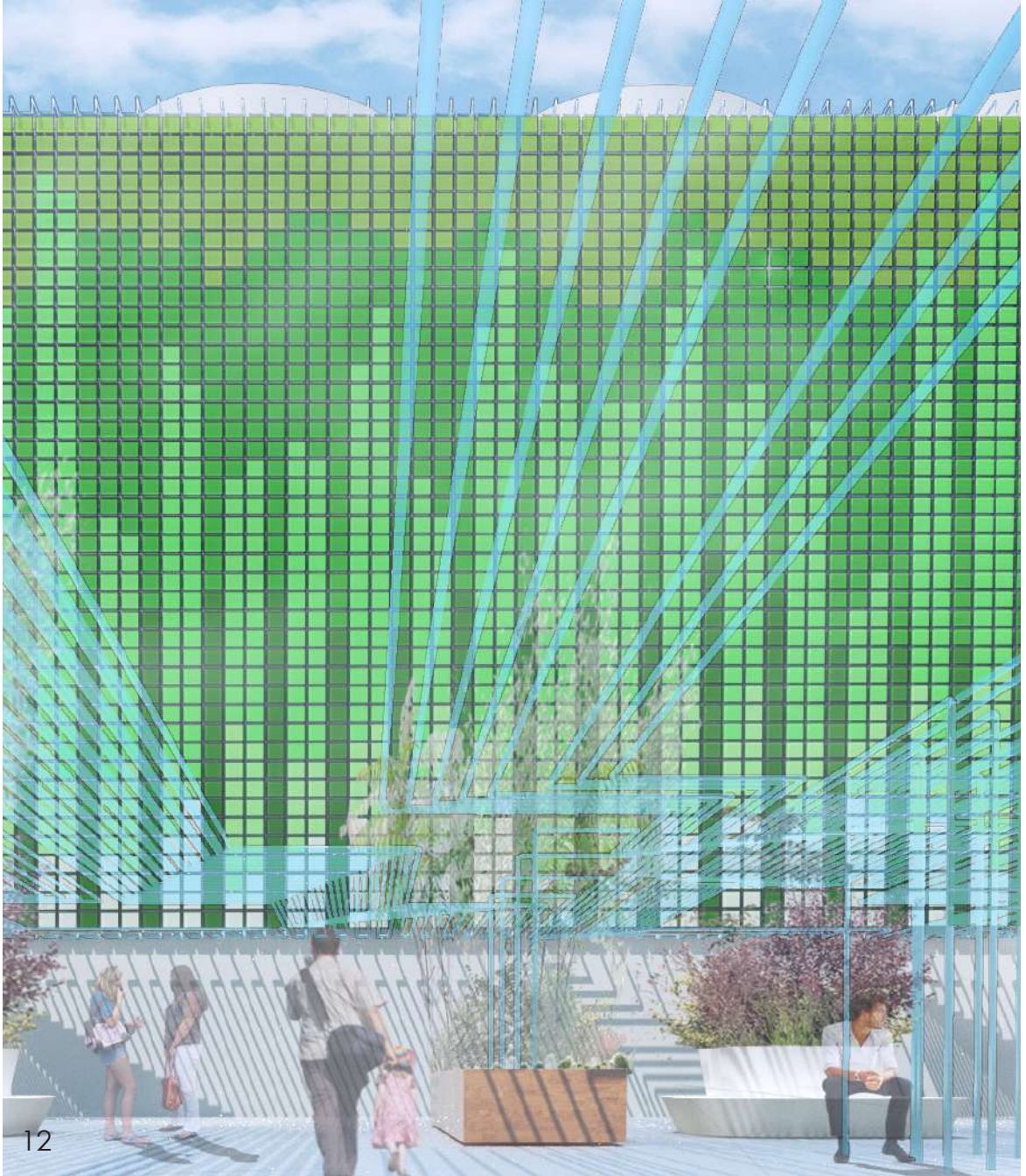
RAD-UM capitalizes on this potential, bringing research to bear on the built environment from a variety of fields that exploit the spatial consequences of distributed computing: responsive and interactive systems, augmented reality, embedded/situated technology, ambient intelligence, mobile computing and locative media.

Projects

2015 - 2021



Embedded Technology and the Internet of Things



12 Left: Perspective of the Bio-Display facade system.

Bio-Display

Lead: Rodolphe el-Khoury, Chris Chung, Veruska Vasconez

Team: Frank Chen, Nika Mirrafie, Claudia Aguado

Bio-Display is a sustainable facade system that uses algae as a visualization tool while also sequestering carbon and filtering water.

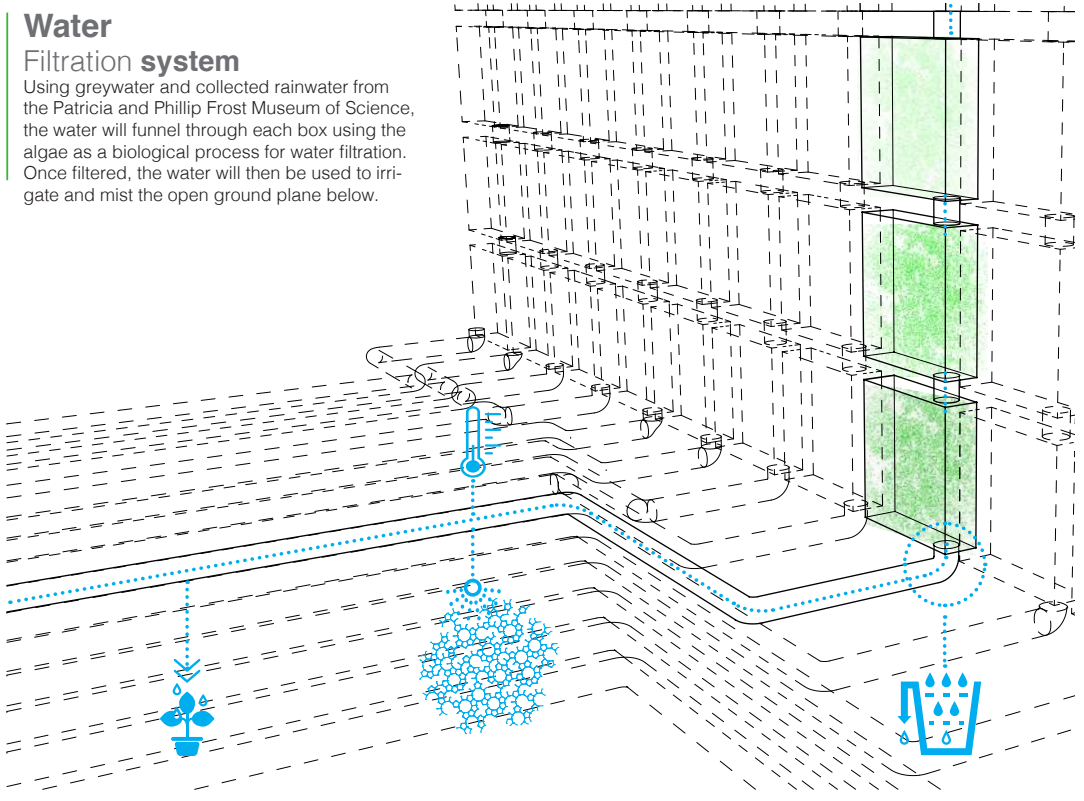
The Bio-Display is a sustainable facade system that uses algae as a visualization tool while also sequestering carbon and filtering water. The algae will be housed within a container with individually-controlled LEDs. By controlling the amount of light each module receives during the day and night, we will be able to control the density and appearance of the algae within each module.

The collection of algae boxes can become a living display on any open surface. Each algae box can be thought of as an individual pixel that when amalgamated across a large surface, a high resolution image appears.

Using greywater and collected rainwater from the building, the water will funnel through each box using the algae as a biological process for water filtration. Once filtered, the water will then be used to irrigate and mist the open ground plane below.
The water pipes from the algae boxes act as a roof over the plaza converging to create sheltered and open spaces.

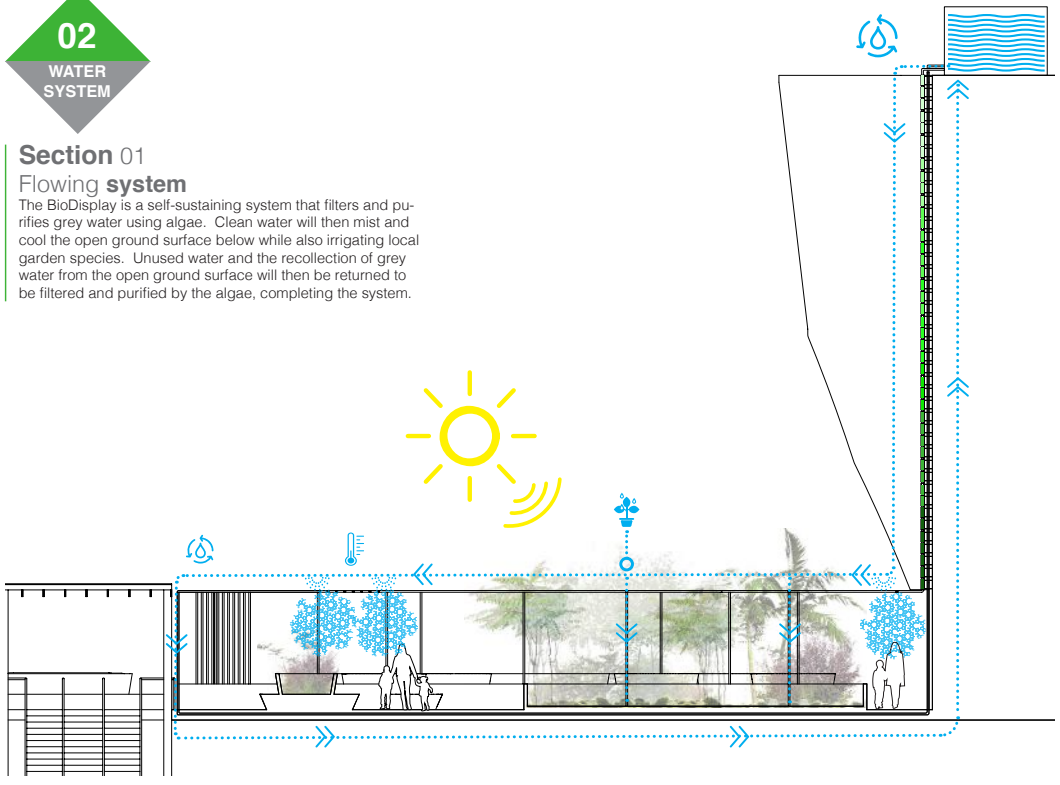
The BioDisplay is a self-sustaining system that filters and purifies grey water using algae. Clean water will then mist and cool the open ground surface below while also irrigating local garden species. Unused water and the recollection of grey water from the open ground surface will then be returned to be filtered and purified by the algae, completing the system.

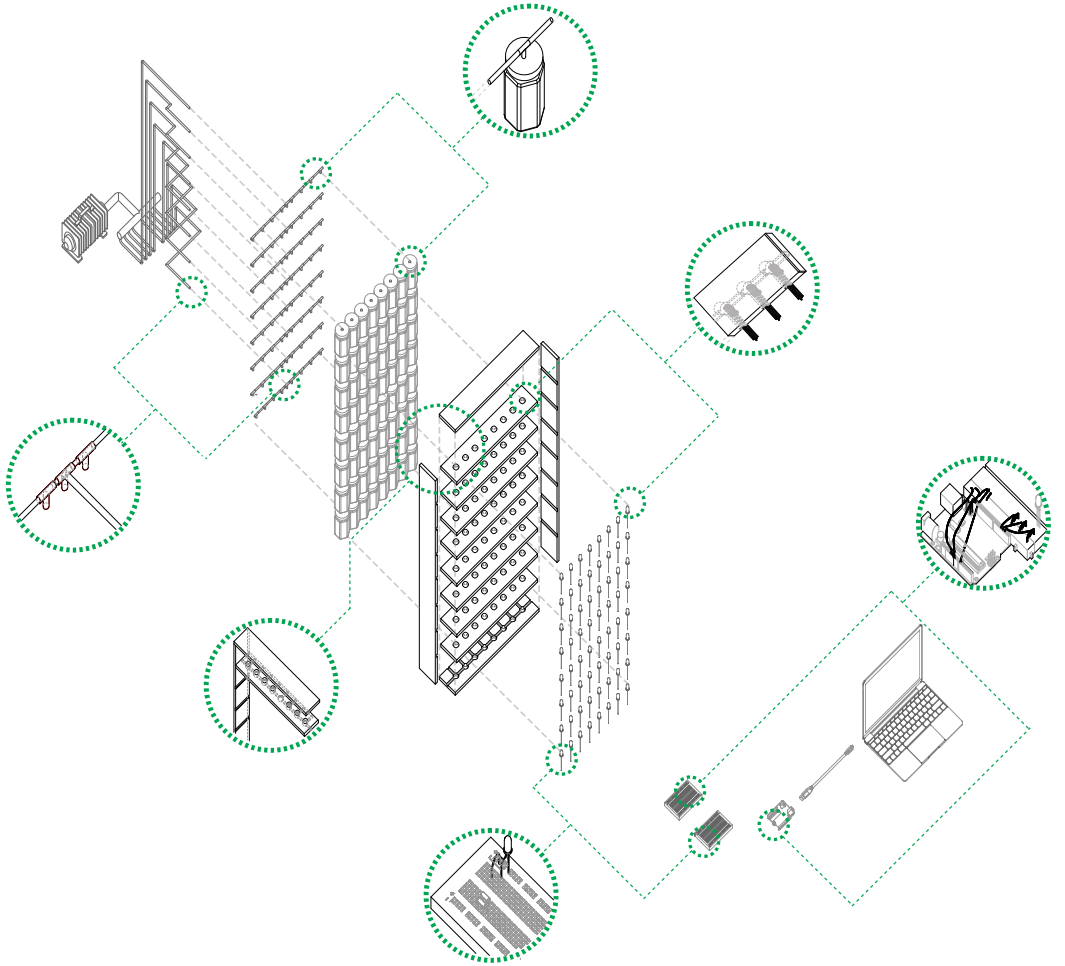
Water
Filtration **system**
Using greywater and collected rainwater from the Patricia and Phillip Frost Museum of Science, the water will funnel through each box using the algae as a biological process for water filtration. Once filtered, the water will then be used to irrigate and mist the open ground plane below.



02
WATER SYSTEM

Section 01
Flowing **system**
The BioDisplay is a self-sustaining system that filters and purifies grey water using algae. Clean water will then mist and cool the open ground surface below while also irrigating local garden species. Unused water and the recollection of grey water from the open ground surface will then be returned to be filtered and purified by the algae, completing the system.





16 Left: Image of Bio-Display prototype.

Low-Res Facade

Lead: Rodolphe el-Khoury, Chris Chung

Team: Conor Stuhrcke, Haochi Zhang

Low-Res Facade uses custom built rods with high power RGB leds to create a low-resolution display on an exterior wall of the new University of Miami School of Architecture's studio building.

Low-Res Facade builds upon the Aurora Room installation using similar rods suitable for the outdoors to create a low-resolution display. Resembling a colonnade, custom steel rods will be placed across an exterior wall of the new University of Miami School of Architecture, Thomas P. Murphy Design Studio building.

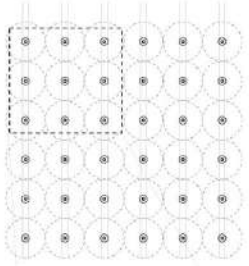
The display will be used to visualize the occupancy of the various public spaces across the School of Architecture campus by students. Updated in real-time, this "occupational heat map" will allow visitors to compare and contrast the usage of public spaces at the School of Architecture campus in the last 24 hours.

18 Left: Artist rendering of the Low-Res Facade on the side of the new Thomas P. Murphy Design Studio building.

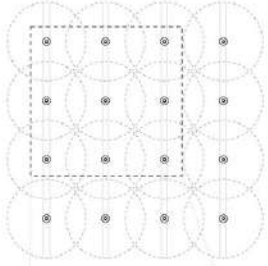
LED Grid Sizing

An investigation was undertaken to see the appropriate grid size and spacing between each high power RGB LED to inform the resolution and clarity of the image displayed.

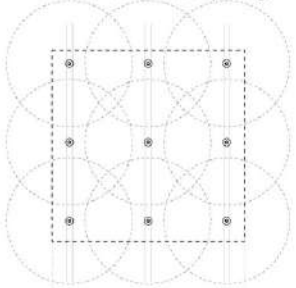
5" x 5" x 5" Grid Spacing



7.5" x 7.5" x 7.5" Grid Spacing

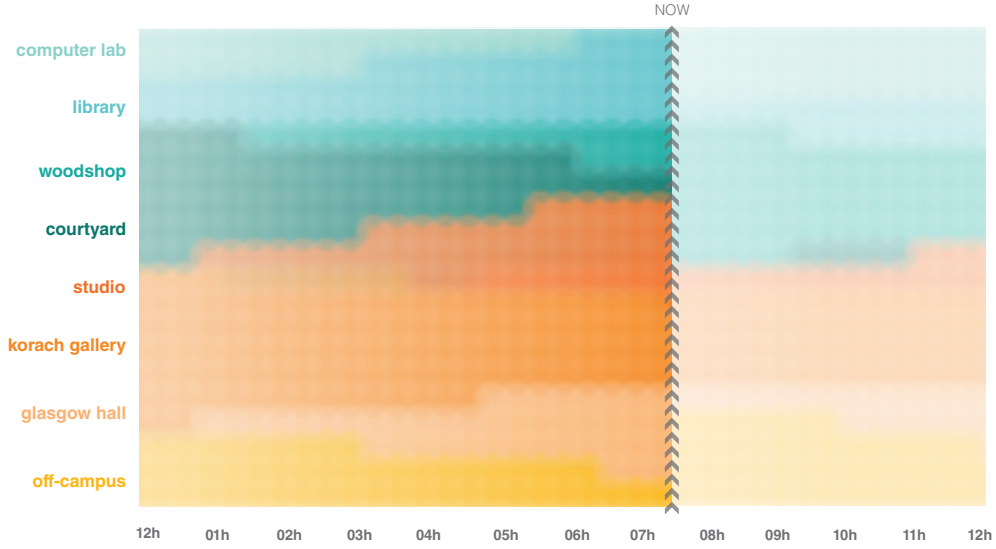


10" x 10" x 10" Grid Spacing



APPLICATION

Occupation heat map



Robotic Cloud

Lead: Rodolphe el-Khoury, Chris Chung, Veruska Vasconez

Team: Stefani Fachini, Melodie Sanchez, Hongyang Wang

Robotic Cloud utilizes drones to create dynamic and responsive shading for specific site conditions determined by current weather conditions, the number of visitors, and the visitor's desire.

Robotic Cloud utilizes the Sunbrella fabric as an inflatable, dynamic, mobile-shading device capable of shading one individual or large groups of people across the Miami Design District. It is a two-part, worker-hive system loosely inspired by the honey bee colony.

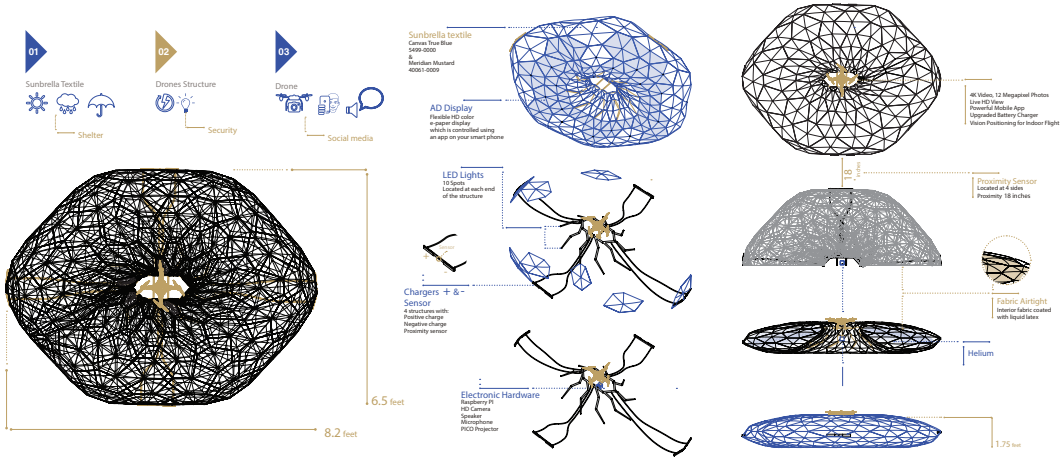
The workers, a.k.a Drones, are automated quadcopters that carry helium-inflated hexagons. These hexagon inflatables use Sunbrella marine fabrics that are engineered to withstand sun, wind, and rain. In order to make the fabric airtight, the Sunbrella fabric will be coated on the inside with liquid latex. The Drones are automated using an algorithm determined by the current weather conditions, swarming algorithms, and the visitor's desire. As a result, the Drones can be configured in a variety of ways from flocking together and casting large shaded areas like an overcast, to hovering individually so it can be used as a personal shading device. In addition, the quadcopter carries an electronic box holding a Raspberry Pi, camera, pico projector, speaker, and microphone. The addition of these electronic devices gives the Drones greater flexibility to respond and communicate with the visitor's desires and needs. The outer edges of the hexagon inflatable are fitted with proximity sensors as well as cathode and anode conductors to be used for charging upon physical contact.

The hives, a.k.a Docking Towers, are independent columns installed throughout the Miami Design District that store and charge the Drones. Each Docking Tower is outfitted with a micro-wind turbine at the top to charge the Drones using wind power. The power is delivered to each Drone by cathode and anode rods placed on each side of the column.

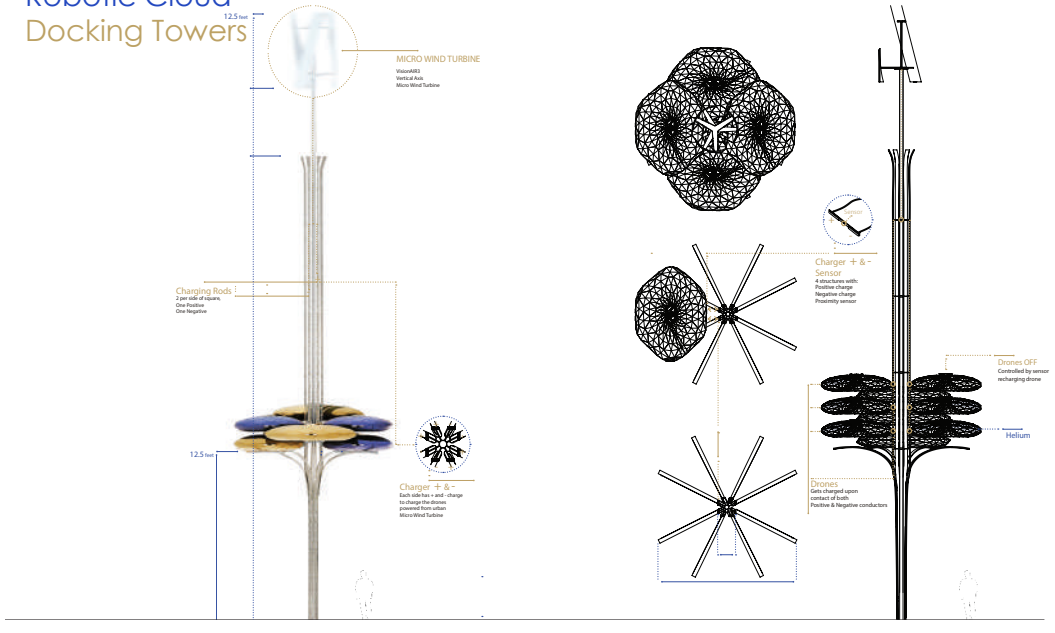
As a result, Robotic Cloud proposes a dynamic shading system capable of providing shade for a wide range of conditions at the Miami Design District.

22 Left: Artist rendering of Robotic Cloud providing dynamic shading.

Robotic Cloud
Drones



Robotic Cloud
Docking Towers



Robotic Lounge

Lead: Rodolphe el-Khoury, Chris Chung, Zhengrong Hu

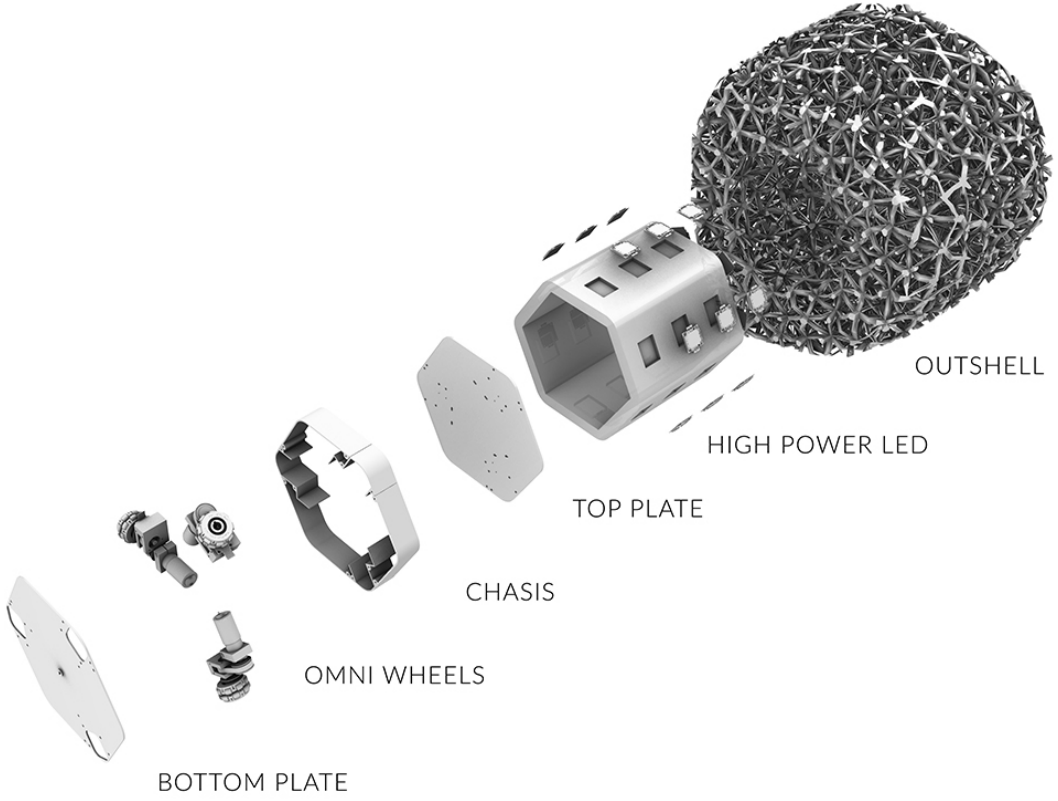
Team: Donnie Garcia-Navarro, Dylan Rzepka, Cristian Arietta

A collection of these ottomans is to be deployed within indoor public spaces; and according to its algorithmic behavior, will provide seating according to the number of individuals within the space and their respective positions.

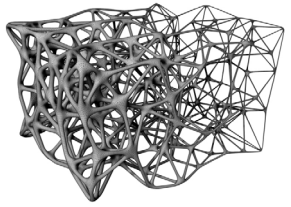
Robotic Lounge belongs to a line of smart furniture developed for indoor semi-public spaces such as hotel lobbies and convention centers. Picture a collection of these ottomans roaming randomly like tumbleweed—in fact tumbleweed was the inspiration for their biomimetic form. They drift about until someone or a group of people stops moving. That's the trigger for the aimless tumbleweed to switch to a swarm logic and converge on that person to offer a seat and create an instant lounge for people to congregate and interact. Of course people can decline the invitation and summon their own seat/lounge by standing still elsewhere.
The behavior we want to prompt among people in public or semi-public places is something that we mirror and embed into the pattern and kinetic features of the furniture and public infrastructure. The flocking behavior built into the furniture's MO is that which nudges, that which shepherds us into an instant micro-community.

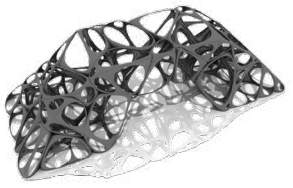
A number of alternative algorithmic behavioral studies were conducted, investigating both top-down and bottom-up system approaches. Examples of bottom-up system approaches include behaviors that evoke similarities with pet animal behavior; if an individual was to come within proximity to an ottoman, the ottoman would follow the individual until it was either being used or it would leave if the individual was idle after a certain period of time. Alternatively, ottomans could be called upon using sound, in which chairs would react and travel to sound that was above a certain threshold. Top-down approaches, while more efficient, require more infrastructural resources and initial setup. In this case, ottomans would get directions from a central server to move to specific individuals and provide specific seating arrangements where appropriate.

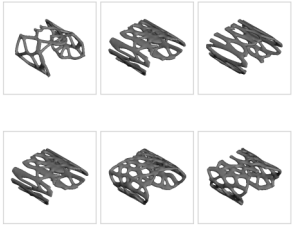
26 Left: Artist endering of Robotic Lounge in a hotel lobby.



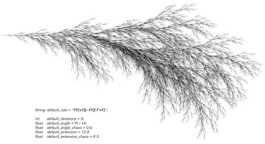
Formal Studies

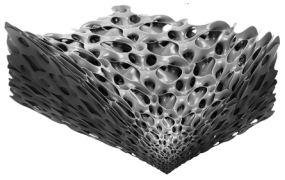

Lattice System


Voronoi 3D


Biomorpher


Modified L-System


L-System


Pufferfish

Density Studies

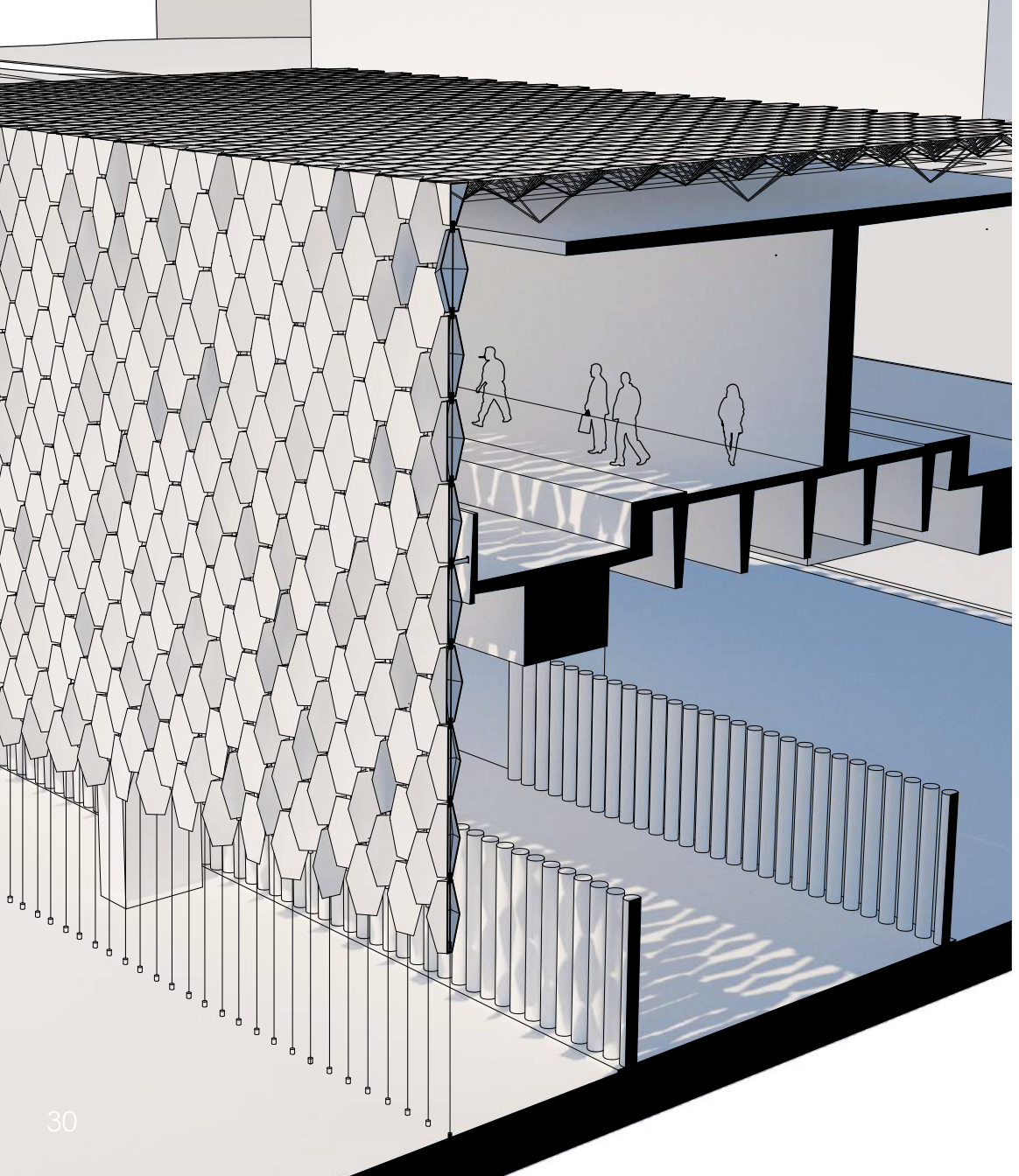

300 points


500 points


800 points


1500 points

Volume + Contour Studies



MyEnergy

Lead: Rodolphe el-Khoury, Chris Chung, Zhengrong Hu

Team: Donnie Garcia-Navarro, Dylan Rzepka

Both a monumental facade and a renewable energy source, MyEnergy connects users to individual solar panels in which users are responsible for the rotation and consequent efficiency of their respective solar panel; and by extension the power output of the entire solar panel array depends on the collective acitivy of the community.

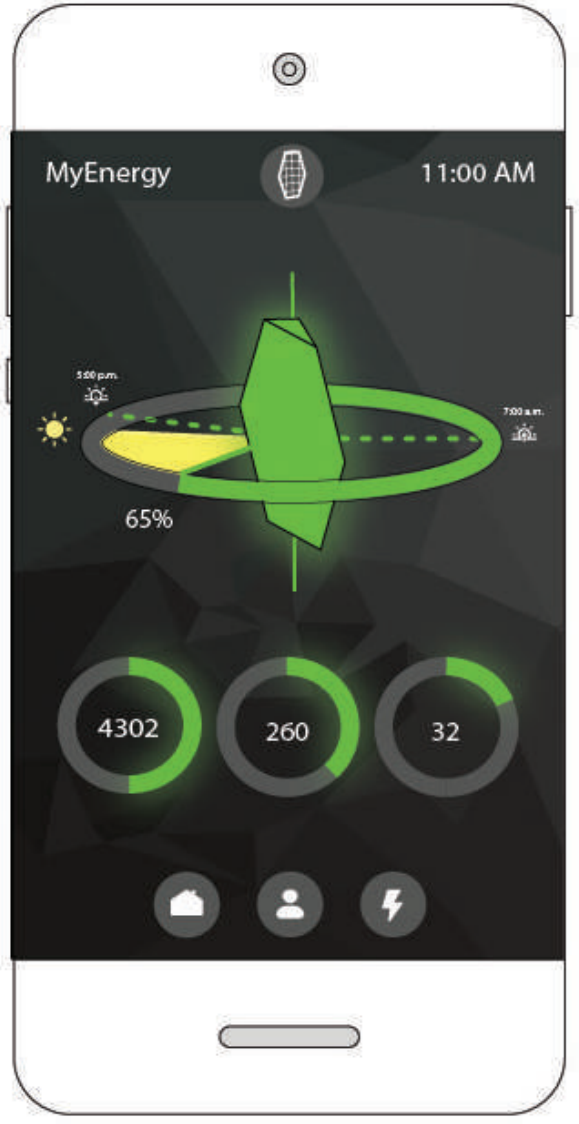
MyEnergy is a photovoltaic array that envelops the University of Miami Metrorail station and powers The Underline – a 10-mile linear park and urban trail below Miami's Metrorail system. It is both, a monumental façade and a renewable energy source.

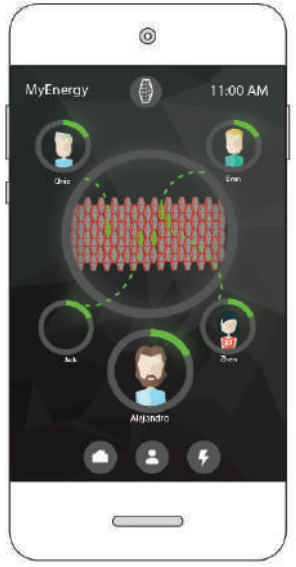
The array's panels rotate throughout the day for optimal solar orientation and maximum efficiency but their motion is correlated to the activity of an assigned individual user of The Underline. A user has to keep pace with their daily activity targets – walking, running, biking etc.— for their dedicated panel to keep up with the motion of the sun. Each user "owns" a discrete panel and they are responsible for their rotation and consequent efficiency; by extension the power output of the entire array depends on the collective activity of the community. At night, the movement of the user triggers the solar panel module to emit energy in the form of light – providing a glimpse into the community's collective nocturnal status. An APP will mediate the relationship between individuals and MyEnergy, communicating data about how many calories have been burned and how much solar energy has been collected. In addition, the APP allows users to compare and contrast their progress and contribution with their peers and friends. Though inefficient solar energy collection will arise, it is a small price to pay for overall awareness and contribution to both the individual's well-being, and the community's energy consumption and collection.

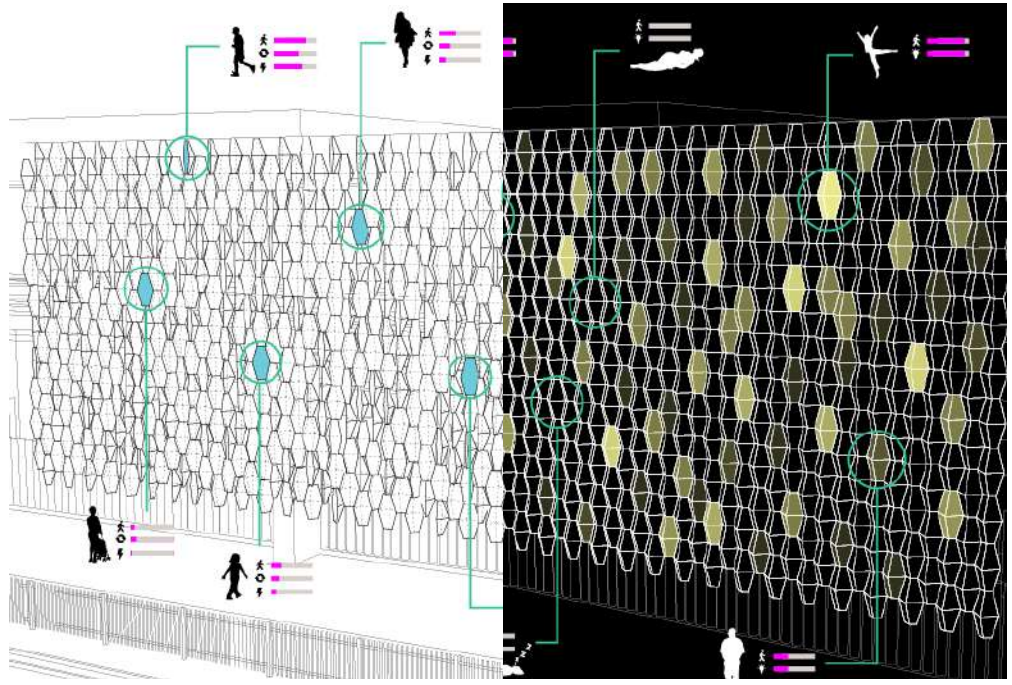
Each module is designed as a triangular prism with each face as an elongated hexagon. The hexagonal profile minimizes the amount of shade to be casted on adjacent modules. While the front face houses the solar-panel, the two back faces allow for images to be displayed that can be seen as the module rotates throughout the day. As MyEnergy faces a highly congested street that serves as a main vehicular artery for Coral Gables, this provides the opportunity for advertising revenue to help support the maintenance of MyEnergy and The Underline.

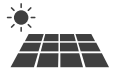
Through the use of technology, public amenities can be individually distributed to members of the community empowering residents to actively engage and contribute back to the community in meaningful ways. MyEnergy provides the opportunity to engage the surrounding community, promote community wellness, provide a source of sustainable energy, generate revenue from advertising while visualizing the community's nocturnal activity.

30 Left: Artist rendering of the photovoltaic solar panel array of MyEnergy.

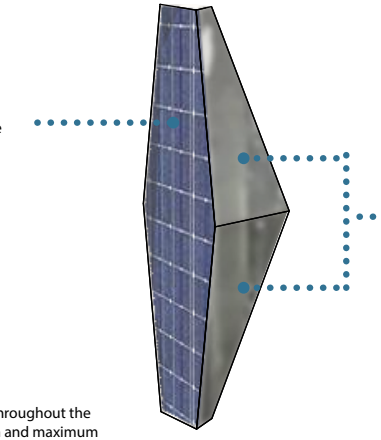




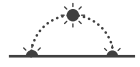




Designed with a hexagon profile, the shape of the module minimizes the amount of shade casted on adjacent modules.



The back of the module allows for images to be displayed that can be seen as the module rotates throughout the day. This provides the opportunity for advertising revenue to help support the maintenance of MyEnergy and The Underline.



The MyEnergy module rotates throughout the day for optimal solar orientation and maximum efficiency but their motion is correlated to the activity of an assigned individual user of The Underline. A user has to keep pace with their daily activity targets - walking, running, biking etc. - for their dedicated panel to keep up with the motion of the sun.

Hulum

Lead: Rodolphe el-Khoury, Chris Chung, Zhengrong Hu

Team: Donnie Garcia-Navarro, Dylan Rzepka, Sheng Qian

Designed to work with the Philips Hue light bulbs and platform, Hulum separates lighting into 3 separate use cases - functional lighting, visualization lighting, and ambient lighting.

With the increasing popularity of wireless colour-changing light bulbs - ie. Philips Hue - these light-bulbs don't particularly serve well as a functional light bulb; one can imagine that when trying to read a book using their Philips Hue light bulb only to continuously flash red according to fluctuations with a specified stock and its stock price. Alternatively, with the various third-party applications developed for the Philips Hue light bulbs, it is helpful to visualize specific data, or to create atmospheric lighting or moods within a space.

As a result, Hulum is designed to separate lighting into 3 separate use cases - functional lighting, visualization lighting, and ambient lighting.

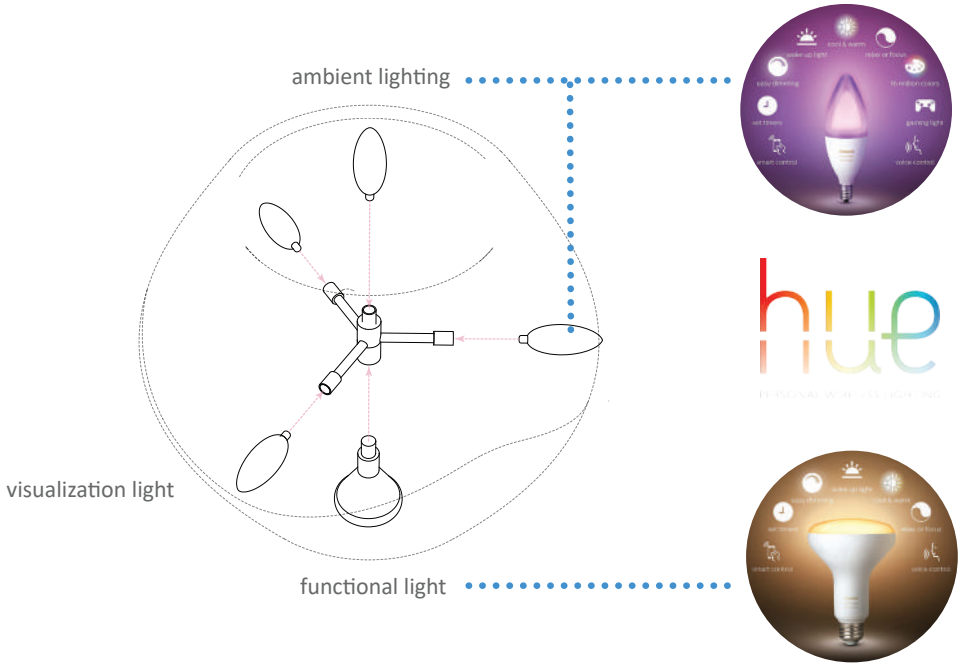
Functional lighting is the downward spotlight from the Hulum lamp, that offers lighting for functional purposes - activities and tasks that require consistent lighting to help maximize productivity - in which lighting is limited to only cool or warm white light.

Visualization lighting is the illumination of the Hulum shell, in which Philips Hue light bulbs are used to communicate some type of information or data that is connected through its various third-party applications, ie. stock information, noise levels, weather conditions etc.

Ambient lighting is the upward spotlight from the Hulum lamp that illuminates the overall room or space. This lighting is used to create a desired mood or ambience for the space.

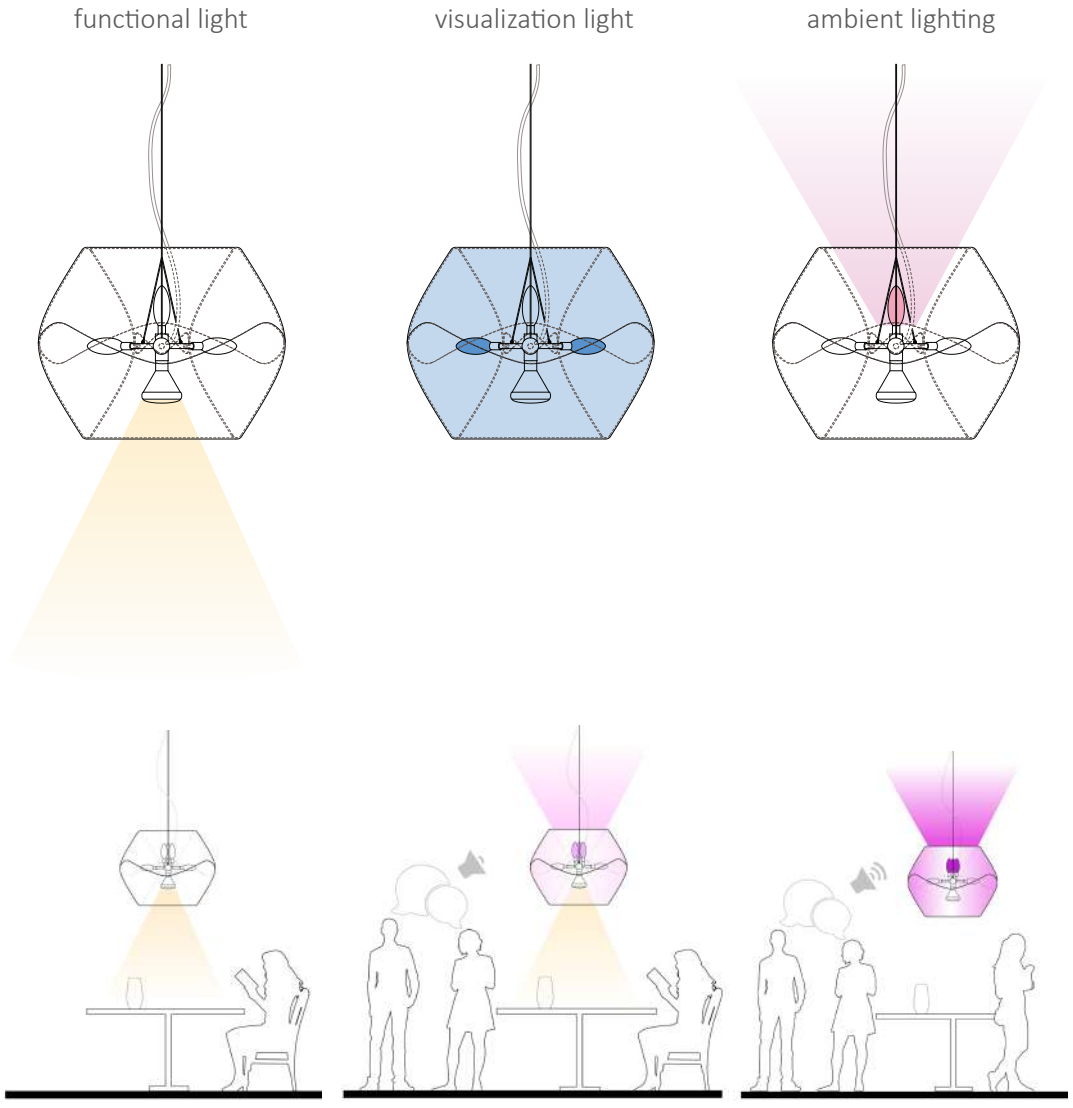
Shaped like a torus, Hulum can hold up to 7 Philips Hue light bulbs (6 candelabras and 1 flood lamp), however, it is not necessary to use all 7 light sockets.

34 Left: Artist rendering of Hulum.



Prototype

Prototype Halves



Health Hub

Lead: Rodolphe el-Khoury, Donnie Garcia-Navarro, Dr. Sylvia Daunert, Dr. Nick Tsinoremas, Dr. Yelena Yesha, Dr. Sapna Deo, Dr. Leonidas Bachas

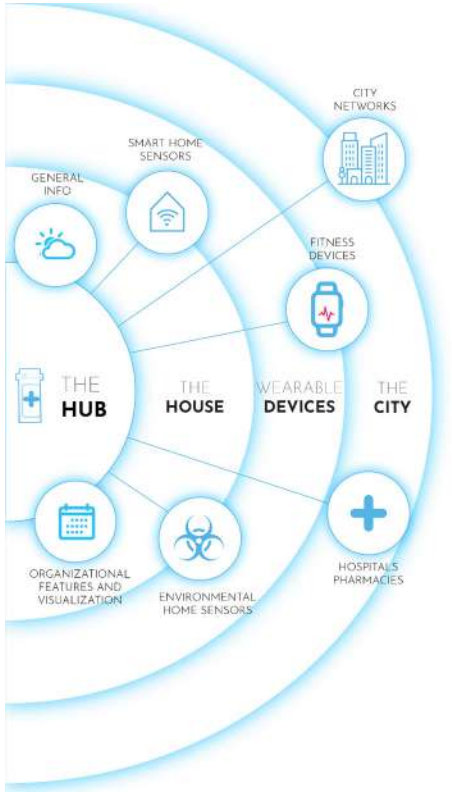
Team: Chris Chung, Sophia Bachas-Daunert, Indrit Alushani, Sheng Quian, Junren Tan, Dr. Chitvan Killawala, Dr. Mitsunori Ogihara, Dr. Gang Ren,

The Health Hub seeks to become part of your typical, everyday routine. Allowing a direct link and portal between you and your health. Through the use of readily available technology, the Hub will help its users with Vital signs, visual displays, medication tracking and scheduling, and virtual/telemedicine capabilities with your healthcare provider.

Surge in population, challenges in healthcare, and infectious diseases demand an architectural intervention that will address and distribute healthcare throughout the city, bringing its atomized components to our homes. We are currently living through a global pandemic that will reshape the way healthcare is delivered. Massive hospitals in our cities are being directly affected and are under siege in meeting the demands of our community.

This micro scaled intervention is aimed to take place in the typical home, highlighting the bathroom as the main intervention point during your morning routine. By introducing the smart medicine cabinet, the bathroom will become part of the smart systems in your home. Allowing the device to communicate with you via visual displays to show a range of data and information regarding your vitals, medication reminders, general information such as time, date, and weather, as well as having the ability to virtually connect to your healthcare provider to perform a number of comprehensive preliminary vitals check and exams.

This project seeks to be a functioning prototype which explores the capabilities of embedding a multi-purpose health station that encapsulates four main functions of the health and wellbeing platform: monitoring, treating, communicating, and data analytics.



38 Left: Artist rendering of Health Hub.

THE HEALTH HUB

Health Hub is a complete ecosystem that becomes the central access point to your health and your homes health.

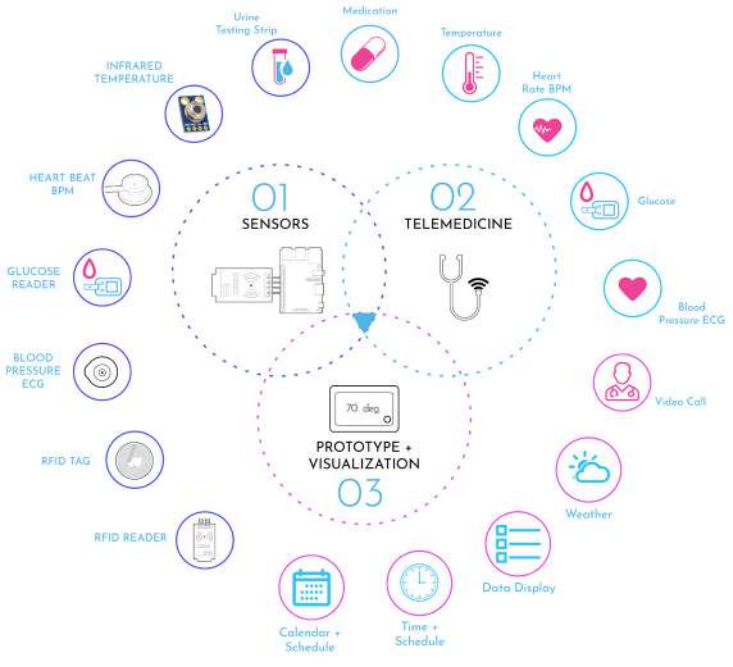
A MULTI-PURPOSE HEALTH STATION WITH 4 MAIN FUNCTIONS:

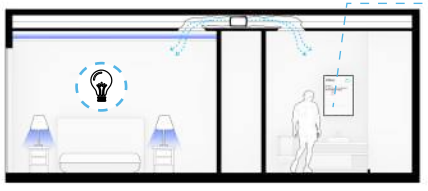
01 MONITORING

02 TREATING

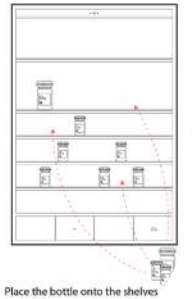
03 COMMUNICATION

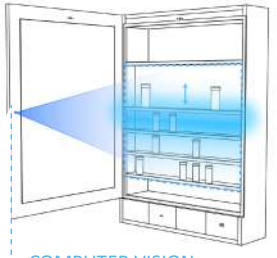
04 DATA ANALYTICS





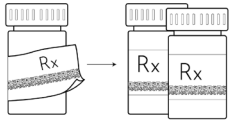
MEDICATION TRACKING AND REMINDER

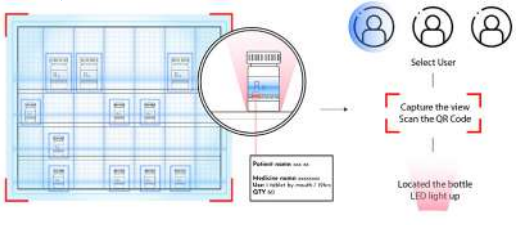




COMPUTER VISION FOR TRACKING

THE NETWORK





6 MODES OF THE MIRROR

MODE 1 | MIRROR

MODE 2 | TRANSPARENT

MODE 3 | INTERACTIVE

MODE 4 | TELEMEDICINE

MODE 5 | EXAMINATION

MODE 6 | DATA DISPLAY

Design Miami/ Lexus

Lead: Germane Barnes, Rodolphe el-Khoury, Indrit Alushani

Team: Matchless Build, Andrea Martinez, Isabella Adelhson, Malih Jenkins, Donnie Garcia-Navarro

RAD UM assisted in this installation by providing expertise in user generated color choices of the Lexus booth. Someone from accross the globe could have access to the exhibit app and select from a preset pallette which would then be selected by the Lexus team and then programmed by the RAD Lab.

Prof. Germane Barnes along with the University of Miami were approached by Lexus toe create an installation of their brand new LFZ electrified concept. The two main principles that needed to be carried accross the piece were: human centered design and carbon neutrality. It was critical for the work to be prioritizing the individual user.

The primary focus of the installation was the car which has been represented in a 1:1 scale wireframe version of the vehicle, lifted and hovering inside the space. On the perimeter of the car are found two swings in the shape of arches, representing the classical way of pedagogical thought at USoA. The final physical component was the furniture which combined the elements from the arches, art deco architecture and elements towards a carbon neutral future.

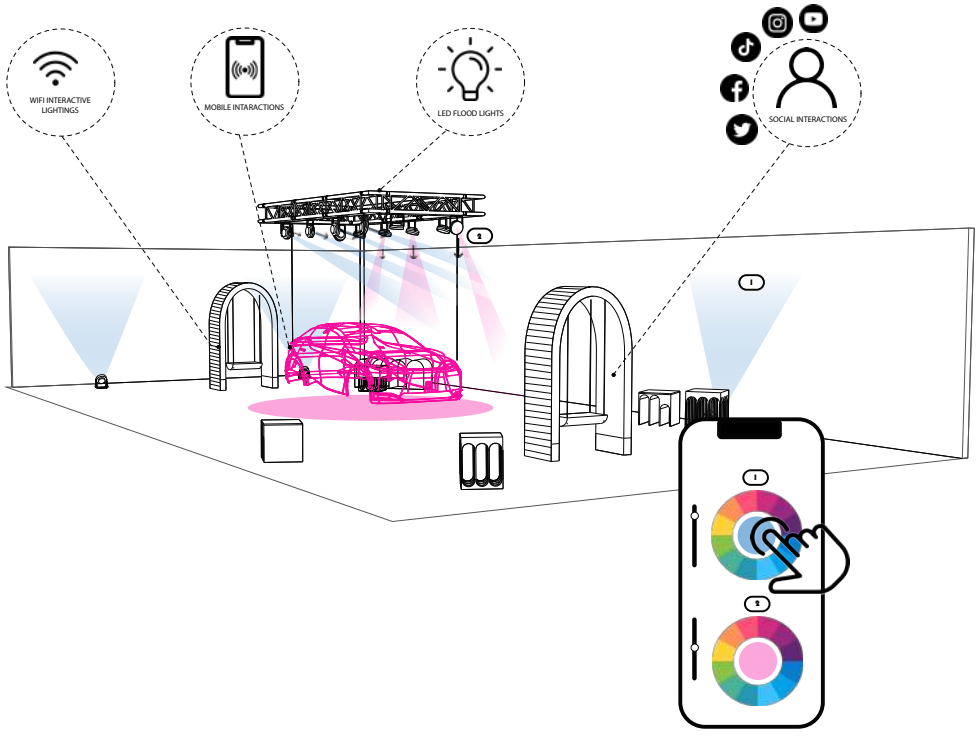
The Lexus team along with RAD created a platform to allow for people that are not physically present in the booth to engage with the design of the booth. The app gave users two elements to choose from, one being the lights on the wireframe car while the other being the lights that would color the wall.

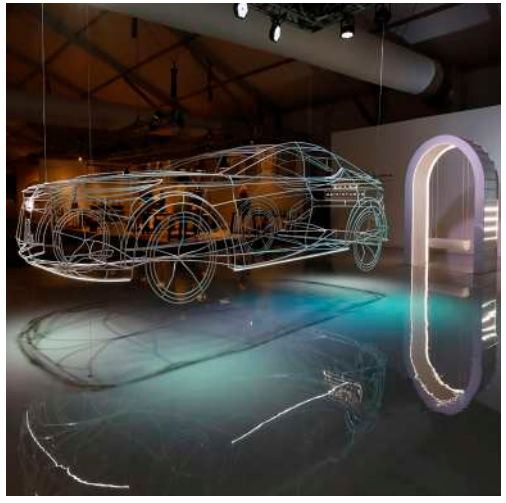
The color pallette consisted of the following colors: Grass Green, Amber, Cyan, Lavander, Pink, White.

Lexus had created a database in which it would collect the public's votes for the color pallette of a

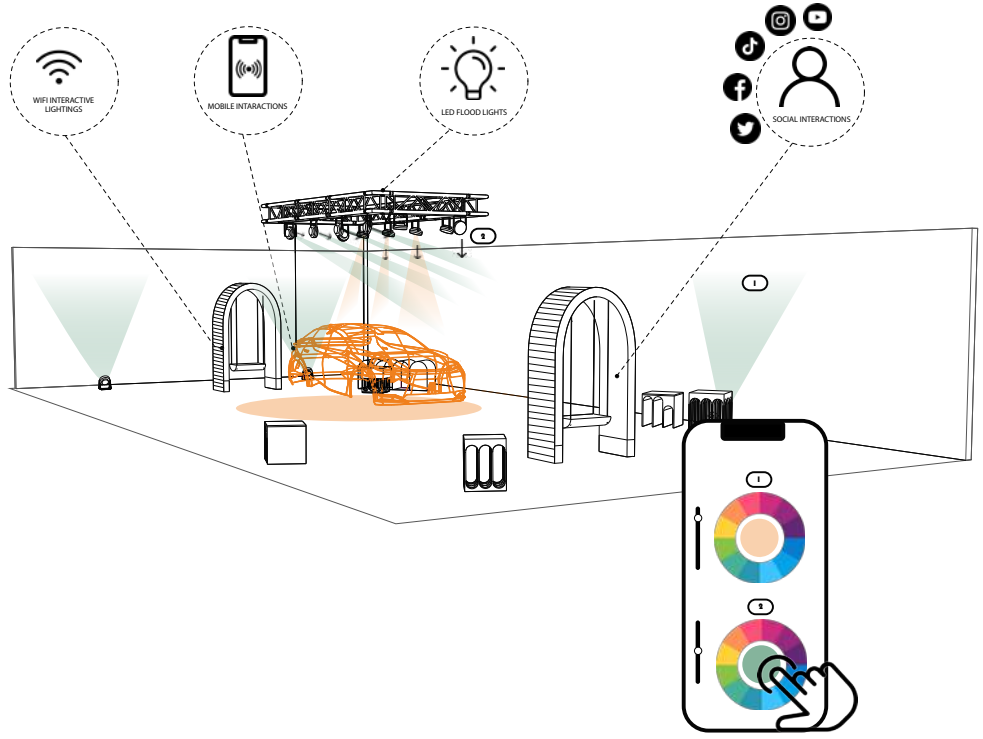
42 Left: Image from Design Miami/ Lexus Installation

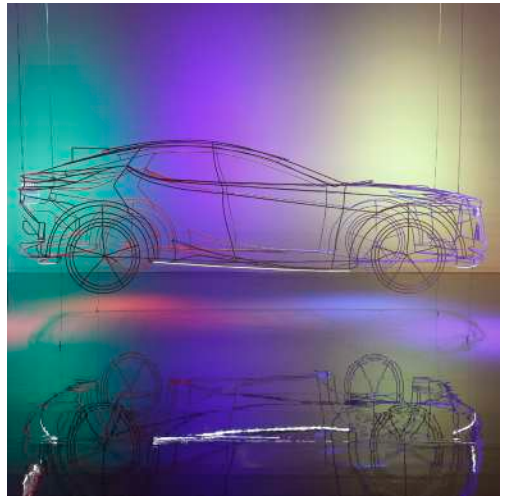
43 Right: Image from Lexus App for color selection





Particular day and then allow the RAD Lab to adjust the color pallatte based on the most appropriate scheme for that day. The exhibition ran from Dec 1-5th, on Nov. 30th and Dec. 1st the RGB lights ran in an automatic sequence rotating between all of the available colors in order to give the viewers a glimpse at what the installation would look like in that particular color scheme. The rotating lights had a setting which would fade in between transition making the visuals a lot smoother. The angle of the lights was aimed in such a way that the farthest lights





44 Left: The diagram shows a combination of blue and pink RGB lights from RAD Lab

45 Right: The diagram shows a combination of green and orange RGB lights from RAD Lab

Burning Man

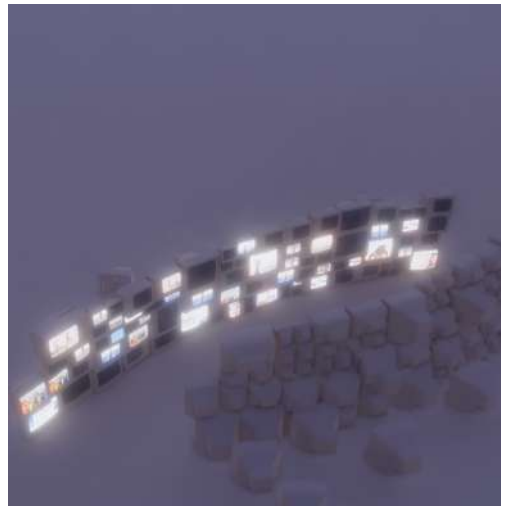
Lead: Rodolphe el-Khoury, Donnie Garcia-Navarro, Dr. Sylvia Daunert, Dr. Nick Tsinoremas, Dr. Yelena Yesha, Dr. Sapna Deo, Dr. Leonidas Bachas

Team: Chris Chung, Sophia Bachas-Daunert, Indrit Alushani, Sheng Quian, Junren Tan, Dr. Chitvan Killa-wala, Dr. Mitsunori Ogihara, Dr. Gang Ren,

Social media today plays a major part of everyone's form of communication, this has been furthered through the rise and decline of covid-19. The physical installation would presentitself as a surrealist mirage in the environment –it would be a tangible structure that would hold the metaphysical conversations of those surrounding it. The project would allow those nearest to converse and dream collectively in a piece that is stuck intime.

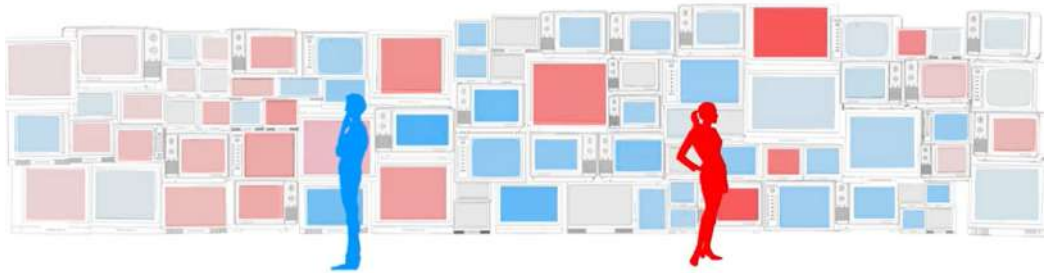
Physical Description
The project consists of stacked TV's from different eras. The TVs are painted in a beige/sand color so they can camouflage with the environment. The TVs are not only of different styles but different sizes. The larger TVs usually sit at the bottom to provide a stronger base, the smaller TVs rest at the top. There is a large vertical truss at the corner of the project that carries a radio dish. This is done in order to provide satellite connection for the phones. The stack of TVs creates a curved wall, and it is mirrored on the other side. The latter is slightly shifted in the x-direction. There are also 2 scanners that scan the mobile phones for the people interested in showcasing their social media feed.

The philosophy of your piece
Self-expression, in its purest forms, will be the catalyst for social activity as we move into 2022. Social media today plays a major part of everyone's form of communication, this has been furthered through the rise and decline of covid-19. The physical installation would presentitself as a surrealist mirage in the environment –it would be a tangible structure that would hold the metaphysical conversations of those surrounding it. The project would allow those nearest to converse and dream collectively in a piece that is stuck intime..

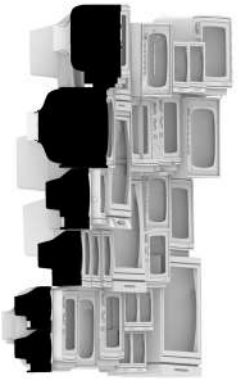


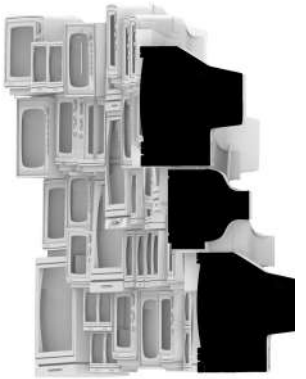
46 Left: The image shows a 3d view of an exebition

47 Right: The axonometric view



Mission
The main idea is that the TV has been an object of commodification, where since its inception it has been a means to advertise products, goods and shows. It has been a means to quite often idolize people from across the world, ones whom we couldn't connect in person. This project reverses that where it repurposes the TV in order to promote your neighbor, your fellow citizen at the Black Rock City.





48 Left: The diagram shows the main elevation

49 Right: The 3d image shows installation during the day

Smart Cities

Zenciti Research Unit

RAD LAB x Urbética

In 2016 RAD and the Center for Computational Science (CCS) were contracted by Ubertica to design Zenciti, a smart city adjacent to Yucatán Science and Technology Park. RAD and Urbetica, signed a gift agreement in June 2019 to support research on smart city design and planning, extending the work done on Zenciti.

Urbetica, is driven by a deep passion to apply innovative technologies to everyday life and wants the School of Architecture to utilize its innovative knowledge and creative thinking towards the advancement of the Zenciti living lab as a smart city platform and model for future smart cities.

With Zenciti, we had the rare opportunity of designing a smart city in Yucatan from scratch, from urban planning and design, to smart infrastructure and services. The support of Urbetica, the development force behind Zenciti, now allows us to continue to research and innovate in this field, at the confluence of urbanism and technology.

Zenciti

Lead: Rodolphe el-Khoury

Team: Robert Levit, Carie Penabad, Adib Cure, Christopher Mader, Joel Zysman, Mark Troen, Juhong Park, Wangda Zuo, Landolf Rhode-Barbarigos, Veruska Vasconez, Chris Chung, Nashid Nabian, Zhao Pei.

Zenciti departs from existing models to prototype from the ground up an innovative platform for new forms of governance, transactions, and culture: a new way of life. It is a living laboratory for open-source research on sustainable development, wholesome living, and participatory governance.

Located in Yucatan, Mexico, Zenciti's public spaces, institutions, and businesses are designed as hybrid environments that bridges between physical space - a public garden, a classroom, or a conference room and the vast network of services and activities online. Zenciti's hybrid environments do more than provide high-speed internet access-a ubiquitous municipal service in Zenciti. They integrate the Internet of Things, Pervasive Computing, Augmented Reality, and Telepresence to bring web-based content and activities to people and places in tangible, interactive, and impactful ways.

Public infrastructure, spaces and amenities are by definition standardized for universal consistent use. Not in Zenciti, where digital technology allows for individuated customization. In Zenciti, residents can configure the city to meet their individual needs with Z-Book: a digital platform featuring apps and interfaces that enables control over a variety of settings, ranging from authorization for access to different neighborhoods and facilities, to preferences defining the shopping experience, and priorities in the use of public transportation.

In Zenciti, infrastructure and services constitute a system that yields great benefits from the hyper-connectedness of its constitutent parts, much like how nature derives its efficiency and resilience for the densely-woven networks of its ecosystem; they come alive in a neural network of live feeds, correlating data with other systems, such as weather and security, and provide critical information for maintenance, safety, and well-being.

ZENCITI is a Startup City

Zenciti departs from existing models to prototype from the ground up an innovative platform for new forms of governance, transactions, and culture: a new way of life. It is a living laboratory for open-source research on sustainable development, wholesome living, and participatory governance.

ZENCITI is a Hybrid City

Zenciti's pubic spaces, institutions, and businesses are designed as hybrid environment that bridge between physical space—a public garden, a classroom, or a conference room and the vast network of services and activities online. Zenciti's hybrid environments do more than provide high-speed internet access—a ubiquitous municipal service in Zenciti. They integrate the Internet of Things, Pervasive Computing, Augmented Reality, and Telepresence to bring web-based content and activities to people and places in tangible, interactive, and impactful ways.

ZENCITI is a Customized City

Public infrastructure, spaces and amenities are by definition standardized for universal consistent use. Not in Zenciti where digital technology allows for individuated customization. In Zenciti, residents can configure the city to meet their individual needs with Z-Book: a digital platform featuring apps and interfaces that enables control over a variety of settings ranging from authorization for access to different neighborhoods and facilities, to preferences defining the shopping experience, and priorities in the use of public transportation.

ZENCITI is an Ecological City

In Zenciti infrastructure and services constitute a system of system that yields great benefits from the hyper-connectedness of its constituent parts, much like how nature derives its efficiency and resilience for the densely woven networks of its ecosystems. Roads, sidewalks, gardens, and gates constitute an ecosystem; they come alive in a neural network of live feeds, correlating data with other systems such as weather and security, and provide critical information for maintenance, safety, and wellbeing.

Park Share

Lead: Rodolphe el-Khoury, Christopher Chung

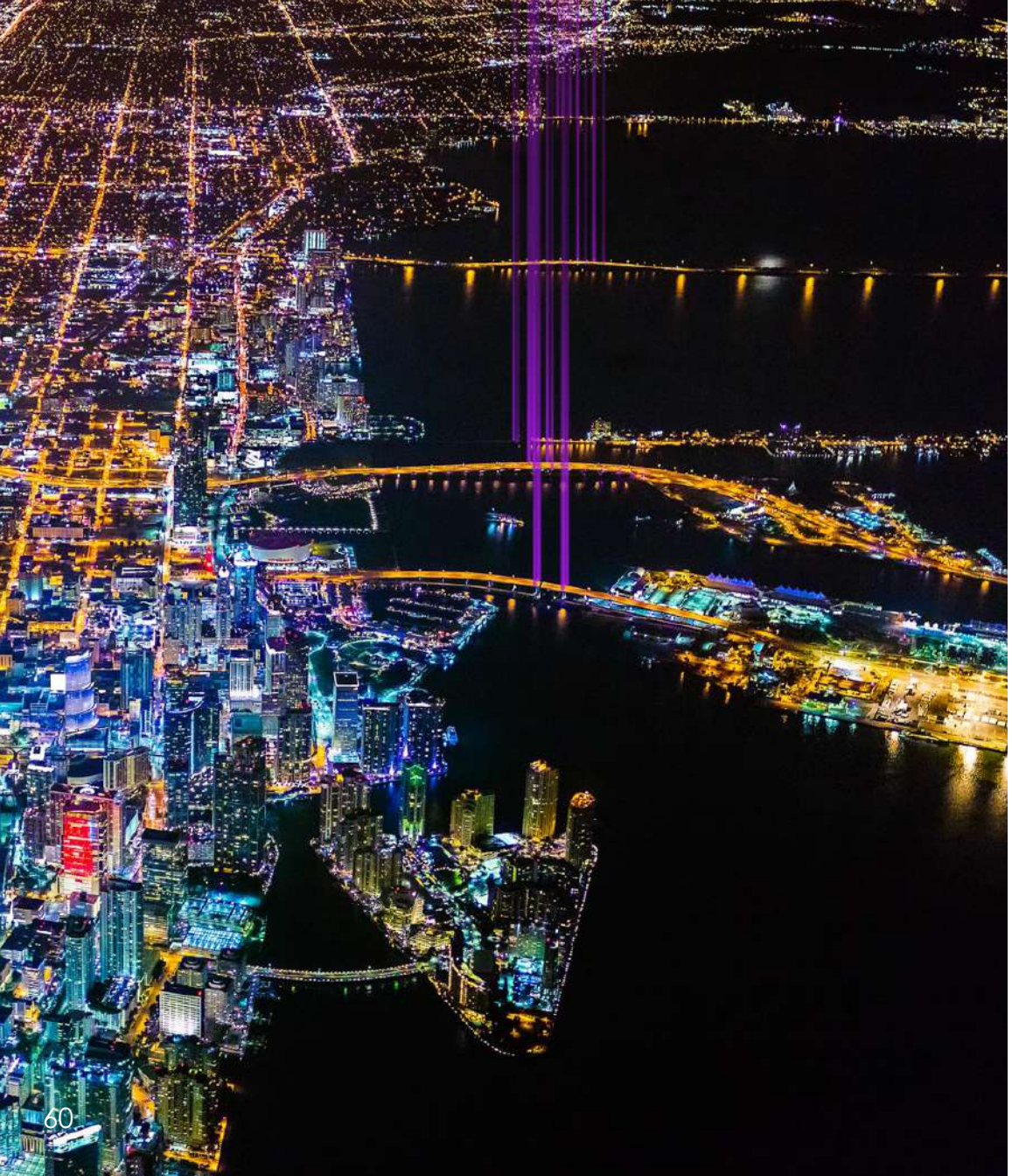
Team: Lorena Knezevic, Michael Alexander

PARK SHARE focuses on the parking spot. With private parking spots being used 50% of the time and the value of real-estate continuing to rise in New York City, a more efficient and economical use of parking can be implemented through a shared parking system.

With over 8 million people residing in New York and over 50 million people visiting New York each year, its transportation system is a network of complex infrastructural systems, including one of the largest subway systems in the world, an extensive bus system, and a fleet of taxis available at any time. With the autonomous car set to arrive, what will that mean for New York City? How can we ease in a smooth transition with the impending arrival of self-driving cars? How will they share the road with semi-autonomous cars? How does that impact parking?

PARK SHARE focuses on the parking spot. With private parking spots being used 50% of the time and the value of real-estate continuing to rise in New York City, a more efficient and economical use of parking can be implemented through a shared parking system. The introduction of the autonomous car and the subsequent co-ordination of large amounts of real-time spatial and infrastructure data allows for a more efficient and coordinated use of public and private parking spaces. Instead of paying for your own monthly parking spot, PARK SHARE finds parking for your car according to your preferences in accessibility, availability, and price. Individuals who own a parking spot can choose to loan out their parking spot in which PARK SHARE will use the parking spot for other cars, reimbursing the owner for the time the parking spot was used.

58 Left: Still image from video clip.



Smart City Public Lighting

Lead: Rodolphe el-Khoury, Chris Chung, Zhengrong Hu

Team: Donnie Garcia-Navarro, Dylan Rzepka

Searchlights placed on either side of the MacArthur Causeway and the 195 rhythmically contour the bridges, creating a colonnade of lights that can be seen from anywhere in Miami.

Using the MacArthur Causeway and the 195 highway as the sites for intervention, bright searchlights are placed on either side of the highways shooting straight up into the sky that rhythmically contour the bridges. This colonnade of lights can be seen from anywhere in Miami, allowing the lighting to become a visible landmark that can be used to get a sense of place and direction. The searchlights can vary in colour between blue and pink that help indicate the density and volume of cars that pass the bridges - blue indicating sparse vehicular traffic and pink indicating heavy congestion - while the searchlights "pulse" to identify the direction of traffic. Furthermore, during the event in which boats pass under each of the bridges, the nearest searchlights to the boat undercrossing intensify while all other searchlights fade out. As a result, this lighting intervention emphasizes the use of a variety of transportation methods while highlighting the two main arteries that connect Miami and Miami Beach.

60 Left: Artist rendering of the colonnade of lights along MacArthur Causeway.

Smart City Public Lighting

Lead: Rodolphe el-Khoury, Chris Chung, Zhengrong Hu

Team: Donnie Garcia-Navarro, Dylan Rzepka

Implemented underneath The Underline, the smart lighting system not only provides lighting for the urban trail, but improves pedestrian and bicyclist safety coordinating with the traffic lighting system on US 1.

The Underline is a 10-mile linear park and urban trail that runs from Coral Gables to downtown Miami. The smart lighting system that is implemented underneath the Underline not only provides lighting for the urban trail, but improves pedestrian and bicyclist safety. Running alongside The Underline is US 1, a heavily congested street that acts as the main vehicular artery from Coral Gables to downtown Miami. As a result, pedestrians, runners, and bicyclists, continually have to navigate from The Underline to traffic stops and cross walks which lead to a number of accidents. The smart lighting system proposed for the Underline communicates with US 1 traffic systems so that continuous pulses of light are coordinated with when pedestrians can cross the street. This helps occupants continue their running or biking throughout the Underline without having to pause and wait for the respective traffic lights so long as occupants remain under the pulse of light.

62 Left: Artist rendering of the smart lighting system underneath the Underline.

Workspaces for Tomorrow

Lead: Rodolphe el-Khoury, Chris Chung, Zhengrong Hu

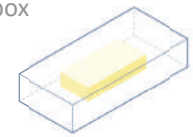
Team: Donnie Garcia-Navarro, Dylan Rzepka

Implemented underneath The Underline, the smart lighting system not only provides lighting for the urban trail, but improves pedestrian and bicyclist safety coordinating with the traffic lighting system on US 1.

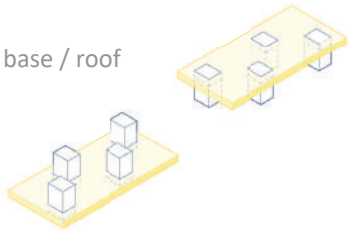
The Underline is a 10-mile linear park and urban trail that runs from Coral Gables to downtown Miami. The smart lighting system that is implemented underneath the Underline not only provides lighting for the urban trail, but improves pedestrian and bicyclist safety. Running alongside The Underline is US 1, a heavily congested street that acts as the main vehicular artery from Coral Gables to downtown Miami. As a result, pedestrians, runners, and bicyclists, continually have to navigate from The Underline to traffic stops and cross walks which lead to a number of accidents. The smart lighting system proposed for the Underline communicates with US 1 traffic systems so that continuous pulses of light are coordinated with when pedestrians can cross the street. This helps occupants continue their running or biking throughout the Underline without having to pause and wait for the respective traffic lights so long as occupants remain under the pulse of light.

64 Left: Rendering of the Workspaces for Tomorrow green roof space

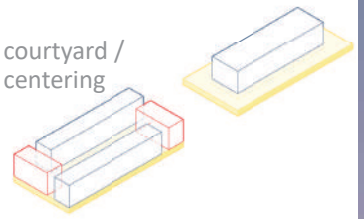
1 box in box



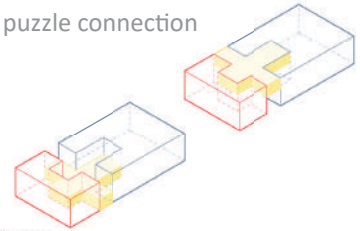
2 base / roof



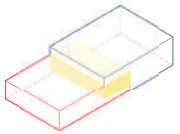
3 courtyard / centering



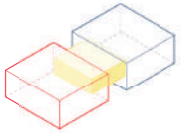
4 puzzle connection



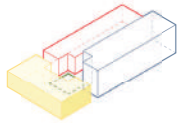
5 intersection



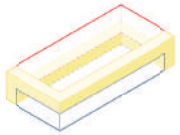
6 bridging



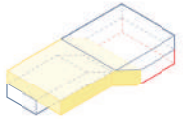
7 independent program



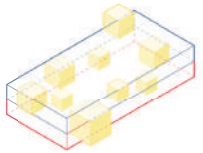
8 circumvolant



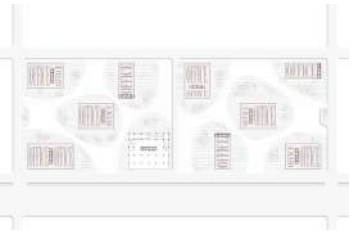
9 shift program



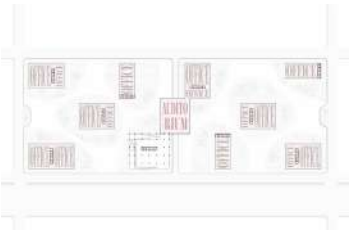
10 swiss cheese



1st Floor Plan



2nd Floor Plan

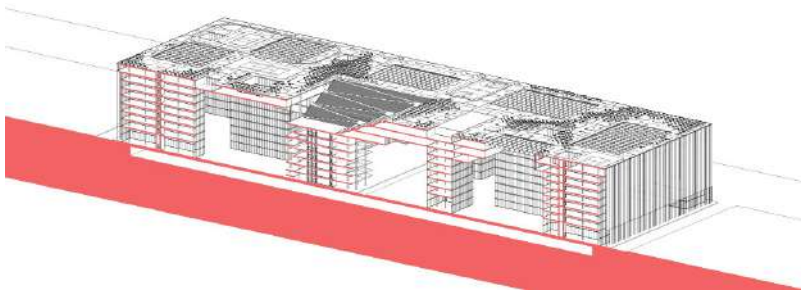


3rd Floor Plan

4th Floor Plan

5th Floor Plan

6th Floor Plan



Kiosk for the Future

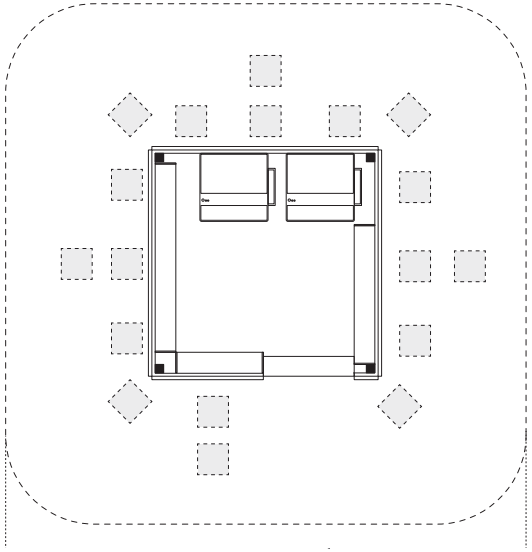
Lead: Rodolphe el-Khoury, Indrit Alushani

Team: Donnie Garcia-Navarro, Peiyang Sang, Flavia Macchiavello, Sophia Bachas-Daunert

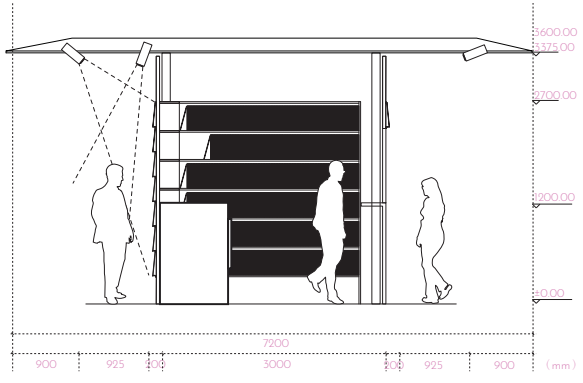
The kiosk for the future envisions the ability to customize your own magazine, catering solely to an individual's interests.

The kiosk is designed to integrate a series of elements that will be crucial in the future. We envision a future kiosk where interactivity bewteen the digital and the physical will be ever more blended and seamless.
The facade is populated with magazines in the form of shingles and they cover the metal clad wall. The twist is that the magazines are blank pages and information is overlayed on top of them through the advent of high precision, high fidelity tracking Panasonic projectors.
There is a huge important between human interactivity after all, it is crucial to adhere to a vernacular on what the core of a newstand entails. The seller is mainly responsible for selling smaller items such as lottary tickets and popular times (news/popular magazines).
The interactivity goes past the customizable and ever changing imagery on the front pages of the magazines. The kiosk for the future envisions the ability to customize your own magazine, catering solely to an individual's interests.
There is a global reach and also a local reach to the kiosk. It not only enables digital media to translate into a tangibly physical object but allows the buyer/consumer to print their own magazine from the printer in the kiosk. This allows for no two magazines to be the same. After all, each individual has their own unique interests. Since there is a printer in place, this allows for unlimited stock to be available and on demand.

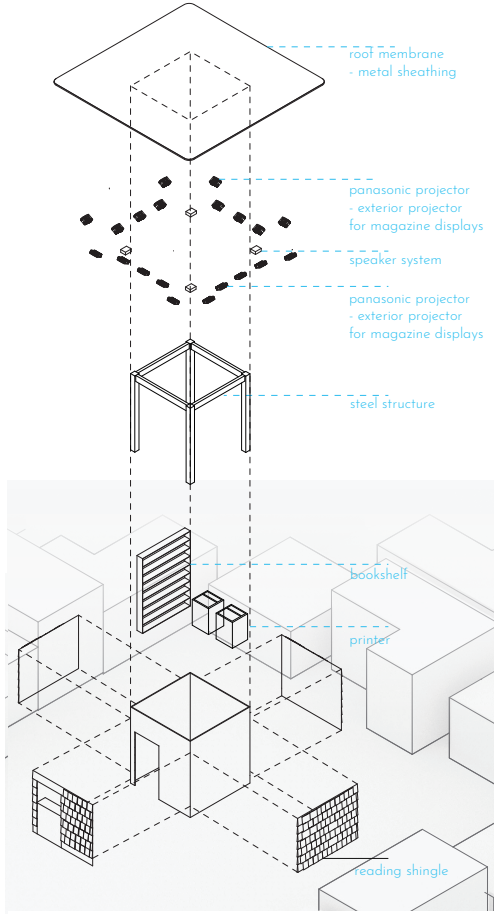
70 Left: Rendering of the Kiosk



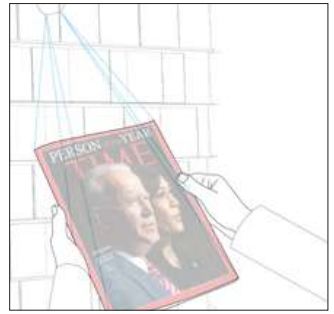
Plan

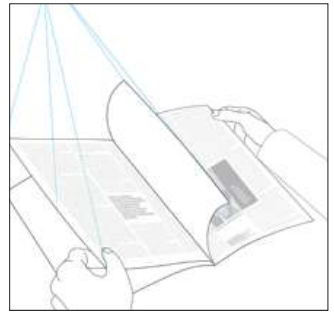


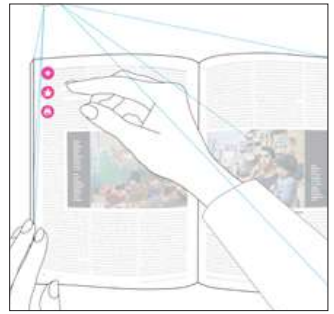
Section

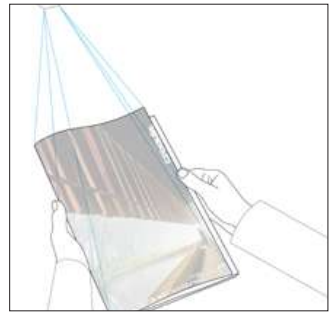


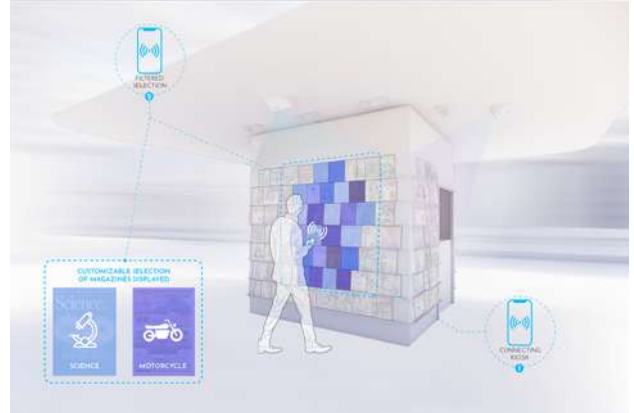
Exploded Axonometric

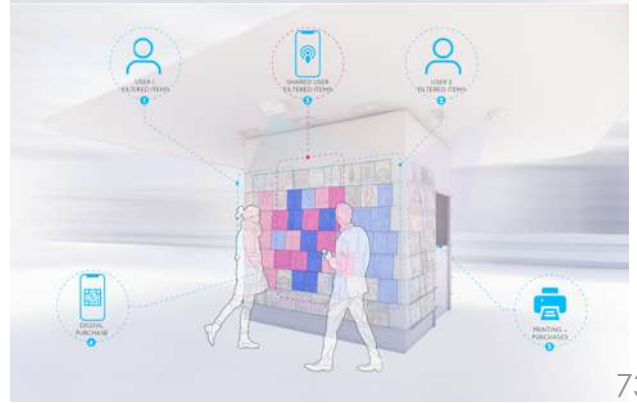












AR/VR

Coff-e-Bar

Lead: Rodolphe el-Khoury, Chris Chung

Team: Veruska Vasconez, Pedro Ramos-Nieves, Zhengrong Hu, Frank Chen, Haochi Zhang, Nika Mirrafie, Claudia Aguado

In this demonstration of the Internet of Things, Computer Vision and Augmented Reality transform paper cups and an ordinary glass tabletop into smart interfaces. The digitally-enhanced objects enable visitors to visualize and navigate the stream of information flowing through social media while enjoying some freshly brewed coffee in real time.

RAD-UM's Coff-e-Bar uses the coffee ritual as a catalyst for social interaction, as well as a vehicle for collective engagement with technology.

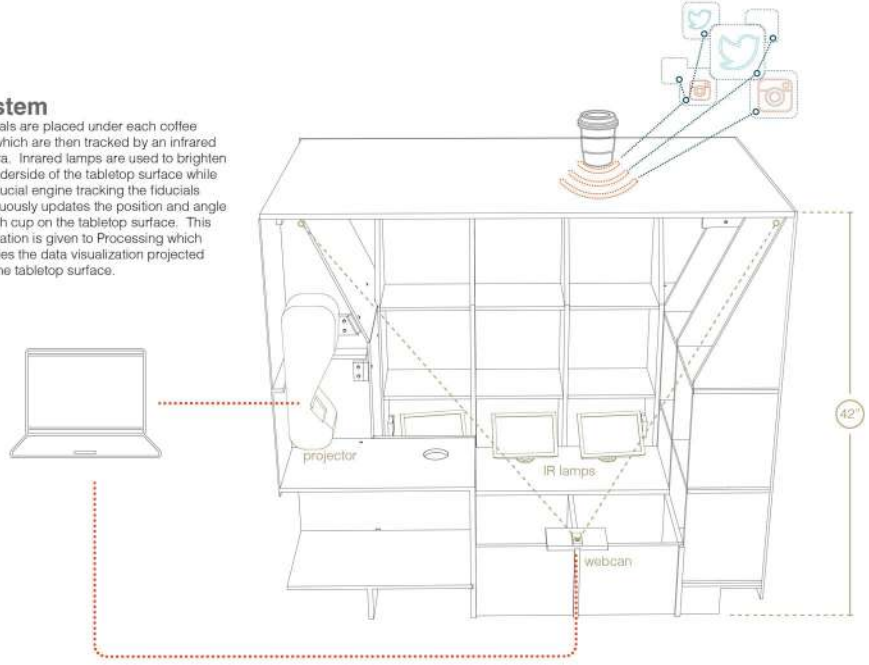
Fiducials are placed under each coffee mug which are then tracked by an infrared camera. Infrared lamps are used to brighten the underside of the tabletop surface while the fiducial engine tracking the fiducials, continuously updates the position and angle of each cup on the tabletop surface. This information is given to Processing which provides the data visualization projected onto the tabletop surface.

Each coffee mug is identified with particular hashtag used to filter out unnecessary social media content. Relevant Twitter tweets and Instagram photos flock to each coffee mug which users can then rotate to cycle through the social media content.

76 Left: Prototype of the interactive table displaying social media beside coffee cups.

System

Fiducials are placed under each coffee mug which are then tracked by an infrared camera. Inrared lamps are used to brighten the underside of the tabletop surface while the fiducial engine tracking the fiducials continuously updates the position and angle of each cup on the tabletop surface. This information is given to Processing which provides the data visualization projected onto the tabletop surface.

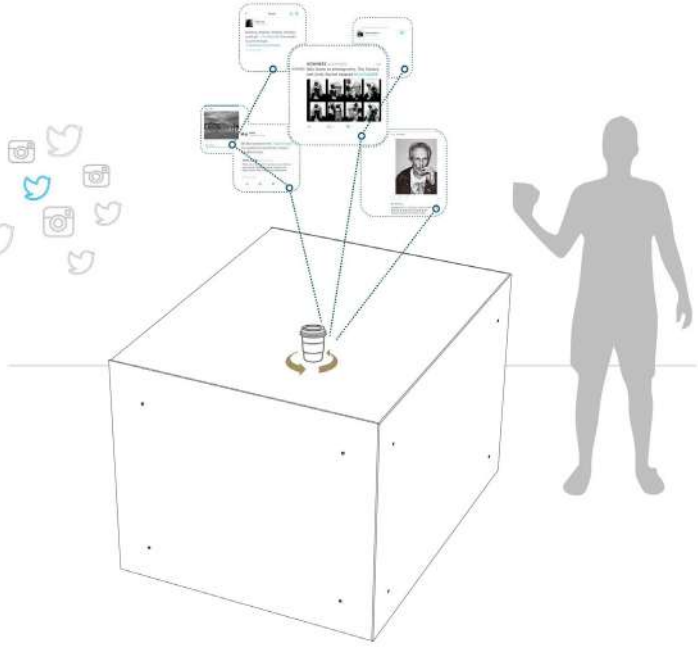


Idea

Mobile x Table

Table Display

Each coffee mug is identified with partifular hashtag used to filter out unnecessary social media content. Relevant Twitter tweets and Instagram photos flock to each coffee mug which users can then rotate their respective coffee mug to cycle through the social media content.



Type-Topia

Lead: Rodolphe el-Khoury, Christopher Chung

Team: Michael Alexander, Xiangyu Shao, Yuanxun Xia

Type-topia, the city, is visible here through the use of augmented reality programmed into tablets through which the city can be surveyed.

Type-Topia is a city defined by its monuments and civic institutions. Seven of Khoury Levit Fong's projects form the mental geography of a cityscape recognized through its iconic artefacts. The intimate and personal experiences of Type-topia's citizenry thread through the collective figures formed by the architecture of the city's civic institutions and monuments. While, travelers' are drawn to the city by the charm of these distinctive figures.

Type-topia, the city, is visible here through the use augmented reality programmed into tablets through which the city can be surveyed. The singular iconic status of the totemic buildings through the use of the tablets reveals their role in the urban geography of Type-topia.

The intent of the exhibition is to call attention to the iconic status of important public spaces and buildings in shaping the identity of cities and producing the locus of their civic realms.

By shifting attention away from some of today's current themes focused on questions of performance the exhibition wishes to underline the role that buildings play as a geography of monuments that are touchstones to urban experience and that forgotten term locus genii.

80 Left: Image of app being used to view augmented reality city of Type-topia.

Miami High Rise

Lead: Eric Firley, Germane Barnes, Christopher Chung

Team: Shaikha Al Duwaisan, Michael Alexander, Yasmine Benchekroun, Owen Berry, Qiazi Chen, Fadak Dashti, Lorena Knezevic, Sydney Maubert, Shannar O'Connor, Xiangyu Shao, Caitlin Smith, Gabriel Soomar, Jingchao Wu, Yuanxun Xia

The Miami High Rise exhibit is an interactive exhibition that documents Miami's development through the lens of typological, stylistic and technological mutations in the architecture of the tall building.

From the Downtown boom of the 1920's to the rise of Brickell Avenue as an international banking hub, a legacy is drawn that understands high-rise not only as a building phenomenon, but as a vivid expression of the local city culture.

The exhibition consists of three parts:

• An illustration of Miami's major high-rise typologies, through an explicative timeline, seven custom-made physical models of historic towers and ten contemporary project presentations.

• An overview of new technologies that will affect the future of high-rise construction (displayed in video format).

• A digital presentation of built and unbuilt work by faculty members of the UM School of Architecture and Florida International University (displayed on screens).

Finally, a Miami High Rise APP was developed allowing visitors to use tablets to view information about each project. By scanning each model, visitors will be able to see the contextual 3D model of downtown Miami.

82 Left: Image of app being used to view the augmented reality city as part of the Miami High Rise exhibit.

EDUCATIONAL PROGRAM

Designing for the Internet of Things

The course examines how current research and development in embedded computation bears on architecture, landscape and urbanism. The course explores the implications and impact of ubiquitous computing in its potential to change the way we conceive, construct, inhabit and interact with our buildings, landscapes, and cities.

Introduction to Programming for Architects

As digital tools continue to play an increasing role in the Architect's toolkit, it is becoming increasingly important that Architects not only understand how to use and navigate these tools, but to customize and adapt them to their specific needs. Learning how to program allows Architects to start to fully utilize the potential in digital tools by maximizing the possibilities in not only 3D modeling and digital fabrication but in responsive architecture, embedded computation and animating spaces, contributing to a more dynamic and potentially inter-connected built environment.

Spatial Computing in Architecture - a RAD studio

Computing is migrating from dedicated static appliances to mobile devices, objects of everyday life, and physical environments thanks to proliferating microchips, ever-expanding information networks, and new interactive interfaces such as Augmented/Mixed Reality. Soon every object around will be inherently or virtually equipped with some computational power and become enmeshed in a network of communication. The built environmentswill take on functionalities we usually reserve to computers and hand-held communication devices. This studio course explores this new reality and propose designs for its unprecedented environments.

Contact

USoA
University of Miami
School of Architecture
1223 Dickinson Drive
Coral gables, FL 33146
Tel: +1(305) 284.3731
http://www.arc.miami.edu

RAD LAB
Tel: +1(305) 284.5080
http://www.rad-um.com

"We are at this moment looking at these things — the Internet of Things — and the more astonishing transformation is not yet in sight. It's beyond the horizon."