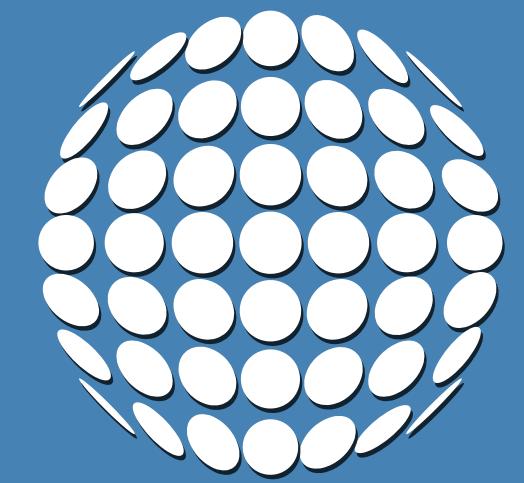
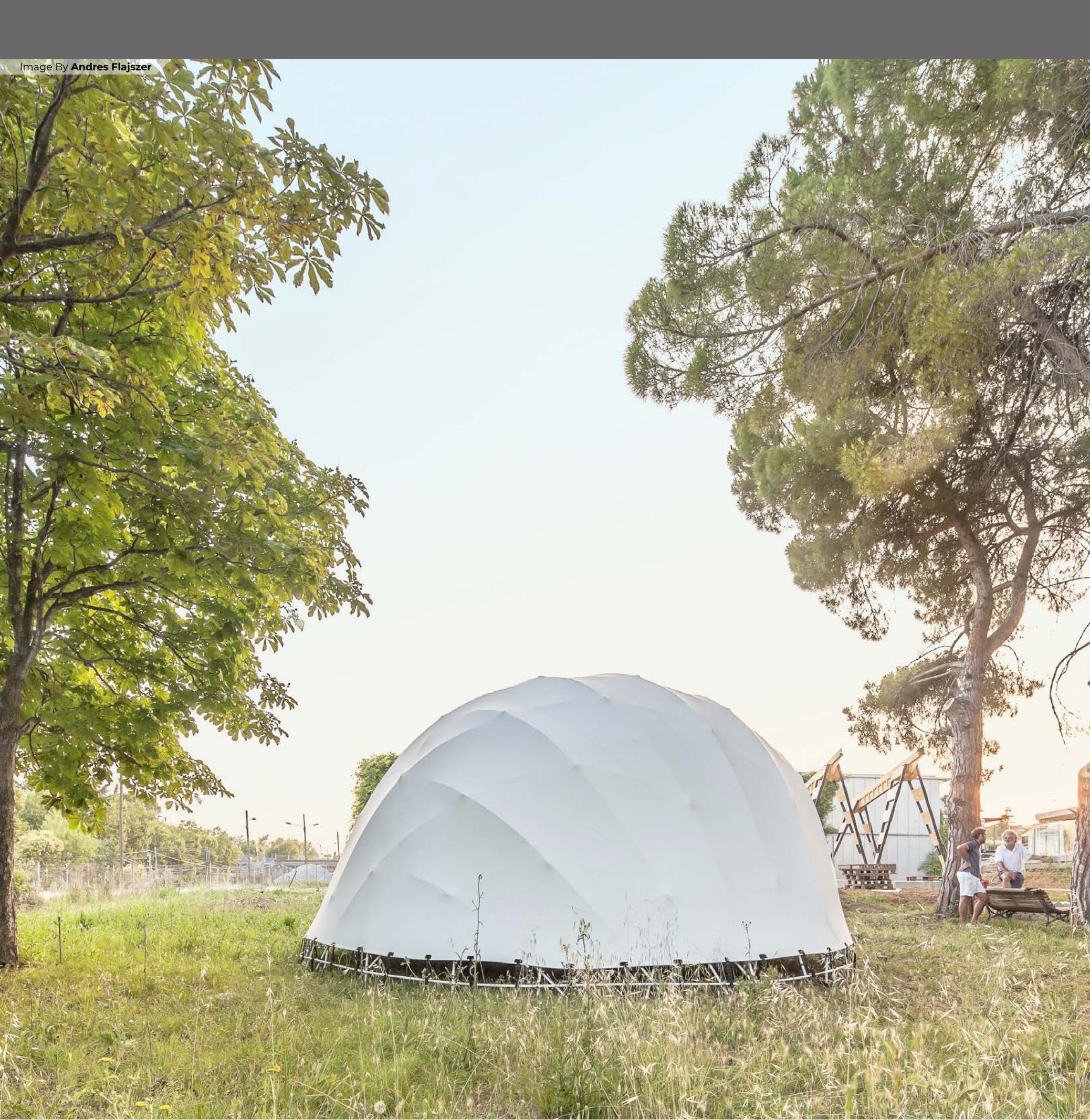


Image By **Andres Flajszer**



# *Christian Dimitri*

PORTFOLIO 2018  
Architecture & Parametric Design



I am Christian Dimitri, I am an optimistic Architect specialized in parametric architecture and computational design. As a self taught computational designer and 3D visualizer, I am able to say that I am familiar with the computational tools available today.

## Planar Quads in Free-Form Surfaces

### Chebyshev Net Triangular Gridshell

### Geodesic Gridshells: Waitomo Caves Visitor Center

### Digital Fabrication 2D Machining: Planar Quad Stripes

### Digital Fabrication 3D Machining: Kachigata

### Algorithm in Technology

### Form-finding and Structure Optimization

ARTE ROBOTICA V1.0  
Insection PARIS  
OCT 06 - OCT 08



which took place at  
WOMA  
15 Bis Rue Leon Giraud  
75019 Paris, France  
on Oct 06 to Oct 08, 2017

### Building-Reality.com

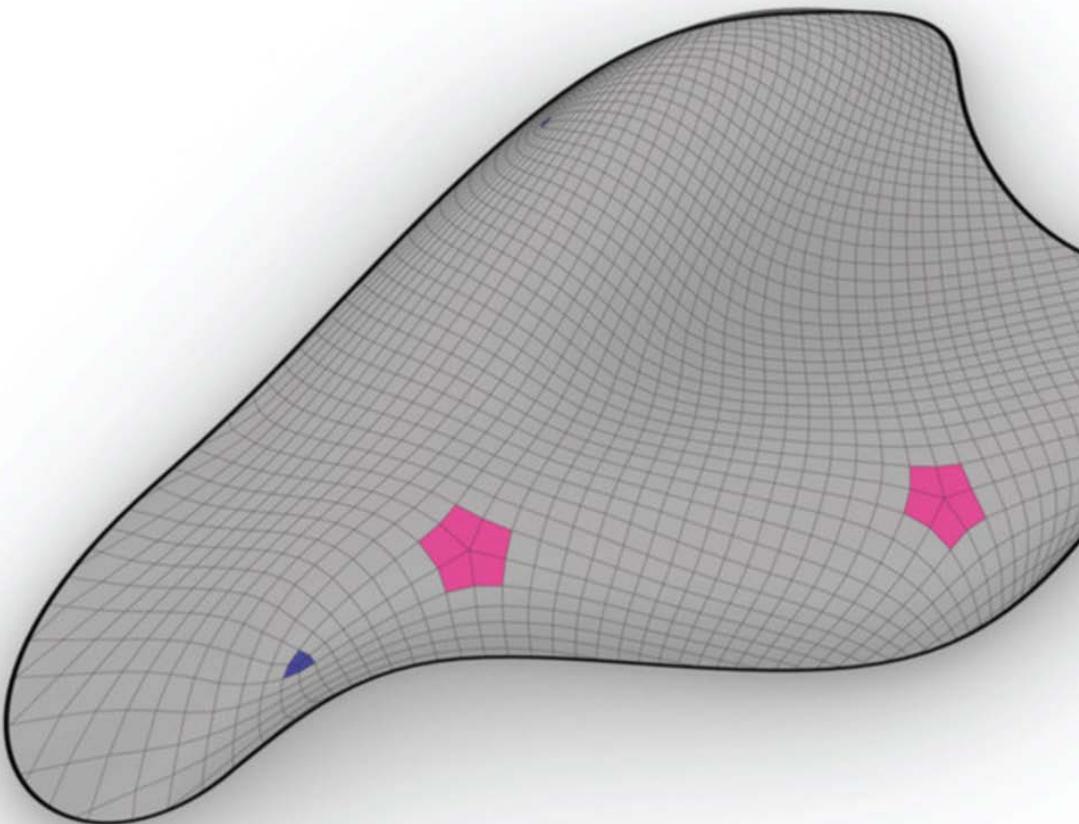
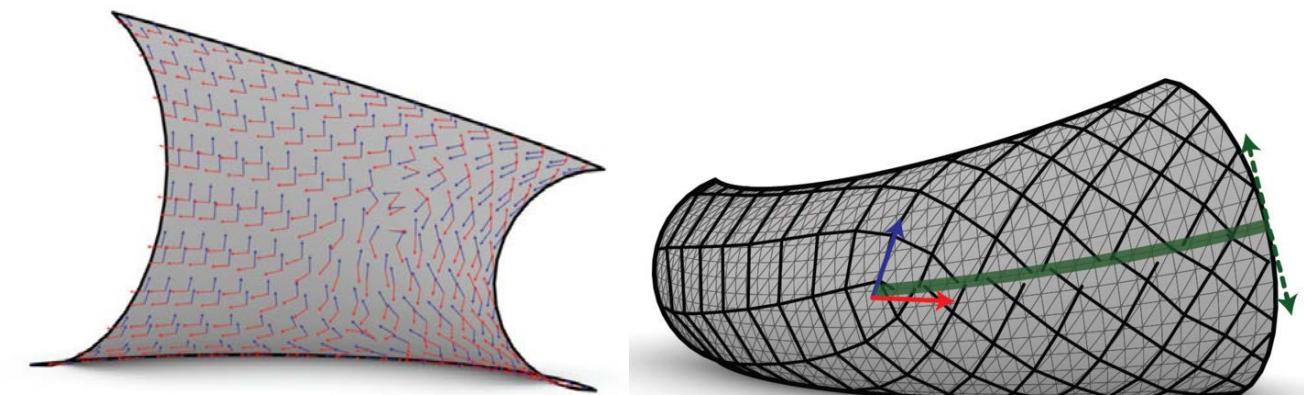
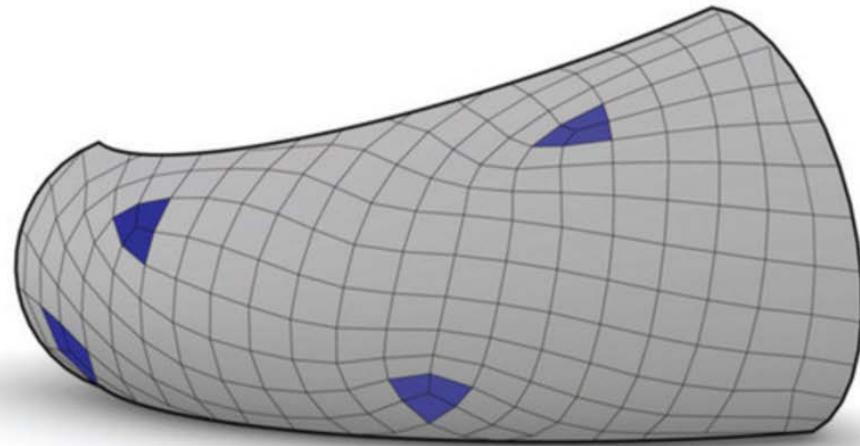
### Fouad Chehab Stadium: Community Sports Hub

### LRCEMS

### In between

### The Heart of the Campus

### Developable Lavabo



## Planar Quads in Free-Form Surfaces

Architecture geometry: Rationalization techniques for Planar Quad meshes

This paper will cover the preprocessing techniques for planar quad meshes in architecture free-form surfaces. As a first step, we will cover the problems and objectives behind *PQ* meshes for construction, their benefits, their metrics as well as their goals, considering their constraints for a better optimization of the candidate *PQ* mesh. Secondly, we will explain the several preprocessing algorithms that generate a candidate *PQ* mesh ready for optimization. In addition to that, the output will be optimized according to its properties qualifying it to be *PQ* meshes. The last-mentioned are based on scientific papers, and were applied to concrete architectural projects. Combining chapter two and chapter three iteratively, we will be hitting the last chapter of this paper; generating subdivision method algorithm and a quad planarization in order to have a planar quad mesh.

**AUTHOR:** Christian Dimitri

**DATE:** July 2018

rhino3d

grasshopper3d

capybara/dodo

millipede

kangaroo2

VSC

Csharp

python

pandoc/latex

illustrator

photoshop

**CATEGORY:** Parametric design in architecture masters thesis

**FIRM:** MPDA 18 - Universitat Politècnica de Catalunya (UPC)

**LOCATION:** Barcelona - Spain

**SUPERVISOR:** Enrique Soriano

free-form surfaces

planarity

rationalisation

aspect ratio

curve networks

conformal mapping

frame fields

subdivision technique



Image By **Andres Flajszer**



**AUTHOR:**

Christian Dimitri, Martina Fabré, Noelia Rodriguez, Jatziri Rodriguez, Alan Rynne, Martí Sais

**LOCATION:**

Barcelona - Spain

**DATE:**

July 2018

**AREA:**

28.3 m<sup>2</sup>

rhino3d

grasshopper3d

VSC

Csharp

3dsmax

Vray

illustrator

photoshop

## Chebyshev Net Triangular Gridshell

Design & construction of a spherical actively-bent gridshell covered by a stretchable membrane

The aim of this study is to design and build a 6 m diameter dome structure covered by a stretchable membrane; using the previously published work in Chebyshev Net gridshells [Baverel et al.], the introduction of singularity points in the grid design [Yannick Masson et al.]. A special case exists when introducing a single valence 3 singularity on the center of a spherical dome: the bracing of each patch follows the same direction as the rods of its neighbouring patches, leading to the assumption that structure and bracing could effectively be the same element. Regarding the design & construction of the membrane, some assumptions had to be made in order to simplify the welding process.

**CATEGORY:** Case study

**FIRM:** MPDA 18 - Universitat Politècnica de Catalunya (UPC)

**LOCATION:** Barcelona - Spain

**SUPERVISOR:** Enrique Soriano, Gerard Bertomeu

elastic gridshell

lightweight structure

temporary pavilion

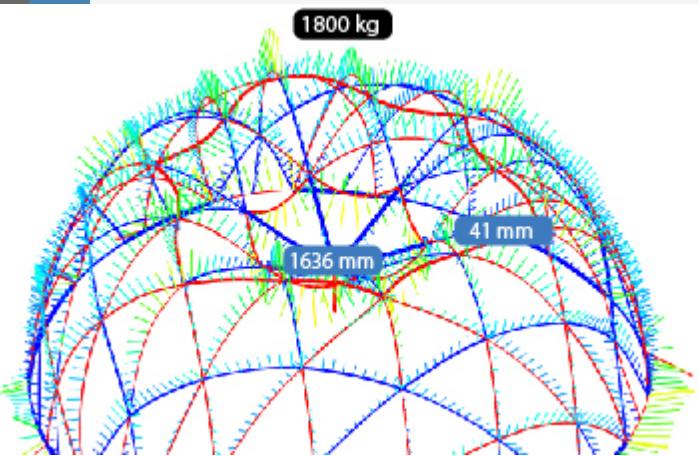
gridshell bracing

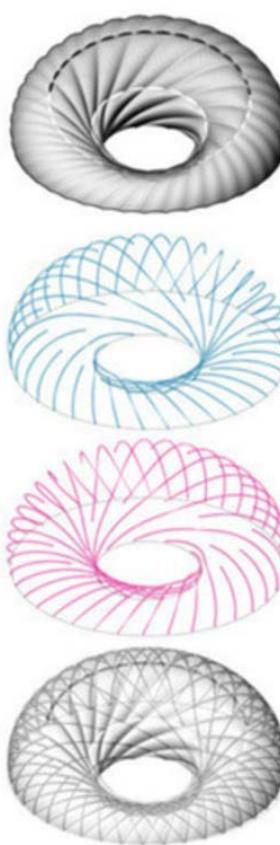
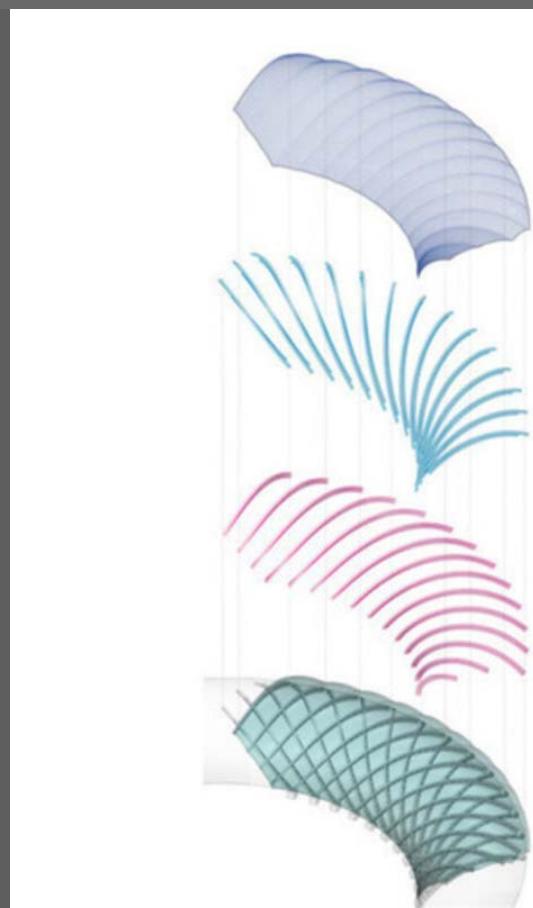
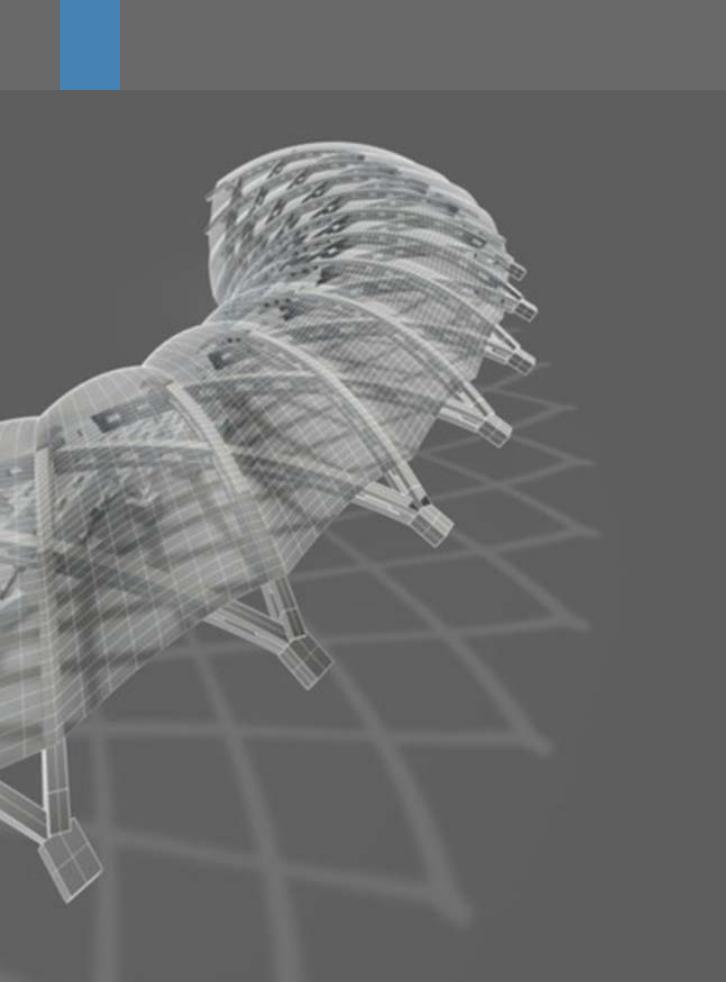
composite materials

spherical domes

active bending

elastic membrane





**AUTHOR:** Christian Dimitri, Sebastian Sánchez, Orlando Torricos Rachid Naboulsiv

**LOCATION:** New Zealand

**DATE:** February 2018

**AREA:**  $1846 m^2$

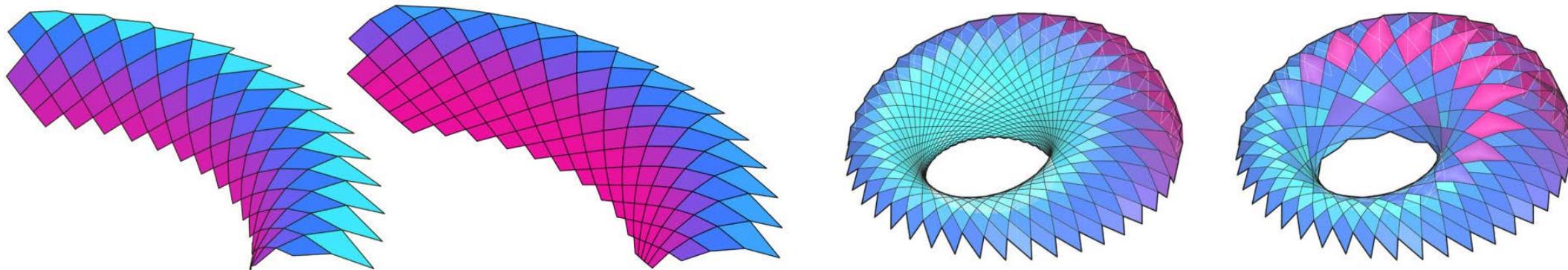
rhino3d grasshopper3d InDesign illustrator

photoshop

## Geodesic Gridshells: Waitomo Caves Visitor Center

### Building systems optimization

This research presents a case study of the Waitomo caves visitor center, explaining the different design strategies going from the form-finding and analysis till the optimization of the building system. The final step consists of adapting the same design system after collecting the information in the previous step onto a free form surface. The project is a wooden grid shell made of geodesic beam on a toroid. In order to study the project multiple 3D models were made to approximate the real project then analyzing and comparing the data between different 3D results.



**CATEGORY:** Case study

**FIRM:** MPDA 18 - Universitat Politècnica de Catalunya (UPC)

**LOCATION:** Barcelona - Spain

**SUPERVISOR:** Enrique Soriano, Gerard Bertomeu

geodesic gridshells

lightweight structure

touristic center

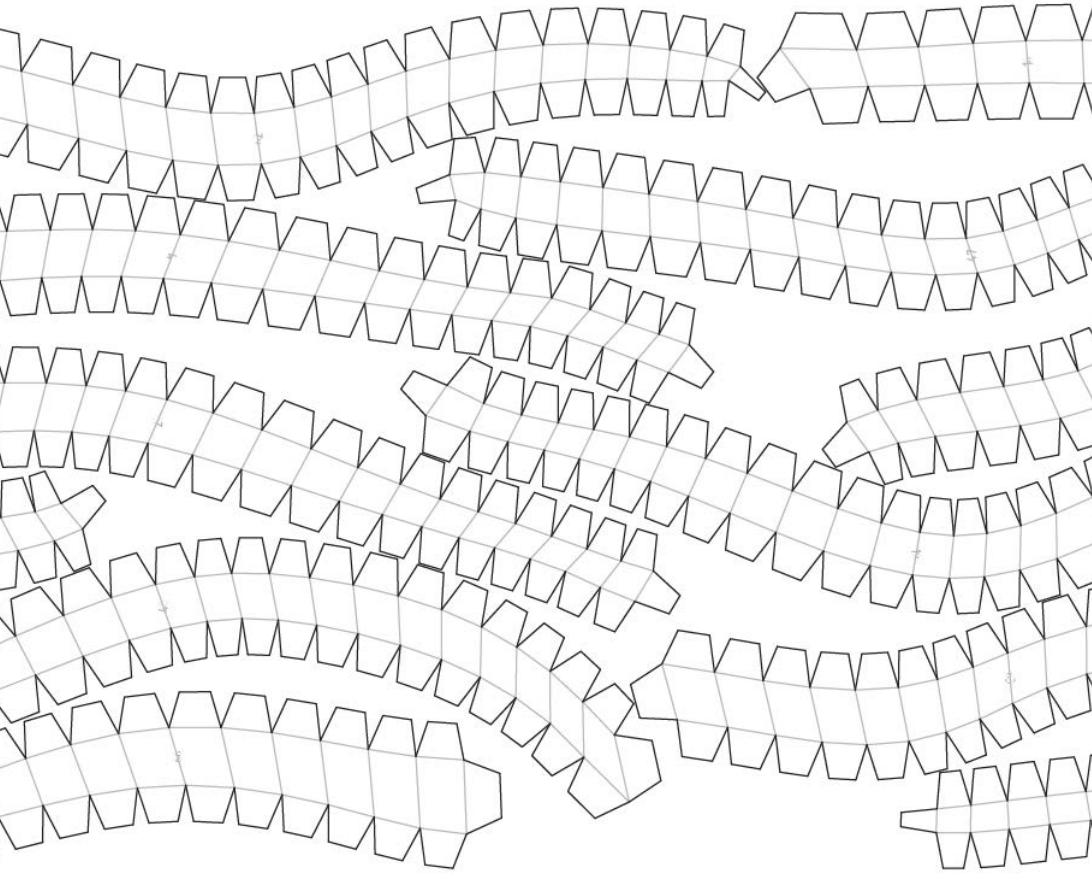
active bending

wood structure

etfe cuchon

system optimization

geometric adaptation



**AUTHOR:** Christian Dimitri, Jatziri Rodriguez, Uri Lewis  
**LOCATION:** Barcelona - Lebanon  
**DATE:** February 2018

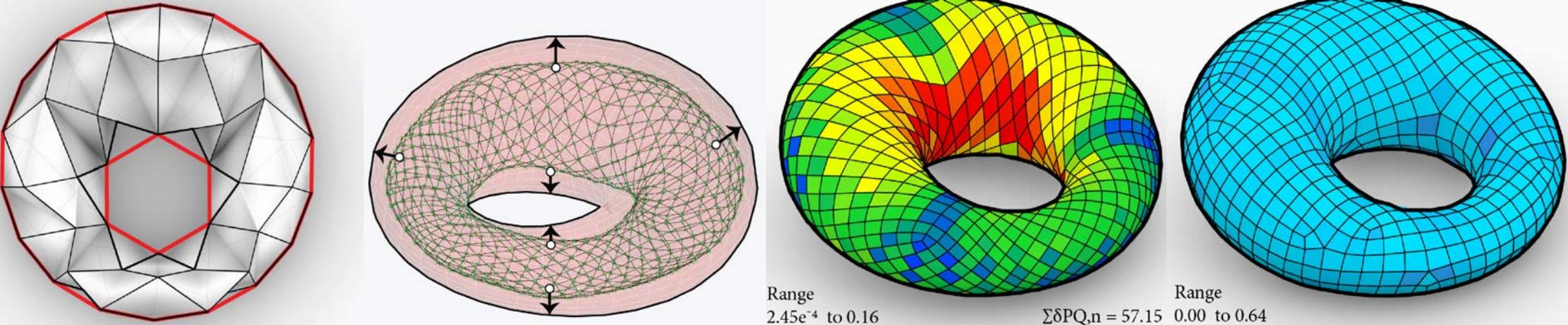
rhino3d grasshopper3d 3Dsmax illustrator

photoshop inDesign

## Digital Fabrication 2D Machining: Planar Quad Stripes

### Dupin cyclide rationalization

Polygonal meshes are important representations with a large number of applications in geometric modelling, computer graphics, mechanical engineering, simulation, architecture etc. Such representation are based on the idea of cell decomposition: a complex object is represented with an assembly of simple polygonal cells. In this survey we are going to discuss the background information of different techniques and algorithms mentioned in the literature for a quadrilateral remeshing. Thus, we will apply those techniques on a free-form surface called Dupin Cyclide. Therefore, we will introduce the process behind this paper showing different techniques in order to remesh a free-form surface while respecting it's semi-regularity that defines it's type. This phase consists of different ways to build a coarse mesh with a regular valence 4 on it's vertex, but with a variant number of singularities such as there placement on the mesh. Then we will optimize those meshes to fit them on the Dupin Cyclide. We will planarize the panels, reduce the hinge effect on each of them, and finally analyse and compare the outputs in order to select the optimal mesh fitting the PQ meshes requirements. After Outputting, the 2D nets have been generated and cutted using a 2D KNK machine then built on a small scale.



**CATEGORY:** Architecture geometry

**FIRM:** MPDA 18 - Universitat Politècnica de Catalunya (UPC)

**LOCATION:** Kaslik, Lebanon

**SUPERVISOR:** Enrique Soriano, Gerard Bertomeu

dupin cyclide

planar quad stripes

aspect ratio

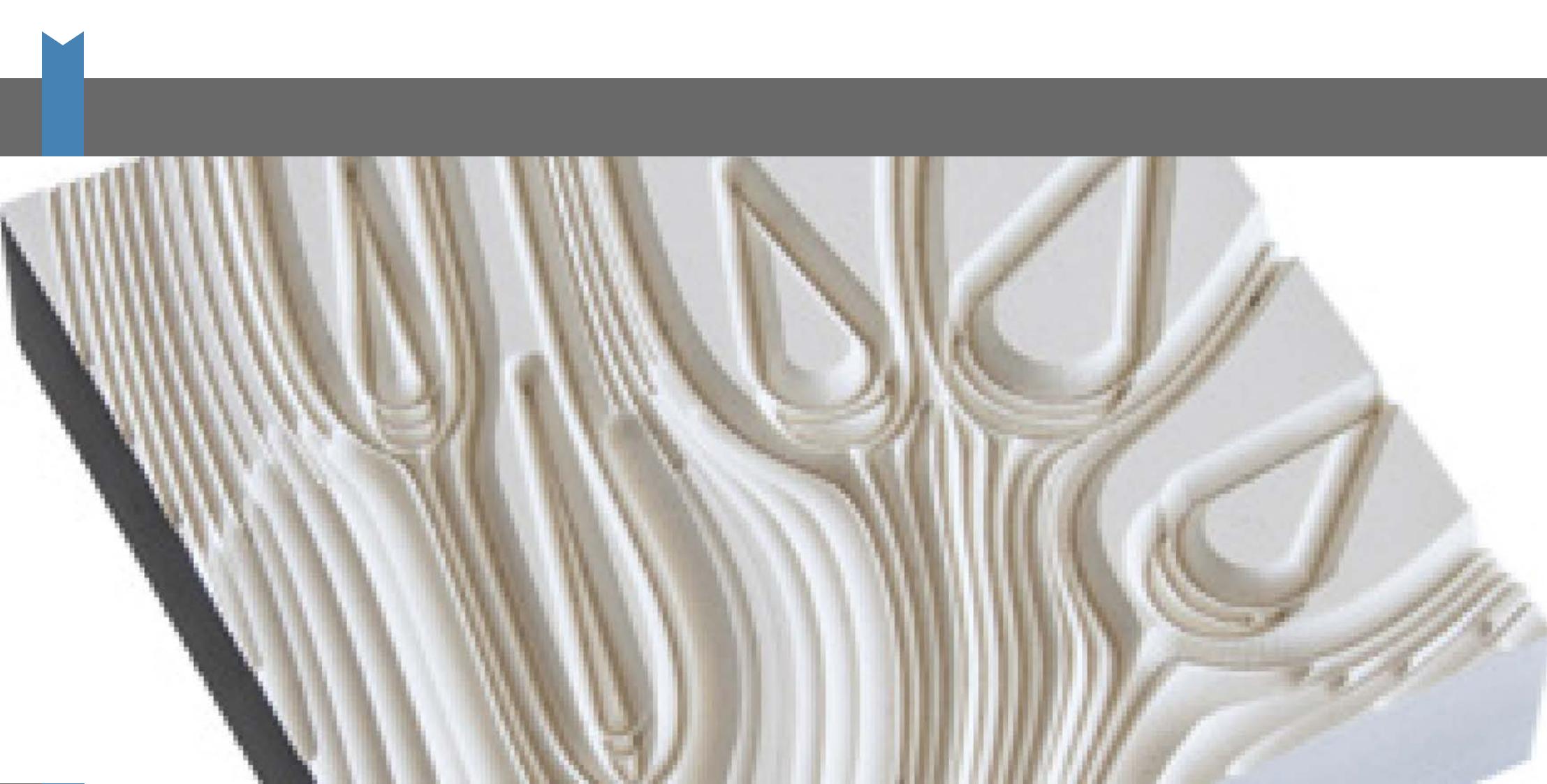
anisotropic remeshing

top down approach

digital fabrication

rationalisation

2D machining



**AUTHOR:** Christian Dimitri

**LOCATION:** Barcelona - Spain

**DATE:** February 2013

rhino3d

rhinoCAM

grasshopper3d

## Digital Fabrication 3D Machining: Kachigata

### Experimenting tool-paths and tool-tips

In the occasion of this task, I had the opportunity to generate a vector field on a surface and generating a mesh following these streamlines. This process was based on experimenting tool-paths using the available tool-tips in the factory. This art box shows a contrast between the rounded tool-tip and the sharp one.

**CATEGORY:** Digital fabrication

**FIRM:** MPDA 18, Medio Design

**LOCATION:** Barcelona - Spain

**SUPERVISOR:** Enrique Soriano, Gerard Bertomeu, Juan Pablo Quintero

kachigata

CNC machining

digital fabrication

vector field

streamlines

3D art

sculpting art

toolpath  
experimenting



```
Custom Properties
List<Line> growthLines = new List<Line>();
List<Point3d> previousPointsOnCurve = InputPoints;

Curve previousCurve = InputCurve;
int previousPointCount = previousPointsOnCurve.Count;
double tolerance = 0.001;

Do something
for (int i = 0; i <= maxIterations; i++)
{
    //offset the previousCurve
    double offsetValue = Math.Sqrt(i + 1);
    Curve offsetCurve = previousCurve.Offset(InputPlane, offsetValue, tolerance, CurveOffsetCornerStyle.Sharp(0));
    //get points on polyline
    int numberofPoints = (i + 1) * 2 + previousPointCount;
    double gap = 1 / Convert.ToDouble(numberofPoints);
    List<Point3d> ptList = new List<Point3d>();
    for (int j = 0; j < numberofPoints; j++)
    {
        double t = gap * j + gap / 2;
        Print("t:" + t);
        double r = rnd.NextDouble();
        r = r * ((gap / gapFactor) + (-1 * gap / gapFactor) + (-1 * gap / gapFactor));
        Print("r:" + r);
        Point3d pointOnCurve = offsetCurve.PointAtNormalizedLength(t + r);
        //Search closest point from each point
        Point3d closestPoint = Point3dList.ClosestPointInList(previousPointsOnCurve, pointOnCurve);
        //drawLine
        Line line = new Line(closestPoint, pointOnCurve);
        growthLines.Add(line);
        ptList.Add(pointOnCurve);
    }
    previousCurve = offsetCurve;
    previousPointsOnCurve = ptList;
}

Output Data
A = growthLines;
B = previousCurve;
```

AUTHOR: Christian Dimitri

DATE: April 2018

rhino3d grasshopper3d python VS

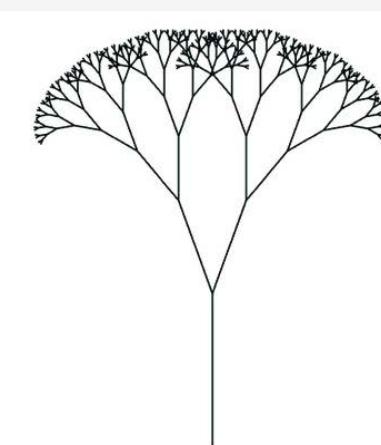
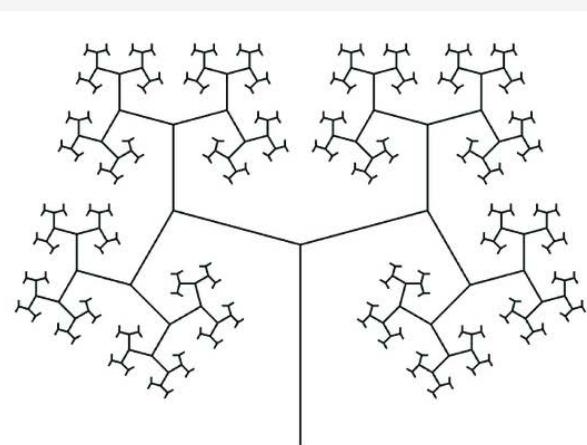
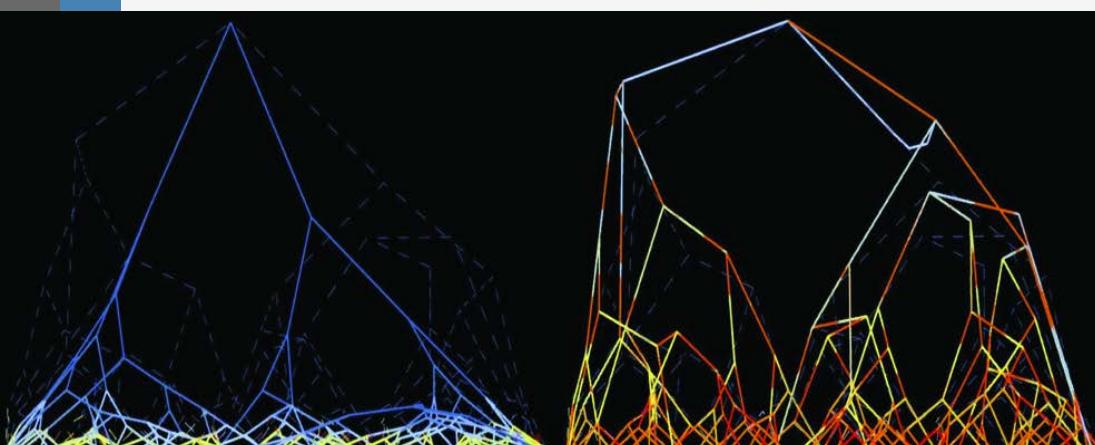
Csharp anemone

CATEGORY: Programming

FIRM: MPDA 18 - Universitat Politècnica de Catalunya (UPC)

LOCATION: Barcelona - Spain

SUPERVISOR: David Andres, Enrique Soriano, Ramon Sastre



nature

algorithms

scripting

dendrogram

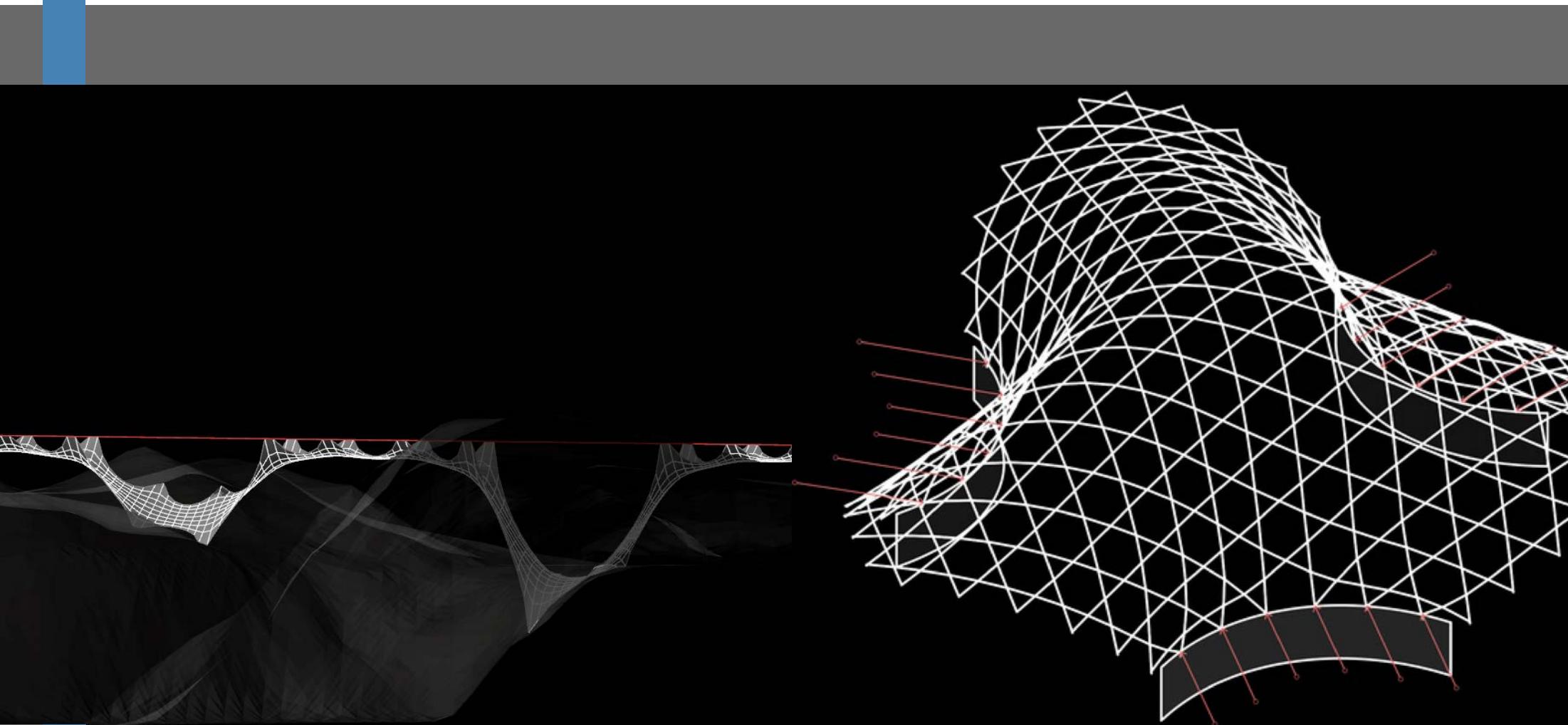
fractal tree

growth

## Algorithm in Technology

### Scripting and fun algorithm

This section covers a variety of algorithms I scripted. In the occasion of learning programming and algorithms in technology made my obsession in programing grow more. I have been always optimistic about the implementation of the maths in architecture and technology. Since the future hides a lot of secrets related to computer and science, I have decided to develop my scripting skills in order to implement them in architecture and design for construction.



AUTHOR: Christian Dimitri

DATE: April 2018

rhino3d

grasshopper3d

kangaroo2

k2 engineering

karamba3D

VSC

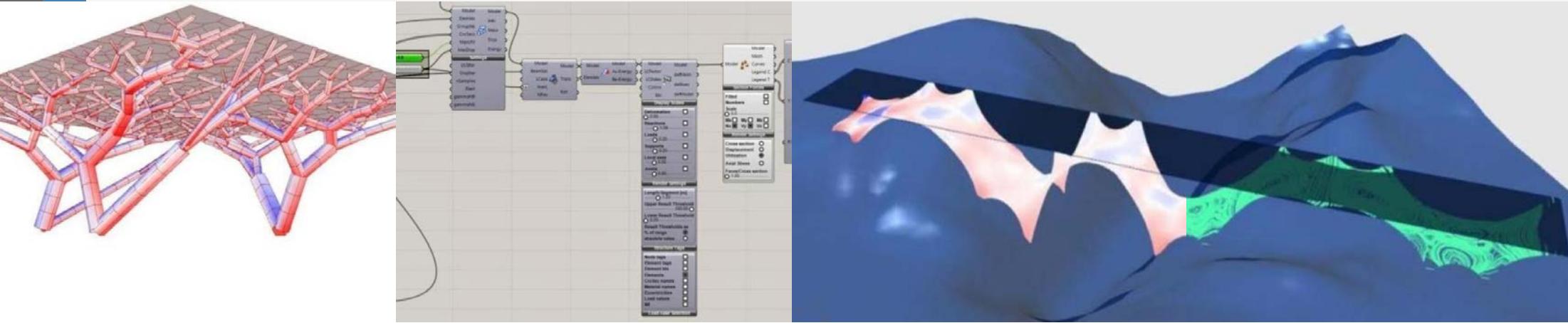
Csharp

anemone

## Form-finding and Structure Optimization

Structure design using grasshopper3d and optimization using Karamba3D

This section will show a set of form-finding algorithms. Thus some algorithms such as the dendrogram is applied on a task to carry a platform of a uniform load of 150kg/cm<sup>2</sup>. After this step the curves have been assigned as supports in the Karamba assembly mode. Therefore a set of thicknesses has been optimized using an Evolutionary system engine in order to have an acceptable displacement. On another hand, a set of forms have been found using the dynamic relaxation techniques generated using kangaroo2 (musmeci bridge of Arthuro Tedeschi, gridshells, etc...) , after that the stress lines and utilization are computed using karamba3D assembly mode.



CATEGORY: Building information

FIRM: MPDA 18 - Universitat Politècnica de Catalunya (UPC)

LOCATION: Barcelona - Spain

SUPERVISOR: Enrique Soriano, Pep Tornabell, Gerard Bertomeu

form-finding

lightweight structure

complex structures

algorithm in construction

structure optimization

deflection

max displacement

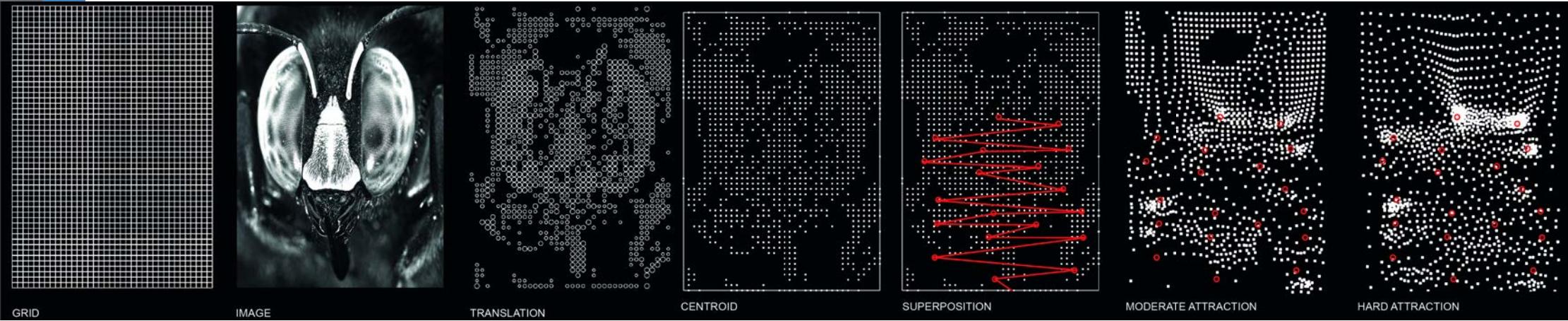
utilization



## Insection

### ARTE ROBOTICA V.01: Computational robotic painting workshop

Insection is a visual representation of the method which an image could be distorted by the sound. The way a subject is perceived, it is isolated by itself. The aim of the attempt is to produce a final piece of work which should be generated by an image and a sound and moreover it should be a collaboration between generative design and unexpectedness of the robot's work. This aspect or randomizing the final result gives the possibility of unlimited solutions and interpretations. Initially an image of an insect has been chosen and it was associated with the sound of the source. The image and the sound are working together in order to complete the perception of the idea about the insect. Insection is an attempt of visualizing the interaction between these three objective qualities of the subject: word, image and sound. The image of the insect is inserted into the software and translated into the language of the linear graphic which makes the interaction between an image and the graphic of the sound wave possible. Afterwards the sound wave and the linear image are put into superposition in order to observe the interaction between the two. The sound wave is glitching the linear image metamorphosing it into something new which cannot be related neither to the sound wave nor to the image.



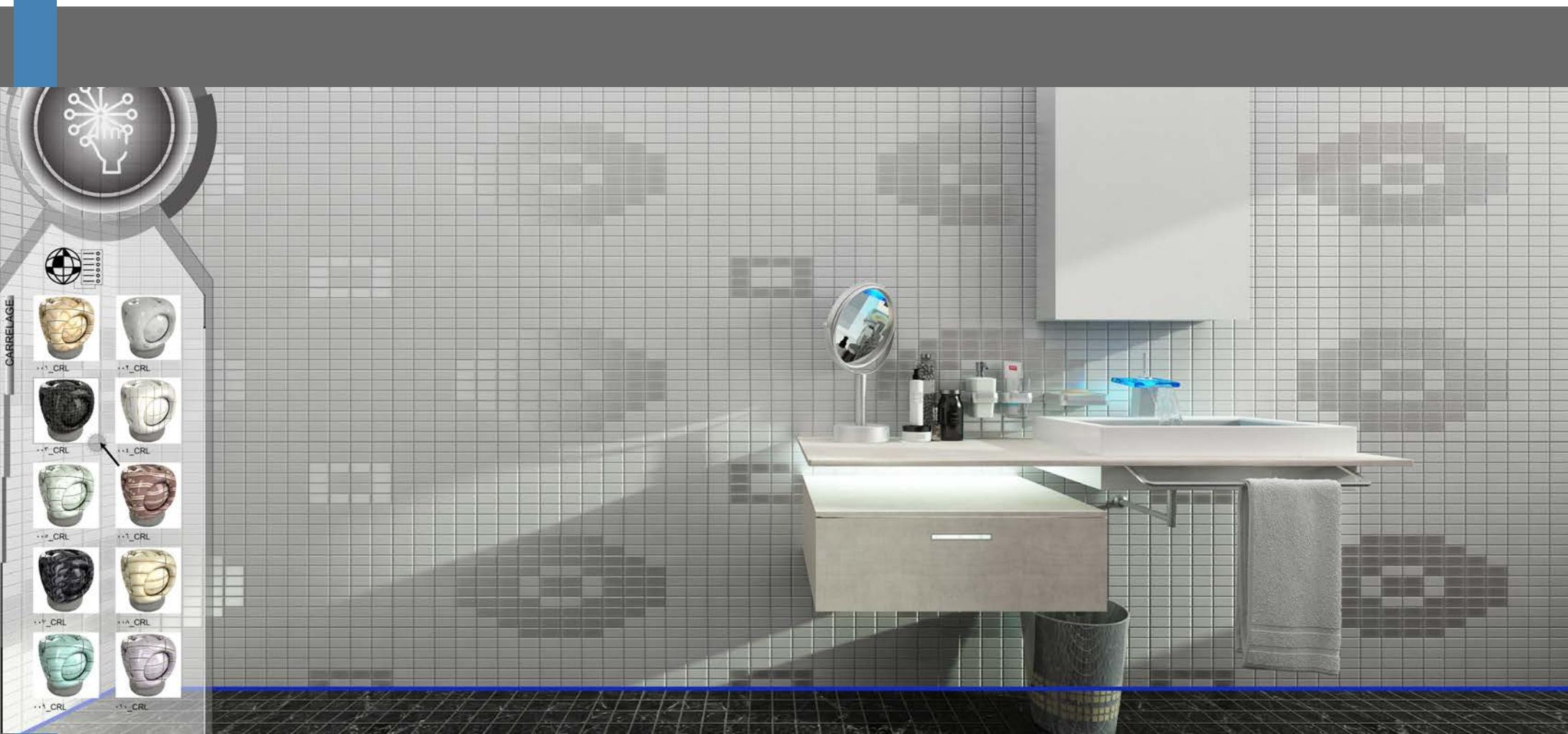
**AUTHOR:** Christian Dimitri, Dimitrova, Ben Tay  
**LOCATION:** WoMa Paris - France  
**DATE:** October 2017

rhino3D grasshopper3d anemone tacob ABB

illustrator photoshop inDesign

**CATEGORY:** Workshop  
**FIRM:** DesignMorphine, IAAC  
**LOCATION:** Sofia - Bulgaria, Barcelona - Spain  
**SUPERVISOR:** Lidia Ratoi, Kunaljit Chadha

computational design digital art  
dadaist concepts ABB robot arm  
customized tooltip insection concept



## Building-Reality.com

Optimized real estate prototyping solution innovative, immersive, adjustable

Collaborating with the software developers and the founders of the french startup that offers prototype services of buildings and renovating real estate through virtual reality experience. The essential element of our product is the ability to experience the future, to be immersed in it. Indeed, it provides the answer to a real client need. In today's current market, with the existing software, it is impossible to move around inside your building project as you make enhancements or adjustments. However, with the new Reality Building software, this attractive idea becomes a reality.

**AUTHOR:** Fabio Curia, Paul Berger, Julia Merpillat, Axel Imerdis, Nicolas Laurent, Christian Dimitri, Lea Monnot  
**LOCATION:** Nice - France  
**DATE:** January 2018

**CATEGORY:** Start-up

**FIRM:** Building Reality

**LOCATION:** Villeneuve-Loubet - France

**CO-FOUNDER:** Fabio Curia, Paul Berger

virtual experience

realtime render

real estate

flexible service

self modification

materials & furniture

immersive technology

innovative services





AUTHOR: Christian Dimitri

LOCATION: Jounieh - Lebanon

DATE: June 2016

AREA: 30 000 m<sup>2</sup>

autocad

3Dsmax

Vray

photoshop

autodesk 123D

## Fouad Chehab Stadium: Community Sports Hub

From a municipal stadium to a sports hub

**Would the installement of new administrative and sports equipments on site of the Fouad Chehab Stadium supported by local investors and sponsors, be a solution for the enhancement of regional collectivity?** In the city of Jounieh are dispatched more than ten private sports facilities, offering an average of six activities each. However, existant building the stadium presents four possible choices of activity only. On the other side it is a cultural platform in summer; the Jounieh International Festival is hosted there, along with other festivities for the citizen and the surrounding regions. As shown in the picture above, it is clear that the regional radius is not proportional to its present day utility. This is why I developed a conceptual urban design, employing the maximum of resources on site, creating an innovative potential upgrade under-estimated stadium.

CATEGORY: Architecture masters thesis

FIRM: Holy Spirit University of Kaslik (USEK)

LOCATION: Kaslik - Lebanon

SUPERVISOR: Abdel Halim Jabr

urban design

public domain

sports hub

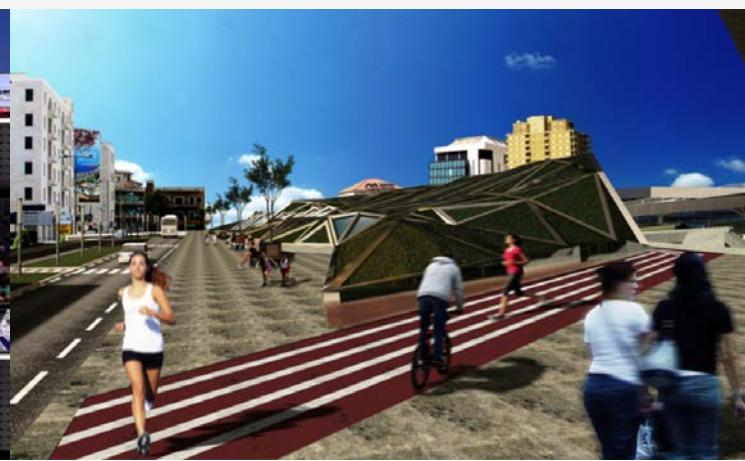
municipal stadium

public spaces

humanitize the land

city cycling path

green roof





AUTHOR: Christian Dimitri

LOCATION: Sahel Alma - Lebanon

DATE: June 2014

AREA: 7 500 m<sup>2</sup>

autocad

3Dsmax

Vray

photoshop

## LRCEMS

### Lebanese red cross new center

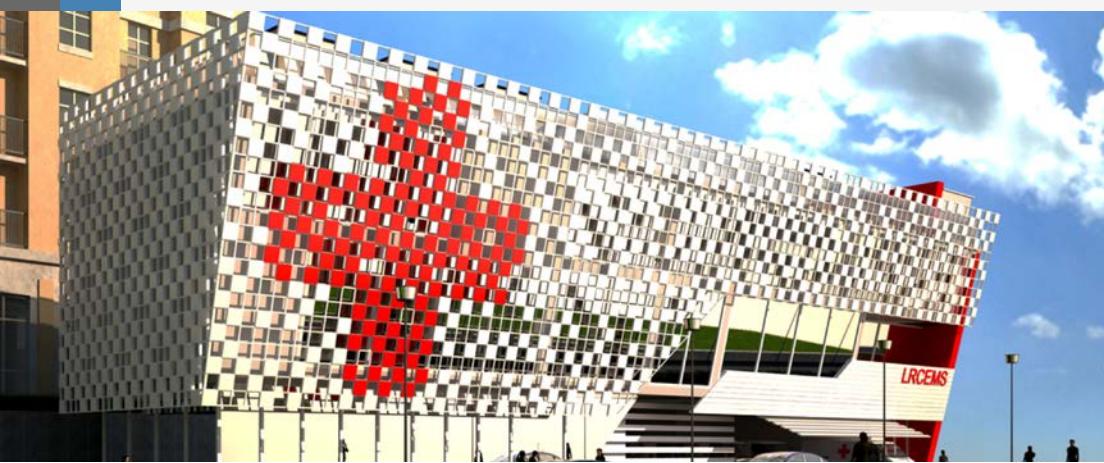
In the occasion of a facade design competition I had the honor to win the first place in the challenge of covering the structure of new Lebanese Red Cross center. My creativity and my knowledge in digital tools and design drove me to design an iconic design. The latter is a double skin facade covered with ceramic panels on a metallic chassis. The panels are colored and culled in order to express and show the red cross on the main facade of the building. The stairs which embed the verticality of the geometry is colored in red in that way the center is highlighted.

CATEGORY: Facade design proposal

FIRM: BlankWorkshop

LOCATION: Sarba - Lebanon

SUPERVISOR: Anthonios Rizk, Georges Nicolas



box morphing

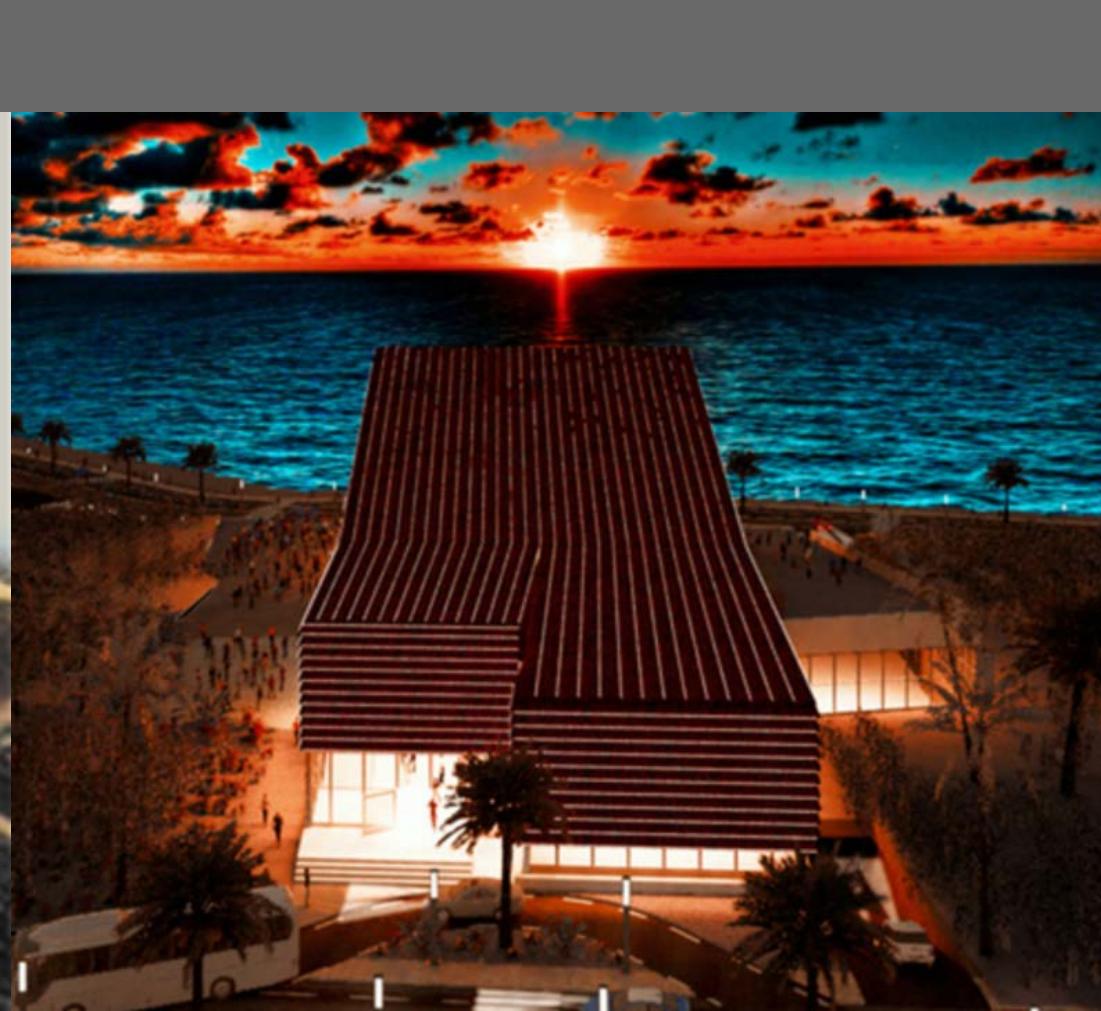
red cross

facade design

conceptual design



RED COPPER PANELS  
PUBLIC CIRCULATION  
REINFORCED CONCRETE PILLERS  
REINFORCED CONCRETE WALLS  
GREEN ROOF  
EXPERIMENTAL THEATRE ROOM  
AMPHITHEATRE BALCONY  
  
ADMINISTRATION  
  
BACKSTAGE PRIVATE CIRCULATION  
BACKSTAGE TOU  
LOBBY  
MULTIFUNCTIONAL ROOM  
AMPHITHEATRE  
VIP PARKING ENTRANCE  
ORCHESTRA HALL  
STAGE



**AUTHOR:** Christian Dimitri

**LOCATION:** Batroun - Lebanon

**DATE:** October 2013

**AREA:** 7 500 m<sup>2</sup>

autocad

3Dsmax

Vray

photoshop

## In between

### Cultural and art center

This site is located in north Lebanon, specifically in an old town called Batroun. It is in fact one of the most beautiful settings for Mediterranean sea-scent lovers. Surprisingly, it is one of the oldest cities in the world; Phoenicians founded this borough and handed it over to the Orthodox, to finally fall into the Ottoman's arms. That being said, an architectural stratification imposes itself, as proof of an unmissable clearly heavy cultural background. Hereinafter, the university's jury has decided the given subject: Art and cultural center. The building is located at the interface between the sunset by the sea and the city lights. As amazing as it seems, some constraints came along the way. The first and most important one was the matter of flowing circulation to both major points of site; in other words, I didn't want to reduce the space to a box. Henceforth, the west part of the building underwent an elevation and widening process, as well as the conception of an opening, giving on a wide view sea-side terrace, including an outdoor amphitheater south, and an eysoothing landscape ensuring pedestrian continuity towards the architectural promenade-north, with the sea as only scenery.



**CATEGORY:** Architecture design studio V

**FIRM:** Holy Spirit University of Kaslik (USEK)

**LOCATION:** Kaslik - Lebanon

**SUPERVISOR:** Fouad Gabriel

stratified cultures

art & culture

Mediterranean

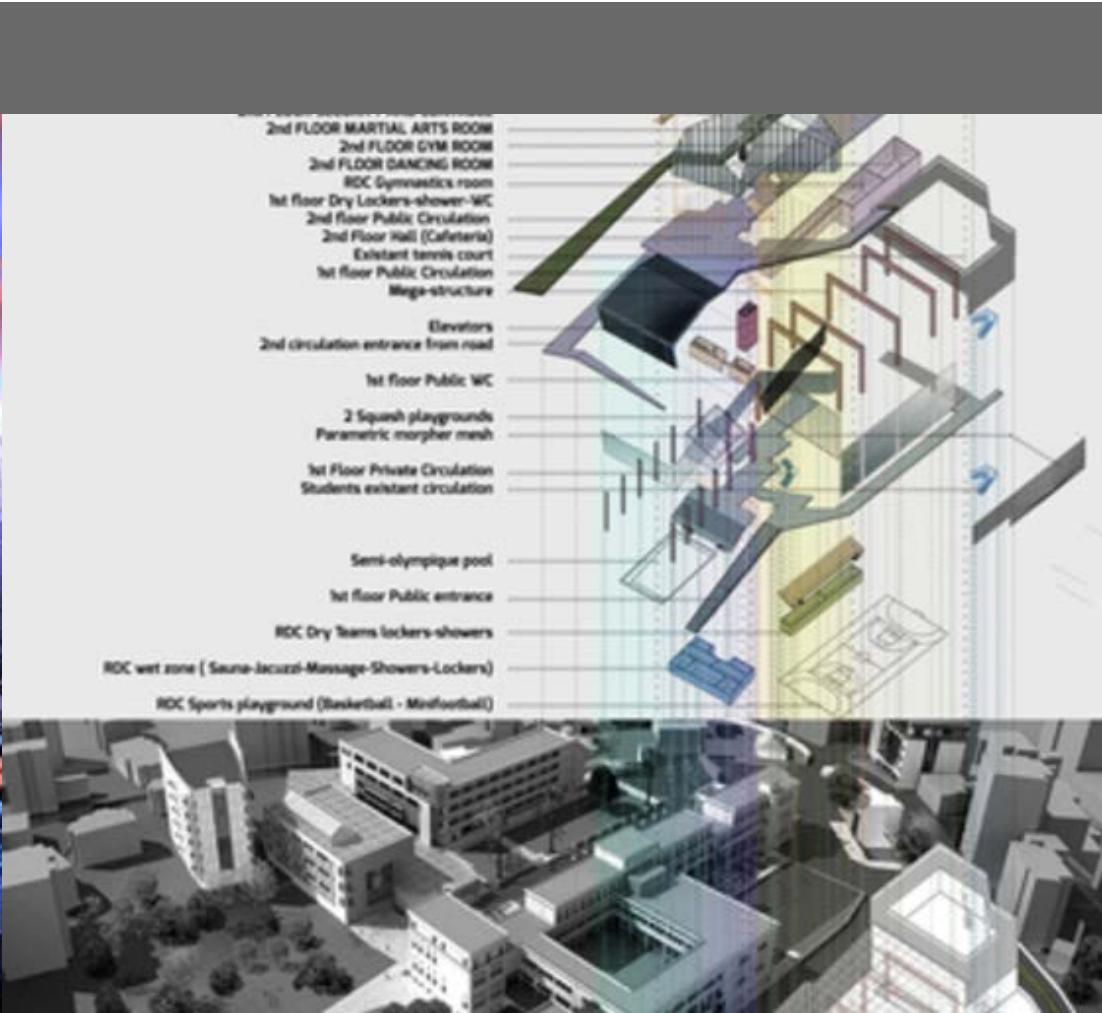
old village

new citie

amphitheatre

multi-fucunction space

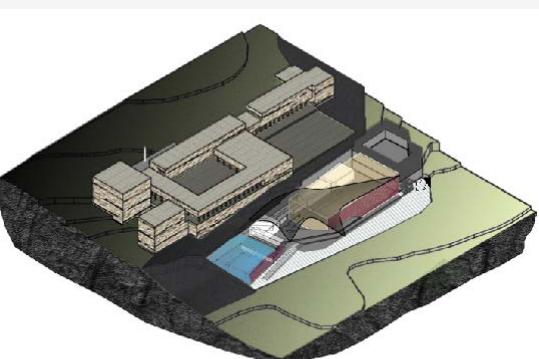
exhibition space



## The Heart of the Campus

### Sports & health center

Education and its various systems hasn't always been what it is today. From a class of two under a tree, to immense metling pot surface, the creation of universities is obviously a big game changer in the upgrade of education as a whole which happens to be the literal translation of the Latin word universitas, logically referring to our modern university. Thus the design approach was to create the best social environment possible for the university's sports and health center. Situated on Kaslik's main road, the new  $25\ 000\ m^2$  facility includes competitive and recreational athletic facilities. As a major point to start off, I put my entire focus on the inner/outer pedestrian circulation; As it appears on the first graph, I have located the density points of the pedestrians around campus and have joined them to a focal point situated in the exact middle of the site, therefore creating safe passages to the sports health center building.



**AUTHOR:** Christian Dimitri

**LOCATION:** Jounieh - Lebanon

**DATE:** May 2013

**AREA:**  $25\ 000\ m^2$

autocad

3Dsmax

Vray

photoshop

**CATEGORY:** Architecture design studio V

**FIRM:** Holy Spirit University of Kaslik (USEK)

**LOCATION:** Kaslik - Lebanon

**SUPERVISOR:** Fouad Gabriel

tensile membrane

atrium

pedestrian passages

sports community

youth center

health center

parametric facade

box morphing



**AUTHOR:** Christian Dimitri

**LOCATION:** Spain

**DATE:** January 2018

**MASS:** 70 kg - 121 kg

rhino3d

grasshopper3d

Keyshot3D

## Developable Lavabo

### Customized Parametric Furniture

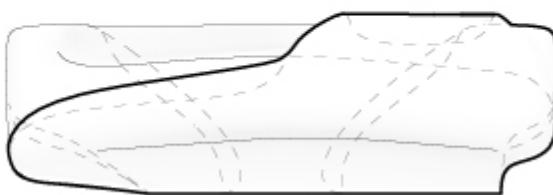
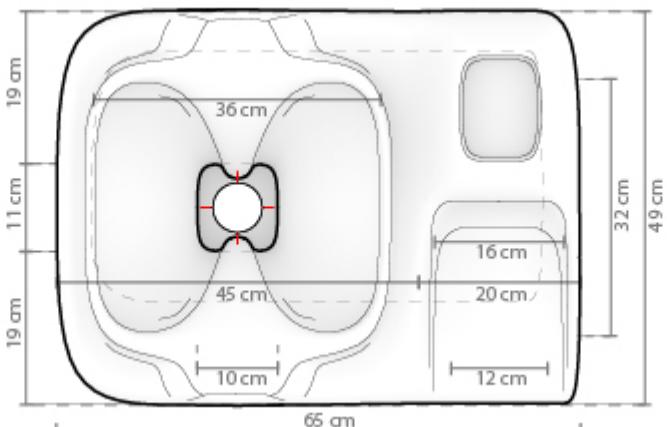
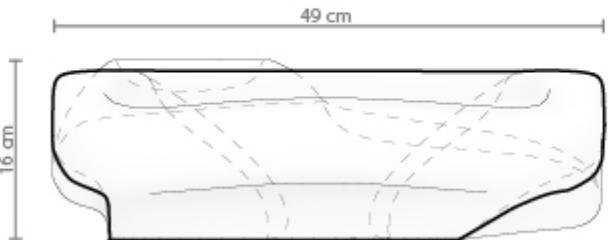
In collaboration with an industrial robot manufacturer, I had the chance to create and design a parametric lavabo. The entity can be used as single or a double lavabo, the dimensions are computed using functions that parametrize the mesh. The weight is optimized under a certain minimum. The user can modify the dimensions live, and make it suite the space he needs.

**CATEGORY:** Series of parametric furniture

**FIRM:** Collaboration

**LOCATION:** Spain

**CLIENT:** Nerinea-Essence Natural Stone



customized furniture

parametric furniture

live modification

uniqueness

developable surfaces

smooth meshes

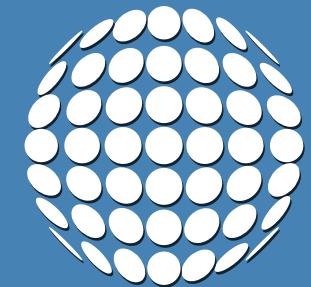
computational design

luxurious lavabo

Image By [Andres Flajszer](#)



Work !!! It's just a serious fun ...



You can still visit my website [here](#)

Or feel free to contact me at

[contact@chrisdimi.me](mailto:contact@chrisdimi.me)



Made with html, css and Pandoc.

Hosted in Github.