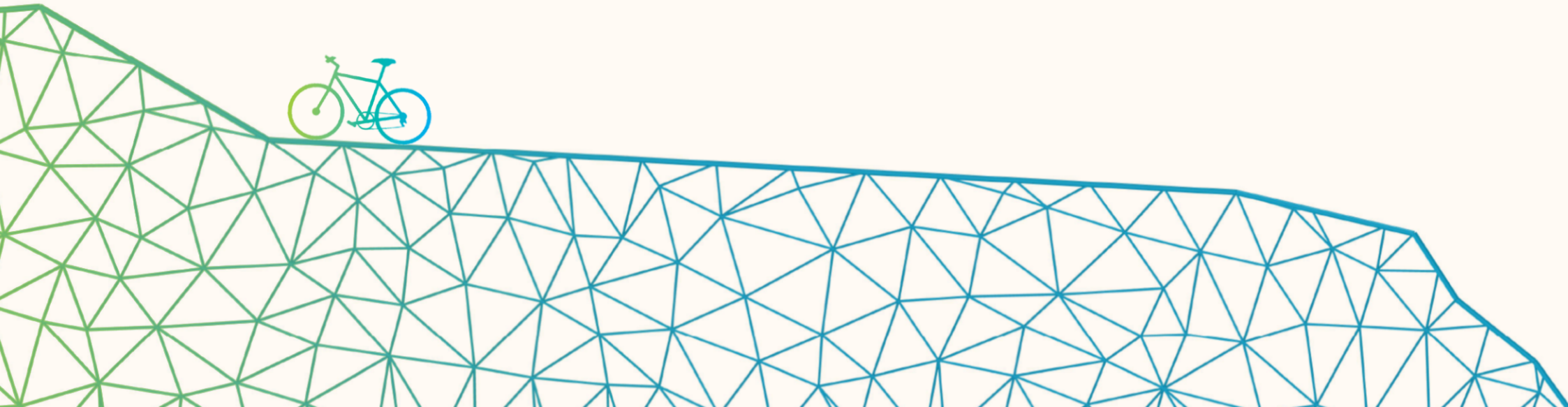
PORTFOLIO

Amir Goli

Selected Works

2018 - 2021



C O N T E N T S

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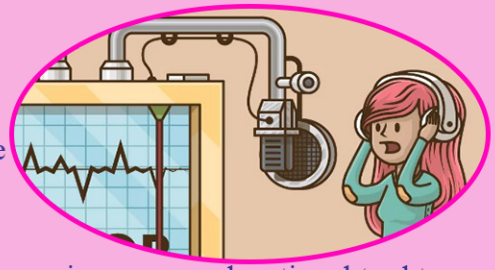
GAODE

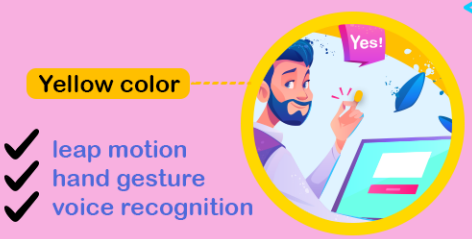
Academic Project - Group Work
The Pars University
Role: Conceptualization, Software, and Investigation
Supervisor: Ali Andaji
Email: aliandaji@gmail.com
Movie: ***link***

The present study seeks to create an integrated framework as a serious game to improve the visualization and design power in a student-centered and open learning space. This procedure begins with the design phase, in which students model the architectural designs considering their experiences and knowledge, leading to an indefinite result in a familiar CAD environment. The procedure continues until the user is satisfied with the outcome.

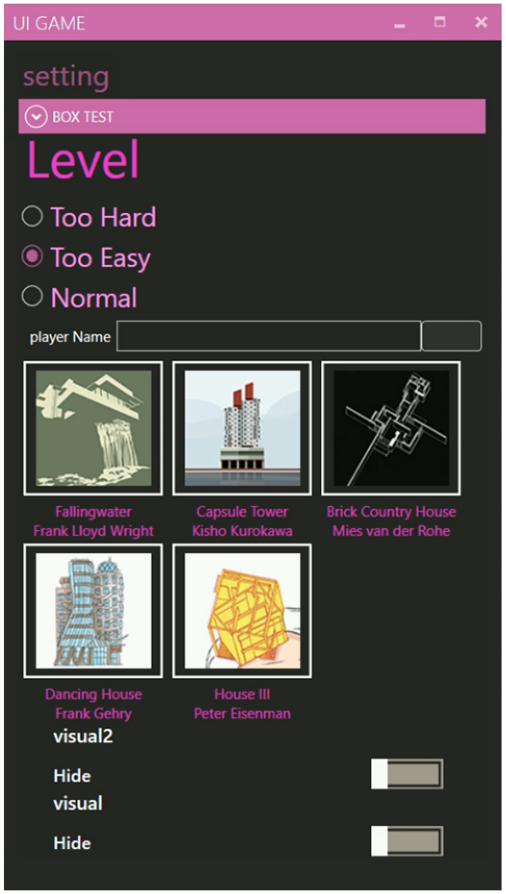
Achievements



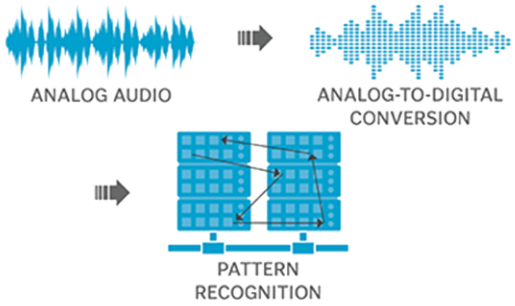
- By using the educational method of student-centered open learning environments, an educational framework was developed in the form of a serious game to develop architectural education.
- The framework of GaoDe was introduced as a serious game educational tool to improve the learning and perception of students in the architectural design process.
- By using five different games, this educational tool allows the users to compare their design-game process result in the form of a digital model or 3D printing with that of the original architect and perform self-assessment.
- Using a multi-modal user interface, GaoDe provides the opportunity for self-assessment of students' motivation and interest.
- The multi-modal user interface, including sound and gesture recognition, can be employed in the design process in architecture offices.



Concerning the high accuracy and speed required for 3D coordinates in the modeling procedure and in order to avoid the negative effects of hand gesture recognition in inappropriate time or repeated or incorrect recognition during the real-time procedure of the game, Leap Motion Controller is used in the modeling. Furthermore, machine vision technology is used to execute the needed commands in the modeling procedure.



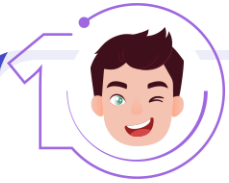
For instance, by clenching the left hand, opening the right one, and moving it around the left fist, the movement of the camera in the environment can be controlled, or one can become further from or closer to the result designed in the game by making the right hand further or from closer to the left fist.



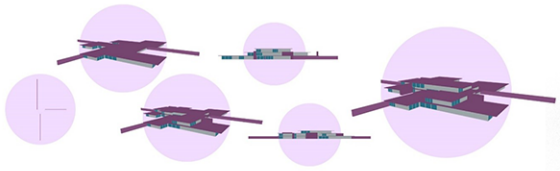
A practical and light model was employed in speech recognition, given the remarkable tendency of the individuals to create an offline speech system. By using the Grasshopper environment, the model was coded in an offline mode.

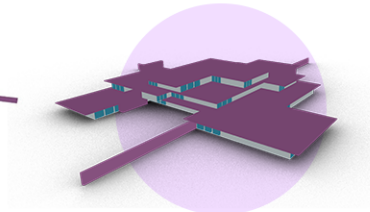
Utilizing the OpenCV library, the system activates the sound commands by sensing yellow color. The system starts to receive the user's sound command once the yellow color is detected by the webcam.

In order to improve motivation and offer more opportunities for self-evaluation in the preliminary version of this tool provides five modes of games with various styles of five well-known architects, including Brick Country House, Fallingwater, Dancing House, HOUSE III, and Capsule Tower, are considered.



Mies van der Rohe - Brick Country House



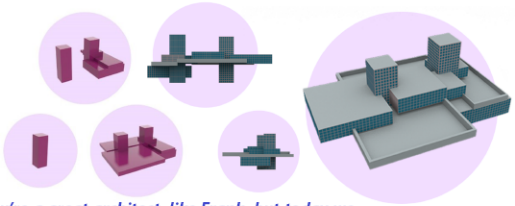


You are one of the best future architects my friend. Get help from your hands! Implement your design! Let's see who is better! You or Ludwig? Of course, you. Keep your hand in front of the device! Change its mode! See what the displayed block turns into! I will help you to better arrange the blocks in the 3D space. Just show your finger point to the camera when you think the displayed block suits your design! It will be saved. When your design is finished, just show High five to camera! Let's go to the next game! You can use voice commands to see your design from different views. Hey! Don't forget to open your right hand and clench the left one! See what happens! Let's go!

Finger Point save it by showing Finger Point.

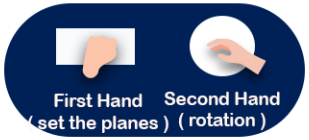
Five Finger When you are satisfied with the whole design.

Wright - Fallingwater



First Hand : supposed to set the plan of the game .

Second Hand : supposed to rotate in space of the game.



You're a great architect, like Frank, but today we want you to be better than him. Like the previous game, put your hand in front of the device to change its mode! Develop your design and save it with your pointer finger! The game is at your command. Give voice commands to better evaluate your design! If you high five, your raw cubes will get the style of Fallingwater. Then, you can see who has designed better, you or Frank. Don't forget to walk through the environment while playing the game! Did you learn from the previous game? Clench the left hand, open the right hand, and spin it! Enjoy moving your hands and your design!

Finger Point

add to ...

Five Finger

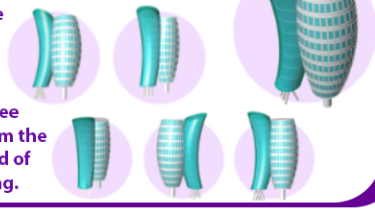
final ...

Gehry - Dancing House

Do you know how to dance? But you don't need it! Just make the buildings dance! You only need the first and pinky fingers of your hands, my friend! Your first hand dances the top of the building, and your second hand dances its waist. Did you know their dancewear is changed? If you like the result of the buildings' dance, move down the three middle fingers of your first hand! It'll be chapped and saved. Hey! Don't forget to examine your design, in fact, the dance of the buildings, from different views. Use voice commands to better evaluate it! Is it OK? Let's go!

The first hand is the top of the building, the second is the back of the building.

Lower the middle three fingers from the upper hand of the building.



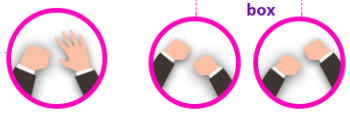
ESENMAN - House III

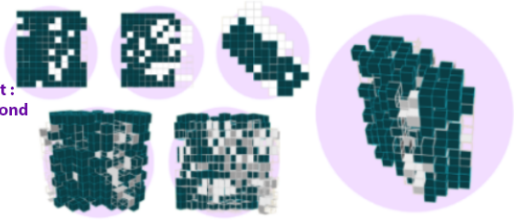
Do you know your right and left hands? Clench them! Each time, involve one of them for the first time in the game, and see what happens! But don't forget! If you want to roam the environment, open your right hand! Enjoy it!

Right hand first : move the first box

Left hand first : move the second box

This position suppose to rotate in the space of the game.





Kurokawa - Capsule Tower

Clench your hands! Let your fists play the game! Whenever you get tired, open them pal. Examine the result of your game! If you don't enjoy it, clench it again! Don't forget! If you open your right hand, you can turn the camera. The voice commands are at your service.

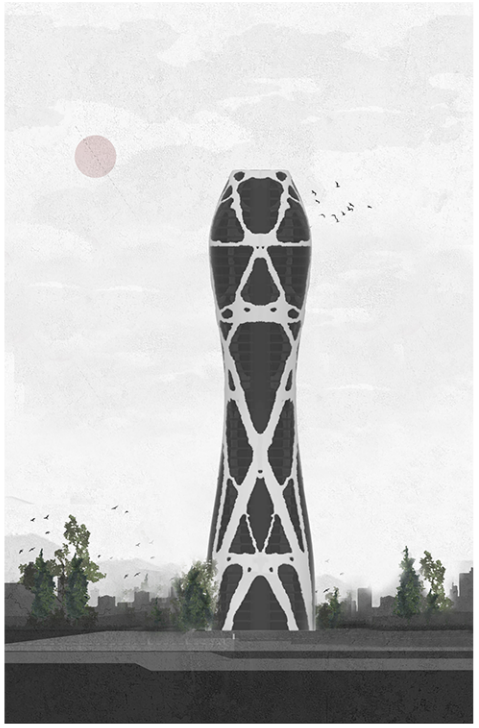
Fist your hands and lets play...

This position suppose to rotate in the space of the game.

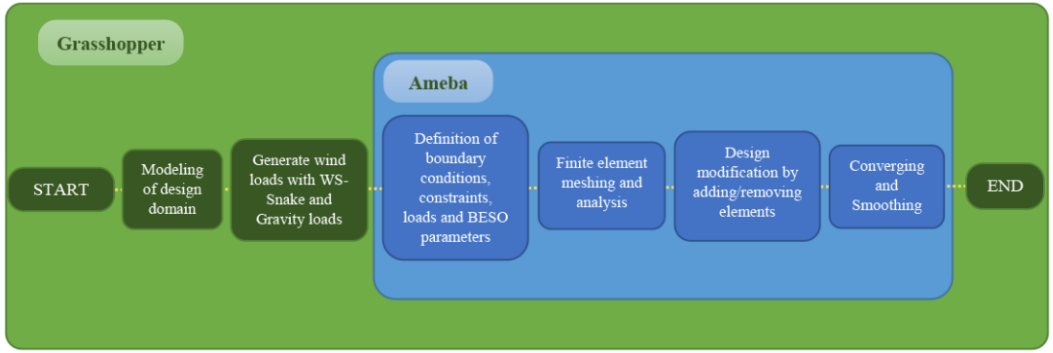
BESOLOGY

Academic Project - Dissertation
Pars University
Supervisor: Dr.Matin Alaghmandan
Email:m.alaghmandan@gmail.com
Paper: doi.org/10.1061/(ASCE)AE.1943-5568.0000511

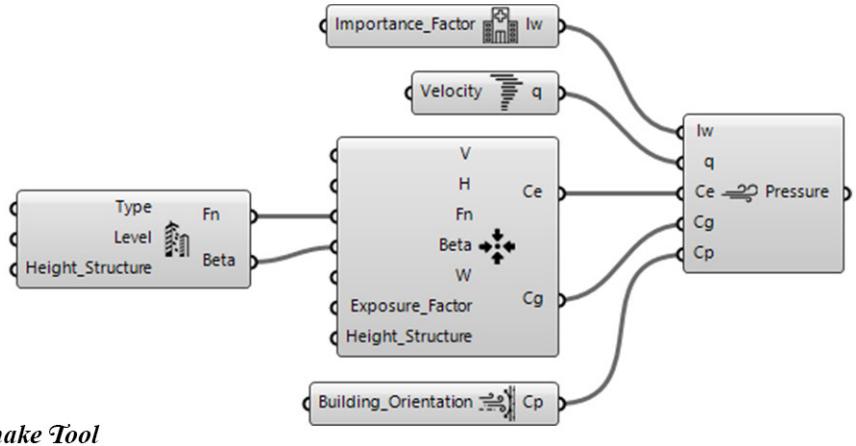
Integrating the parametric design and BESO topology optimization technique, the present study proposes an innovative method in the form of a modern structural design framework that allows for more efficient designs of structures with exterior braces in tall buildings. The outcomes are accompanied by considering structural engineering and architecture to create elegant structures with obvious structural engineering components.



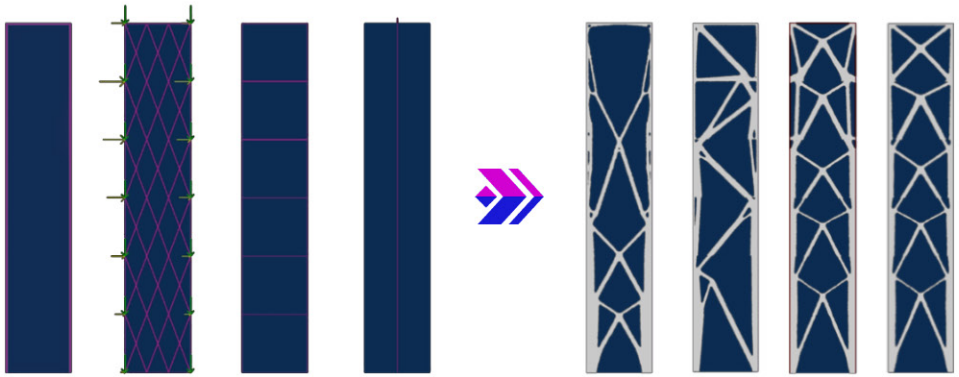
In the case of tall buildings, building designers pay special attention to weight, and it is the decision-making parameter in choosing a structural system from several structural alternatives. Moreover, the lateral system of a structure must have sufficient stiffness to sustain gravity and lateral loads. Accordingly, the reliable analysis integration mainly aims to design the exterior structure of a tall building concerning the nature of gravity and lateral (wind) loads. Topology optimization aims to achieve the maximum stiffness and the minimum weight of a structure under all caseloads. Nevertheless, in order to meet the architectural and engineering requirements, designers should define constraints for aesthetic and manufacturing design issues. This requires the parametric adjustment of variables that influence the major objective. Therefore, the Ameba tool and the parametric Grasshopper plug-in were integrated for modeling and topology optimization to provide designers and engineers with a cooperative environment helping them achieve a unique solution for the design of the exterior structures of tall buildings.



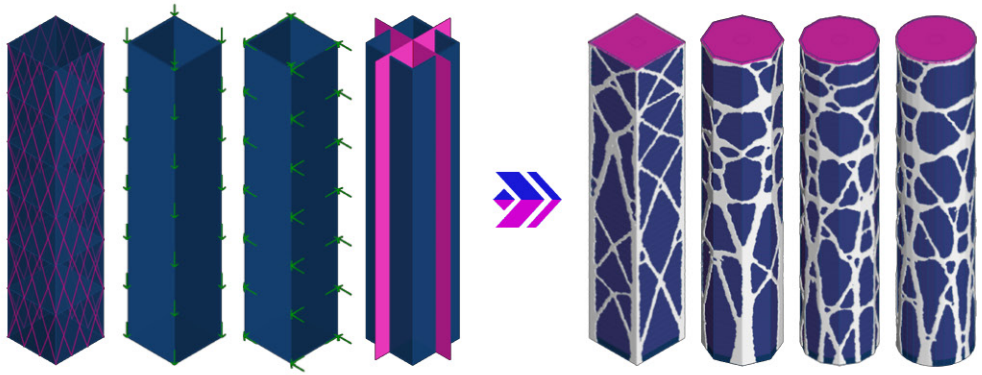
With respect to the influential role of wind in parametric topology optimization and its consequences in tall buildings, by using the Python coding, the guidelines to estimate the impact of wind on tall buildings recommended by NBCC 2015 were defined as a parametric tool in the Grasshopper environment and published under the title WS-Snake. It is created by applying a number of components working with respect to the main wind direction and identifying the pressure/suction on each side of the building regarding the main wind direction obtained. It takes into account various circumstances of facing the wind (e.g., urban land and open land) and provides unique values for each part of the building façade with respect to the building height and side where it is located.



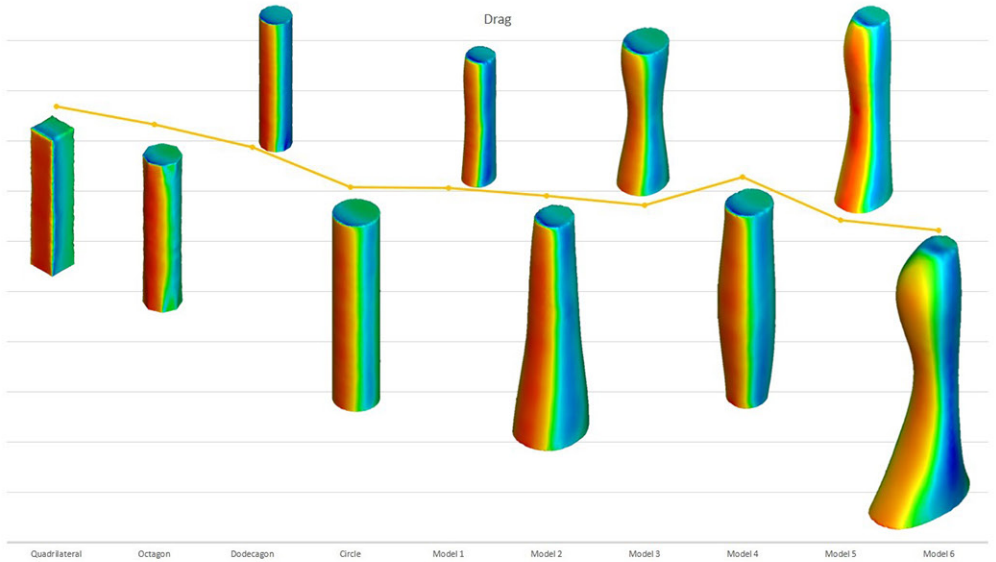
WS-Snake Tool



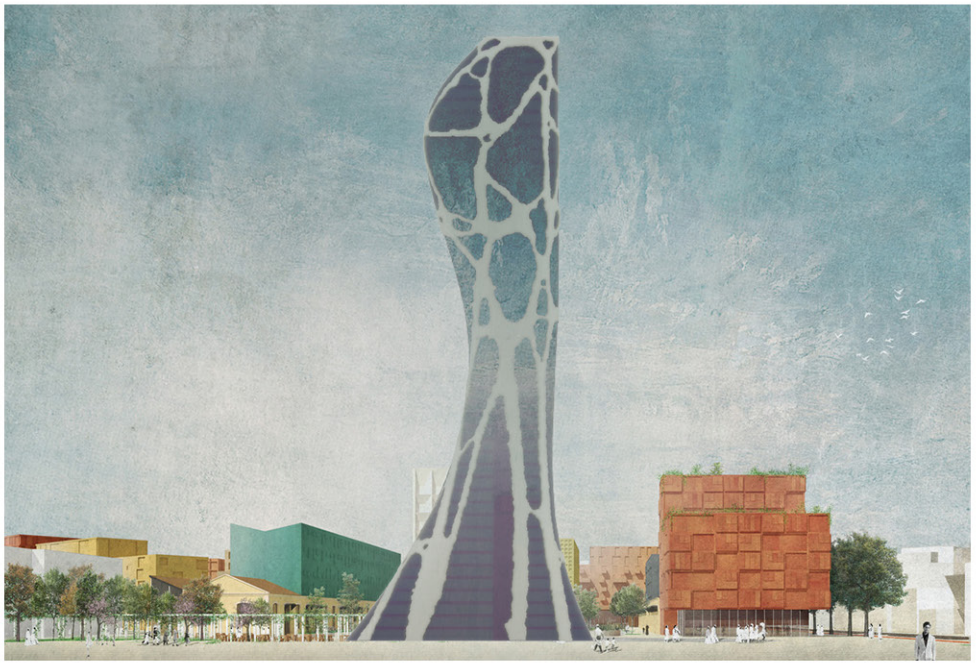
2D High-rise Building Problem



3D High-rise Building Problem



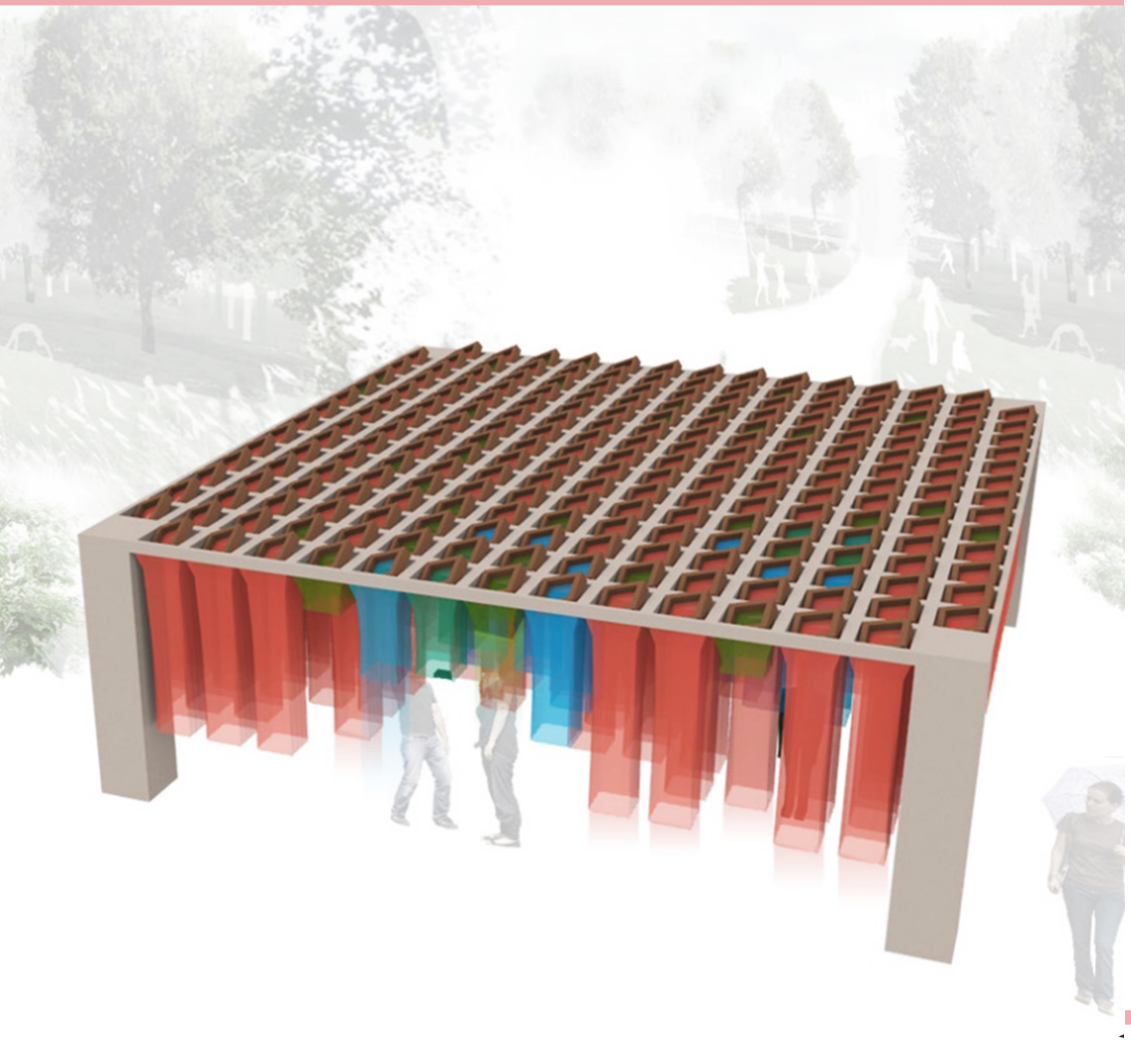
Form-finding Regarding CFD Results



OROSI INTERACTIVE PAVILION

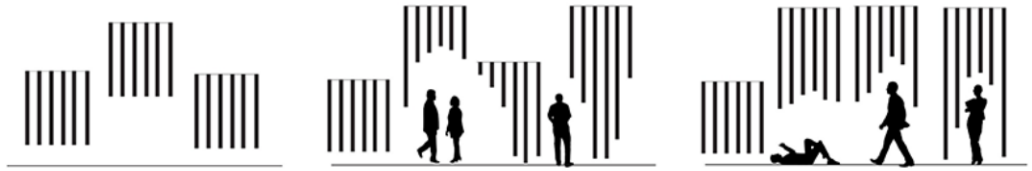
Workshop Project - Group Work
Digital FUTURES 2021
Role:Conceptualization, Software, and Visualization
Supervisor: Dr.Mona Ghandi et al.
Email: mona.ghandi@wsu.edu
*Movie:**link***

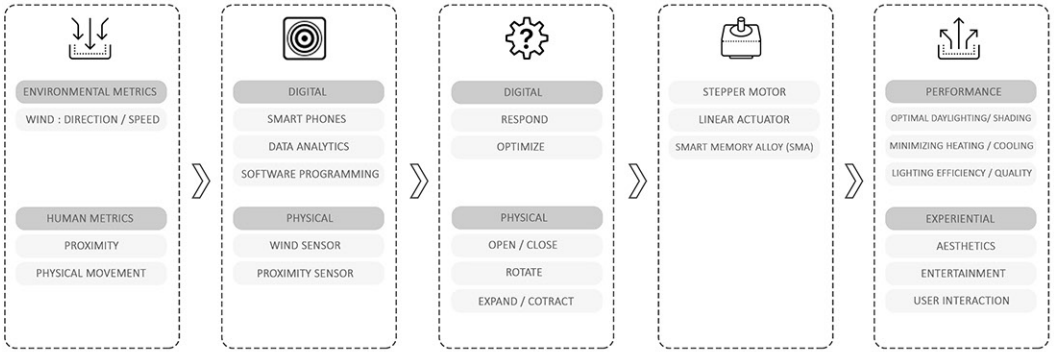
The present project seeks to invoke simple traditional principles, including the use of colorful glasses for windows to achieve optimum visual comfort and a better experience of interior space. An effort was made to develop the Orosi method, a major architectural element in traditional Iranian buildings, more than just a façade and apply it to alternative architectural elements like a pavilion by means of panels with three kinetic layers colored in blue, red, and green.

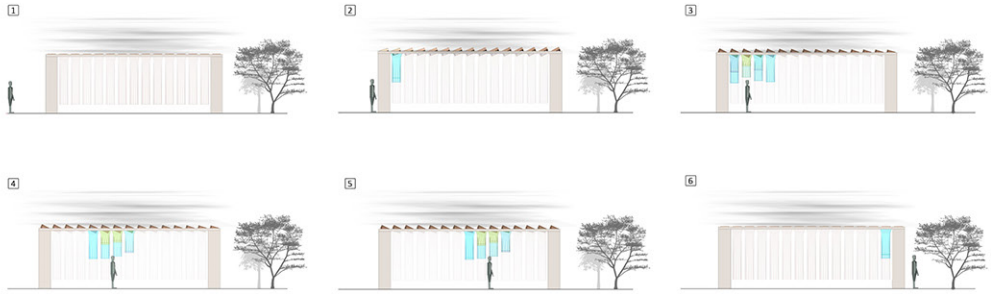


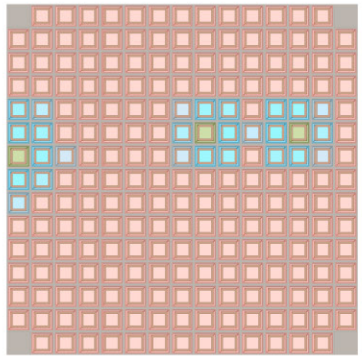
Orosi, a latticed window with colorful pieces of glass and an Iranian-Islamic pattern, is among the major architectural components in traditional Iranian buildings. While previous studies have focused on the psychological impacts and aesthetic aspects of Orosi, the traditional architecture of Iran used this element to manifest daylight rays in different colors through colorful glasses as a passive strategy to adjust the light.

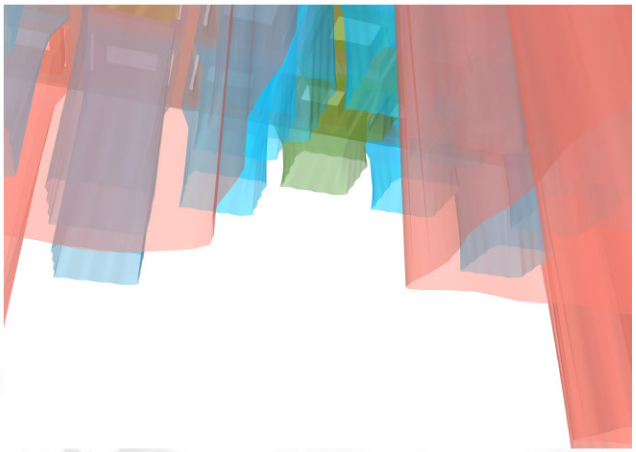
The goal was to design an interactive pavilion that responds to environmental and human stimuli to offer users a mesmerizing and memorable experience. The height of the fabric modules and the color of the panels react to the physical movement and proximity of the users. When an individual walks through a pavilion, the height of the hanging fabrics varies with their distance from the user. Moreover, each panel's color changes to blue as the user gets closer to it and alters to red when he/she is exactly below each panel. In addition, in order to provide favorable ventilation in the pavilion, the panels rotate with respect to the wind direction. To this end, three mechanisms were applied for the modules' opening/closing interaction. A shape memory alloy wire was attached to the fabrics in two points, top and bottom. Therefore, through an ultrasonic proximity sensor, the wire could detect the existence of the user below it. The interaction with the sensor also alters the color of the panels, but their movement mechanism is a linear actuator making the panels slide into one another. As a result, each time, the light is provided in the desired color through the hanging fabric. Regarding the panels' rotation mechanism, a servo motor senses the wind direction rotating the panel to the intended angle, ventilating the inner space effectively.











STIMULI

ACTIONS

Wind

Rotation of panels

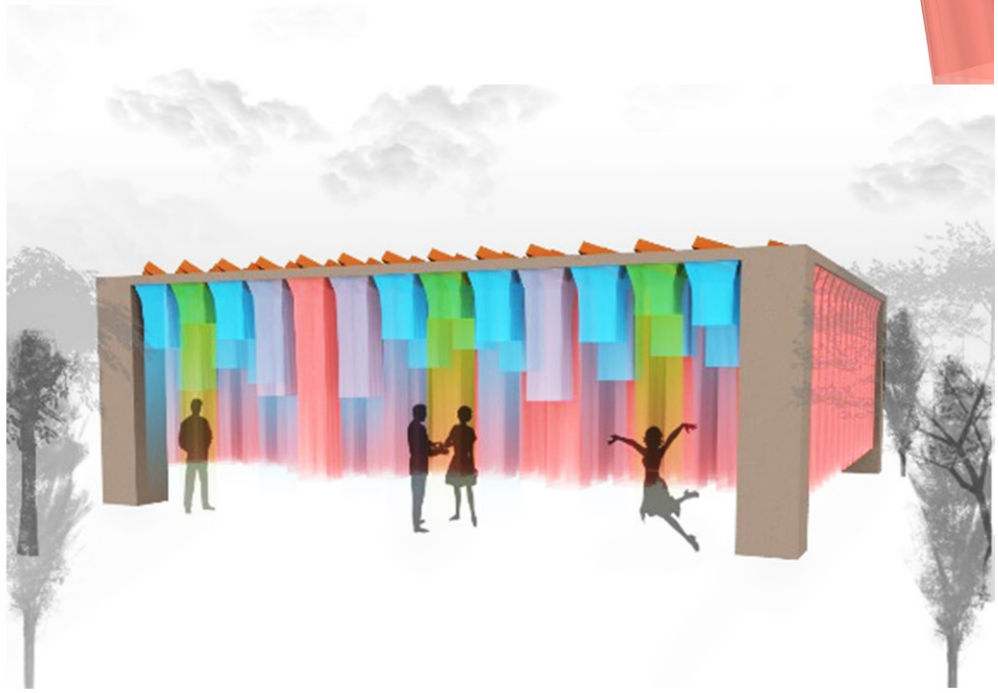
STIMULI

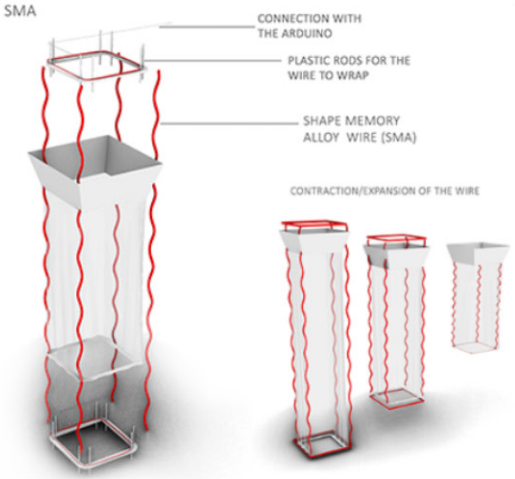
ACTIONS

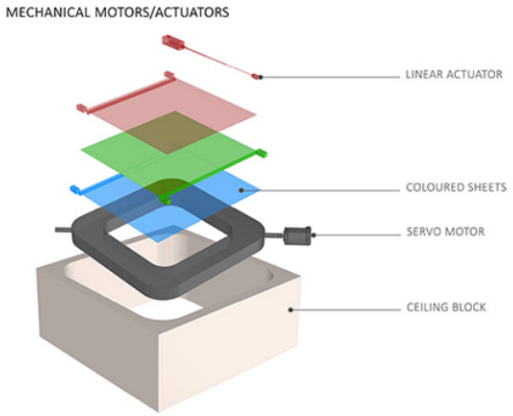
Human presence/Motion

Colors sliding into one another

Up and Down movement of hanging fabrics
Contraction/Extension







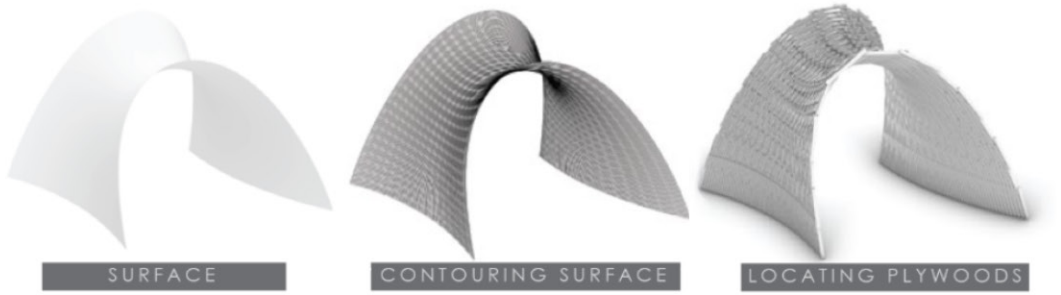
ROBOTISM

Workshop Project - Group Work
The University of Tehran
Role: Design, Software, and Fabrication
Supervisor: Ramtin Haghnazar et al.
Email: ramtin.haghnazar@gmail.com

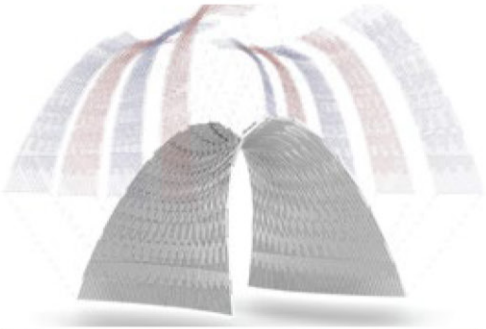
As a ten-day workshop, ROBOTISM was presented, covering robotic fabrication and computational design. Concerning the Pick and Place method, KUKA KR6 was employed along with a KRC2 controller, a pneumatic gripper, and an air pump in this workshop. The quantity of the available material, i.e., 40 square meters of 18-mm plywood, was the main limitation of the designs.

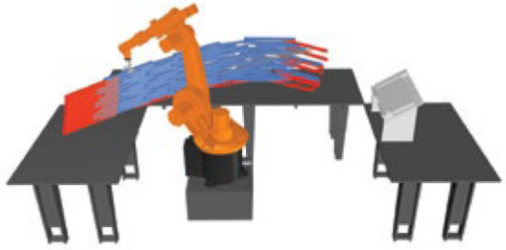
As the first exercise, curves with human patterns were defined in the grasshopper by our group, and the motion path of the robot was defined. The G-Codes were developed, and then, the light painting was started by means of a simple LED installed on the robot's head. The corresponding G-codes were produced to help the robot follow the defined routes and draw the pattern using the light.

Each group was requested to design a structure using wooden pieces with particular limitations concerning the Pick and Place method. A jury evaluated all the proposals, and our team's design was chosen for the ultimate project. Furthermore, alterations were done to achieve the final design.



The ultimate design had to be made ready for the assembly procedure. Concerning the constraints of the robot's reach and the site conditions, it was decided to halve the arch and divide each half into four and five sections, respectively, to obtain a total of nine sections. In order to connect the wooden pieces, two techniques were presented; employing a glued roller to which each wooden piece would be rubbed by the robot and placed at its position, or applying a collaborative human-robotic production method in which one can utilize a pneumatic nail gun to connect objects after being located by the robot. The latter was preferred due to time limitations and a number of practical issues. The sections produced in the workshop were transmitted to the campus and assembled in two hours.











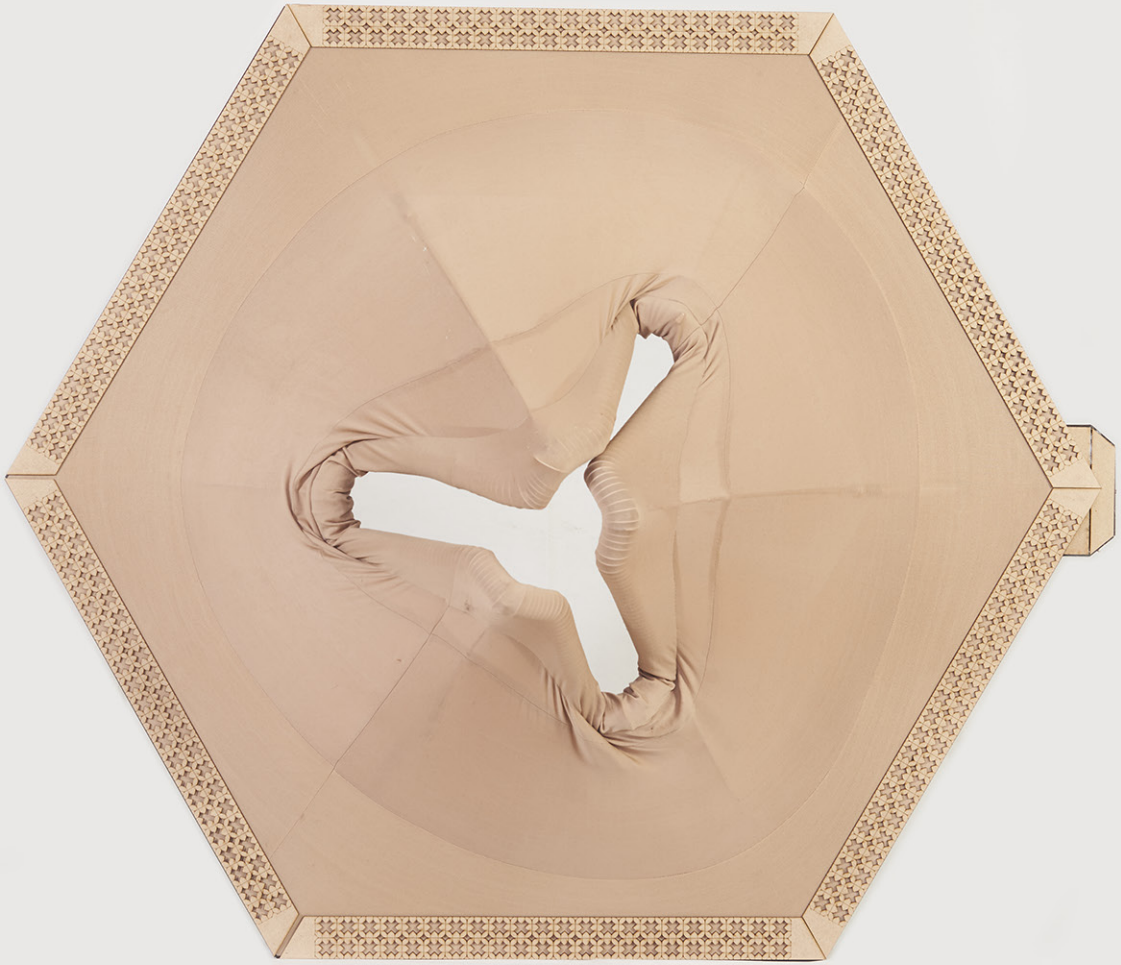


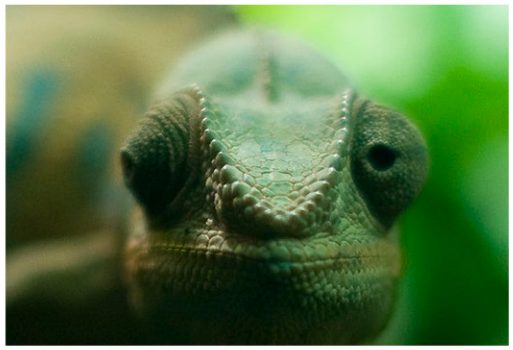


CLIMATE-RESPONSIVE FACADE

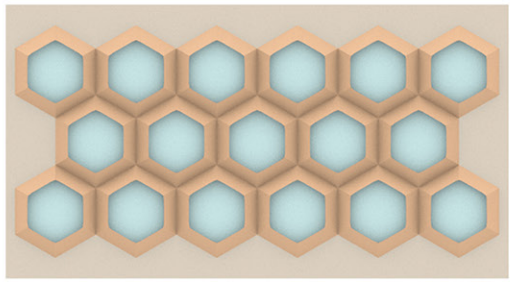
Academic Project - Group Work
The Pars University
Role: Conceptualization, Software, and Investigation
Supervisor: Dr. Matin Alaghemandan
Email: m.alaghmandan@gmail.com
Movie: link

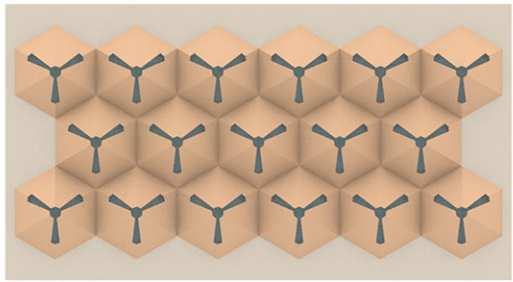
In this study, a biomimetic-oriented technique was employed to design and fabricate a climate-responsive prototype inspired by the chameleon's eye. An adaptor, an Arduino Uno, three relays, three photoresistors (LDR sensors), and three linear actuators were used to produce the climate-responsive unit. The prototype can react based on the Sun path and other comforting factors for the users. Accordingly, a noticeable improvement was obtained in the occupants' comfort relying on numerous simulations.





The present study assumes that the building surface is steady, as the body of a chameleon. Chameleons can track and aim at their intended targets by moving their eyes with no need to move their body. The design of the CRF units is inspired by these independently moving eyes. The responsive units control the entering light by moving, closing, and opening their apertures according to any comforting necessity.





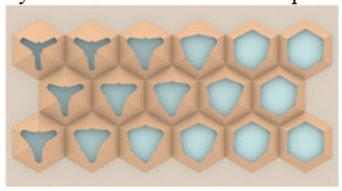
The designed system can operate either manually or automatically, responding to environmental changes autonomously. In the responsive mode, the devices apply a four-step technique to improve visual comfort and daylight performance:

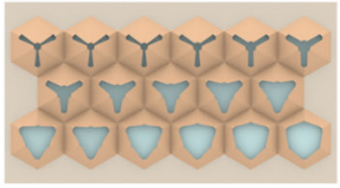
Step 1. The daily motion and height of the sun are considered to arrange all CRF units.

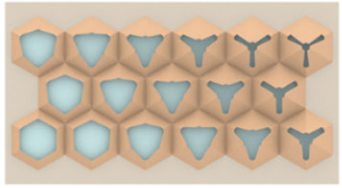
Step 2. Regarding the sun's relative position to the units, their configuration (the previous step), and the user's needs for comfort inside the room, the movable arms can be adjusted for the highest shade performance. Accordingly, the opening length varies in real-time with respect to shifts in the sun's position.

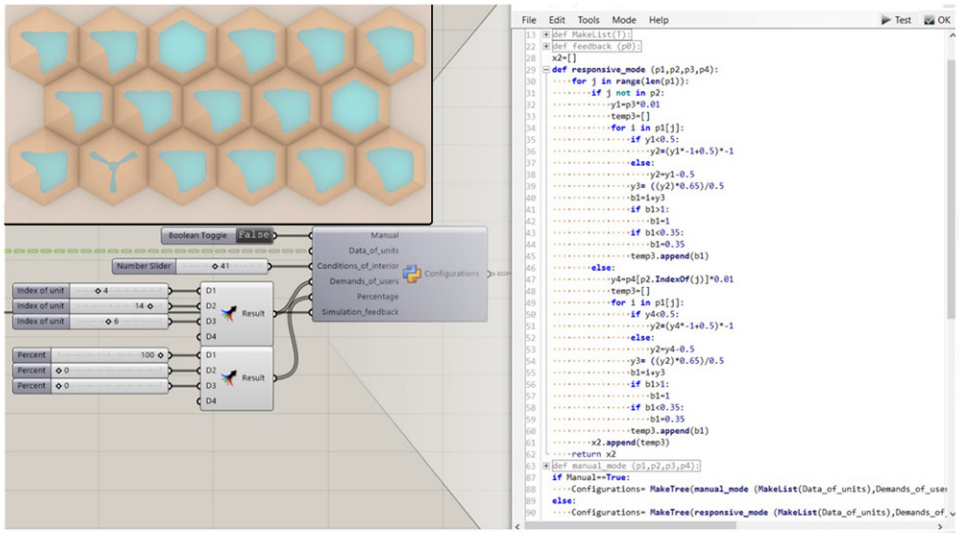
Step 3. By using a personal smart device such as wearable devices, smartphones, or biological sensors, some of the units can be personalized in the responsive mechanism by the occupants to their specific desires.

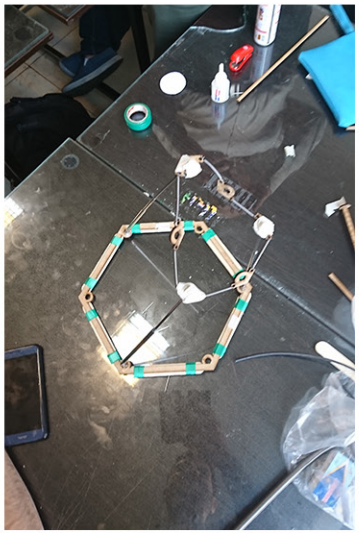
Step 4. Given the previous steps, especially step 3, the other units not changed by the user should be re-evaluated and re-arranged to offer the needed comfort level throughout the room. If the level of light inside the room is insufficient, the algorithm goes back to the first step and adjusts the arrangement of the units not changed by the users to achieve the required level.

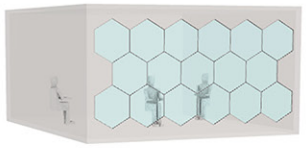


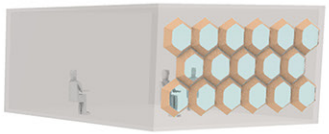


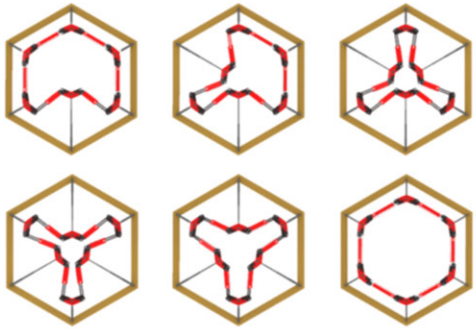


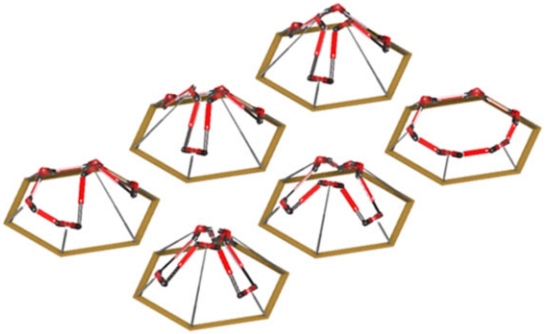

Boolean Toggle
Number Slider
Index of unit
Index of unit
Index of unit
Percent
Percent
Percent
Result
Result
Manual
Data_of_units
Conditions_of_interior
Demands_of_users
Percentage
Simulation_feedback
Configurations
File Edit Tools Mode Help
Test
OK
def MakeList(T):
def feedback (p0):
x2=[]
def responsive_mode (p1,p2,p3,p4):
for j in range(len(p1)):
if j not in p2:
y1=p3*0.01
temp3=[]
for i in p1[j]:
if y1<0.5:
y2=(y1*-1+0.5)*-1
else:
y2=y1-0.5
y3= ((y2)*0.65)/0.5
b1=1+y3
if b1>1:
b1=1
if b1<0.35:
b1=0.35
temp3.append(b1)
else:
y4=p4[p2.IndexOf(j)]*0.01
temp3=[]
for i in p1[j]:
if y4<0.5:
y2=(y4*-1+0.5)*-1
else:
y2=y4-0.5
y3= ((y2)*0.65)/0.5
b1=1+y3
if b1>1:
b1=1
if b1<0.35:
b1=0.35
temp3.append(b1)
x2.append(temp3)
return x2
def manual_mode (p1,p2,p3,p4):
if Manual==True:
Configurations= MakeTree(manual_mode (MakeList(Data_of_units),Demands_of_user
else:
Configurations= MakeTree(responsive_mode (MakeList(Data_of_units),Demands_of_

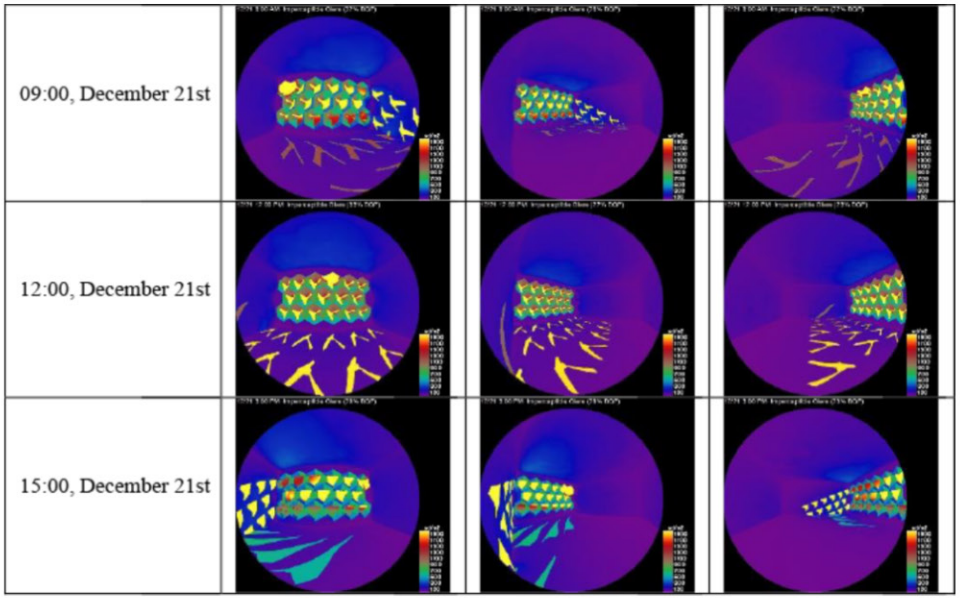










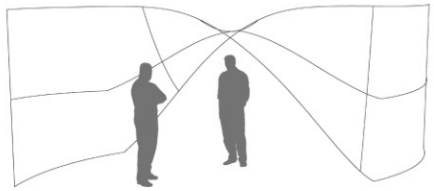

09:00, December 21st
12:00, December 21st
15:00, December 21st

INTEGRITY

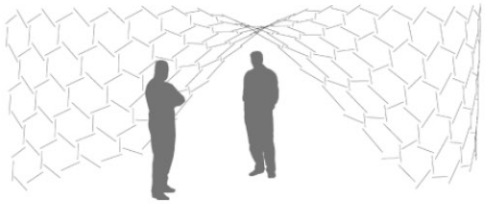
Academic Project - Group Work
The University of Art
Role: Conceptualization, and Fabrication
Supervisor: PhD. Seyed Ali Derazgisoo et al.
Email: seyedali.derazgiso@gmail.com

By using a Nexorade structure, the integrity pavilion was made from plywood sheets, 18 mm in thickness, and cut with digital fabric cutting machines. Ultimate tests and production of all parts of the partition were done digitally. They were then fastened by screws.

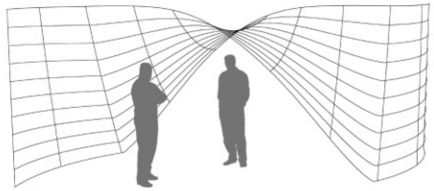
Main Curves



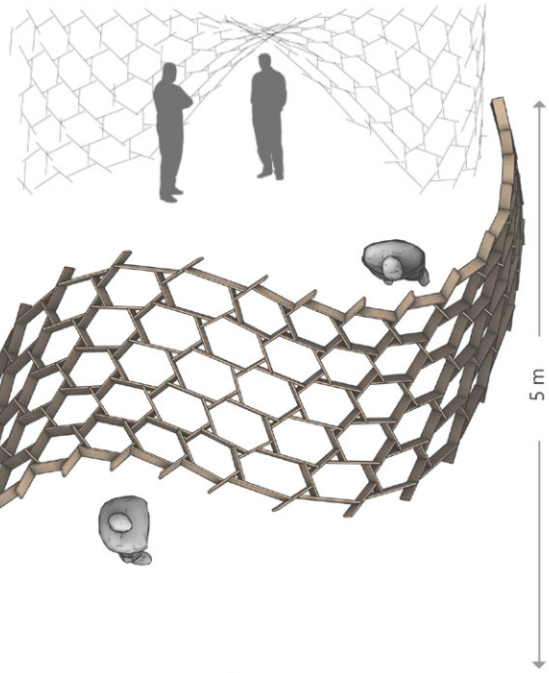
Rotating the elements



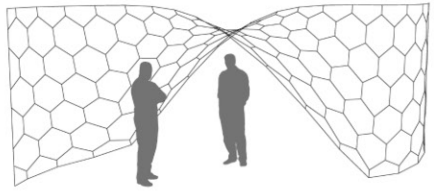
Generating the surface

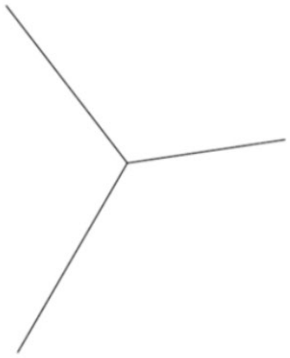


Extending the elements

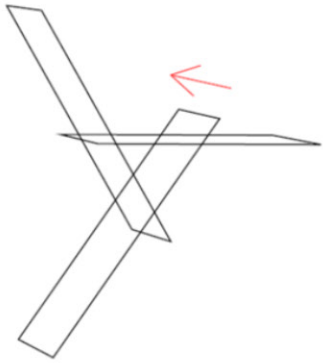


Pattern drawing

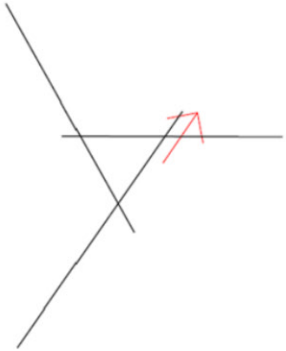




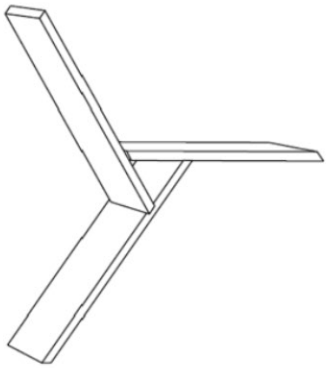
Preliminary wire mesh



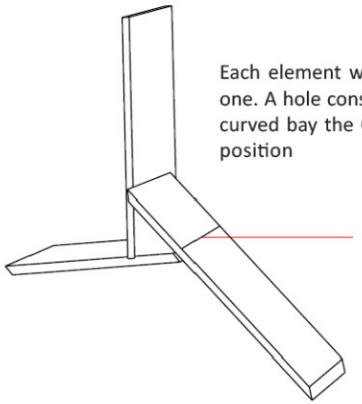
Extruded along the normal vector of the main surface



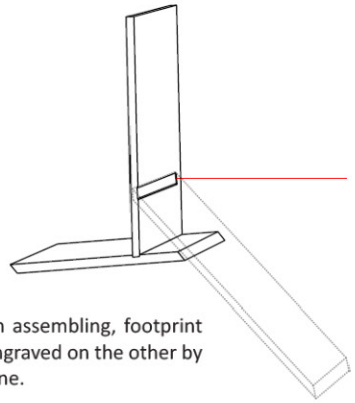
Extending the elements



Generating the final shape of the elements



Each element was screwed to the other one. A hole considered in the design and curved bay the CNC to show the nailling position



In order to ease in assembling, footprint of each element engraved on the other by CNC milling machine.

Thank You
For Your Attention