

Bambu-Flex mechanism

Jaime A. SIMON-CALLE.¹; Josué E. DE LA CRUZ-MORI.²

¹ *Student; School of Architecture and Town Planning, Ricardo Palma University (URP)
Av. Benavides 5440 Santiago de Surco Lima 33 – Perú.*

e-mail: jasimon01@hotmail.com Telefax: (+51) (+1) 2753641

² *Student; School of Architecture and Town Planning, Ricardo Palma University; (URP)*

Abstract

The **Bambú - Flex** Mechanism was created under the vision of the efficient structural design, looking for bamboo's light constructive alternatives. The mechanism qualities are: flexibility, modulation and adaptability, which enable us to visualize potential configurations to obtain many designs as a result of this modular system. This document presents the first prototypes design in a full-scale, in order to analyze mechanically its adaptability capacities and its own structural aspects.

Keywords:

Flexibility, Efficiency, Modulation, Temporality, Adaptability, Communal.

1. Introduction

The **Bambú - Flex** Mechanism as a light modular system is the result of experiences and reflexions in the investigation area. We have been investigating about bamboo's light structural systems, due to its qualities as rapidly renewable material, non contaminant, economic and of industrial and handmade constructive feasibility, which gives and efficient contextual adaptability. Also, bamboo's flexibility and lightweight maintains its morfo-structural potential.

Part of the bamboo's election is due to the vision "the use of local material to the solution of local problems", as a sustainability response.

2. Description

The identity is formed by transversal section (laminated sections), and longitudinal sections (diaphragms) that as a banking, gives a proportional high to the scale.

Its principal structural quality is flexibility, which can be seen efficiently in the identity and it translates as the principal effort in the arch's configuration. This flexibility can be adapted to any assembly scale. In this way the arch turns into a morfo-structural unit.

Elasticity is other quality since the identities assembly that forms the arch.

The arch as a **generatrix unit** allows obtaining many structures, like domes and vaults that we have been working on until now.

3. Structuralization Process

The identity is determined from the bamboo laminated sections of 1.00 meters long and diaphragms sections of 10 cm. The laminated sections are assembled as tangent clamps to the diaphragms section and finally the laminated section extremes are put together, creating the system identity.

From the overlapping translation of assembly identities in a shaft, archs are organized on three to more identities. The arch becomes **the generatrix unit** that translated and /or rotated generates many possibilities, and finally acquires the stability and rigidity through the corresponding bracing between the established units.



Figure1. Analogue Modulation:
Diaphragms section, laminated sections and rolled sections and (left)
The generatrix Unit (The identity) and possibilities (right) – Bamboo-flex Mechanism.



Figure2. Digital Modulation: Sequence – Bamboo-flex Mechanism.

1. Bamboo laminated sections.
2. Graph of flexion of a bamboo laminated section.
3. The overlapping translation of Bamboo laminated sections submitted to flexion.
4. Bamboo laminated sections joined the transverse diaphragm section to increase the banking.
5. Bamboo laminated sections joined and displaced to increase the length.
6. Basic module forming the identity.
7. Traslape of modules
8. Formation of tensed arch.

4. Prototypes

Let's sense beforehand prototypes that depart from the formal adaptability of the Unit (arch).

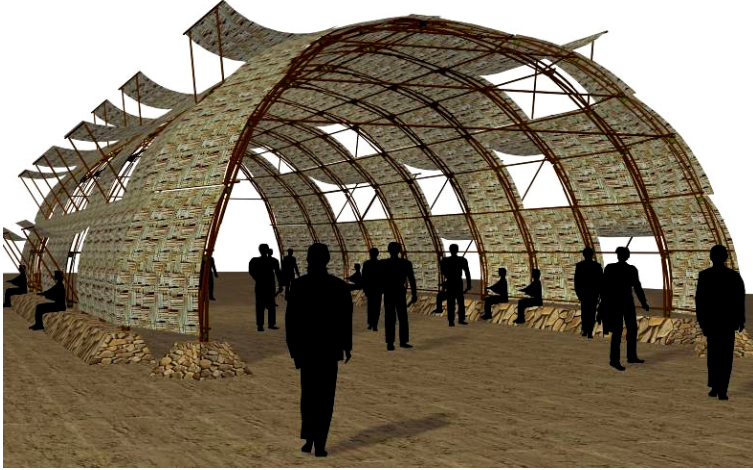


Figure 3. Bambú-flex Hangar.

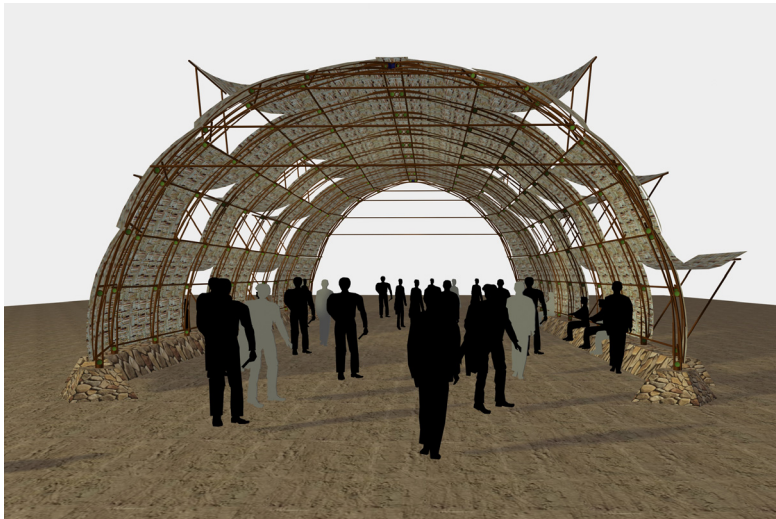


Figure 4. Bambú-flex Hangar.

First Place, in the Tenso-Estructuras Student Competition, organized by the III Simposio Latinoamericano de Tenso Estructuras (SLTE) and the IASS, in Octubre, 2008 / Acapulco – México. Destined to be a Communal Center.



Figure 5. Bambú-flex Arch.

Model of test Arch Bambú - flex, constructed in the Ricardo Palma University, Faculty of Architecture and Urbanism, Lima - Perú.

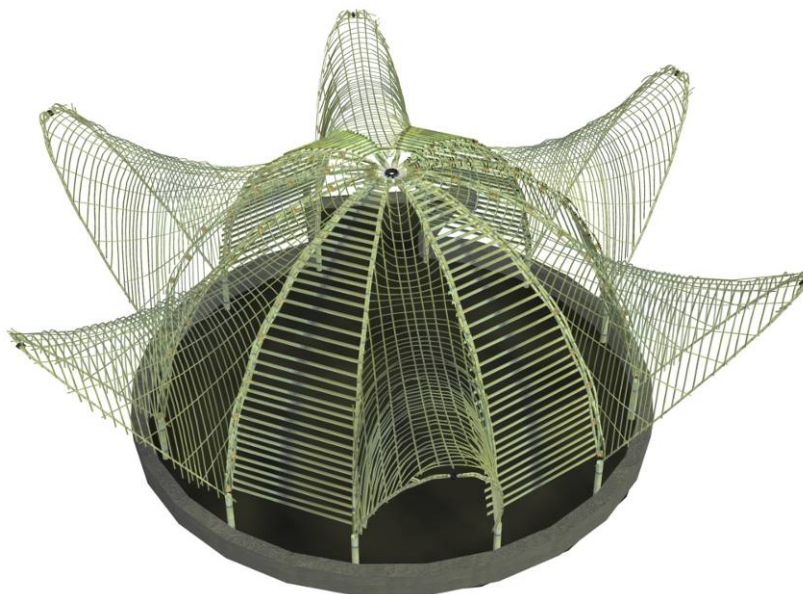


Figure 6. Bambú-flex Dome.

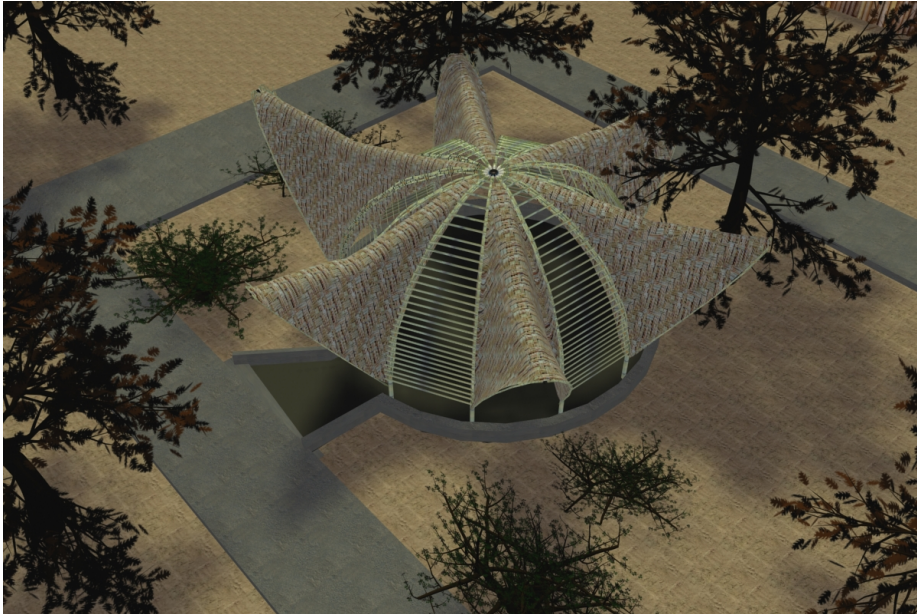


Figure 7. Bambú -flex Dome.

Model Dome Bambú – flex, developed in the Ricardo Palma University, Faculty of Architecture and Urbanism, Lima - Perú. With the purpose of being a pavilion of exhibitions.

5. Conclusions

- The Bamboo-flex morfo-structural qualities are maintain in its high capability of flexibility and elasticity in the configuration of its components, which give efficient stability and tension balance to the compoused unit.
- Bamboo-flex allowed us to achive different aplications, consolidating the development of a temporal hangar and an exposition dome, and nowadays we have been working on new projects.
- Though the prototypes allow us to explore the level of structural efficiency of the system Bamboo - flex, the following step of this investigation(research) will integrate(repay) the corresponding analysis of structural calculation.

6. References

- [1] BAIXAS J. *Forma resistente*
Santiago de Chile, 2005.
- [2] HIDALGO – LOPEZ O. *Bamboo, the gift of the gods.*
Colombia, 2003.