**portfolio . pedro veloso**

**architect . researcher**

**MIT ARCHITECTURE . phd apliccant**

**design and computation program**

PEDRO LUIS ALVES VELOSO

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EDUCATION

2001-2006 University of Brasília (UnB): Diploma in architecture and urbanism

2008-2011 University of São Paulo (USP): Master in architectural design

Master Thesis: Technical gesture: the interferences of digital modeling in the architectural conception.

TEACHING

Lecturer in the Specialized Program of Commercial Architecture at SENAC Santa Cecilia (São Paulo, 2nd Sem., 2011). Modules: Architectural Design: Conception of Commercial Architecture; Applied Theory.

Lecturer in Architecture and Urbanism, Industrial Design and Environmental Engineering at SENAC University Center (São Paulo, 2010-2012). Modules: Mathematics; Technical Drawing; 2d Computer Graphics; 3d Computer Graphics; Methodology; Complementary activities; Technical Drawing and CAD.

Graduate teaching assistant at USP for the AUH156 History and Theory of Arch. and Urb. IV (1st Sem., 2010 and 2011) taught by Prof. P. Bruna, Prof. H. Segawa, Prof. M. Junqueira, Prof. L. G. Machado.

LANGUAGES

PORTUGUESE: Native l ENGLISH: Excellent (TOEFL 107) l SPANISH: Excellent

COMPUTATIONAL SKILLS

Programming/scripting languages: VBA, VB.Net, Python, Processing

Software applications: Adobe Photoshop / Illustrator / InDesign / AutoCAD / Generative Components / Rhinoceros 3D / Grasshopper

Electronics prototyping: Arduino

CONFERENCES AND LECTURES

2013 SiGraDi Conference: Knowledge-based Design (Valparaíso, CH).

Publication: “An Archaeology of Cybernetic Diagrams”. With Anja Pratschke (Best paper awards).

2012 SiGraDi Conference: form(in)formation (UFC, Fortaleza, BR).

Lecture: “Architecture and instruments, architecture and information”

Presentation and publication: “Christopher Alexander and the dilemma of the (in)formed space”.

2011 SiGraDi Conference: Augmented Culture (UNL, Santa Fé, ARG),

Presentation and publication: “Culture augmented or substituted?”

2011 Symposium of Architecture and Urbanism: Extremes. (SENAC, São Paulo, BR).

Publication: “Fascination or digital abstention in Metropolitan Architecture?”

2011 National Conference: Projetar: design processes (UFMG, Belo Horizonte, BR).

Presentation and publication: “Instrumental idiosyncrasies or denying the architectural psychographics”.

2011 Seminar on digital processes and fabrication in architecture (SENAC, São Paulo, BR).

Lecture: “Digital Architecture: between Design and Technology”.

2010 Meeting of the National Association for Research and Graduate Studies in Architecture and Urbanism - architecture, city, landscape and territories (Rio de Janeiro, BR).

Presentation and publication: “Digital modeling in contemporary architecture”.

2010 Symposium of Architecture and Urbanism: Habitat in transit (SENAC, São Paulo, BR).

Publication: “Weaving Architecture: questions about the complexity of contemporary practice”.

2010 Brazilian Architects Congress: architecture in transition (Recife, BR).

Presentation: “Digital modeling in contemporary architecture: towards a critical approach”.

PUBLISHED BOOKS, CHAPTERS AND PARTICIPATIONS

Veloso, P. L. A. and Pratschke, A. (2013) “Between form and performance: Christopher Alexander’s design theory” In: Didáctica Proyectual.

Celani, G., Veloso, P. L. A., Neto, W. B., Mendes, L., Godoi, G. (2013) “Workshop at 9th São Paulo International Biennale”, in Celani, G. LAPAC 2006-2013: The Laboratory of Automation and Prototyping for Architecture and Construction, 1st ed., Campinas: Cesar Lattes Central Library.

Abreu e Lima, F. and Veloso, P. L. A. (2012) Projeto, Ética e Autonomia: ensaios sobre emancipação e domínio no fazer arquitetônico [Design, ethics and autonomy: essays on emancipation and domain in architectural practice], 1st ed., Lisboa : Chiado.

WORKSHOPS

Instructor

Parametric design and digital fabrication (17 April – 09 May, 2013, IAU, São Carlos, BR)

Parametric design with Grasshopper (08-13 Oct, 2012, SiGraDi.LAB, Fortaleza, BR) with B. Raviolo.

Parametric architecture (12 Sep – 05 Dec, 2011 l 06 Sep – 22 Nov, 2012, SENAC, São Paulo, BR)

Parametric design: application for climatic performance optimization (02 dec, 2011, 9th International Biennale of architecture, São Paulo, BR) with Prof. G. Celani, L. Mendes, G. Godoi and W. B. Neto.

Complex surfaces in architectural design (10 may, 2010 l 10 June, 2011, SENAC, São Paulo, BR).

Participant

Computational Design: generation, evaluation and digital fabrication (08-13 Nov, 2012, SiGraDi, Fortaleza, BR). Organization: G. C. Henriques, E. Bueno and A. Orciuoli.

Shape Grammar in social housing (30-31 Mar, 2012, Mackenzie, São Paulo, BR). Org: Prof. G. Celani.

Estructuras Evolutivas (17-19 November, 2011, SiGraDi, Santa Fe, ARG). Org: Prof. Arturo Lion.

NAi + AA Visiting School: Micro Revolutions (16-24 July, 2010, Escola São Paulo, São Paulo, BR).

Organization: Franklin Lee and Anne Save de Beaurecueil.

Complex Geometry and Parametric Design with grasshopper (12-18 Nov, 2009, SiGraDi, São Paulo, BR). Organization: E. Bueno and G. C. Henrique.

PROFESSIONAL AND EDITORIAL EXPERTISE

Editor of V!RUS Magazine #9 (Feb-Oct, 2013, BR) with M. Tramontano, A. Pratschke and A. Ventura. Colaboration in edition, revision, translation, graphic and web design.

SiGraDi reviewer (2012-present).

Associate Architect at Quinta Architecture (Brasília, Jun-Nov, 2007): Colaboration in Venice Lagoon Competition proposal.

Intern at Bizzi Architecture Office (Mar 2004- Feb 2005, Brasília, BR): Colaboration in Headquarters of the National Confederation of Agriculture and Livestock of Brazil (Brasília, BR), and Reform of Banco do Brasil branch (Brasília, BR).

COMPETITION AWARDS AND PARTICIPATIONS

Environmental rehabilitation of Brasília Palace Hotel (2005, Brasília, DF). Team: J. M. O. Barros, P. L. A. Veloso and R. A. Maciel and Prof. Claudia Amorim (supervisor).

1st prize in Procel Prize.

Honorable mention in 4th José Miguel Aroztegui biennale.

Publication in architecture journal, local newspaper and television news.

Venice Lagoon Park (2007, Veneza, IT). Team: P. Farage, P. L. A. Veloso and V. Goulart.

Headquarters of the National Confederation of Municipalities (Brasília, BR). Team: P. L. A. Veloso, D. Cavalari, V. Berbel and F. G. Cavalcanti.

EXHIBITION

International itinerant exhibition EKO Project Brasil-Italia: La Complessitá del Progetto Contemporaneo per un’Architettura Responsabile (2012). Posters of Environmental rehabilitation of Brasília Palace Hotel proposal.

Professors architects, Architects professors. Exhibition at University Center SENAC (2011, São Paulo, BR). Posters of the design proposal for the Headquarters of the National Confederation of Municipalities competition.

Architecture and Mathematics. Exhibition at SENAC (2011, São Paulo, BR). Presentation of models developed by the undergraduate students in the module “Mathematics” and in the “Ruled surface in architectural design” workshop.

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Current experiments

All patterns utilized in this portfolio were generated by a processing definition created by the author.

**01 drawings**

live model 2012

2 minutes sketch

graphite drawing

hands 2012

graphite drawing

self portrait 2012

graphite drawing

live model 2012

2 minutes sketch

graphite drawing

**02 undergraduation**

**Environmental Rehabilitation of Brasilia Palace Hotel**

2005 -1st prize in Procel Prize - Category: Buildings - Student -Brazil

Honorable mention in IV Biennal José Miguel Aroztegui -Chile

The City of Brasilia with the Paranoa Lake and the site location of the project detached. Google Earth Image.

1. Main Acess

2. Building support - services

3. Main Buinding - Bedrooms

4. Garden Terrace and salon

5. Pool

6. Main Parking

7. Service Parking

8. Garden

DIAGRAM OF INTEGRATED SYSTEMS

TEMPERATURE

WIND ANALYSIS

DAYLIGHT ANALYSIS

ORIGINAL BEDROOM

PROPOSAL

WEST FACADE MODULE - wood “brise soleil” with garden

BEDROOM SECTION WITH CROSS VENTILATION

DIAGRAM OF PREDOMINANT WIND PERMEABILITY IN ATRIUM SECTION

WEST ELEVATION

LONGITUDINAL SECTION

EAST ELEVATION

**Park and Social Center of University of Brasilia**

2006 - Undergraduate Thesis Project

School of Architecture and Urbanism of the University of Brasilia.

A. Ecological D’or Eye Park

B. Arboretto protection area

1. Deck with floating pool

2. pavilion for sport activities

3. observatory tower

4. pavilion for cultural activities

5. amphitheater

6. pavilion for general education

7. circuit for urban sports

8. open pavilion

9. open pavilion

10 school of environmental education

double layer gridshell structure

building distribution

below: sketches of the design process

Internal perspective

Located in a campus terrain at the lakeside in Brasília, the Park and Social Center of Universidade de Brasília (A) integrates pre-existing urban spaces, such as a Bragueto Park (B), The Ecological D’or Eye Park (C) and Aroboreto environmental protection area (D), and reinforces Paranoá lake public potential. The project is connected to the urban public transport system and to the neighbor parks with footbridges, sidewalks and a deck. There is a border pathway that promotes a tour around the project and many pseudorandom transepts pathways that cut the park to reach the lake border – which has a special landscape treatment to promote direct contact with the water.

To activate the Social Center as a vector of attraction in this network of spaces, it contains cultural, educational and sport activities to the community. The architectural design conciliates architecture and landscape, subverting the superquadra distinction between construction (building block) and nature (continuous park). Forming the park’s spine, the center is composed of a promenade of architectural events that follows the site topography. This sequence of spaces comprises the main activities: (1) a north deck with a floating pool; (2) a double layer gridshell pavilion for sport activities; (3) an observing tower connected to the pedestrian footbridge; (4) a double layer gridshell pavilion for cultural activities and cinema rooms; (5) an open amphitheater; (6) a double layer gridshell pavilion for educational activities and a community library; (7) an open circuit for urban sports; (8 and 9) two small open pavilions; (10) the school of environmental education in a frustoconical building in the middle of a clearing. All double layer gridshells are assembled on arch structures supported by tree-like columns, that emphasizes the promenade.

P. Veloso and J. Rodrigues (supervisor)

**03 competitions**

**New Headquarters of the National Confederation of Municipalities**

2011 - National competition organized by Brazilian Institute of Architects

1. first line

2. two walls

3. acess

4. openings to view the city and the lake

5. final composition

6.sunset and sunrise

The New Headquarters of the National Confederation of Municipalities is located in Brasília, in close contact with the monumental axis and the university. The building is defined by two main elements.

The first is a deflected longitudinal wall in the middle of the site. In the scale of the territory, this wall marks the site occupation and defines the visual relationship with the surrounding elements, while it also works as a background to the open piazza and configures a portico in the building access. With a nearby wall, it configures the office building as a longitudinal prism with privileged openings to the sunset and sunrise. In the building borders both walls are removed, creating a continuous rift that captures diffuse daylight to the 2 office floors. Both walls have also a horizontal opening to the skyline of Brasília.

The second element is a folded topography that articulates the access to the different part of the program and define generous semi-public spaces. From the front line of the site, the floor folds up to create the open piazza and the belvedere to the Paranoá Lake over the auditorium and an direct access the office building . It also folds down and configures a porte-cochère below the portico to access the convention center with its foyer, auditorium and multi-use rooms.

Team: Pedro Veloso (architect) , Diogo Bella, Flávia Garofalo , Victor Berbel (Colaborators)

**2G international competition - Venice Lagoon Park**

2007 - Organized by 2G International Architecture Review

The site’s landscape qualities served to smooth out the conventional limits between natural and artificial space. Due to its somewhat remarkable topography, with its little hill bordered by a charming channel in construction, the east side of the park was defined as the central space and its distinctive characteristics were made even more noticeable. Firstly, the little channel was extended, so as it could play a greater role in the proposed landscape (1). A spread spiral-like theater was located at the point where the water and the level curves converge. Beyond its primary functional goals, it is invested with the condition of “nervous system” of the park, a place of gathering and circulation which also provides a sense of order. From this center, a curvilinear promenade (2) follows the topography until it changes directions, heading north to end by the lagoon with indentures and pool excavations on the floor (3). A second curvilinear promenade (4) shapes the access of the park from Murano Island on the southeast, touches the first promenade and follows west to meet the lagoon on the other extreme - creating a roof to the park facilities (5) and a access pier (6). On the west, the space between promenades configures a large access piazza (7).

Contrasting with the geometrical features of the park, there is the great corten steel footbridge (8) with its precise and steady shape. Besides positing itself in the horizon line with an elegant slope of 2 %, it intertwines different relations with the park and is punctuated by important activities. It starts on the east as a pier, then it pierces a small hill - becoming the main corridor of an excavated museum (9) -, it crosses the channel as a bridge, it passes between larges masses of trees and culminates in the observatory tower (10).

Team: Pedro Veloso , Veridiana Goulart and Paula Farage

**04 master and selected papers**

**Technical gesture: the interferences of digital modeling in the architectural conception.**

Master Thesis presented at University of São Paulo, Brazil, 2011.

This thesis approaches the incorporation of computational thinking in architectural design in the last two decades (1990-2010). It stipulates two approaches. The first refers to the understanding of the architectural conception as a disciplined practice through a review of design theory. It establishes a reading on the role of man and its tools in architectural design, defining criteria for the discussion on the influence of digital technology. The second approach is based on the design philosophy proposed by Vilém Flusser to analyze computational thinking as a means of overcoming human limitation. Complementary to the design theory field, Flusser’s schemes are utilized to demonstrate that technology affects the structures of thinking and creating, marking new relations between man, knowledge, creativity and reality. Case studies and computational theories are analyzed with the support of key concepts proposed by the philosopher: “gesture of making”, “apparatus”, “technical image”, “gesture of calculation and computation”, and “the program”. Finally, we settle critical considerations about the influence of digital technology in architecture, offering up prospects for a computational-based architectural design.

**Culture augmented or substituted? Distinctions between the tool-architect and the robot-architect.**

In: Proceedings of 15th Conference of Sociedad Iberoamericana de Gráfica Digital (SIGraDi): Augmented Culture, Santa Fé, ARGENTINA, 2011.

This article investigates the notion of an augmented architectural design culture elapsed of the digital revolution. Based on analytical categories proposed by the philosopher Vilém Flusser it compares two systems of creative production (the tool-architect and the robot-architect), establishing new perspectives on the architectural design supported by computers. Thereafter, it identifies in the digital design agenda the overvaluation of the generative techniques over the psycho-physiological capacity of man. Lastly, the article discusses Flusser’s theories to present the risks and limitations of a design practice determined by the digital techniques.

**Instrumental idiosyncrasies or denying the architectural psychographics.**

In: Proceedings of V Projetar: processos de projeto: teorias e práticas, Belo Horizonte, BRAZIL, 2011.

In this paper, we approach the relation between design instruments and processes. In contrast to an idealist vision of architectural creation, we assume that design instruments and actions stimulate specific modes of production. Firstly, we articulate important theories in the field of design (N. Cross, D. Schön, A. C. Martinez, R. Evans and C. Gänshirt) to define an analytical scheme based on the reciprocity between action, perception and reflexion with the support of external representation systems. Based on this scheme, we analyze an excerpt of the historian Bruno Zevi and design proposals and representations of three important architects (Le Corbusier, C. Alexander and P. Eisenman) to discuss the role of the design instruments. Finally, we utilize our own project example to explore the idea that an explicit comprehension and a critical approach to the design instruments is essential to the design process, especially in an era of domestication of computation theories and techniques.

**An Archaeology of Cybernetic Diagrams.**

In: Proceedings of 17th Conference of Sociedad Iberoamericana de Gráfica Digital (SIGraDi): Knowledge-based Design, Valparaíso, CHILE, 2013. \* Elected Best Paper of the Conference.

This paper investigates the use of explicit structures of information in architectural design. Particularly, it approaches the use of diagrams related to cybernetics and information theory in experimental practices in the 1960’s and 1970’s. It analyses the diagram of cybernetic control proposed by the cybernetician Gordon Pask for the Fun Palace, the diagrams produced by the utopian architect Yona Friedman in the conceptual description of the Flatwriter program, and Christopher Alexander’s diagrams of Synthesis of Form and Pattern Language theories. Finally it establishes a brief parallel between current domestication and use of dataflow programming with the cybernetic diagrams, highlighting differences in their complexity approach.

**05 books**

The proposal of the book “Design, Ethics and Autonomy” was initiated by the Renaissance historian Fellipe de Andrade Abreu e Lima as an opportunity to debate the ethical dimension of architectural production. I was invited to participate with incursions in the contemporary design theory and technology. In general, I based my contribution on Vilém Flusser’s comprehension of gesture. According to his theories, when man builds tools and representations he is instantiating a radical process of redefinition of his own reality and existential condition. Flusser invested in this constructive scheme developing an original comprehension of man’s existential conditions. According to this scheme, the different technical means of representation instantiate a recurrent process of dimensional loss of his gestures– from four-dimensional humankind fully immersed in Nature to the zero-dimensional post-human that lives in an unpredictable calculus-based reality. Thru 3 chapters I organized an incremental approximation between Flusser’s gestures theory and the architectural design process. In the chapter called “Dialogues with Flusser: approximation between architecture and gesture” I investigated Flusser’s essays to identify relevant elements to analyze architectural design. In “The architectural design: action and compulsion with instruments” I inverted the vector, exploring architectural theories that reveal the central role of gesture in the actions, perceptions and reflections of design. Finally, the chapter “Gesture without gesture or calculating architecture” addresses the challenge of design with calculus-based apparatus and systemic thinking. I examined computational design in flusserian terms, prospecting the different nature of the medium and its influences on the architecture concepts and relationship with the body.

Today it is really clear the importance of the pioneers of computational design and their contributions to current theories on computational design – what can be reinforced by exhibitions such as Archaeology of the Digital (CCA) or conferences as Futures Past: Design and the Machine (MIT). In 2012, I participated in the SIGraDi conference with the paper “Christopher Alexander and the dilemma of the (in)formed space”, which was intended to contribute with this link between generations. In the paper, I discuss the challenge of Alexander to establish a systemic conception of space that recognizes the interaction and complexity of human forces during the 1960s and 1970s. And I bring this spatial dilemma to the contemporary context, to foster new challenges to the computational architecture. In the next year it was elected one of the23 papers (of 2011 and 2012 SIGraDi conferences) that would constitute a book called “Design teaching and post-digital surrounding. With the support of Prof. Anja Pratschke , I emphasized the theme of performance in Alexander’s diagrammatic investigations and established a balance of his contributions to a system-based design teaching.

Abstract

The current propagation of explicit structures of information in architecture follows the inclusion of topics such as performance-based design within architectural education. This chapter addresses the propositions of Christopher Alexander between his theories of synthesis of form and pattern language that anticipate these debates in nearly four decades. It examines his theoretical investigations on the generation of architectural form based on the systematization of the various environmental forces through diagrams. The text identifies important theoretical elements to discuss a contemporary architectural design education amid the amplitude and the radicalism of his proposals.

**06 parametric algorithmic research**

**Complex surfaces in architectural design**

workshop realized in SENAC architectural school, São Paulo, BRASIL, 2010 and 2011

This workshop was complementary to the 1st year Mathematics module. The general objective of the workshop was to characterize mathematical surfaces based on different criteria: ruled or non-ruled, developable and non-developable, single or double curved. Firstly, there was a lecture on these classifications and a presentation of buildings that utilize these complex surfaces to configure spaces and constructive elements. After this theoretical part, the students utilized wire, paper and synthetic polymers to create different surface models. The paper was a material constraint to present the characteristics of developable surfaces, with its constant normal vector along the generator curve. If incorrectly configured it would wrinkle, knead and rip. On the other hand, the flexible polymer ensured a great variety of undevelopable and double curved surfaces, while it demanded a constant tension of the wire to maintain its form. Both models were intended to stimulate an intuitive as well as a mathematical comprehension of complex surfaces properties and its possible uses in architectural design. The great challenge was to connect abstract concepts (such as vectors, generators, directrix etc.) to concrete constructive and design concerns.

developable models

non-developable models

sketches of mathematical concepts

a developable model of a frustoconical strip

**Parametric architecture**

Workshop realized in SENAC architectural school, São Paulo, BRASIL, 2011 and 2012

This workshop provided basic training with the software Rhinoceros and introduced parametric modeling with Grasshopper. As a final exercise, the students designed a pergola to be implanted in the patio of the academic building of Senac. The project was supposed to display parametric variation with the intend to be adaptable to the many patios of the school - each with different dimensions and boundary conditions.

**Parametric design and digital fabrication**

workshop realized in Instute of Architecture, USP, São Carlos, BRASIL, 2013

This workshop was complementary to the Design Studio 3 of the IAUUSP, taught by the professors Marcelo Tramontano and Renato Anelli. The main theme was the redevelopment of the transportation network of São Carlos. Besides large scale proposals, the students should propose a parametric constructive system that would base the design of a bus shelter and a bus station. The first part of the workshop was an introduction to parametric modeling, in which basic concepts of associative programming were taught. The workshop followed the design of shelters and the terminals, giving support to the development of specific grasshopper definitions. The second part was dedicated to a brief introduction to digital fabrication. The students were supposed to think about the fabrication and assembly of the projects with the use of models. The initial models were produced during an 8 hours immersion in the Laboratory of Automation and Prototyping for Architecture and Construction, with the kind support of Prof. Gabriela Celani.

**NAi + AA Visiting School: Micro Revolutions**

participation in workshop , Escola São Paulo, São Paulo, BRASIL, 2013

team: Camila Thiesen, Daniel Pitta, Nathalia Canamary and Pedro Veloso

The goal of the joint Architectural Association and Netherlands Institute of Architects (AA- NAi) Design Workshop was to “explore the rehabilitation of otherwise obsolete, residual and overlooked urban environments, communities and physical materials, through critical urban analysis seminars, as well as through the use of innovative computational design and digital fabrication processes”. It focused specifically in the outdoor sports facilities of the Garrido Boxing Academy under the Coffee viaduct. The Workshop intervened in this space by producing small installations to complement the provision of new outdoor gym equipment. Our team invested in a multi-use mobile furniture that could be moved around the large floor space of the academy and could supply many daily demands. The mobile could be used as bleachers for boxing fights, as a stand, as a chair or even as an individual shelter. Its structure was made with residual plywood, sanded, cut in a cnc milling machine. It was assembled with half-lap joint and industrial casters were installed. Then, it would be filled with residual upholstered and lined.

**Mango/Cocoa shelter**

16th Conference of Sociedad Iberoamericana de Gráfica Digital (SIGraDi): Form (in) formation, Fortaleza, BRASIL, 2012.

The design was developed in the scale of a public sculpture with the purpose to experiment parametric design and digital fabrication. The main geometric motive was inspired in a common pattern of laying ceramic tiles in Brazil. This patterned grid was parametrically defined in the floor plane and then projected on a double curvature surface, becoming a wood frame structure based on a four pieces module. Due to the need to build it quickly, the structure was created from extrusion of the frame structure and the joints were designed in the simplest way. In each module, two pieces have the notches facing up and the other two down, providing a half-lap joint that uses pressure to ensure structural stability. Each module was assembled separately and then they were assembled sequentially to form the pergola. To add each module to the structure it was necessary to remove one of its pieces, which would be reinstated after, stabilizing the whole assembly. This shelter was implanted in an urban oasis: the woody patio of the architecture school of the Federal University of Ceará, in the middle of a tropical metropolis. Working ironically with the idea of idleness and the lack of function of the experiment, it was defined as a shelter for a sitting person from the falling tropical fruits (mango and cocoa). Finally, it was presented in the opening ceremony of the SIGraDi conference.

projection on the surface

geometrical pattern

grasshopper definition

module

**Auditorium generator**

program developed in the FEC-0122 introduction to VBA for AutoCAD, taught by Prof. Gabriela Celani, UNICAMP, São Paulo, BRASIL, 2009.

The Auditorium generator was the final project of the module FEC-0122. It was developed with VBA for AutoCAD and had a visual interface to facilitate its integration in the design process. Basically, the VBA script utilizes lines of sight to configure the section of an auditorium. The user defines the variables (number of rows, width of rows, vertical distance between consecutives eyes, and the points of focus) and the script generates the drawing with the auditory, the lines of sight and the section of the auditorium.

**Brise soleil for CB3 building**

project developed in the AU910 Prototyping and digital fabrication, thaught by Prof. Gabriela Celani, UNICAMP, São Paulo, BRASIL, 2013.

team: A. T.C. Vilella, P. L. A. Veloso, R. Oliveira, R. F. Marangoni and R. Cavalcante.

There is a new campus building planned to shelter labs for undergraduation research activities, the CB3. In the module AU910, we presented a proposal for the environmental design of the southwest facade of the building, which will face the central piazza of the campus. We developed a brise soleil system based on the nail loom process. Each side of a rectangular diagram was divided in 24 parts, with a nail marking the division points in the model. A thread was used to connect these points based on different intervals, resulting in different levels of shading. In the building, these modules were developed as plates that would be assembled on vertical modular click rails fixed over brackets. While the plate would be modular, the thread would be automatically coiled over the standard panel by a robotic arm. These different patterns of threading of the facade were defined with the support the support of a radiation analysis. We adopted panels with 60% to 86% of opening to the range of radiation values. Then we superposed a vertical variation on these apertures, to ensure the optimal entrance of light on the floor plans. And finally, we stipulated a pseudo-random variation, which subverted the predictability of the distribution without altering the average of apertures in each part of the facade.