

Week 5

Introduction to Parametric Design

CLASSROOM TIME:

This week we will be gaining our first understanding on parametric design and how it differs from non-parametric design. We also will look at what entails to be a parametric designer.

LINKS:

Podcast 1:

https://youtu.be/K_2H5I-enGM

https://v.youku.com/v_show/id_XNDc0Mjc1NTc5Mg==.html

Podcast 2:

<https://youtu.be/C-04o4TtgAs>

https://v.youku.com/v_show/id_XNDc0Mjc2MTUwNA==.html

Podcast 3:

<https://youtu.be/xz0PUmj09Bc>

https://v.youku.com/v_show/id_XNDc0Mjc3OTM0MA==.html

Quiz link:

<https://www.surveymonkey.com/r/DF9FNPS>



Outline

01

INTRODUCTION:
Aims and objectives, LOs

03

CLASSROOM ACTIVITY 2:
Online peer assessment

02

CLASSROOM ACTIVITY 1:
Group presentation and Q&A

04

REFLECTION:
Lesson summary, next week's topic and feedback

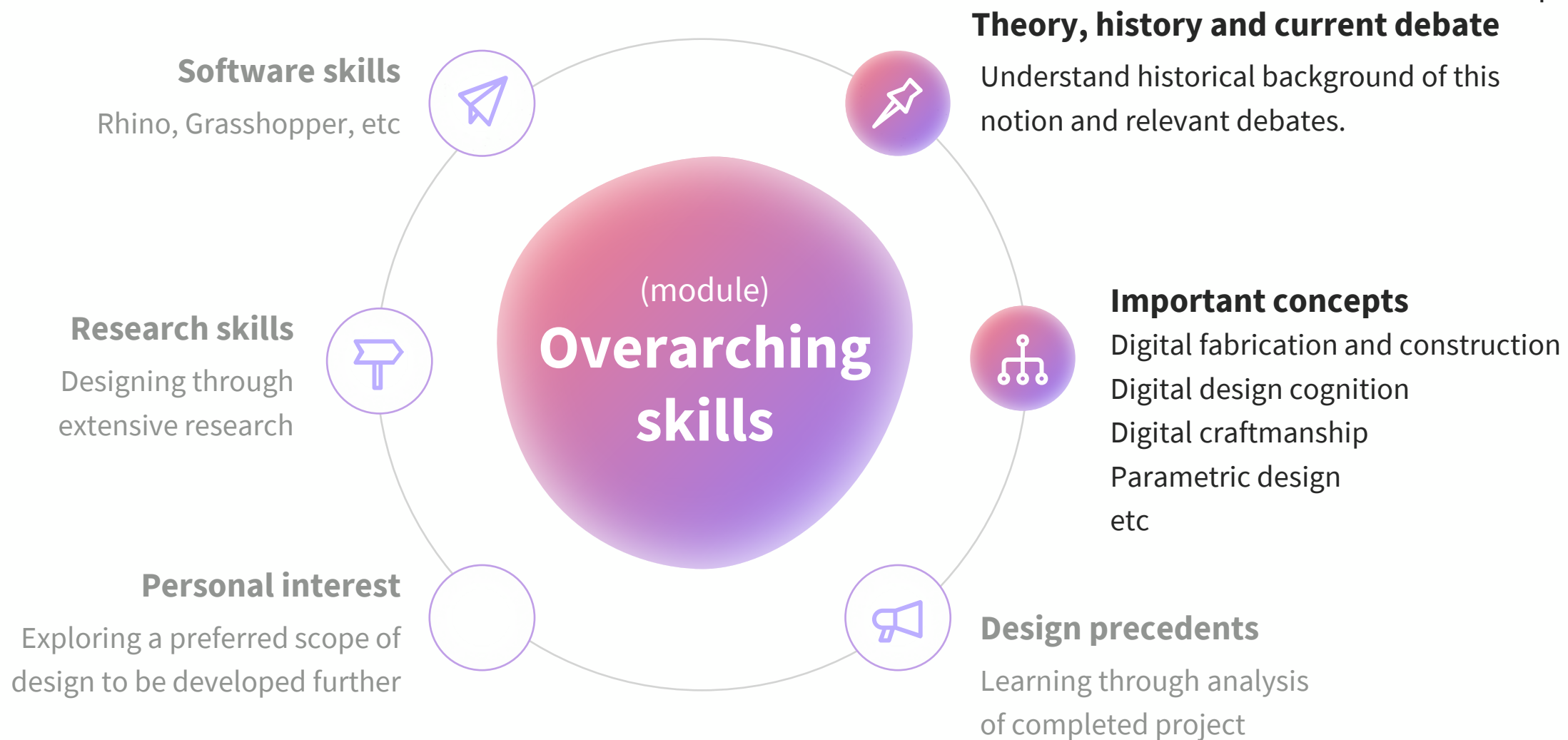
Aims and objectives

- To **introduce** the concept of parametric design
- To infer **parametric design thinking**
- To provide illustration on **how designers can use the concept** in their practices

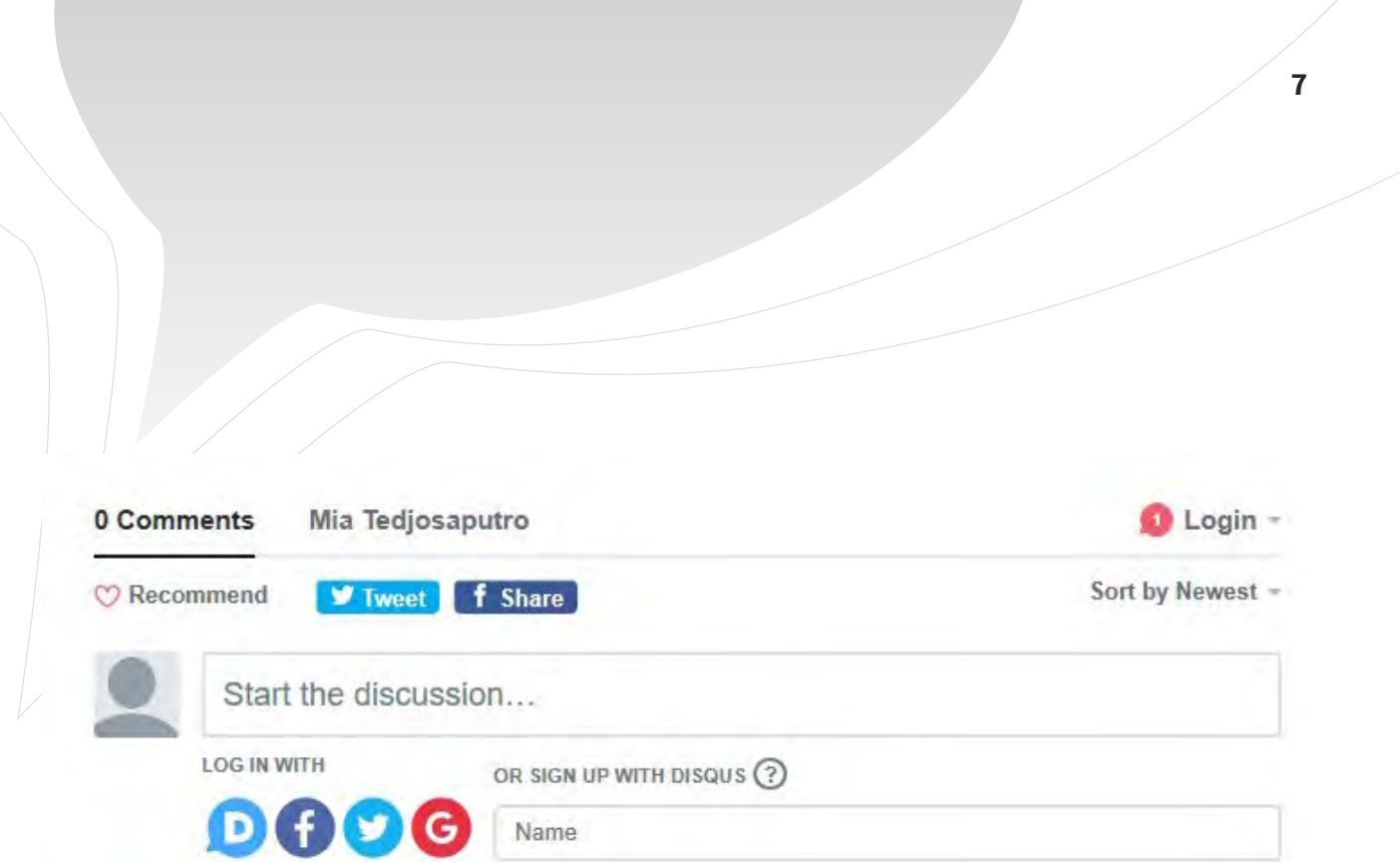
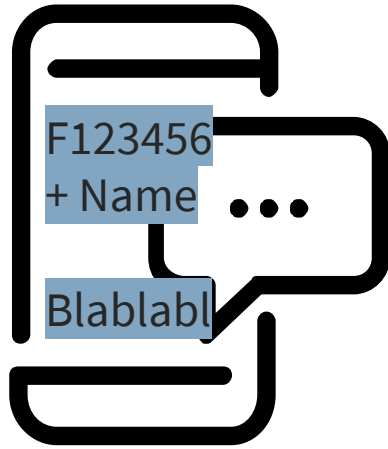
Learning outcomes

Students will be able to..

- 01 Summarise **what is** parametric design and **its key differences** with non-parametric design
—
- 02 To infer **main potentials** of parametric design
—
- 03 Critically **inform their design practice** with regards to parametric design



Discussion



What are your individual **takeaways** of parametric design?

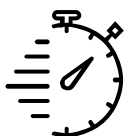
<https://miatedjosaputro.com/2020/03/24/week-5-discussion/>

Previously in Week 4



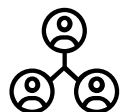
WEEK 1

IMPORTANT NOTIONS TO VIEW THE FIELD



WEEK 2

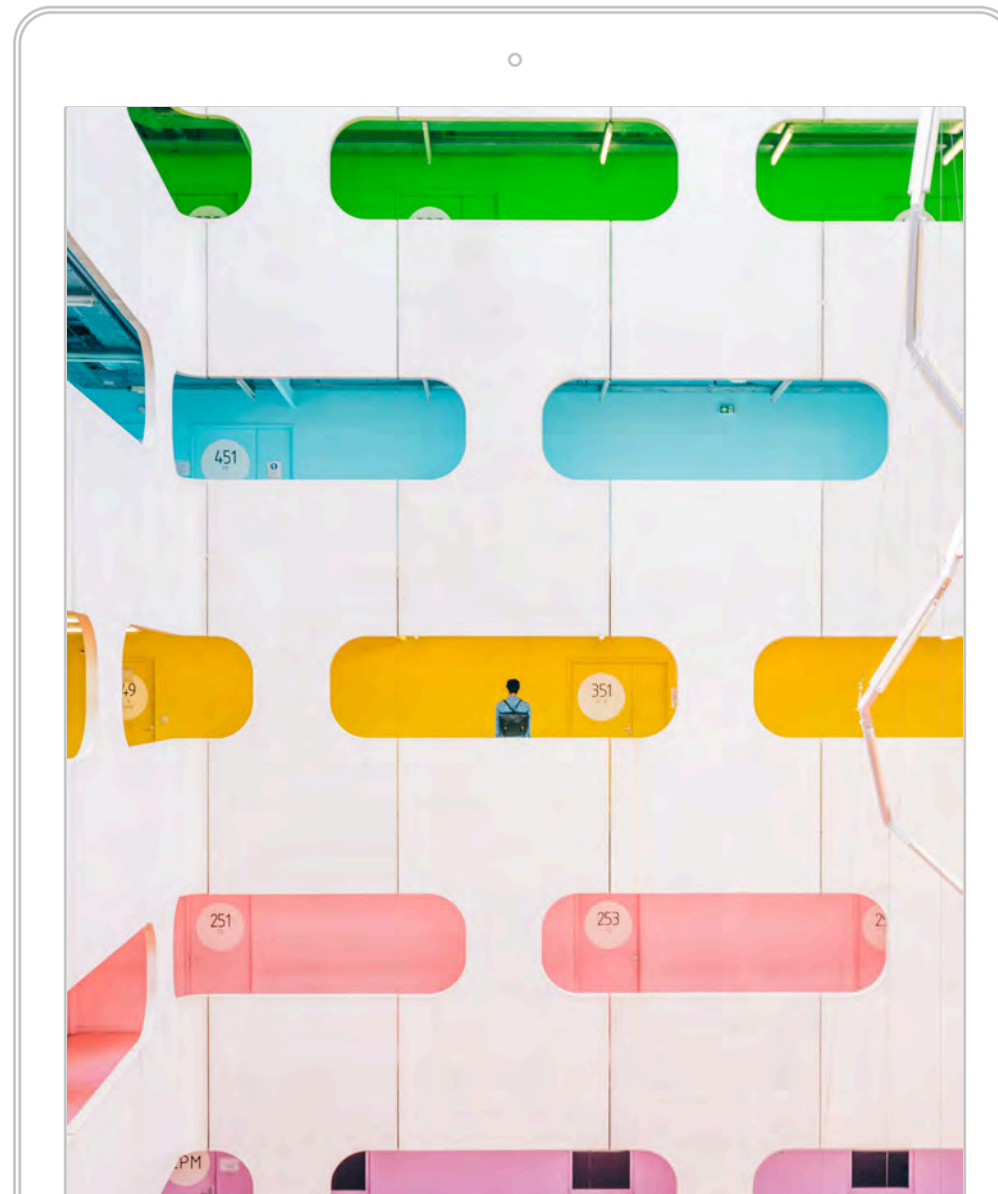
HISTORICAL BACKGROUND



WEEK 3

ACADEMIA AND INDUSTRY DIALOGUE

Photo by Victor Lam on Unsplash





**What kind of
understanding have
we established?**

**With regards to digital
architecture**

The understanding

Think-draw-make

Changes on the way architects think-draw-make in computational design have presented benefits to design stake holders (clients, collaborators and public) and improve quality of built environment. Architecture practices are also shifted.

New possibilities

Creativity is pushed further with the help of computational design tools, which addressed critiques that they hinder creativity. Strategies to address environmental issues are also in the main agenda of this emergent way of designing.

Digital design pedagogy

Comprehensive understanding of digital design as learners develop digital literacy is important. In their five years of digital studio reflection, Ikeda et al. (2016) posit five factors design skills can be exercised.

Ikeda, Y., Toyoda, K. & Takenaka, T. (2016). The Pedagogical Meanings of an Experimental Full-Size Mock-Up of Computational Design.

Digital design ecosystem

Design process is moving away from being linear and architects are at the centre of this ecosystem. Collaboration with specialists in industry, academia, local craftsman and end users provide more meaningful design.

Introduction to Parametric Design



What is parametric design?

What is parametric design?

- Parametric Design is a process **based on algorithmic thinking.** *
- Enables the expression of **parameters** and **rules** that together; **define, encode and clarify** the relationship between **design intent** and **design response.** *
- A parametric design system is defined by its: **input, algorithm and output.** *
- Focus mainly on **geometry and topology.** *


*Jabi, W. (2013). *Parametric design for architecture*, Laurence King Publishing.



Activity 1: **GROUP PRESENTATION**

GROUP 1- HISTORICAL ACCOUNT
GROUP 2- TYPES OF PARAMETERS
GROUP 3- SCRIPTING

2 minutes per group
Q&A session



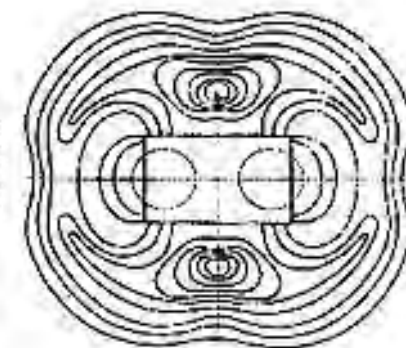
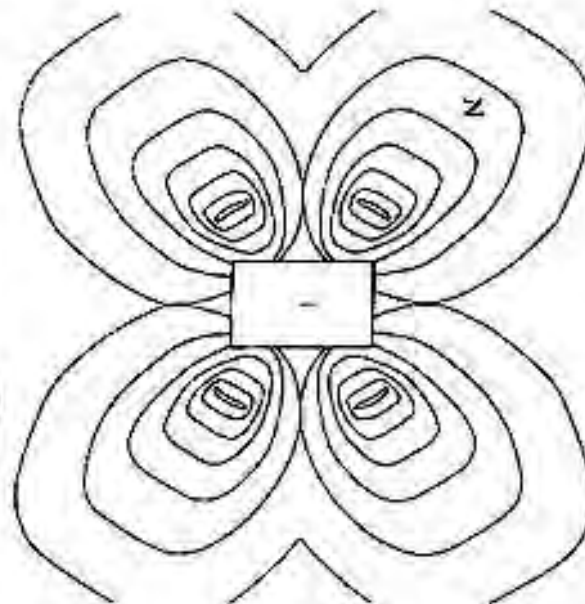
Brief historical account

Architettura Parametrica, coined by Luigi Moretti

He did a research about the relationship between architectural design and parametric equations under the banner of 'Architettura Parametrica' between 1940-1942. Initially without computer.

Eventually in 1960 he was able to exhibit the models of parametrically designed stadia- *Progetti di strutture per lo sport e lo spettacolo*.

Frazer, J. (2016). Parametric Computation: History and Future. *Architectural Design*, 86, 18-23.





Types of parameters

Types of parameters

Jabi, W. (2013). *Parametric design for architecture*, Laurence King Publishing.

- **Mathematical** parameters: most basic type, such as numbers, logical values and strings of characters
- **Geometric** parameters: example includes points, lines, surfaces and solids
- **Topological** parameters: describe how two and more entities are related
- **Representational** parameters: describing and abstracting entities from outside themselves. For example, walls and windows
- **Material** parameters: built on the first four parameters by adding and connecting several physical attributes such as weight, tension, friction, etc
- **Environmental** parameters: time, wind, thermal variations are to name but a few
- **Human** parameters: most challenging class of parameters



Visual scripting

**Direct
modelling:
On-the-fly
design
modification**

RHINOCEROS 3D

VS

**Parametric
modelling:
Associative
relationship**

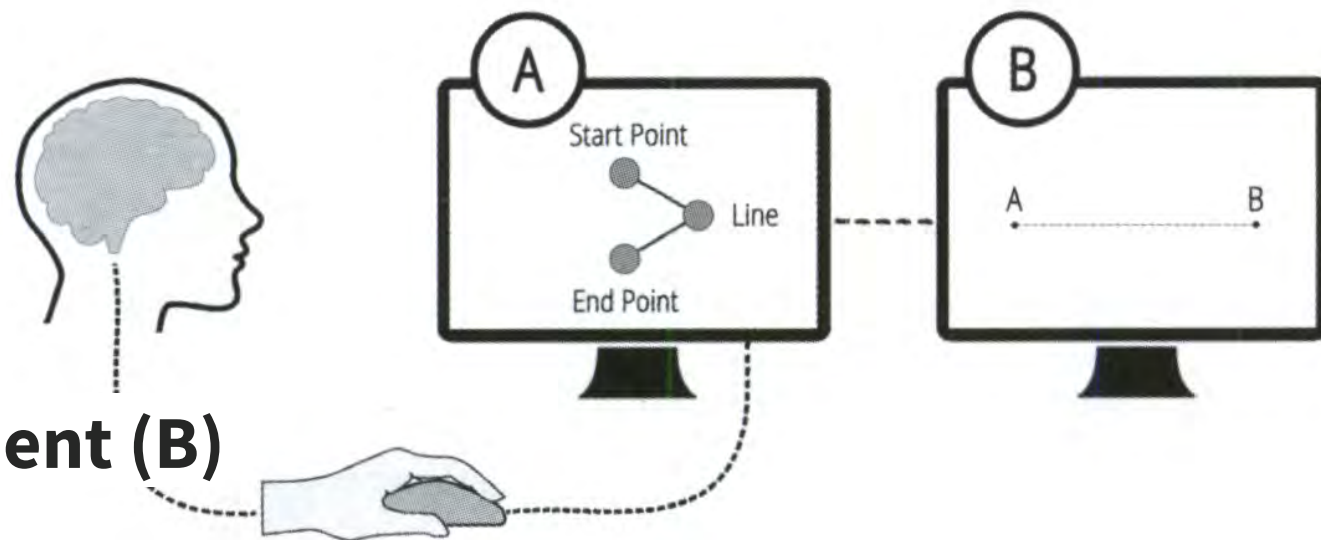
**PLUG-IN FOR RHINOCEROS 3D
SUCH AS GRASSHOPPER**



Visual scripting

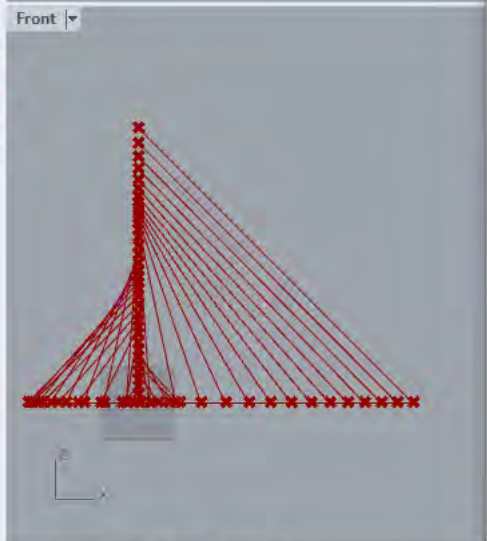
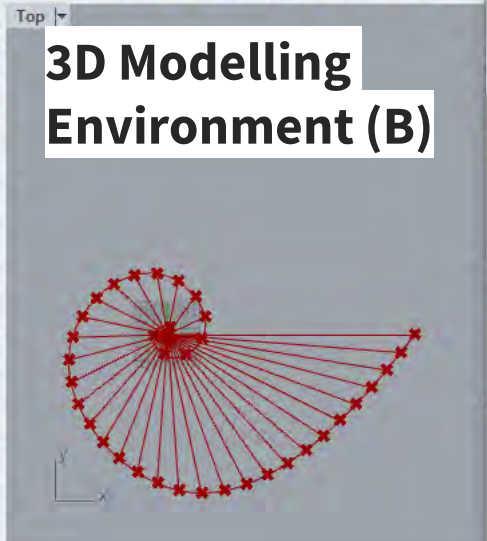
Tedeschi, A. (2014). *AAD, Algorithms-aided design: parametric strategies using Grasshopper*, Le penseur publisher.

There are two working environments:
Visual Editor (A)
3D Modelling Environment (B)

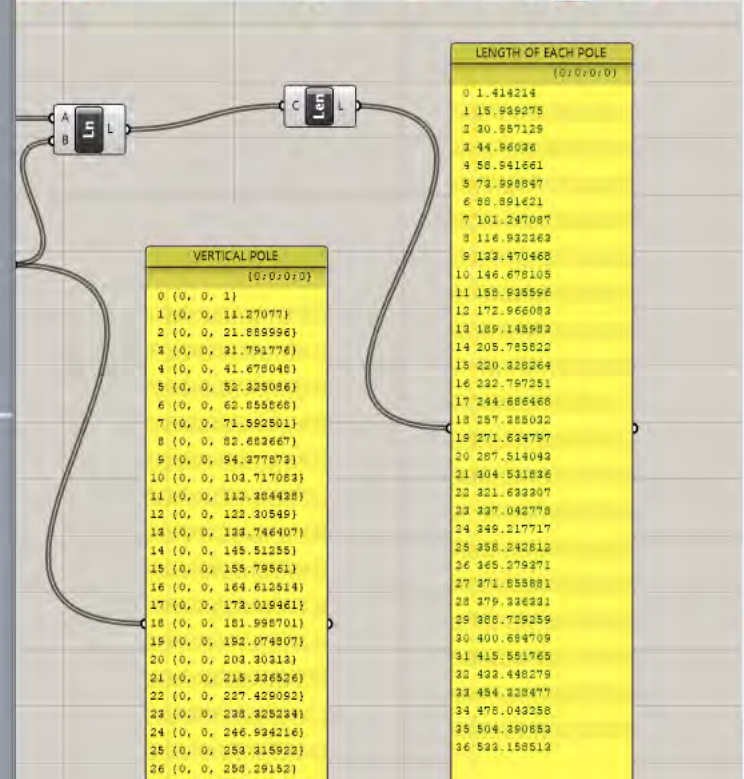
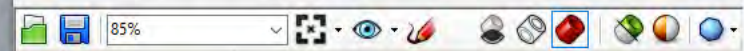




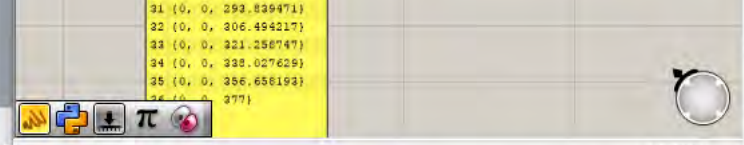
3D Modelling Environment (B)



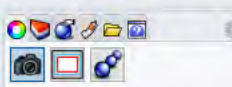
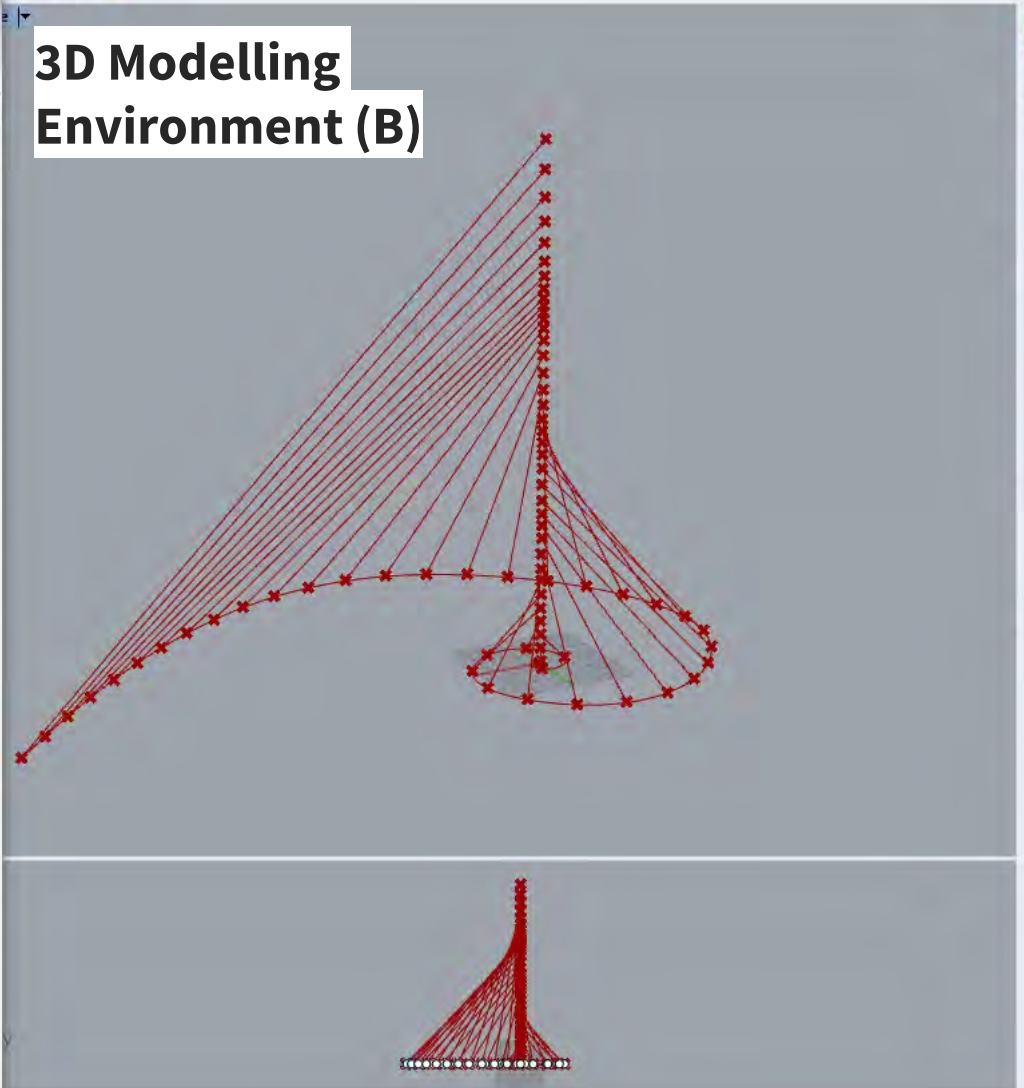
Visual scripting



Visual Editor (A)



3D Modelling Environment (B)



Viewport	
Title	Perspective
Width	827
Height	637
Projection	Perspecti...

Camera	
Lens Len...	50.0
Rotation	0.0
X Location	597.027
Y Location	1062.504
Z Location	459.76
Distance ...	1011.038
Location	Place...

Target	
X Target	154.74
Y Target	183.142
Z Target	228.885
Location	Place...

Wallpaper	
Filename	(none)
Show	<input checked="" type="checkbox"/>
Gray	<input checked="" type="checkbox"/>

Activity 2:

ONLINE PEER ASSESSMENT



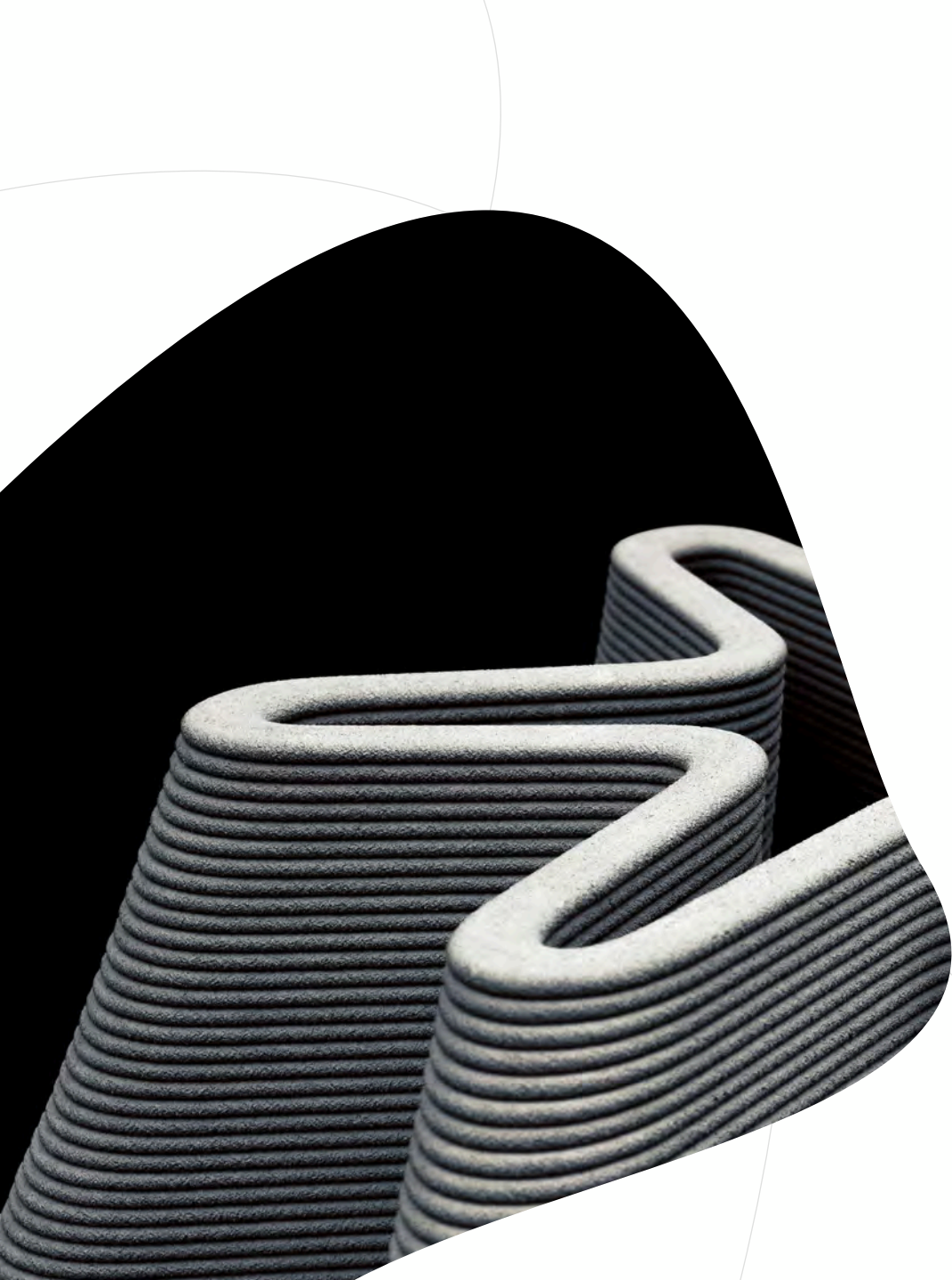
<https://www.surveymonkey.com/r/GBDSWNB>

Re-iterating aims and objectives

- To **introduce** the concept of parametric design
- To infer **parametric design thinking**
- To provide illustration on **how designers can use the concept** in their practices

REFLECTION

**What are the main takeaways?
How does your new understanding
inform your design practice?**



Week 6

Digital Fabrication

Next week we will be looking at principles, forms and broad techniques in digital fabrication.

Leave you **feedback** about
this **flipped classroom**
approach here:



<https://www.surveymonkey.com/r/GBDX669>

