

國立交通大學
建築研究所
碩士論文

數位建築的具時性
The Timeliness of Digital Architecture



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A Thesis

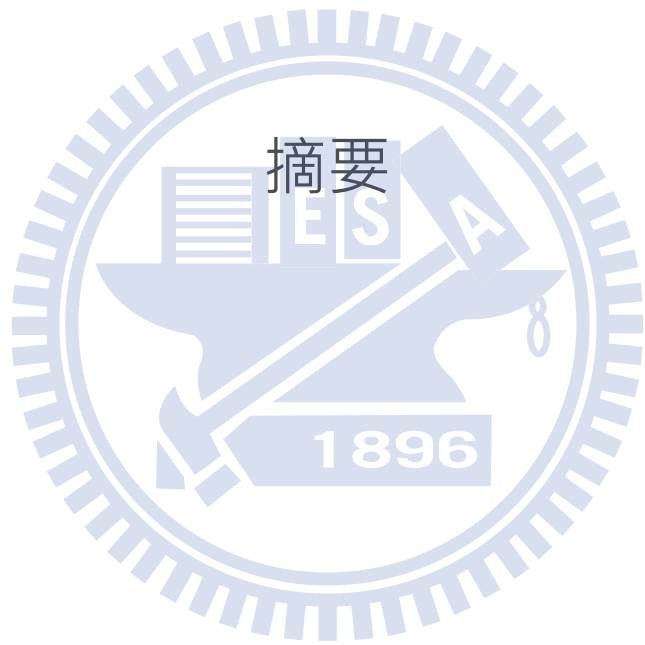
Submitted to Graduate Institute of Architecture
College of Humanity and Social Sciences
National Chiao Tung University
in partial Fulfillment of the Requirements
for the Degree of
Master of Science in Architecture

June 2012

Hsinchu, Taiwan, Republic of China

中華民國一〇一年六月





摘要

1896

無論古典還是現代建築，他們均表現出一種抵抗時間的姿態，將古典主義當前性和非時間性聯繫起來是正確的，這是一種反抗時間的美，而這種美起源於對時間的恐懼” (Ethical Function of Architecture, 2001. P206-P233, Karsten Harries)

如果把時間當成客觀存在之物，則任何物件都沐浴在時間的河流中，建築也不例外。但是建築和時間的關係卻常常被遮蔽在建築的恆持性當中，建築所表現出的永恆的姿態、堅固的形象、穩定的處所使人難以覺察到其在小尺度時間範圍內的變化，正因此，建築經常被認為是獨立於時間之外的永恆之物，它的紀念性似乎是天生的。

自西方建築原點，埃及、西亞的無時性(Timelessness)紀念性建築以降，往後的建築師無不追逐這些建築跳脫於時間之外而散發出的壯美(Sublime)，壯美在康德(E.Kant)的分析下，其形式、質、量、主觀心理上皆是無限的狀態，在時間上呈現完全的真空。建築的無時性延續至現代主義，現代主義雖強調技術、功能和材料，此時的建築信念仍是在這些機能性的訴求下追求無時性的紀念性。結構主義與解構主義的形成，逐漸將建築拉進了時間的軌跡上。結構主義以語言(language)和言語(speech)的概念出發，強調整體性、轉換性與自律性，在時間性上屬共時性(synchronic)，與時間的關係，牽強的說，呈現“點”的狀態。解構主義以痕跡(trace)與延異(difference)反抗結構主義的二元論，打破傳統結構原理的空間狀態，創造意義的不確定性，使觀看建築以及在建築空間內活動的人，以各種不同方式體驗空間，各自詮釋。解構建築乘載的多元經驗，讓建築得以向歷時性(diachronic)邁進。收割了工業革命的成果，建築得以在二十世紀中後葉和時間性接軌。如今在二十一世紀的初期，歷經資訊革命、數位化後的建築如何在時間性上展現別於過往的獨特性？

時間經驗起源於人對物質世界運動變化的感知，或者說，時間是經驗主體對存在於世界的感知。根據海德格(M.Heidegger)於《存在與時間》書中的辯證，正是時間構成了一般存在的意義，當我們詢問存在，便是要詢問存在的意義，即是詢問時間的本質。對於建築而言，大尺度的時間感覺是容易被覺察的：我們在面對舊建物時總會幽然生出思古之情。然而對於生活在萬千瑣碎中的人來說，關鍵是如何建立起日常生活中的存在體驗，如何捕捉空間中的瞬間，如何感知時空之中人之“此在”的那一刻，從而獲得對自身存在的關照。

本研究基於五個不同的設計案：形式的構成(FM Tower/資訊建築)、形式間的並存(new birth from spoil death/實體建築)、形式的紀錄 / 再現(no ceiling/虛擬建築)、動態形式的系統(Gerridae/互動建築)以及材料與工法(ZOWA/CAD-CAM)分別探究數位化後將時間性置入建築的可能性。

關鍵字: 數位建築, 具時性, 數位構築, 數位工藝, 虛擬實境



Whether classical or modern architecture, they all show the attitude of a resistance to time. Karsten Harries stated that it is correct to link the classical architecture to timelessness since it is a kind of beauty to against time. Furthermore, this beauty originated in the fear of time.(Ethical Function of Architecture, 2001, p.206-p.233.)

Time, as the objective existence of things, any object in the world is bathed in the river of time, and architecture is no exception. However, the relationship between architecture and time is often obscured in the building in which the constant holding of eternal attitude prevails. Architecture usually shows its sturdy, stable image, and that makes imperceptible changes in the time range of the small-scale. Therefore, architecture is often considered to be eternal and independent of the time---its monumentality seems natural.

After Egypt and Mesopotamia timeless memorial architecture appearing, later architects all have been pursuing the sublime created from these kinds of buildings. The sublime, in the analysis of E.Kant, is in a state of the infinite whether in the form, quality, quantity, and subjective psychology, showing the complete isolation from the timeline. Timeless architecture had been continually created until the birth of Postmodernism. Even though modernism stressed the technology, function and material, its faith was still in the pursuit of the memorial, timelessness of architecture in a revolutionary way. Along with the formation of Structuralism and Deconstructionism, the concept of the timeline was gradually pulled into the architecture. Structuralist took concept of relationship between language and speech, emphasizing the integrity, conversion and self-discipline of structure. By those principles, architecture appeared on the timeline as a point. Deconstructionism was against the dualism of structuralism with trace and difference, breaking the traditional structural principles, and created uncertain meaning of space, in which visitors are allowed to own their varieties of ways to experience the space, and interpret it respectively. Deconstructivist architecture carries a diverse experience, so that architecture can be diachronic. Harvesting the results of the Industrial Revolution, twentieth century architecture could be connected to the timeline. Now in the early twenty-first century, after the information revolution, and CAD/CAM technology development, how to define contemporary architecture's state on the timeline and how to show the uniqueness state to others in the past?

This study is based on five different design cases: the composition of form (FM Tower / Information Architecture), co-exist of different forms (new birth from spoil death / entity architecture), record/reappearance of form (no ceiling / virtual architectures), the dynamic form of system (Gerridae / interactive architecture) as well as materials and construction methods (ZOWA / CAD-CAM). It aims to explore the possibilities that make architecture much more closer to timeline, and that also makes it closer

Keywords: Digital Architecture, Timeliness, Digital Fabrication, Digital Craft, Virtual Reality



Content



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Title_ FM Tower
Individual Work_ Yu-Yang Yeh
Duration_ 9/2010~1/2011
Instructor_ June-Hao Hou

目前我們正處於資訊時代，資訊大多存在於虛擬與拋棄式的實體輕質載體中。現今博物館、美術館這類建築，僅能當作是上述資訊載體的容器，有限的發揮建築的傳統功能。FM Tower所作的嘗試，即是將擋在資訊與建築兩者間的那分載體消除，以建築本體完成資訊呈現的任務。

原始資料總處於混雜的狀態，成為資訊前必須經過整合、編排的動作。若資訊具有目的性，就必須經過繪圖 (mapping) 的程序，展示性資訊背後必須具有目的性，否則只能稱為顯示。FM Tower (Film Map Tower) 呈現的是紐約市 (五行政區) 下的電影地圖。

設計初期藉由對照電影場景統計(1908-2010以紐約為背景設定拍攝)與人口/犯罪率成長比對，作比對性的繪圖(mapping)，製成二維的電影地圖，顯示電影行銷城市/關注城市頻度與都市成長率之間緊密的關係。三維化的電影地圖構成了FM Tower，FM Tower是一個以虛體空間乘載資訊，實體形式作為資訊分界介質的塔型展示空間。平面上分割成五個動態的區塊代表紐約市的五個行政區，垂直軸向的延伸演示了時間的軌跡，自連續、動態與漸變的空間介質，直觀的顯示出量在歷史上的壓縮與膨脹，虛體空間的量度同時反映資訊的內容。這是一個非全然主動、單方面的形式創作過程。在此，空間形式是由空間使用群體的行為所構成，屬於一種“不知情”下的主動創作。

相對於建築形式呈現了時間上的一個片段，資訊的高度變動性呈現在時間軸上的距離顯得十分長遠。倘若建築得以同步與資訊成長，則建築在時間軸上留下的會是具有生命性的軌跡。尚在研發中的電子黏土 (Claytronics) 技術讓這個想像得以實現。以FM Tower這個由資訊構築的建築而言，與資訊一同發生，一同演生，在資訊消逝時，他的時間軌跡也嘎然而止，質量守恆，形式卻可以不斷的呼應資訊。這種非以物理性崩解的死亡模式，也許是數位建築對時間性詮釋的一種方式。

FM Tower

形式構成的具時性 |||||07



FM Tower

» *Film Map Data*

New York city constructed by films

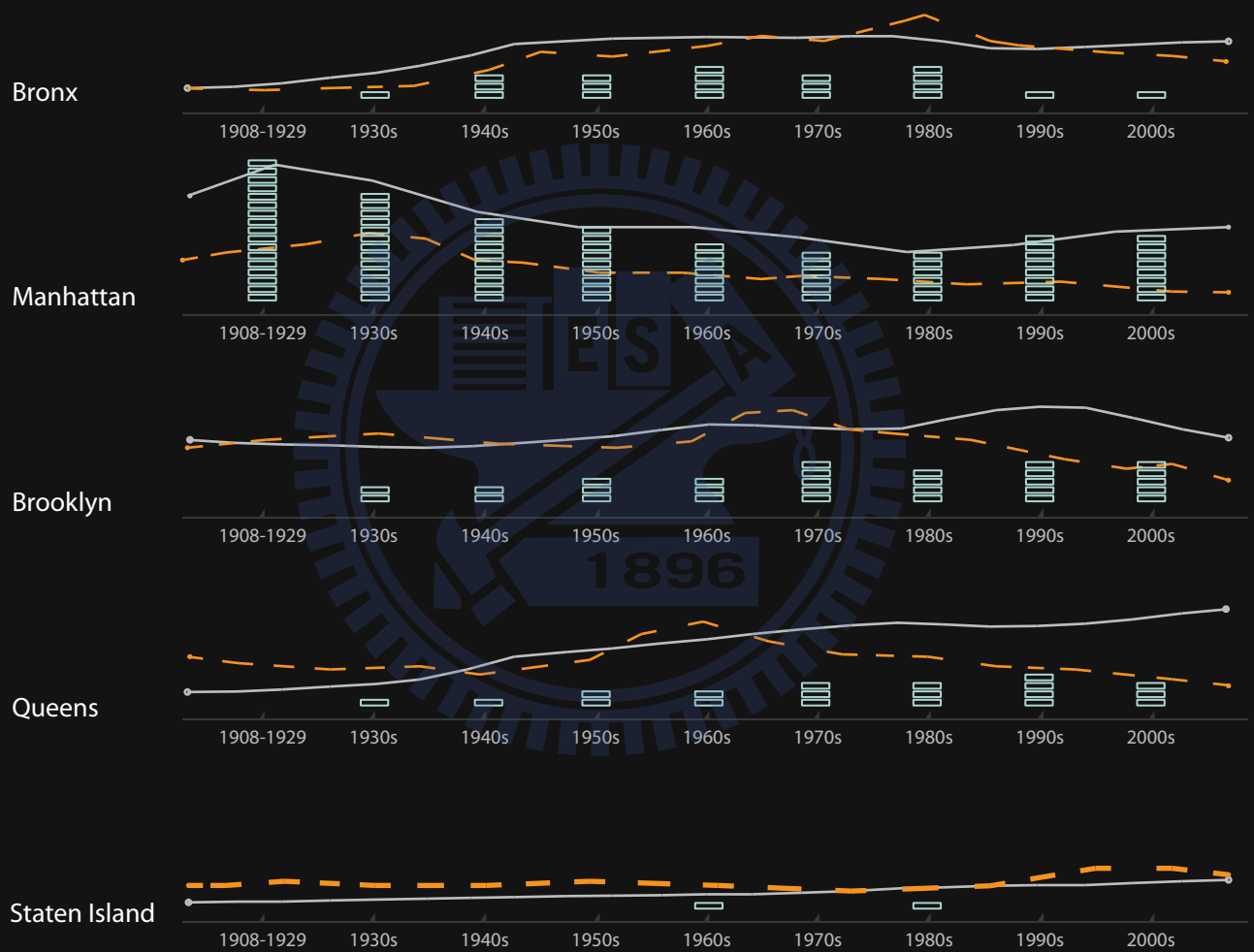
Film is one of the best recording tools for a city. When compared with the print media, the former renders more realistic aspects for specific times and more lifelike for the cultural background.

The film's screening year, genres, appreciation with geo-location are integrated as elements for data visualization. By moving on timeline, this map would show the relationship between urban development process and the city impression in film.

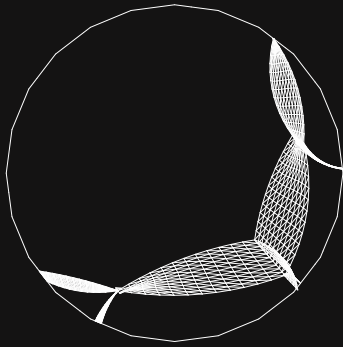
Gotham City Map(NYC constructed by films) is a map to show what places in New York city appeared in the movie scene.



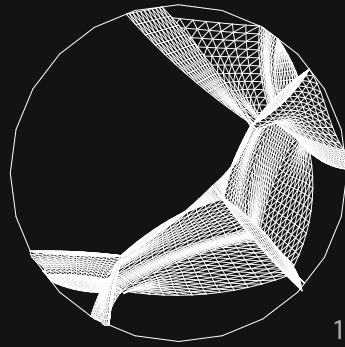
Crime Rate/Population Growth / Film Domain (film released)



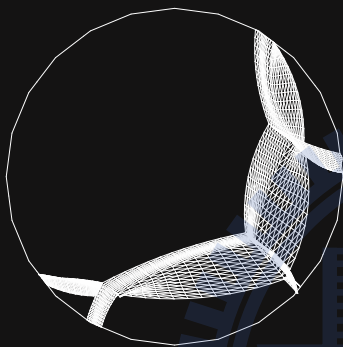
Design Approach



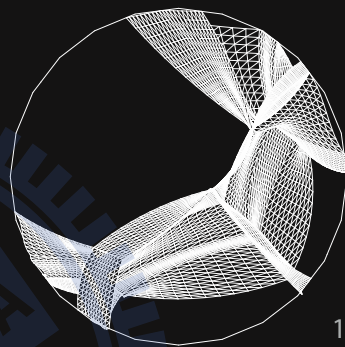
1879-1940s



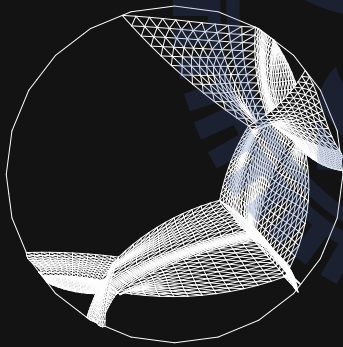
1980s



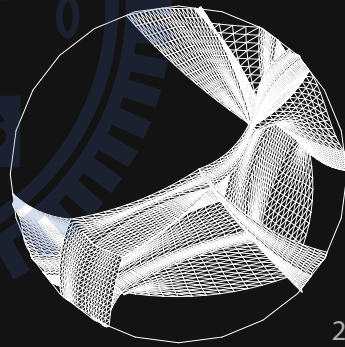
1950s



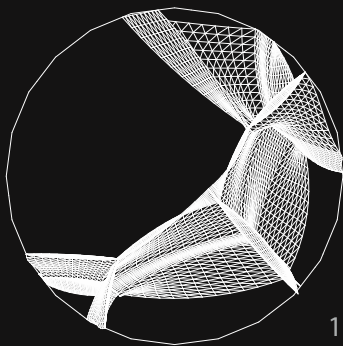
1990s



1960s

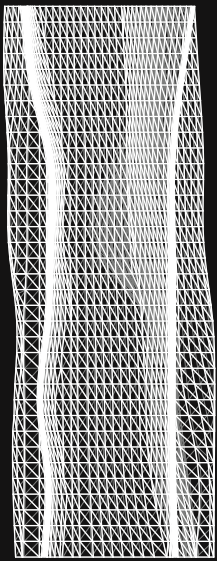


2000s

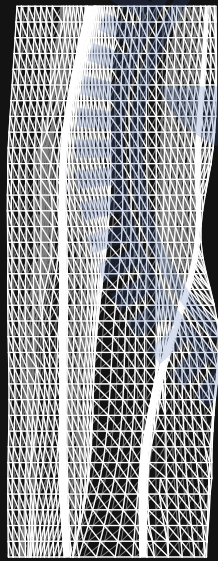


1970s

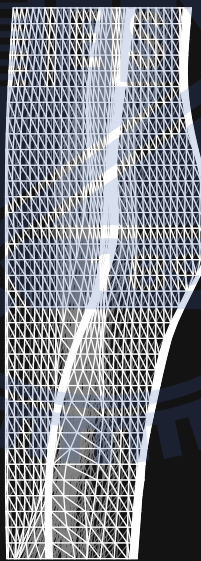




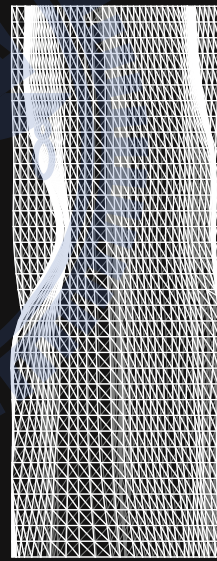
Brooklyn



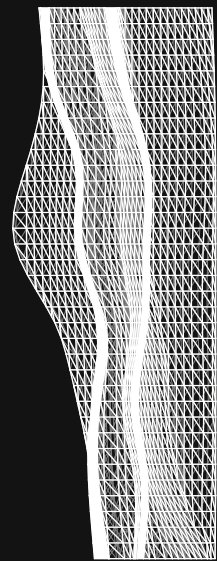
Queen



Bronx



Manhattan

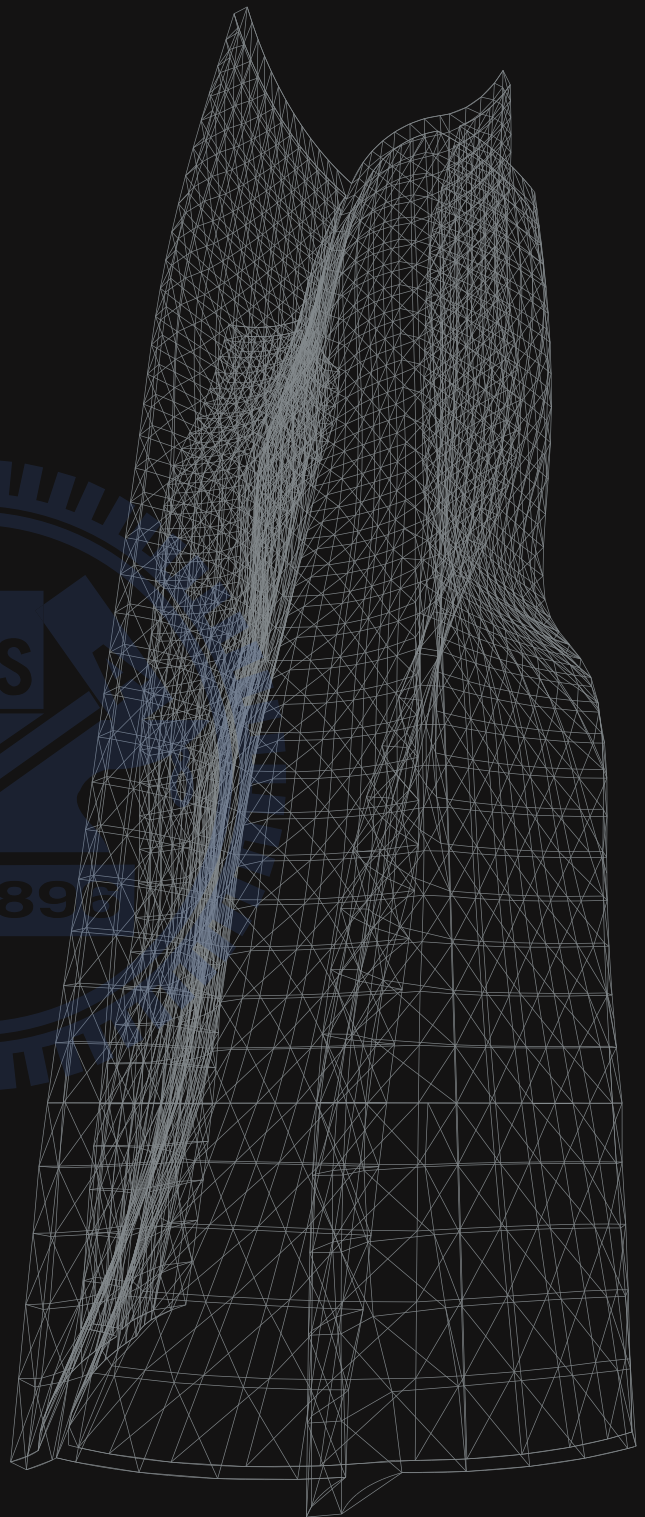


Staten Island



Design Approach

"FM Tower" is a vertical visualization of film map for New York city---
"Gotham City Map". Growing Wall carries the data that explains
the relationship between film domain's extension and urbanization.



Film Map Tower
vertical visualization of film map





若非遭逢自然、人為的劇烈破壞，建築與生俱來的恆持性，使用者僅能辨別大尺度時間下的變化，小尺度變異幾乎是無法察覺的。完全的復原，仿造讓時間向度在這些建築上顯得更加混亂。若傳統非動態的建築在完成的那一刻便昭示在時間性上的死亡，或許在那一刻後也正宣告再創作的開始。違章建築或俗稱的 " 加蓋 " 即是基於這種再創作精神下，以機能性訴求延續建築時間性的表現。假設這種再創作的目的並不是進行對原始建築的機能擴充或機能補完，而是基於建築原始機能復原下，對於形式的再創作，那將會是什麼樣的面貌？

這是一個如何處理不同形式間共存的問題，若是使用傳統設計媒材，在面臨各種不同的形式語法時，必定要經過一番因未知性而生的掙扎，過多的類比性讓再創作者面臨如此困境時都不約而同趨向形式簡化一途。"new birth from spoil death" 設計案探討的正是面臨形式共存前提下的再創作時，如何運用參數設計，將無限的類比性得以切分、取樣，進而讓再創作者掌握更多形式創作的主導權，而非妥協於既有形式下。

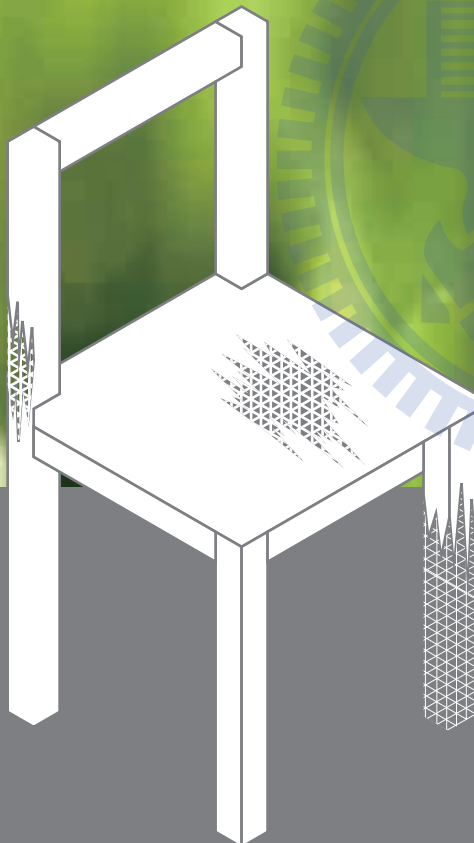
"new birth from spoil death" 以風格派作品-紅藍椅為原始形式，探討在其毀損後如何以與新形式共存的方式修復，同時反應原始形式的時間軌跡。參數使用象徵新芽生長的L-system產生點雲，搭配與風格派正交理念完全相反的Delauney Triangulation做結構上的連續，探究在不同形式語法下與相對應參數的關係。

new birth from spoil death

new birth from spoil death



>>> *Germinate*



new birth from spoil death

Take a piece of old, broken furniture as the original shape element, then set point clouds on that furniture's geometry surface, and define those points as where to start germinated points. With the help of parametric design, let the new birth budgrow and become the new skin/new structure of the old furniture. Some parts of that old furniture might be broken or lost, yet the missing part could be mended or fixed, even though the intensity has been changed.

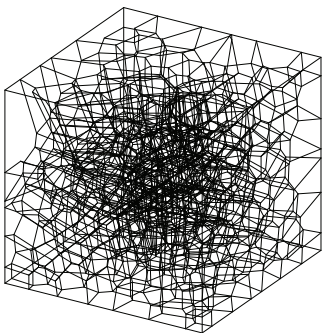
>>>Parametric Reaserch



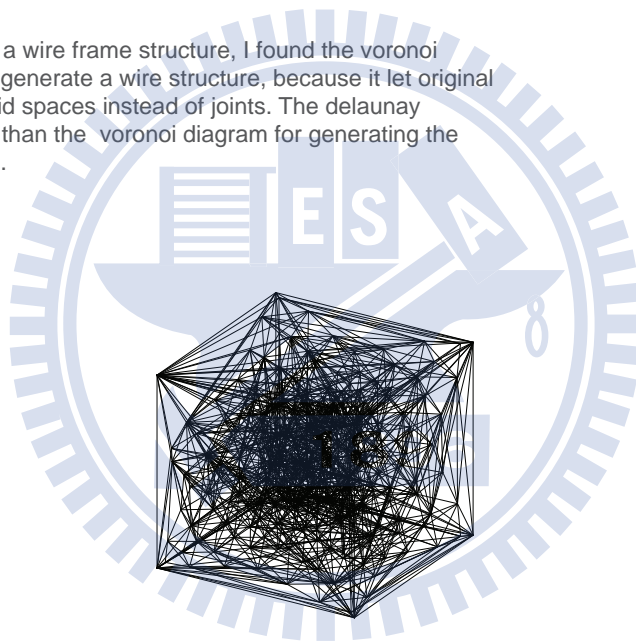
>>> *Parametric Reaserch*

density, position control

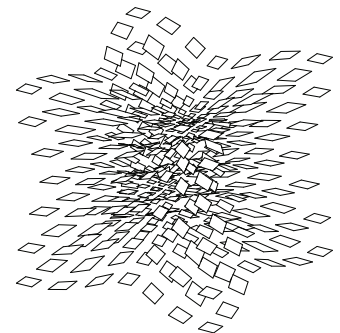
For making point clouds become a wire frame structure, I found the voronoi diagram was not the best way to generate a wire structure, because it let original guide points' position become void spaces instead of joints. The delaunay triangulation seems a way better than the voronoi diagram for generating the wire frame structures in this case.



voroni diagram



delaunay triangulation



point cloud generated grid

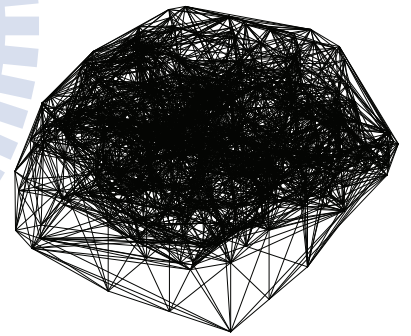
>>>Parametric Reaserch



points



l system

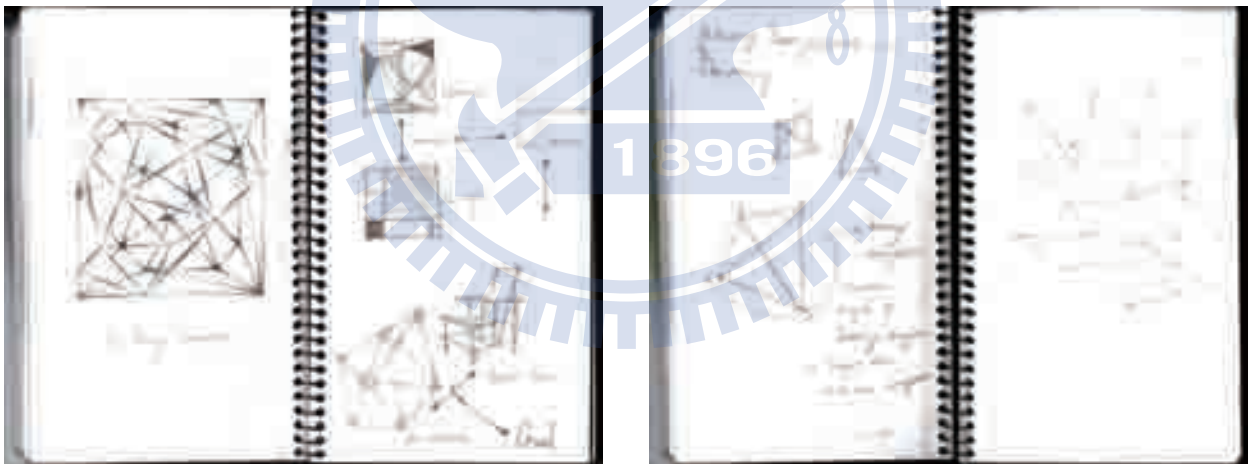


delaunay triangulation

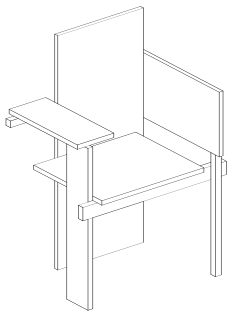
>>>Initial Boundary

De Stijl & Gerrit Rietveld

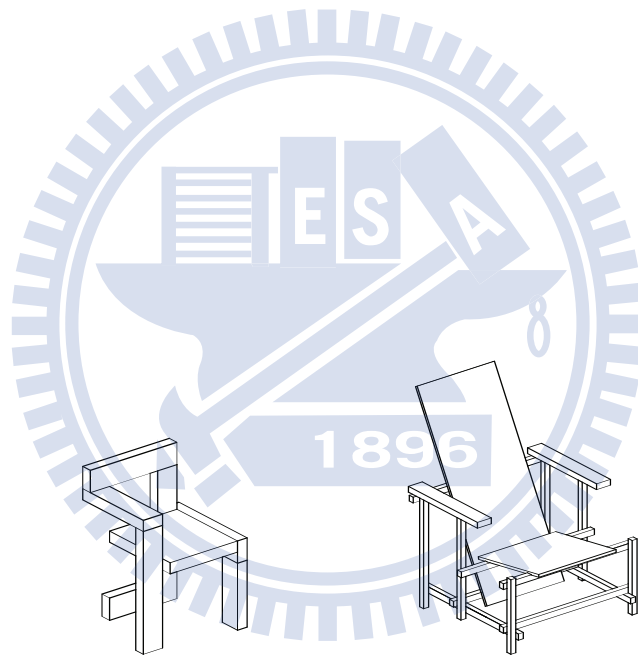
As one of the principal member of De Stijl, Gerrit Rietveld, shows his De Stijl concept through architecture and furniture. The craft skills shows not only strong emotional geometric but aesthetics with sense of times. Parametric design was a contemporary design method, and to combine these different design languages may create a new face of furniture.



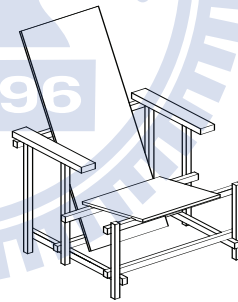
>>>Initial Boundary



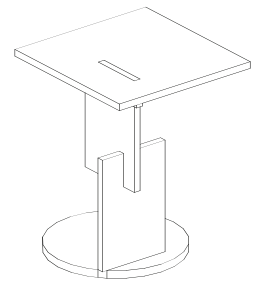
berlin



steltmanstoel



red and blue

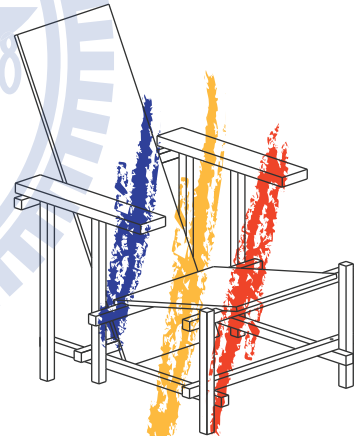


tafel

>>>Initial Boundary/ Fabrication Process

De Stijl & Gerrit Rietveld

As one of the principal member of De Stijl, Gerrit Rietveld, shows his De Stijl concept through architecture and furniture. The craft skills shows not only strong emotional geometric but aesthetics with sense of times. Parametric design was a contemporary design method, and to combine these different design languages may create a new face of furniture.



COMPONENTS LIST

Gerrit Thomas Rietveld red/blue chair by YYYeh

>>>Initial Boundary/ Fabrication Process

