

國立交通大學

建築研究所

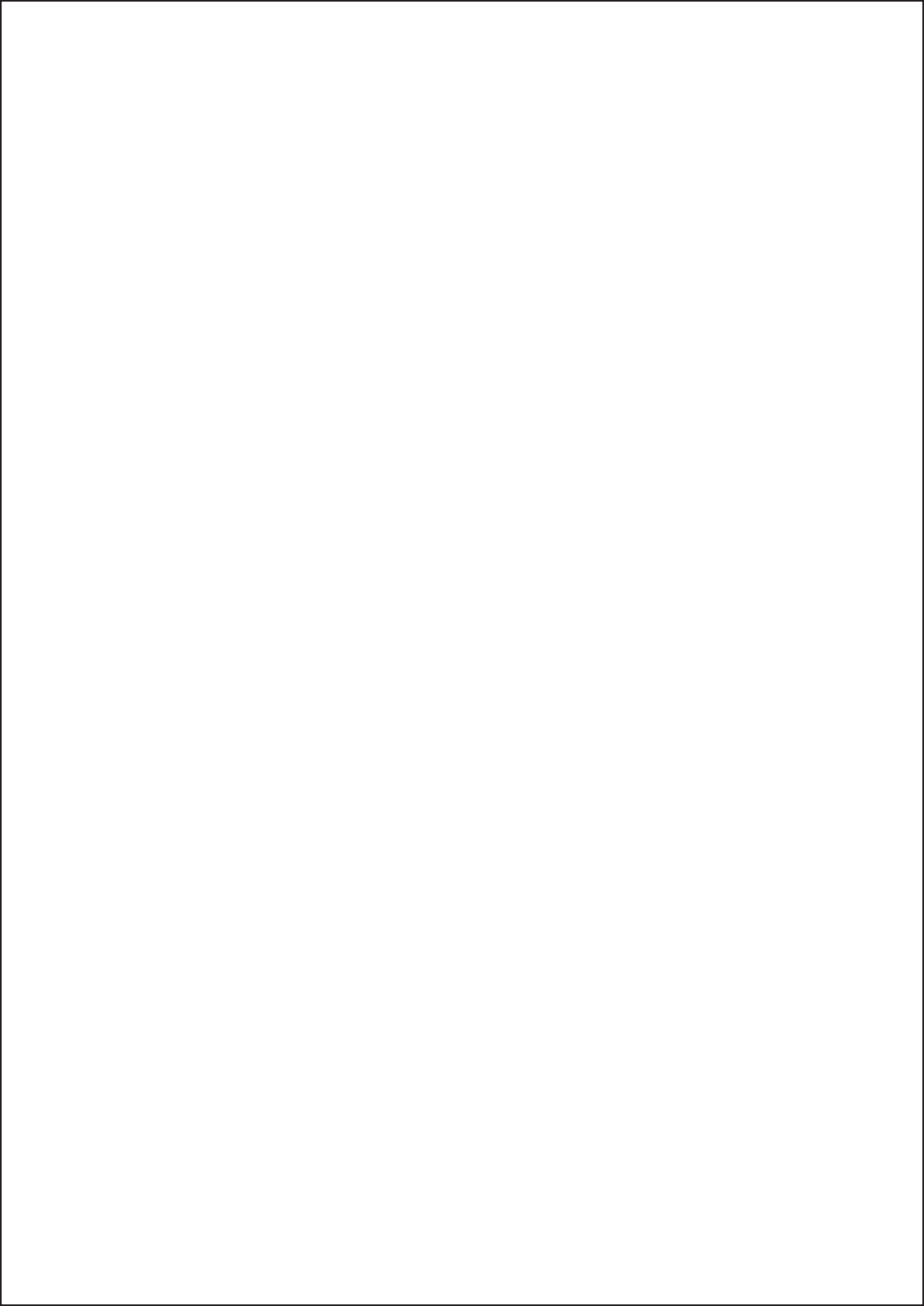
碩士論文



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中華民國一十年七月



Morpho 形構

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中華民國一百年七月

摘要

morpho --- 一種型態之不完整名詞，亦指生活周遭各種事物的形態變化，而此等現象廣泛地涵括所有動物、植物、文化、人文、社會、都市...等等之形態。然而，在這一連串無止盡的名詞下，都存在著一個共通的行為 --- morphogenesis (形態發生)，此種發展的過程，即為(進化)。

時代劇變的當下，科技開啟了不同以往的溝通模式，因而亦改變人文與社會的結構。因此當下面臨文化轉換的同時，也揭開事物多樣性的過渡期。處於資訊快速變遷的時代morphogenesis的行為似乎強烈地使我們感受到各種事物形態發生的存在與變化。

在建築廣大的範疇中，面對科技與資訊的衝擊，使建築的設計思考與觀念，重新被與定義及推進。然而建築morphogenesis之現象，在生活中實質空間裡以可被閱讀與感受，而此資訊空間藉由科技軟體，配合電腦軟體的運算與形塑，顛覆設計者空間設計的想像與空間製成的方式，空間建造皆可被精準地籌畫施作。

面對數位化的必然趨勢，科技與資訊植入建築內外之場域，人們在既定場域中的行為，除了固有的人與人、人與環境之間的互動行為，也加入了場域當中的資訊資訊閱讀行為。資訊元素的介入，擴展了空間的向度。人們在空間中，除了獲得機能的滿足、與光影視覺的感受之外，也透過融入其中的資訊，而獲取另一層的機能與感官認知；環境因而動態地由實體空間與數位資訊共同塑造。

限制在實體靜態的空間下，可能的空間延伸方式亦可以透過數位科技來達成，例如透過虛擬空間，便可能突破實體的物理性限制，彌補實體空間在資訊呈現上的不足。而虛擬空間在沒有真實材料與基地限制下，可使設計者更加沒有枷鎖地思考空間呈現的可能性；若虛擬空間與資訊相互結合，則可延伸真實資訊呈現之場域，譬如：美術館、博物館。然而虛擬空間本身的空間形態、秩序、互動行為、以及瀏覽經驗設計，成為獨立於實體空間之外的設計議題，需要進一步的思考與探索。

實體與虛擬空間元素所共同組成的象限當中可以發現四類的morphogenesis:實質空間形態轉變(實體建築)、機械作用於使用者之形態轉變(互動建築)、資料訊息對於使用者解讀與作用於建築之形態轉變(網際建築)、虛擬空間呈現與資訊傳遞對於使用者之形態轉變(虛擬建築)，在此篇論文中作以討論。

Summary

Morpho, being an abbreviation of “morphology”, also means the variation of forms around daily life. This phenomenon comprises broadly forms of creation: animals and plants, culture, humanity, society, or cities, etc. However, a common behavior exists behind such countless nouns, which is “morphogenesis” (the occurrence of form). This very process of evolving is exactly the equivalent of “evolution”.

With the era changing relentlessly, technology enables new modes of communication that is totally different than ever, thus changing the structure of humanity and society. As we humans confront cultural changes, meanwhile, the transitional period of diversity has begun. Being in an era with fast-changing information, it seems that we humans are feeling strongly the existence and the morphing of forms under the influence of morphogenesis.

Facing the impact of technology and information, the thinking and concept behind designing a building within the extensive scope of architecture has been redefined and boosted. However, the morphogenesis of building is now able to be read and sensed. Thanks to the help of technology software along with its computing and shaping functions, however imagination and spatial formation overthrowing method is applied, the construction of informational space can be precisely devised and made real today.

As the trend of digitalization is imperative, technology and information is planted inside and outside of the field of a building. The reading action in the field has been added with the behavior of men within a given field, in addition to the intrinsic interaction among humans and the environment. With the interference of informational elements, the dimension of space is thus broaden. Human in a space attempt to acquire satisfaction of functionality and visual senses. But besides so, they gain another level of functional and sensory cognition through merging into the information contained within space. The environment is therefore shaped dynamically with the entity of space and digital information working in collaboration.

Given the condition that space is material and static, the imaginable spatial extension could also be made with digital technology. For example, once virtual space is applied, breaking the physical limit of substance could attained, thus making up for the inadequacy of real space in presenting information. Without the limitation of raw material and base, designer no more bounded on thinking about the possibility of spatial presentation. If the virtual space is combined with information, it's possible to extend the field where real information takes shape, such as art gallery or museum. Nevertheless, the spatial form, order, behavior of interaction, and design for browsing experience of virtual space itself, above have become an designing issue independent of real space, and require further thinking and exploration.

Four types of morphogenesis can be found in quadrants formed commonly by real and virtual space: formal transition of space in entity (entity architecture), formal transition with mechanical influence on user (interaction architecture), formal transition with data and information read by user and acted on building (information architecture), and formal transition with the influence of the presenting of virtual space and delivery of information on user. Above mentioned are to be discussed in this paper.

Next Gene

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Self - Sufficiency House

Entity Architecture

Computer - Aided Architecture Design

Multitouch Table

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Interaction

Interaction Architecture

Human - Computer Interaction



Parking Space

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Smart Parking System

Information Architecture

Integration of Information and Architecture

Transformation

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Dream Spce

Virtual Architecture

Designing Experiences in Virtual Space
of Communication and Information

Museum Of Poly-Information

67

3D Interface for
Vitual TOTOTA Showroom

Entity Architecture

Computer - Aided Architecture Design

Next Gene

Self-Sufficient House

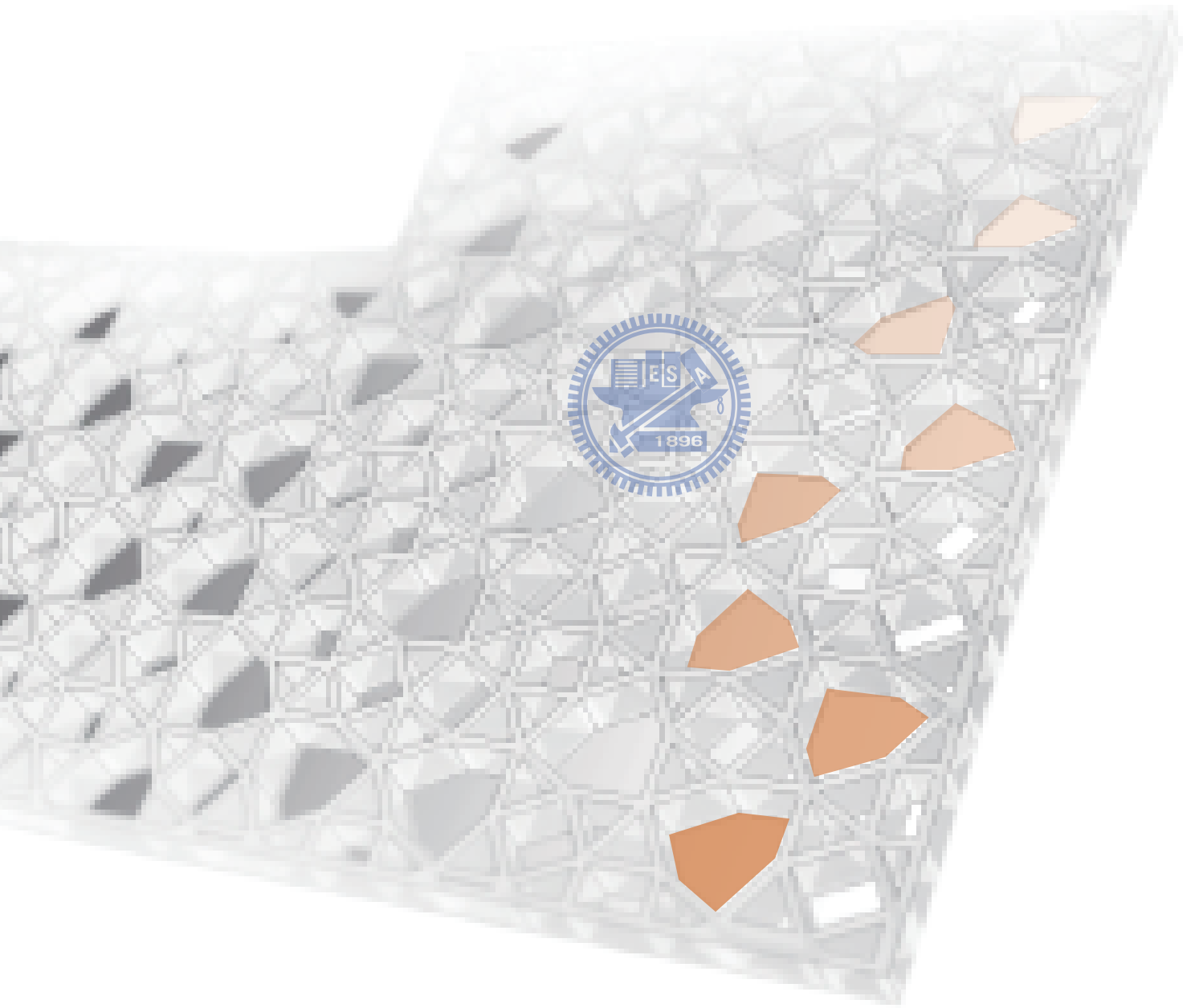
Advisor : Aleppo Liu

2010 Spring

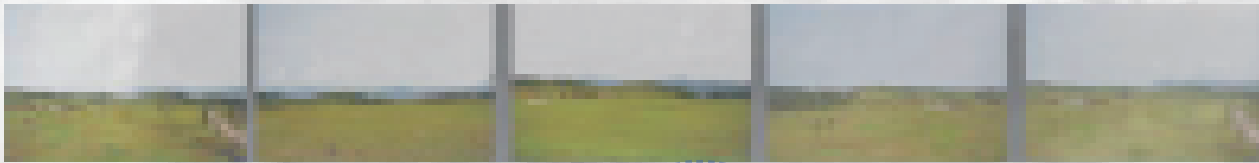


點、線、面，構築建築表現的基本形式，長久以來使用紙和筆作以建築呈現與製造，此現象如今成為建築涵養的基本要求。而建築平面、剖面、透視圖在紙與筆一橫一豎地建構下，使之建築物得以被精準地建造製成。隨之，科技日益進步開始改變效率與程序的發展，進而逐漸取代傳統製圖方式，用以CAAD的資訊技術，提供更為精確與更有效率的軟體，來解決建築長久以來的建築施作流程與設計方式。

而CAAD快速發展的時代，設計媒材輔助設計師在設計與製造上的難題，且更有效率地提高生產施作。在建築形式多元化的同時，建築之樓板、牆、柱空間三元素，逐漸地隨之模糊，而開始產生新的建築形式與語彙。而面對未來的建築空間與環境，究竟是空間形式變換，亦或是環境影響建築空間機能的可能性更大？此兩點確實值得我們思考與省思。



Site Analysis



Location Status



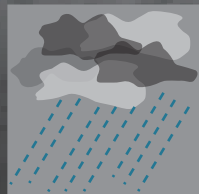
Mountain

+



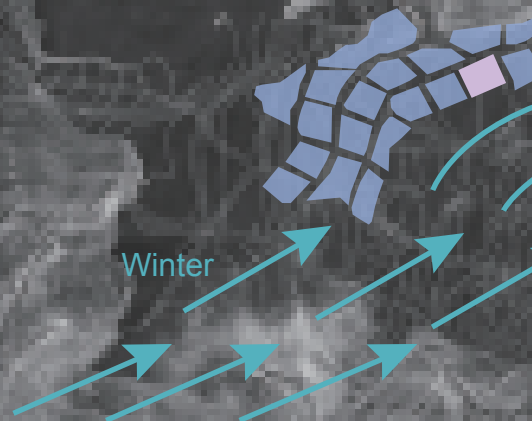
Sea

+



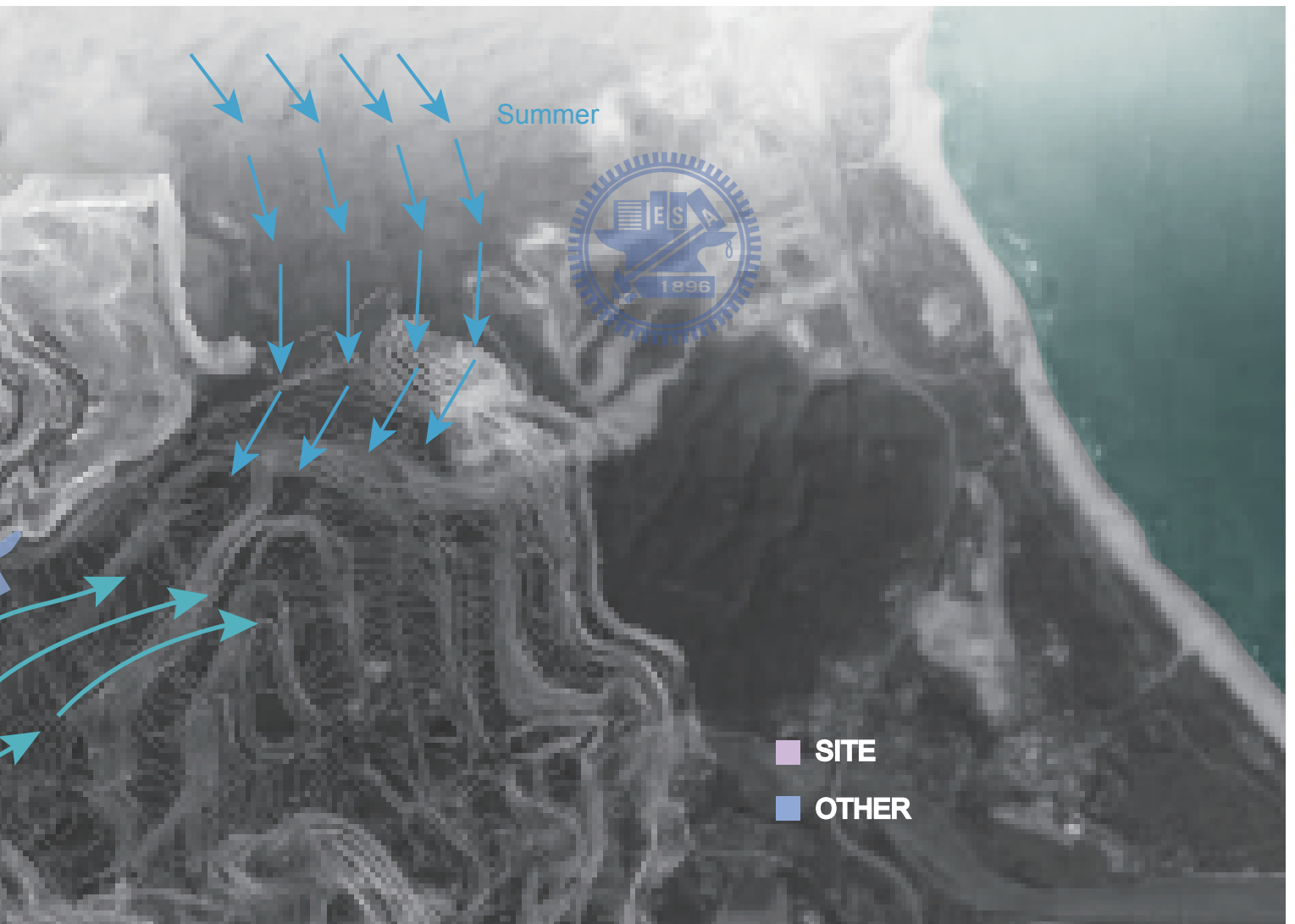
Rain water

Spring and Fall :
Precipitation / Month → 500mm
Summer :
Precipitation / Month → 3mm



Next Gene

Self-Sufficient House



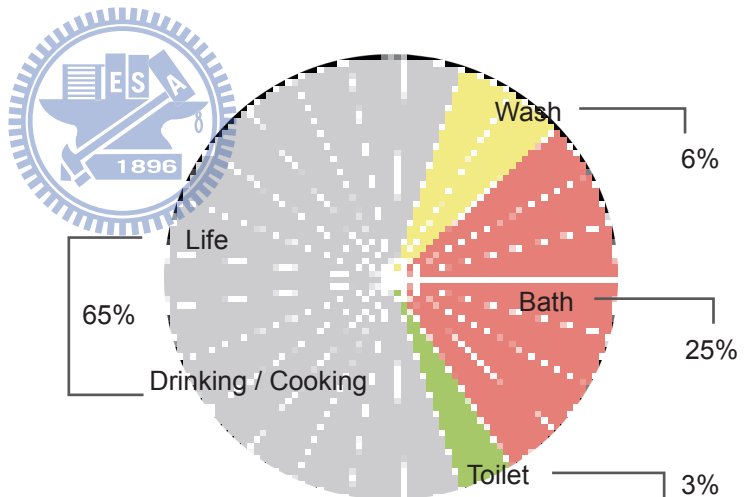
Water Concept

Water and Life
The average water

Average water consumption



In Taiwan : 290 L Person / Day
Taipei : 394 L Person / Day



Water tower capacity



Capacity	Height	Volume	Height	Volume
500L	0.45m	8.5m	4.5m	80m
500L	0.45m	8.5m	7.5m	110m
1000L	0.45m	8.5m	9.5m	130m
500L	0.45m	8.5m	9.5m	130m
1000L	0.45m	8.5m	10.5m	150m
1000L	0.75m	8.5m	10.5m	150m
1000L	0.75m	8.5m	12.5m	180m
2000L	1.05m	8.5m	12.5m	180m
2000L	1.05m	8.5m	14.5m	210m
2000L	1.05m	8.5m	14.5m	210m

$290 \text{ L (Person / Day) } \times 5 \text{ (Person) } = 1450 \text{ L}$

$3000 / 1450 = 2.0 \text{ (Day) } \text{ --- Taiwan}$

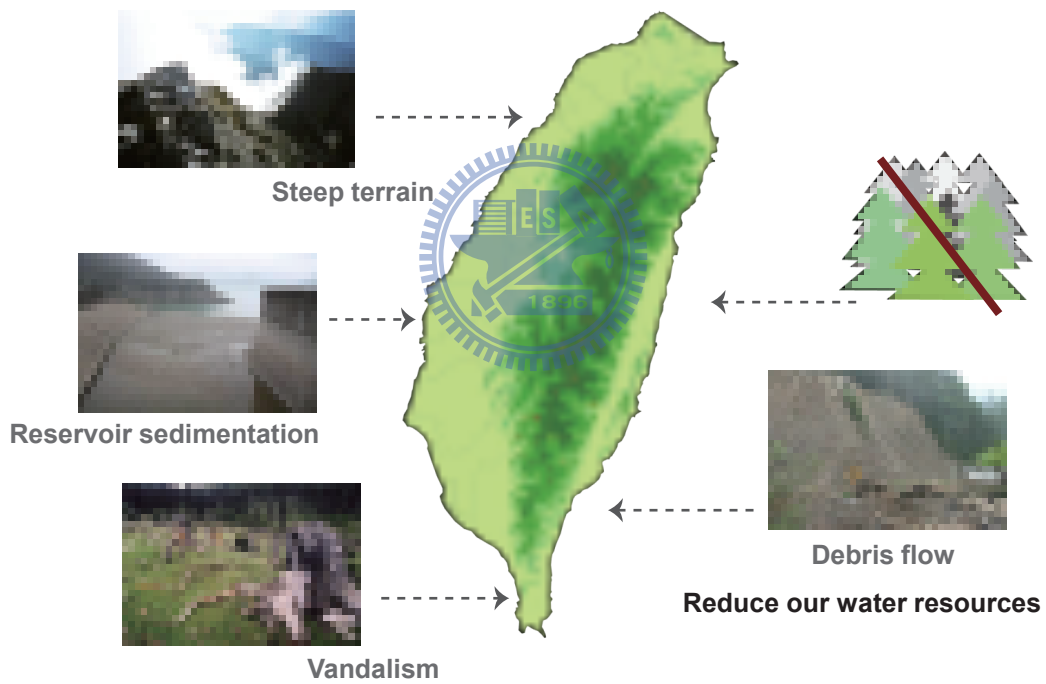
$394 \text{ L (Person / Day) } \times 5 \text{ (Person) } = 1970 \text{ L}$

$3000 / 1970 = 1.5 \text{ (Day) } \text{ --- Taipei}$

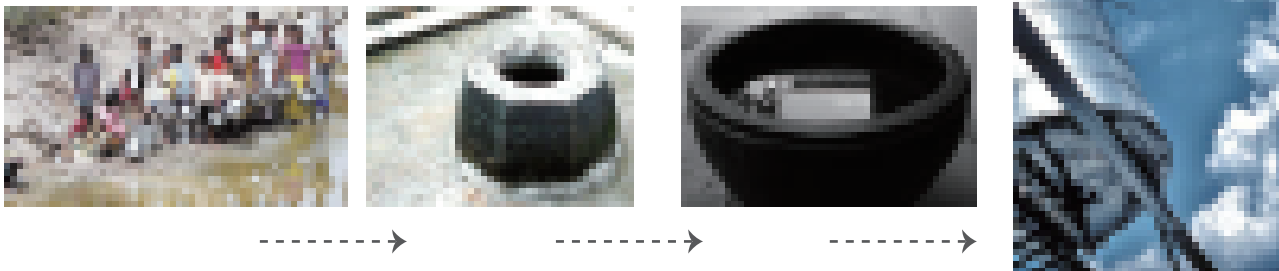
Next Gene

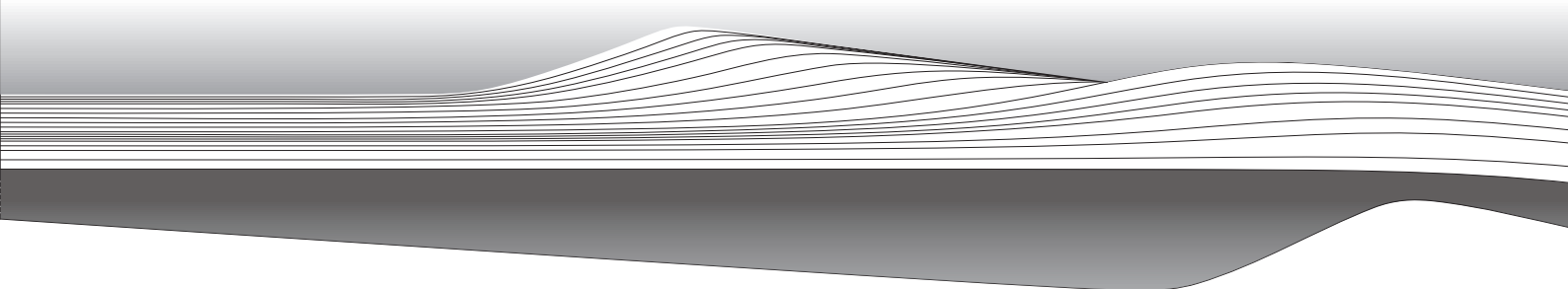
Self-Sufficient House

Taiwan's Water Resources To Reduce



Water Space Relative To Human

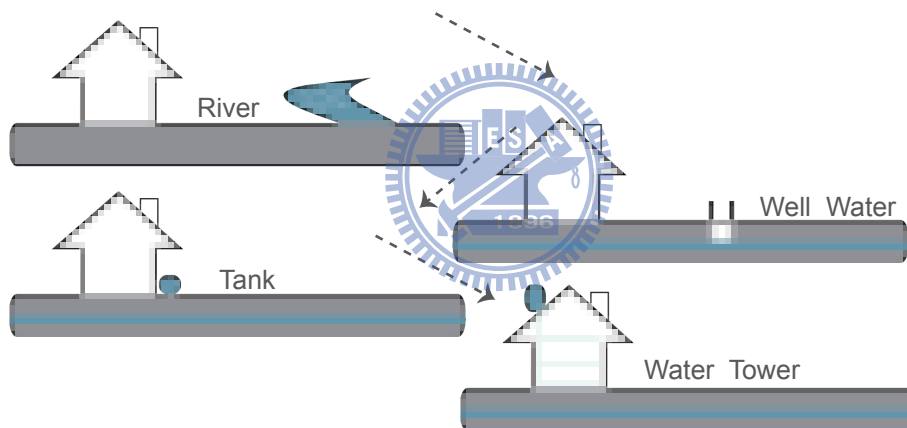




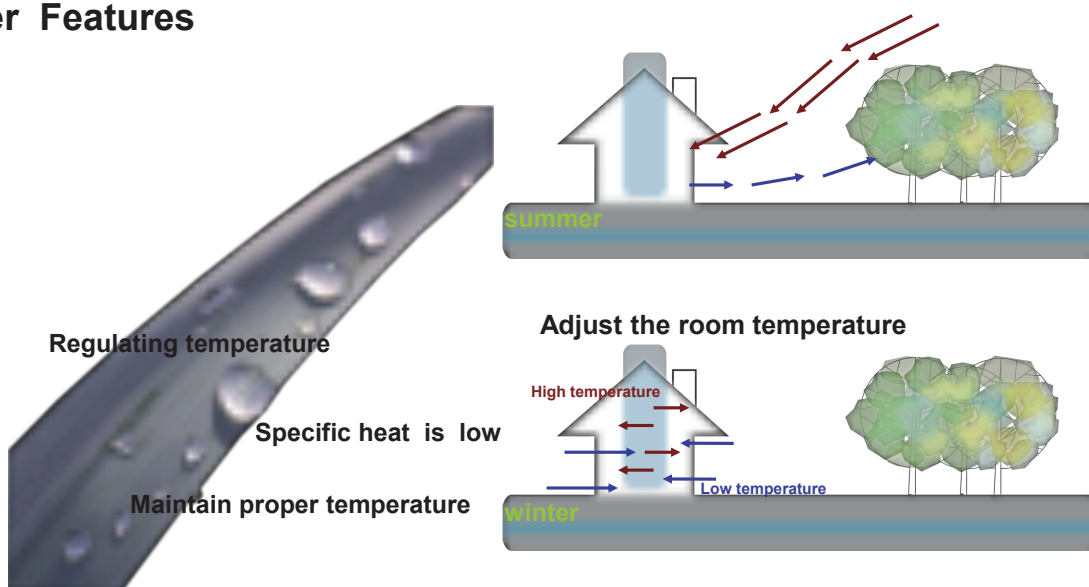
Water Concept

Water and Life

Average water consumption



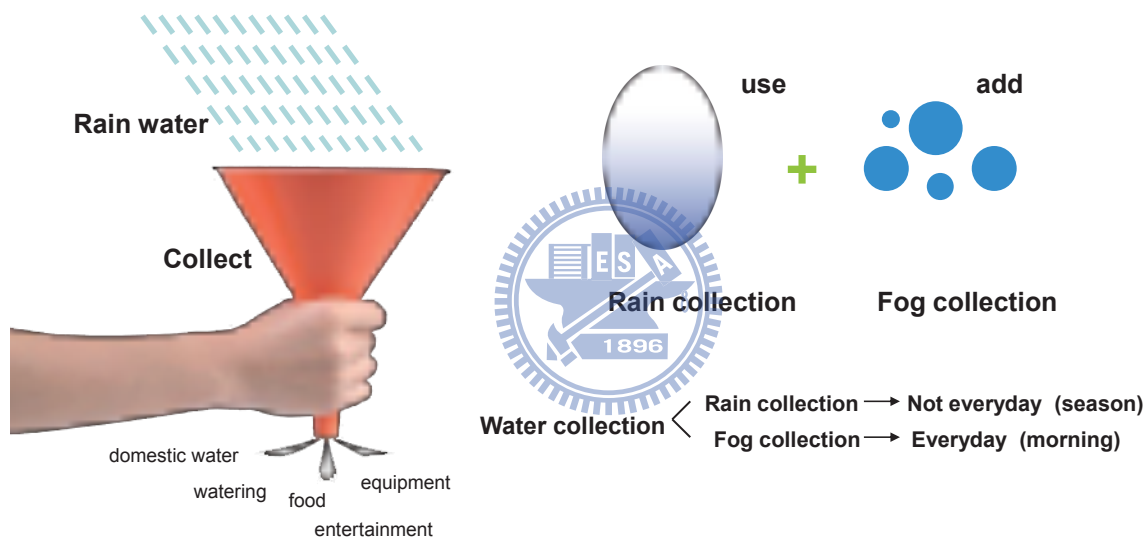
Water Features



Next Gene

Self-Sufficient House

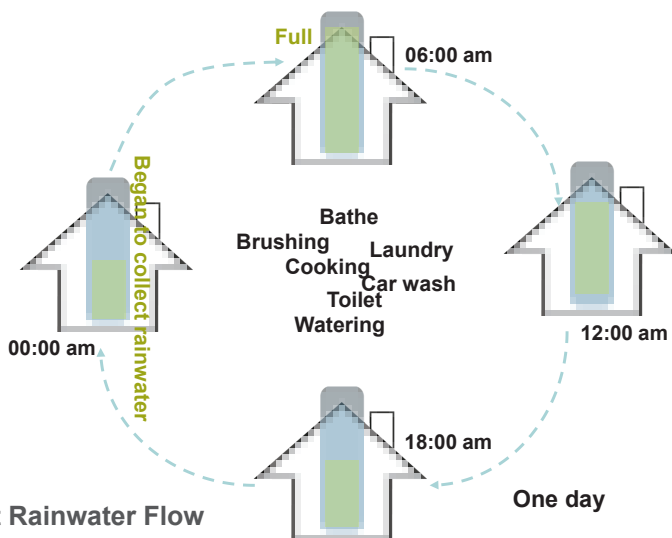
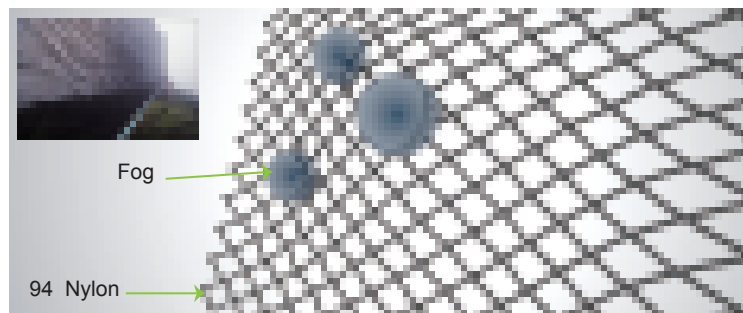
Water Collection System



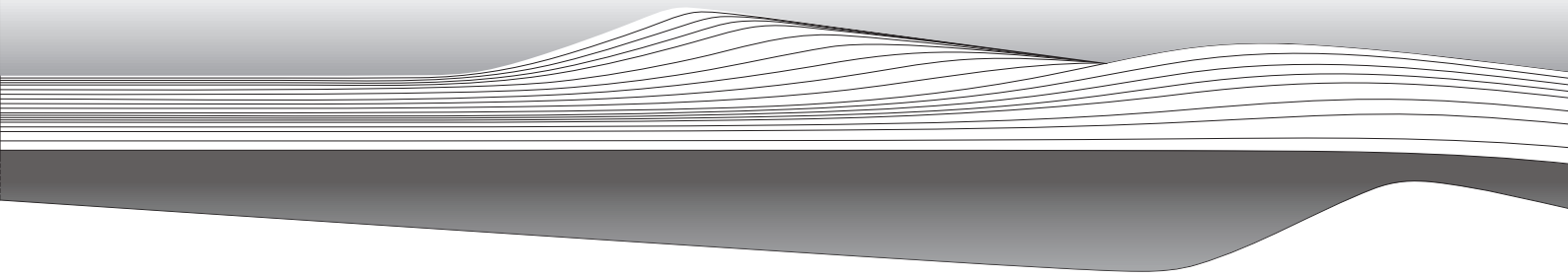
Water Collection System

Fog Collection

In Eastern Nepal



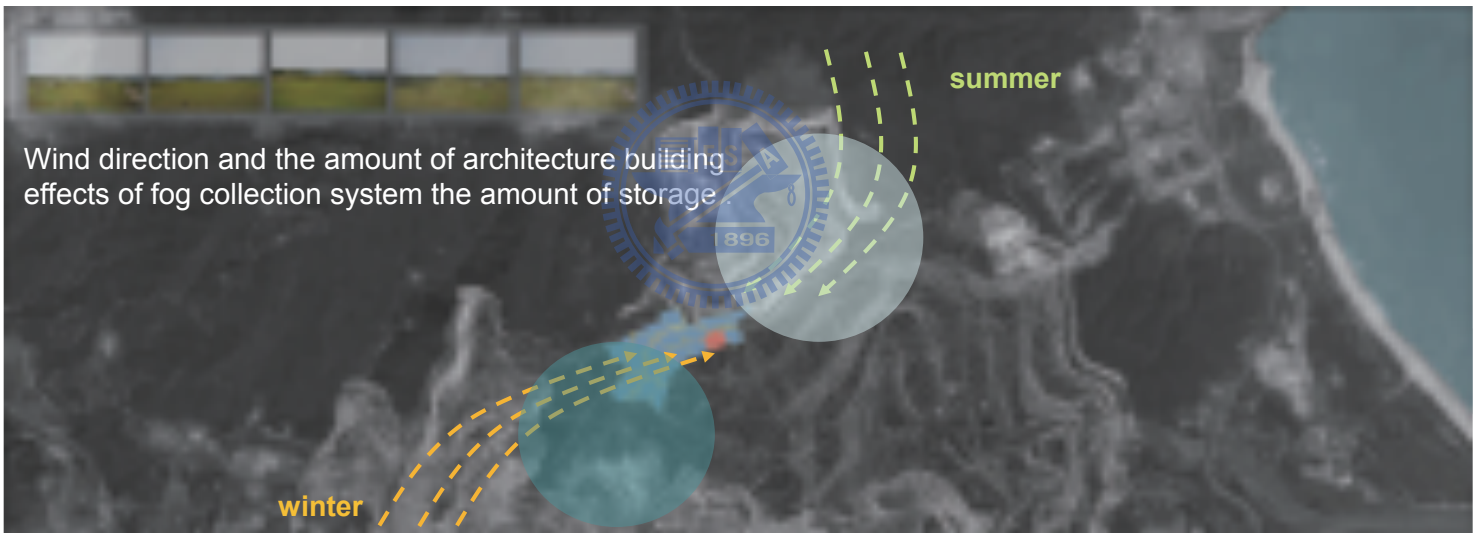
Time To Collect Rainwater Flow



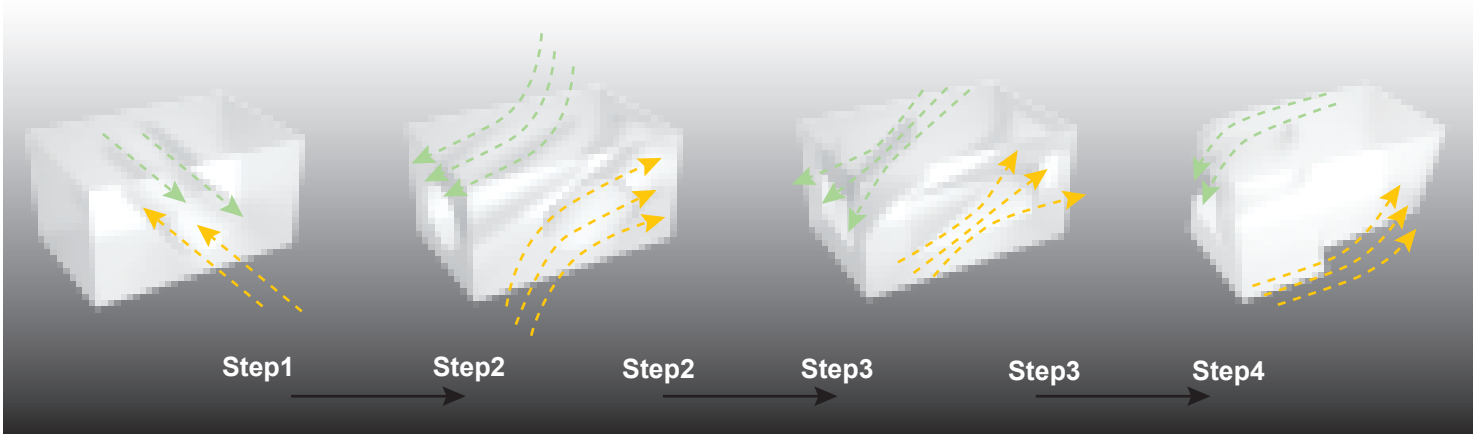
Design Process

Form
Wind Direction

Wind Direction Affect The Forms Of Achitectural



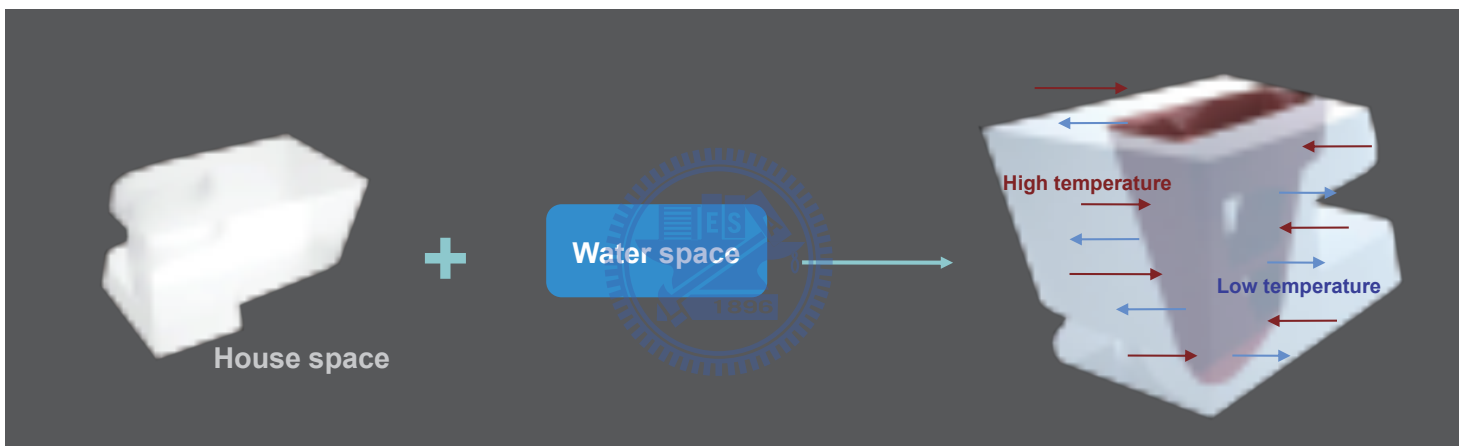
Architecture development process



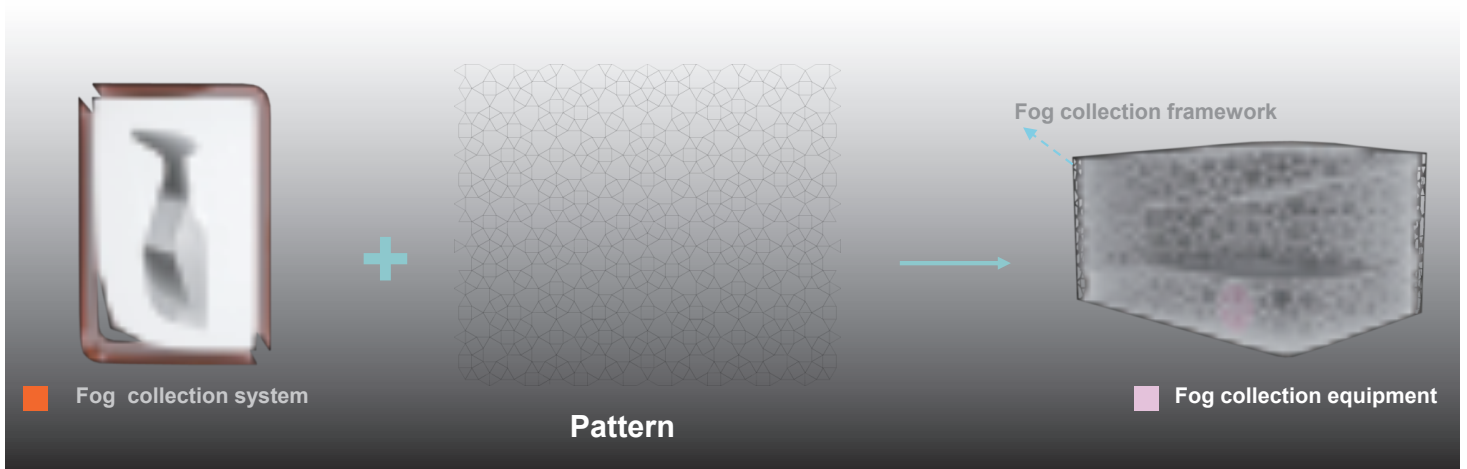
Next Gene

Self-Sufficient House

The Position Water Space

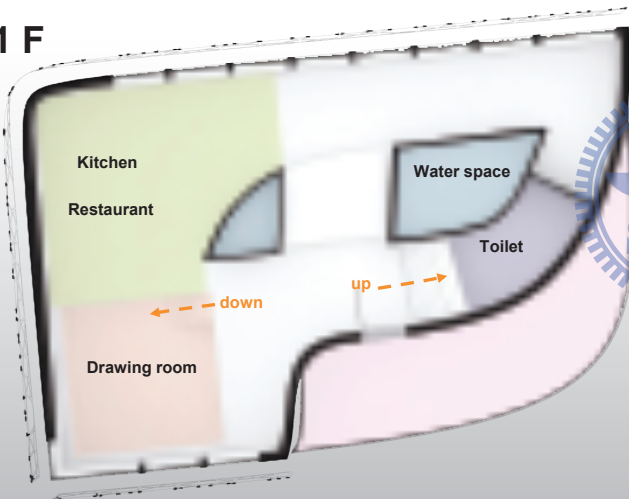


基地上的風向改變建築量體形式，使風可更順暢導向建築物流動，fog collection放置於建築的表層已收集最大量的fog，調節water collection用水量

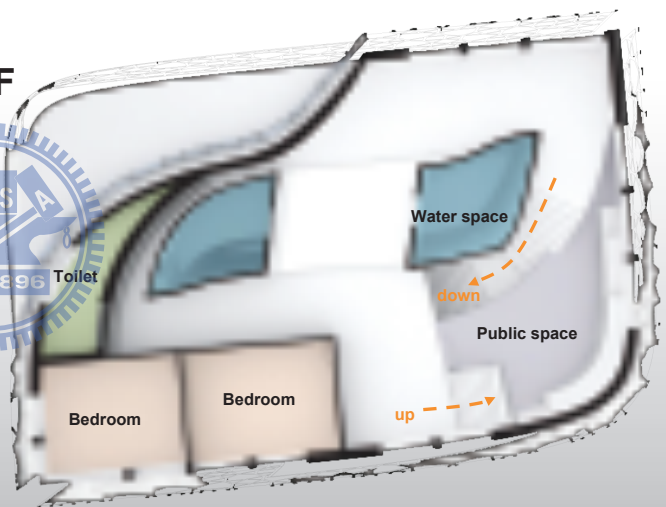


Design Plan

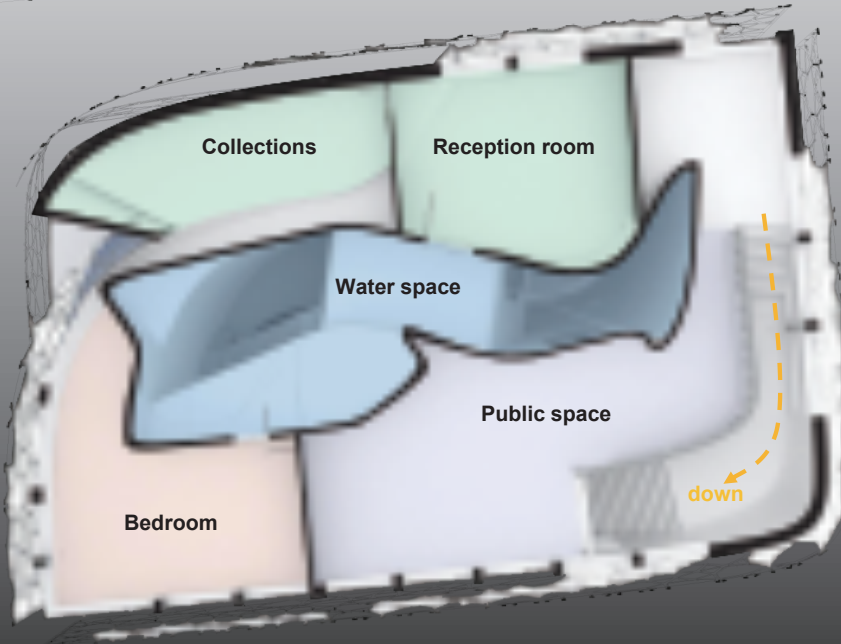
1 F



2 F



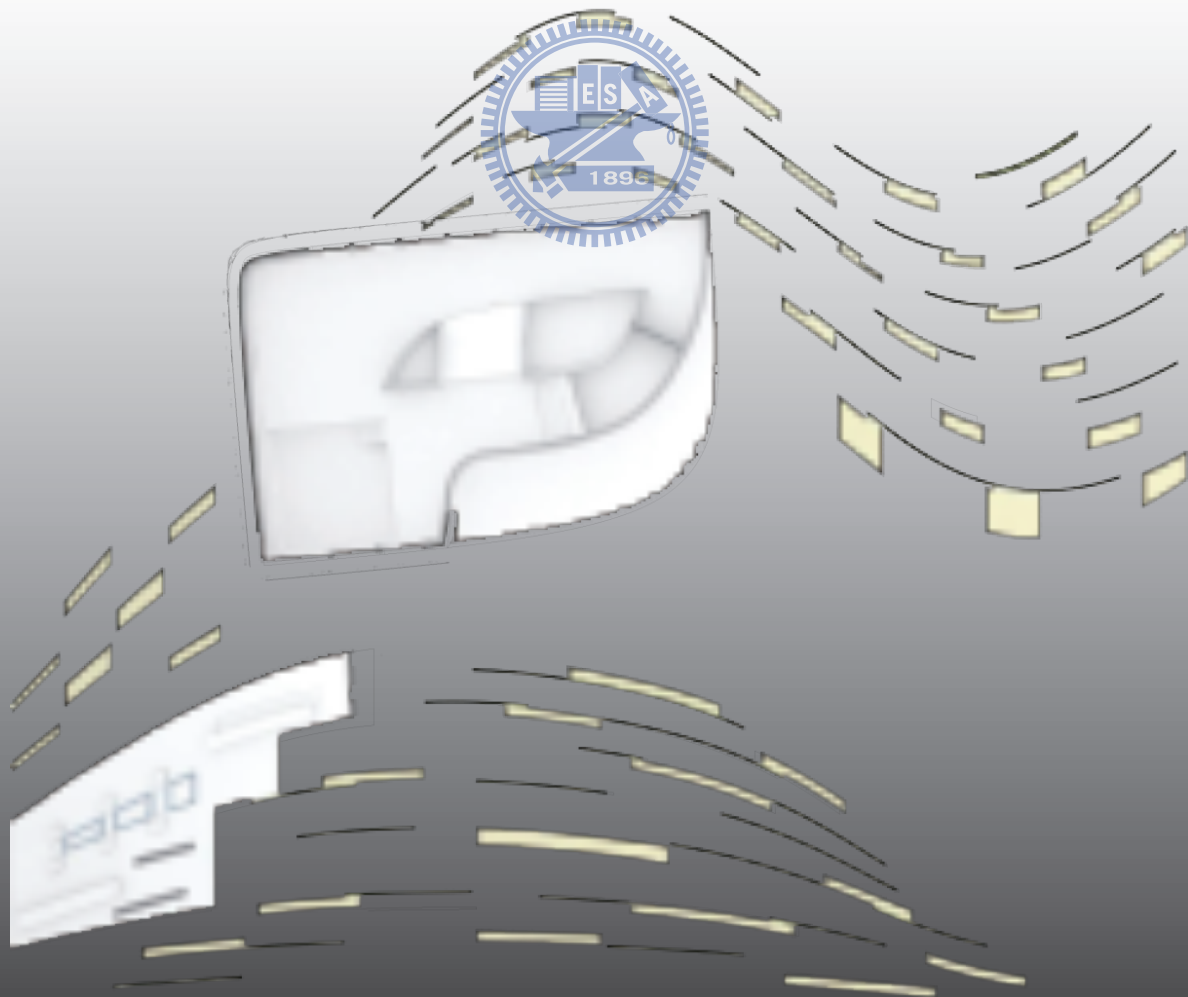
3 F

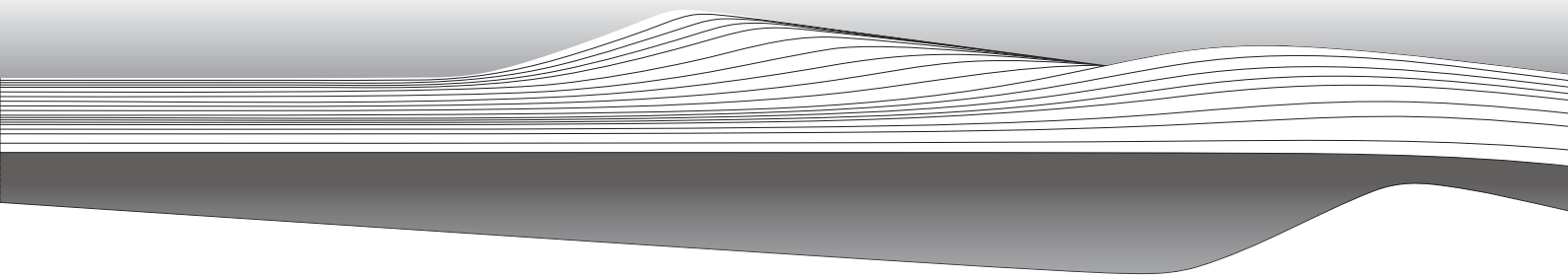


Next Gene

Self-Sufficient House

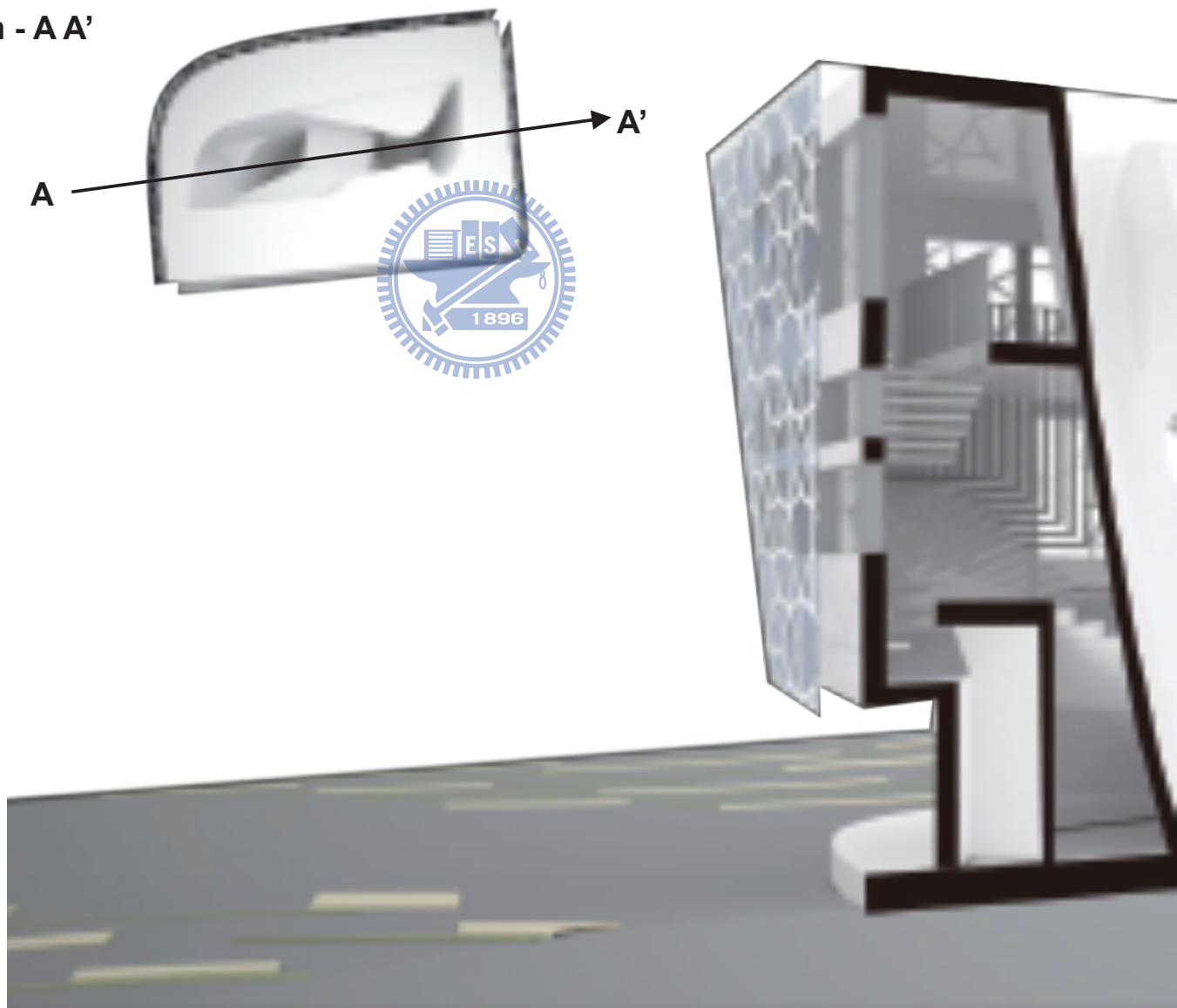
Landscape





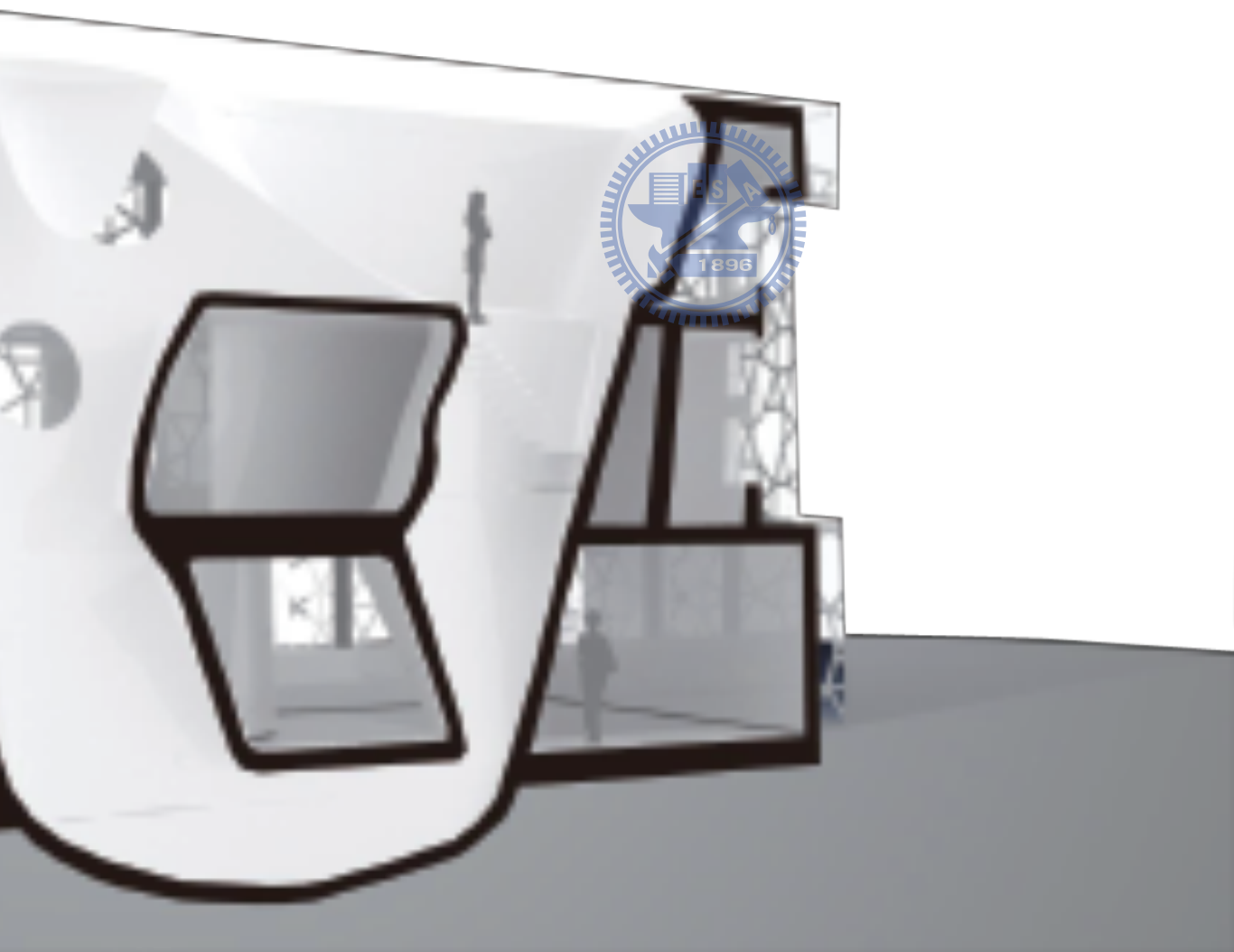
Design
Plan

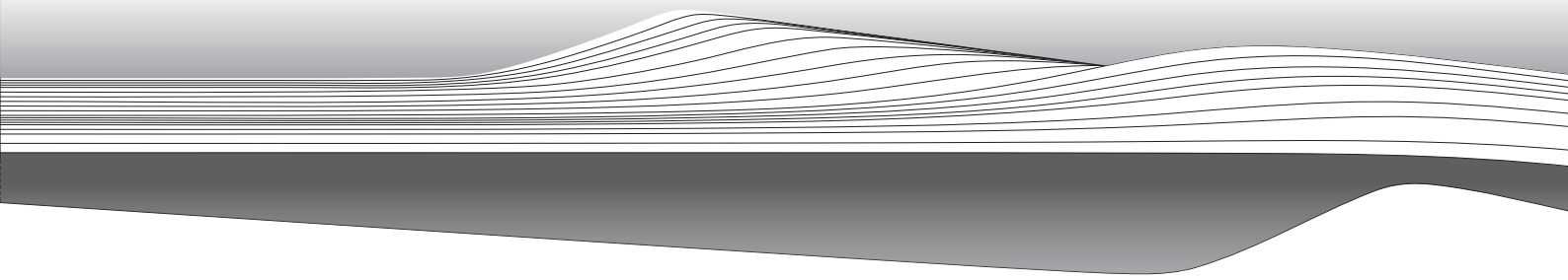
Section - A A'



Next Gene

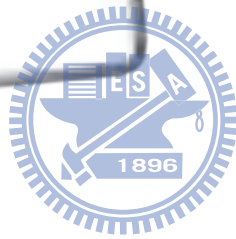
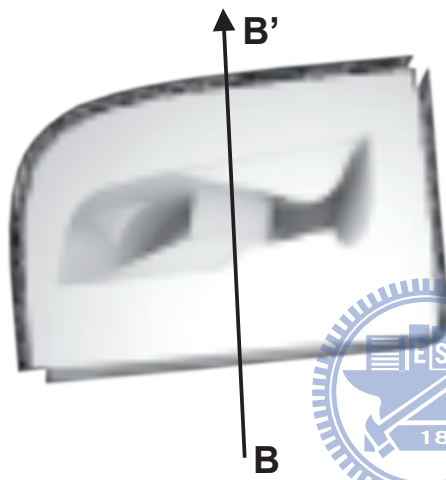
Self-Sufficient House





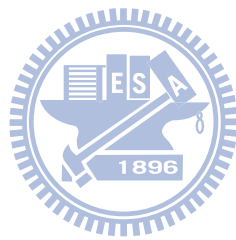
Design
Plan

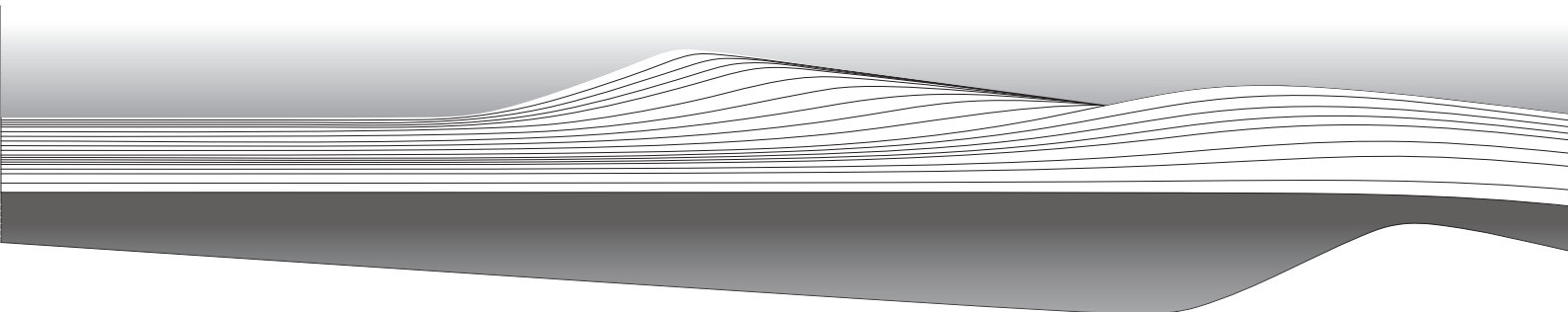
Section - B B'



Next Gene

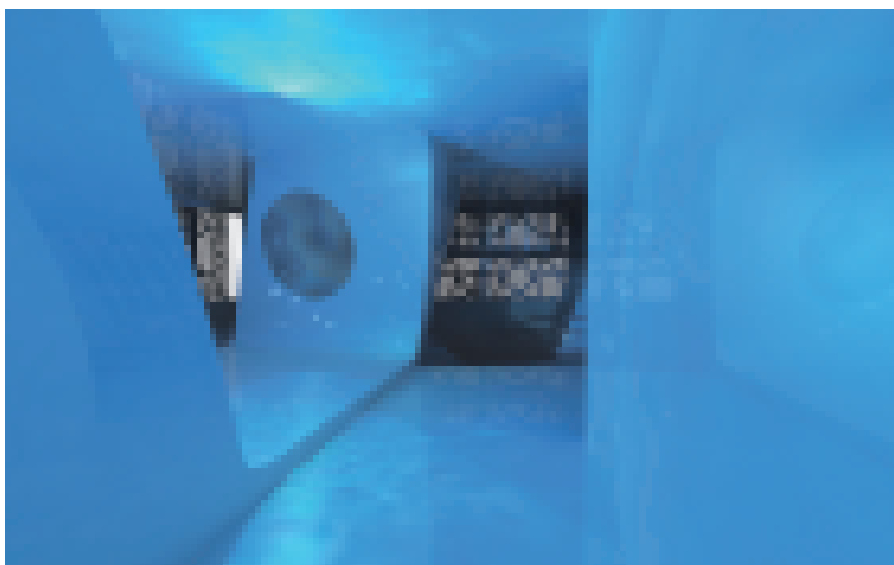
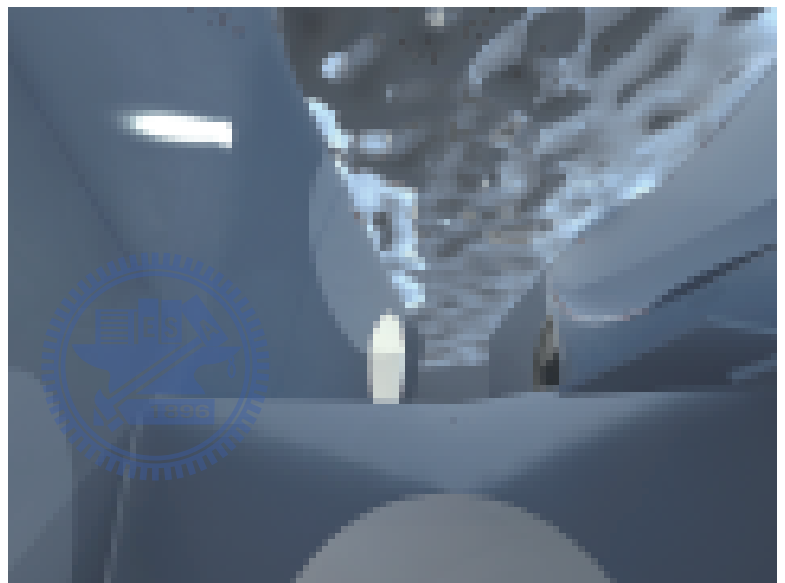
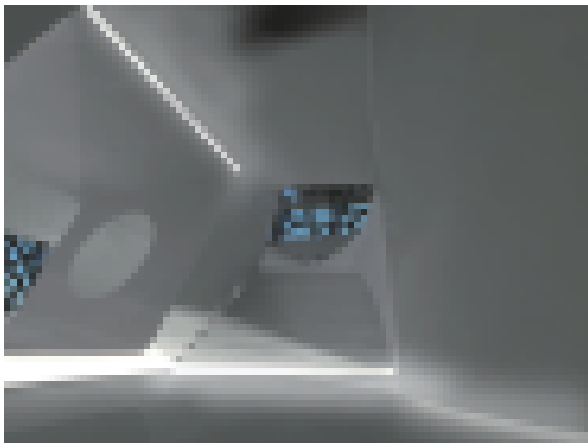
Self-Sufficient House





Design Render

Interior



Water Space
Full of Water

Next Gene

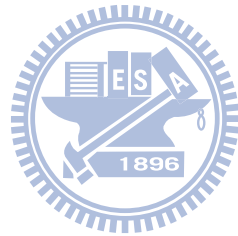
Self-Sufficient House

Outdoor

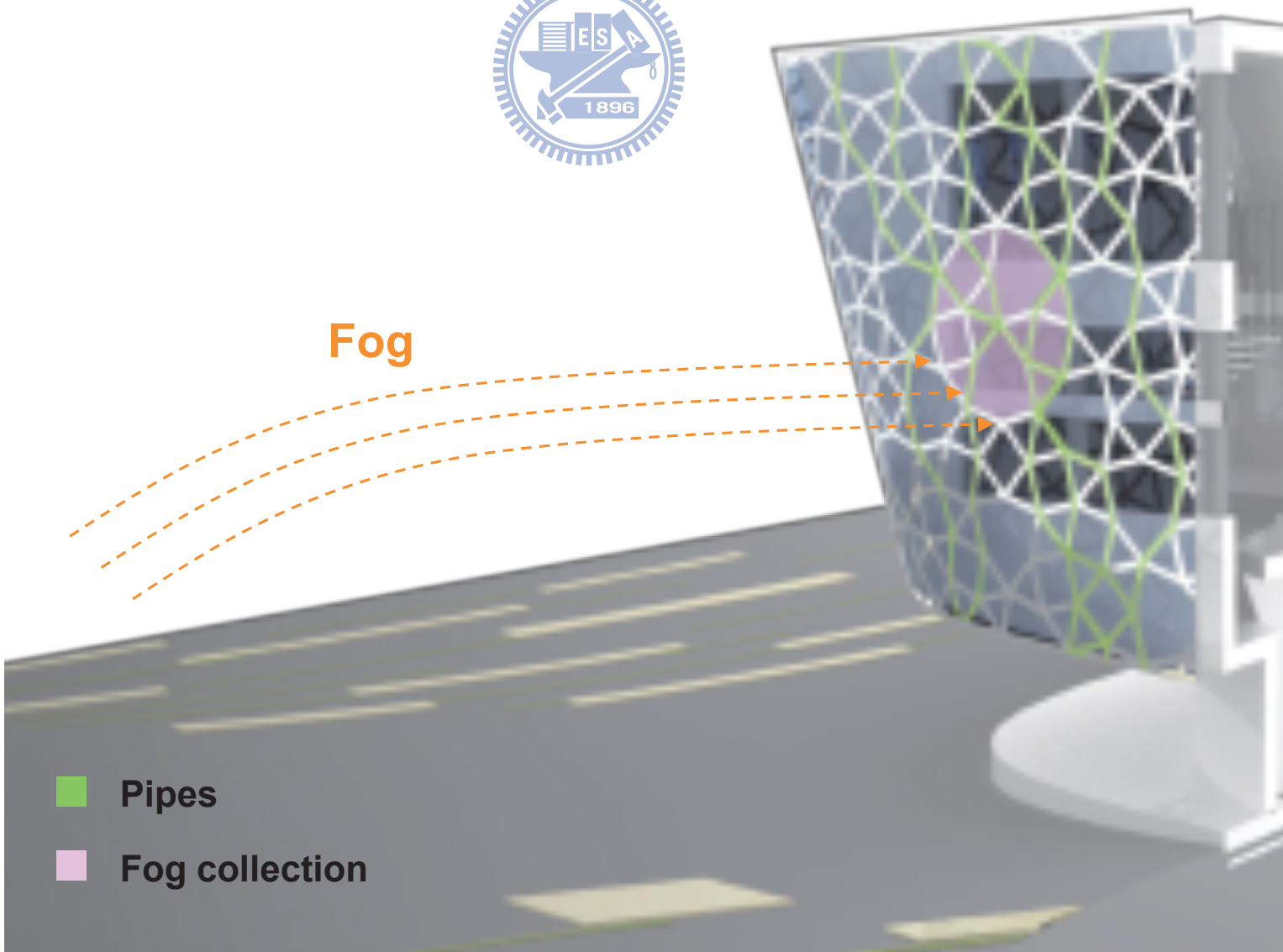


Design

Fog Collection System Description of system

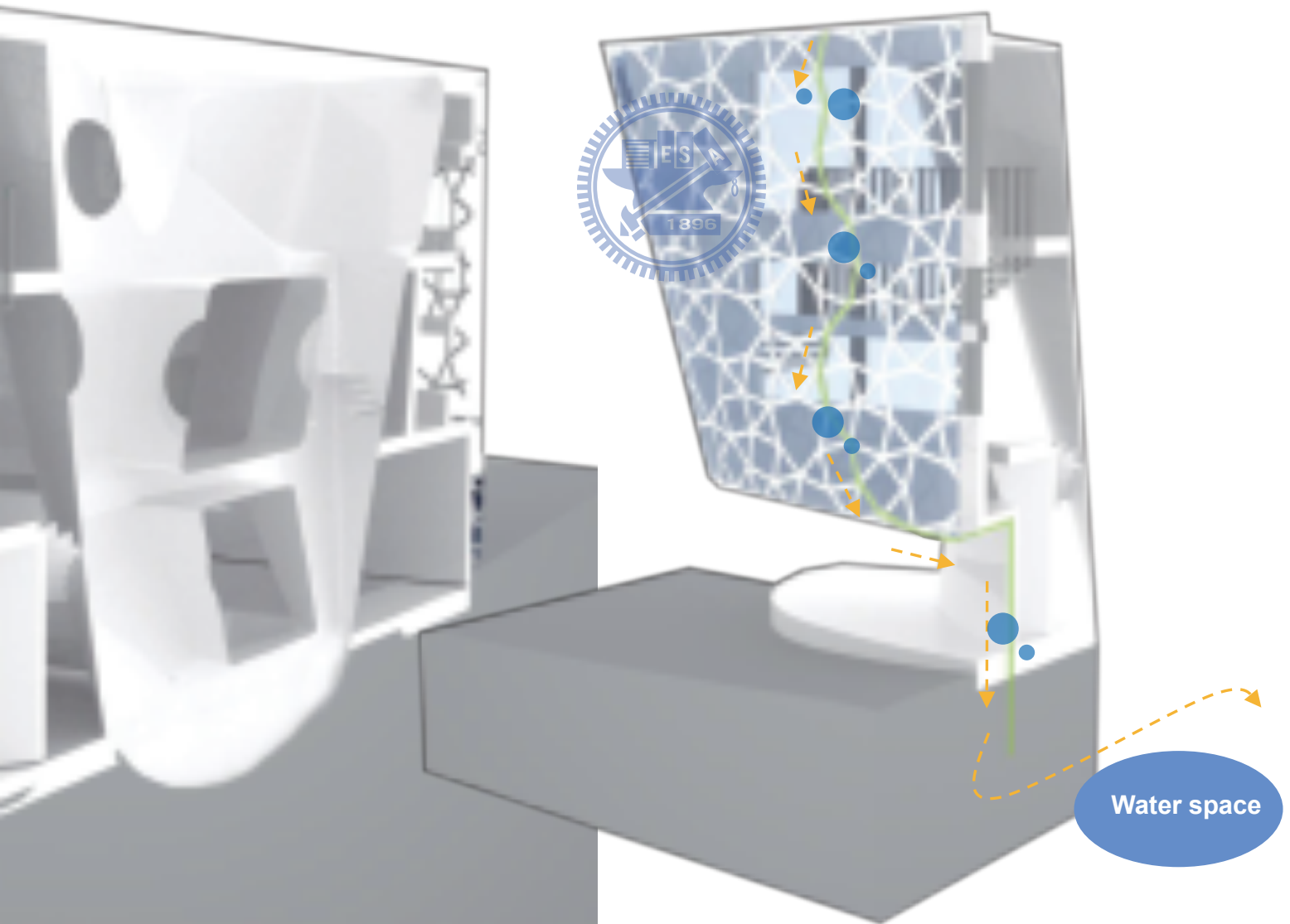


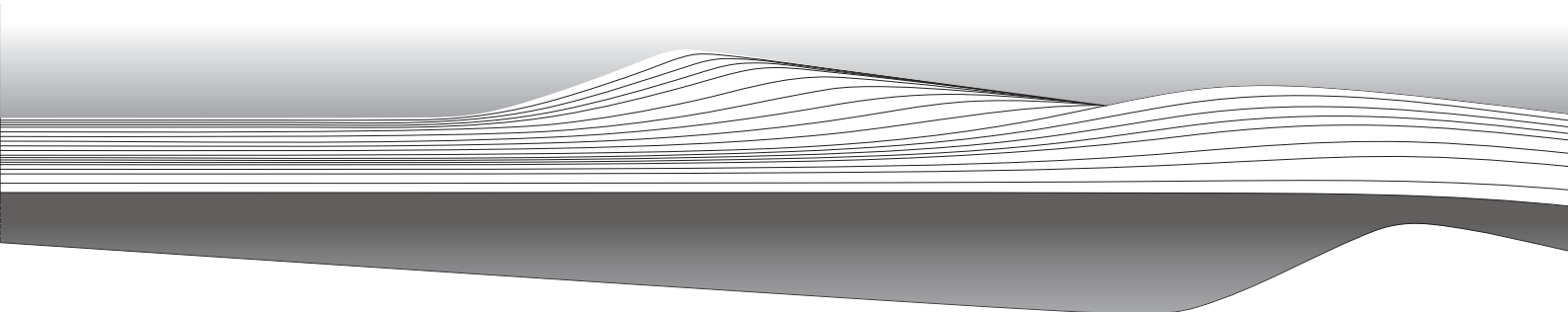
Fog



Next Gene

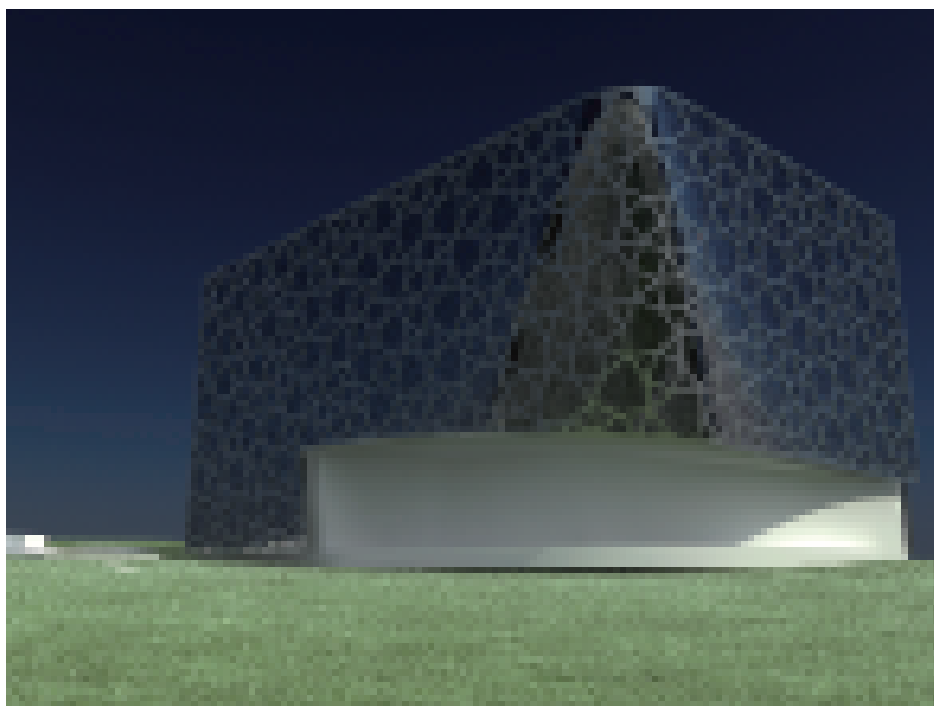
Self-Sufficient House





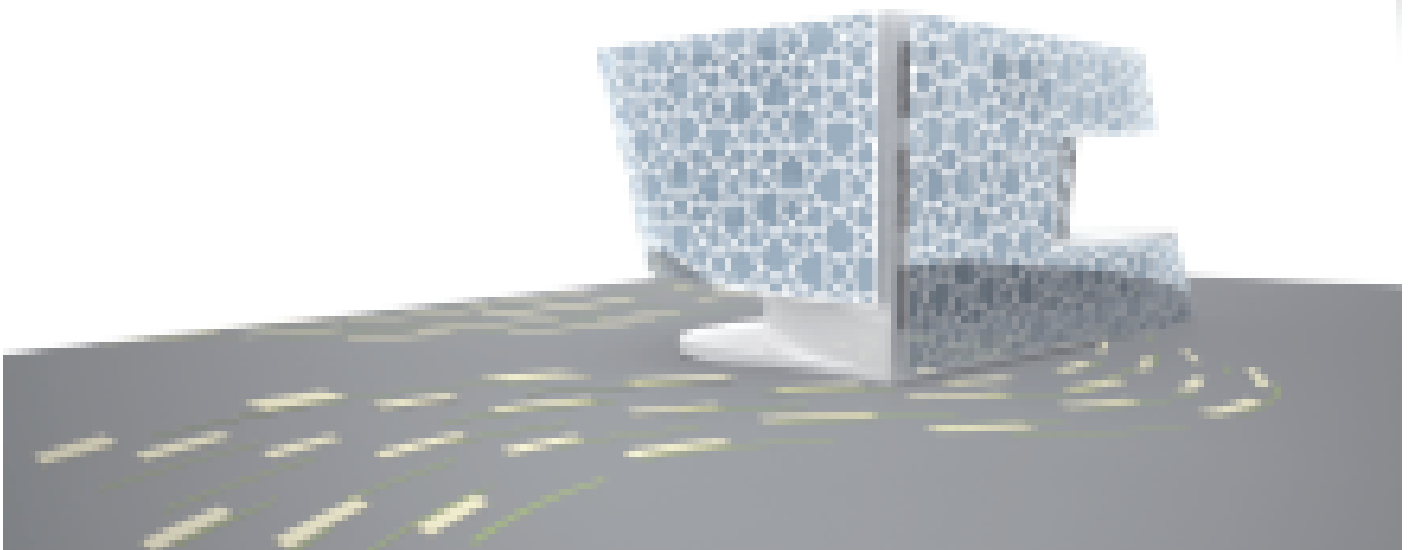
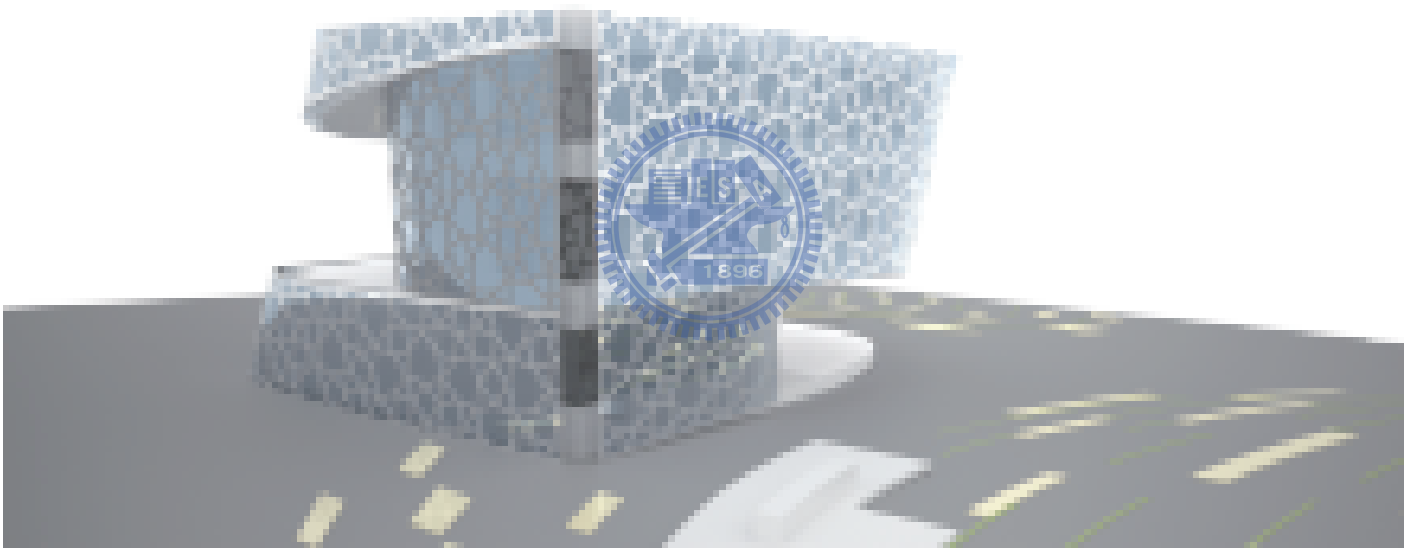
Design

Schematic Diagram



Next Gene

Self-Sufficient House

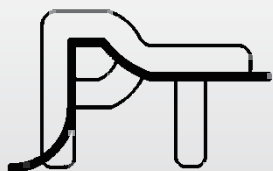


Interaction Architecture

Human - Computer Interaction

Multitouch Table

Interaction



Pippen & Yuting

Studio & Word Space

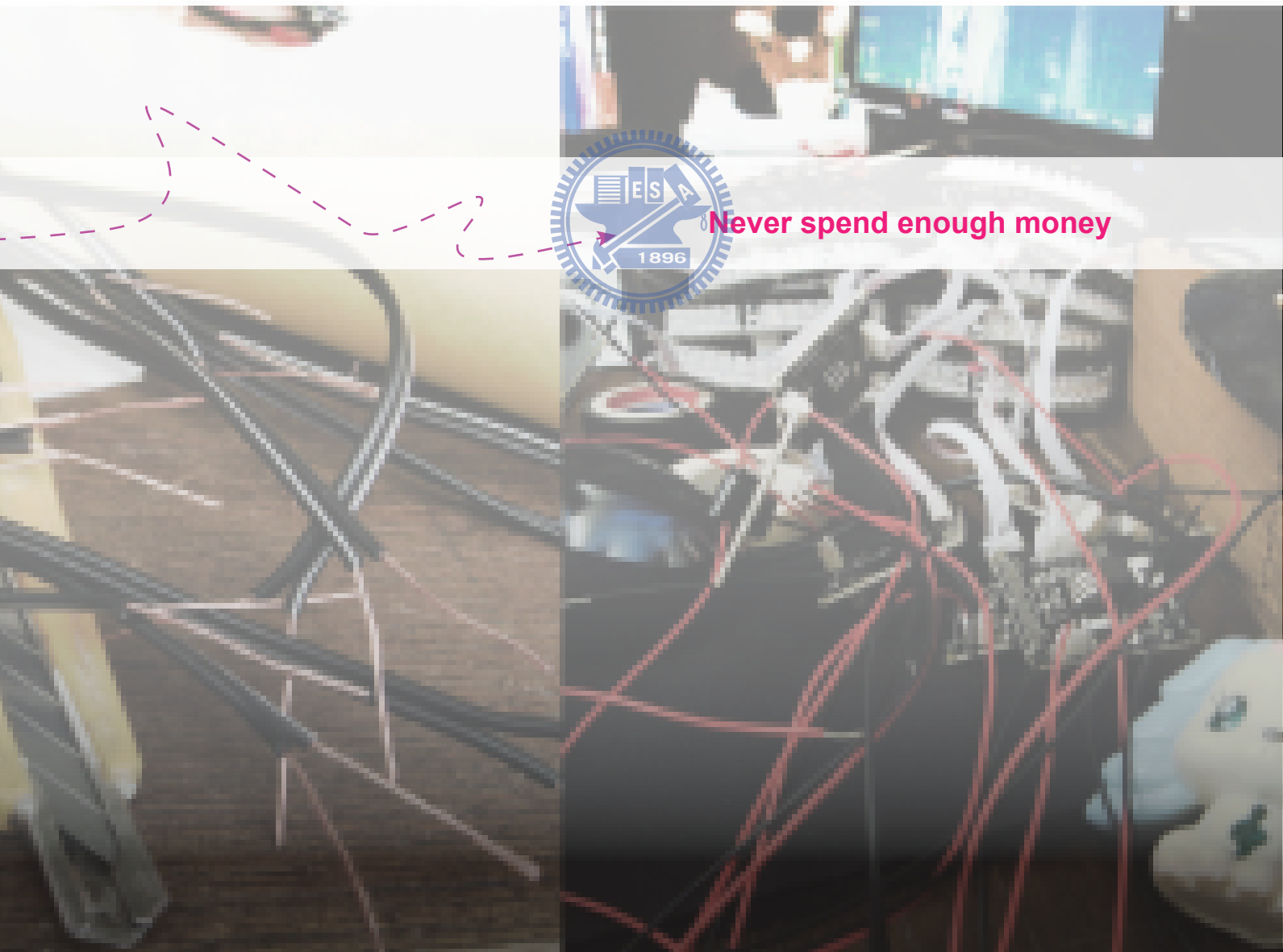
Advisor :

June-Hao Hou

2011 Spring



影響時代進步的因素，取決資訊傳遞的方式。從古至今來討論，由口耳相傳的世代，進而用以手抄文字記載，進一步印刷術的問世，直到近代資訊網路的便捷。在這冗長的資訊傳遞的過程中，演化了人類讀取資訊知識的習慣，而成就更多元的資訊結合。然而此設計取決互動桌來作以衍生下一代資訊傳遞的重要決策，其動機在於互動桌改善了資訊與知識傳遞的方式，亦提供了有別於以往的遊戲或娛樂方式。於是互動桌開始了另一個資訊傳遞的里程碑，可結合各種場域與各種互動行為的發想。此設計之互動行為，考量工作室之工作場域，找出一個需要被以改善的空間。進行互動行為的執行，並以一個新互動形式，重新活化場域。



Never spend enough money

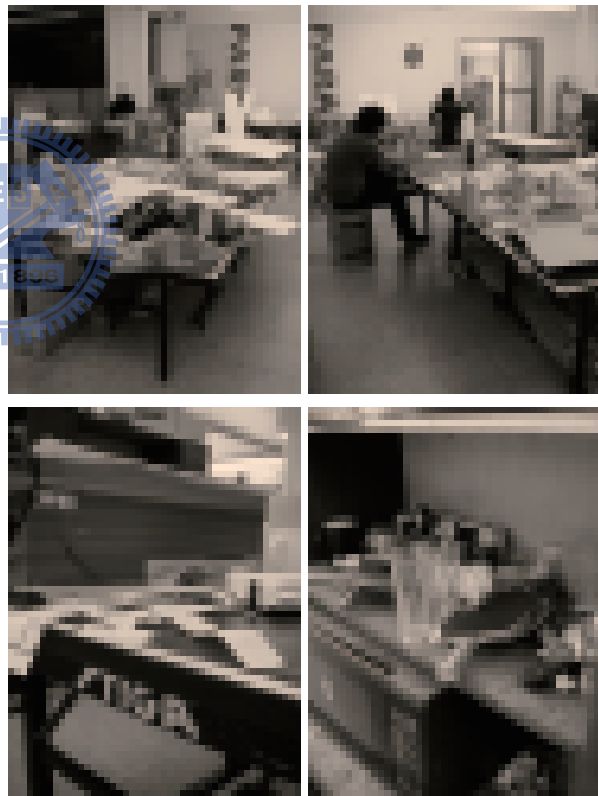
Working Environment

Design objects

Table tennis tables



Site photos



Working Environment

Problem

- 隨設計課模型量越來越多時，乒乓球桌之機能將被占據
- 只有會打桌球的人可以使用
- 乒乓球遊戲最多4人，無法更多人參與
- 乒乓球玩法較為單一

Multitouch Table

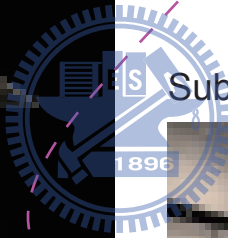
Interaction

Environment Conclusion



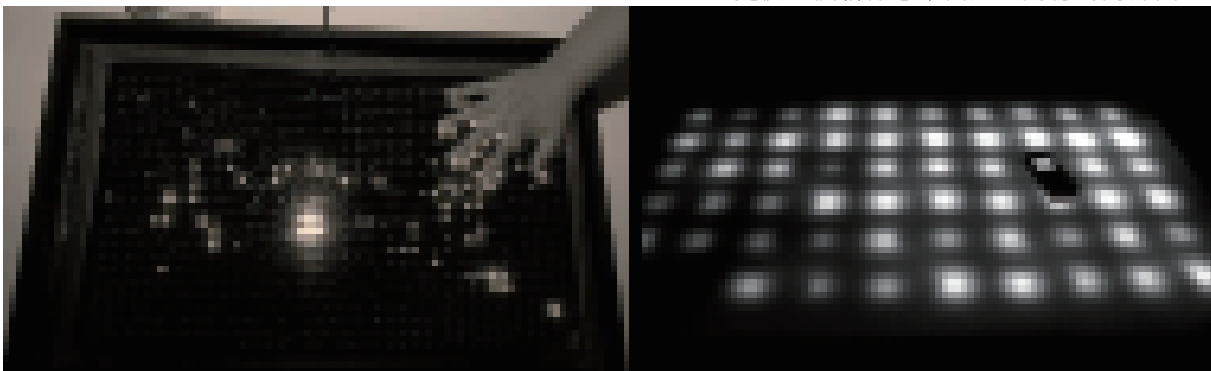
打桌球 不只是打桌球
增加視覺跟娛樂 或擴充功能

可增加更多遊戲方式
增加遊戲人數
增加遊戲的互動行為
增加人與人互動關係



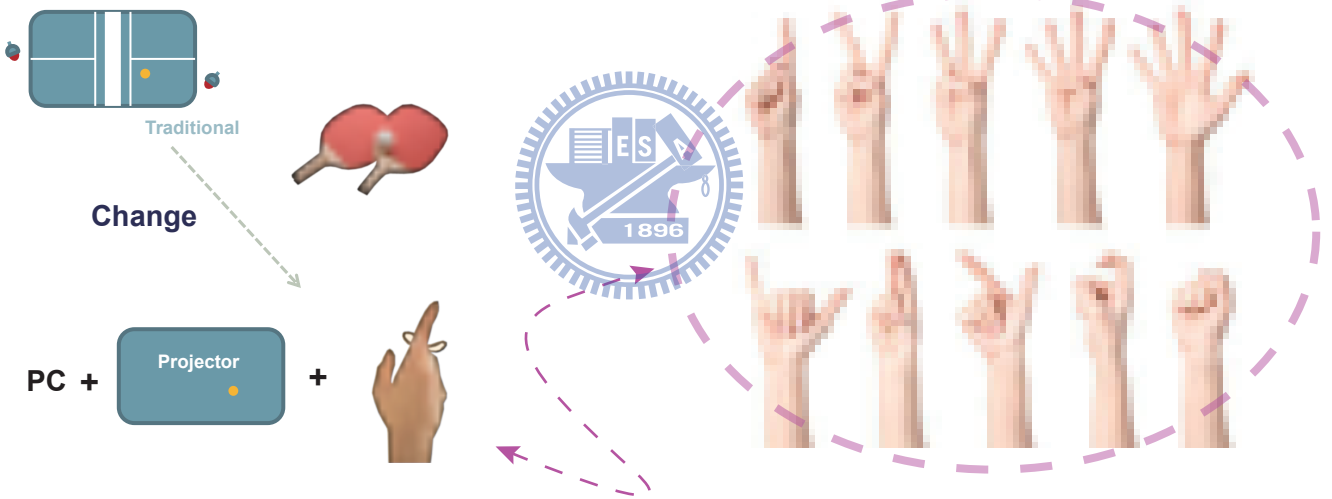
提供一個新休憩平台與互動行為的界面

Multitouch Table



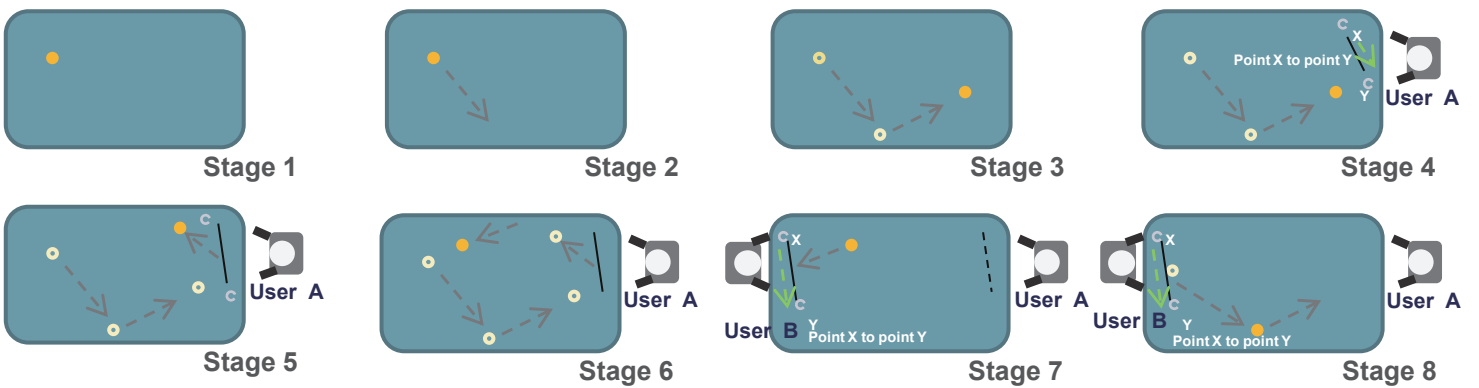
Submit Proposals

New relues of the game



Gesture changes the game can increase the fun of the game

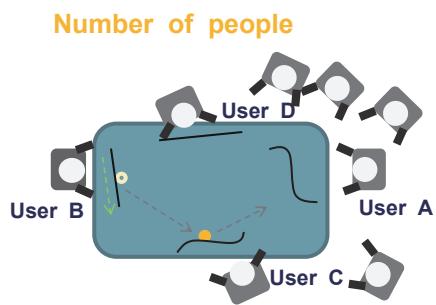
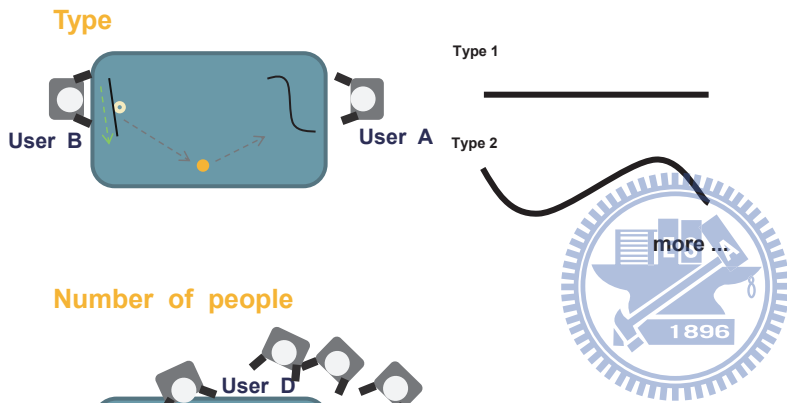
Simulation I



Multitouch Table

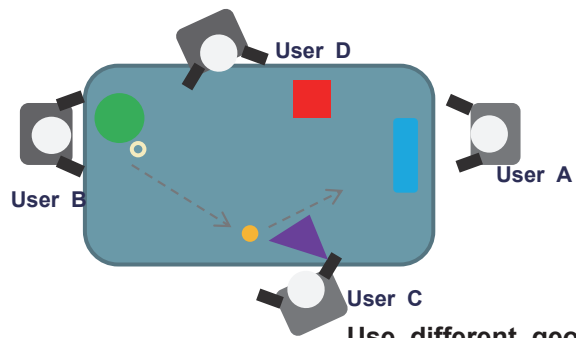
Interaction

Simulation II

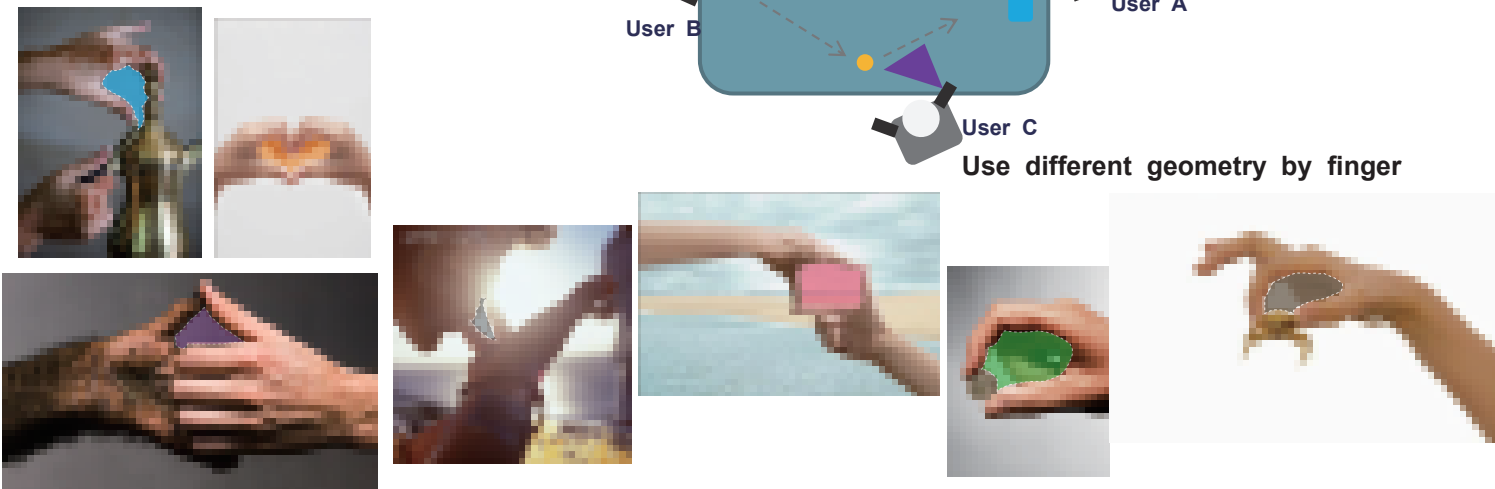


Simulation III

We also can play like this ...

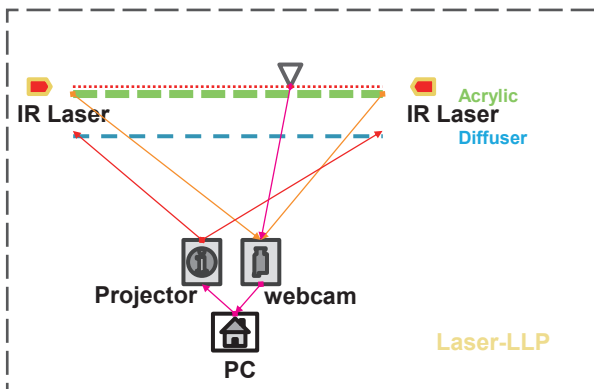
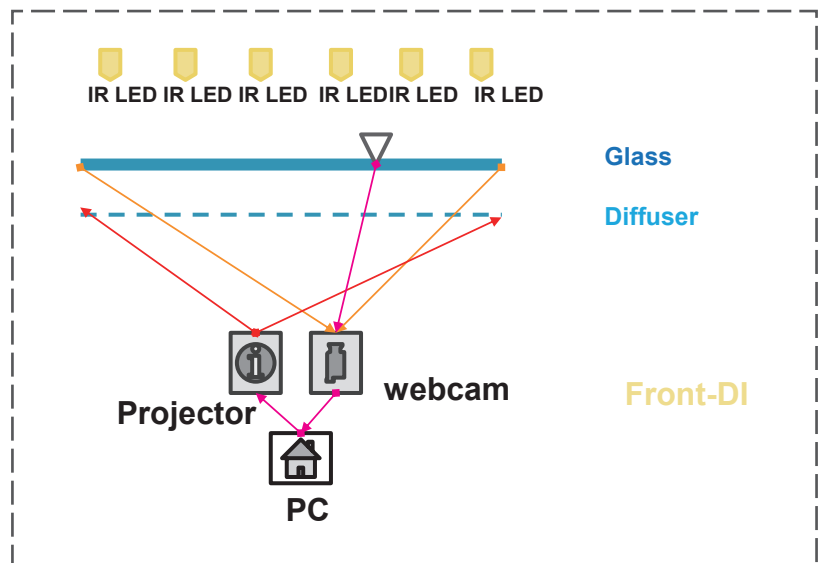
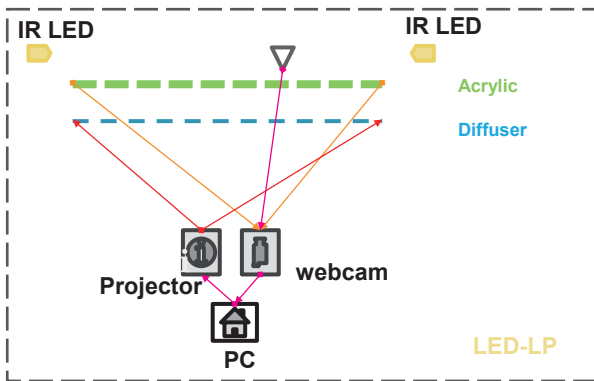
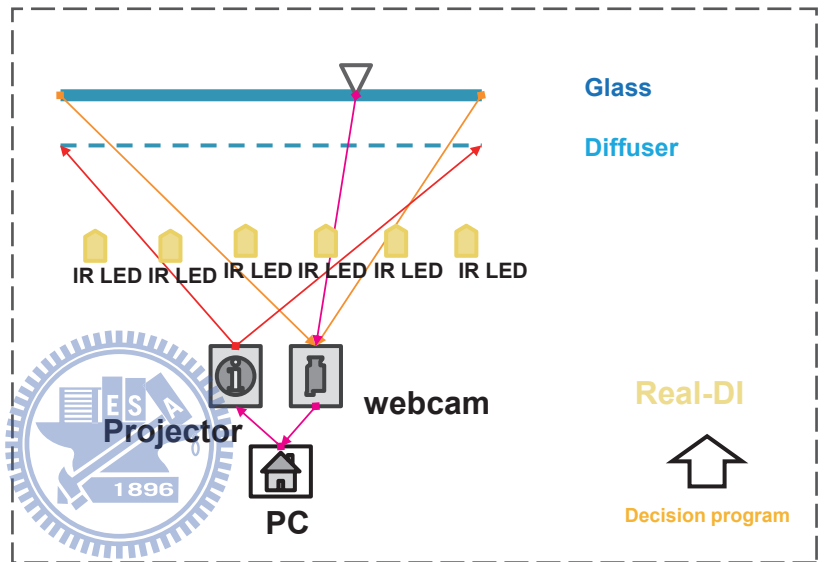
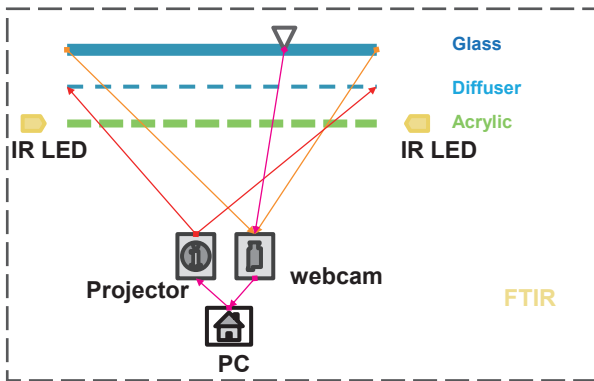


Use different geometry by finger



Research Type Of Multitouch Table

Hardware mode

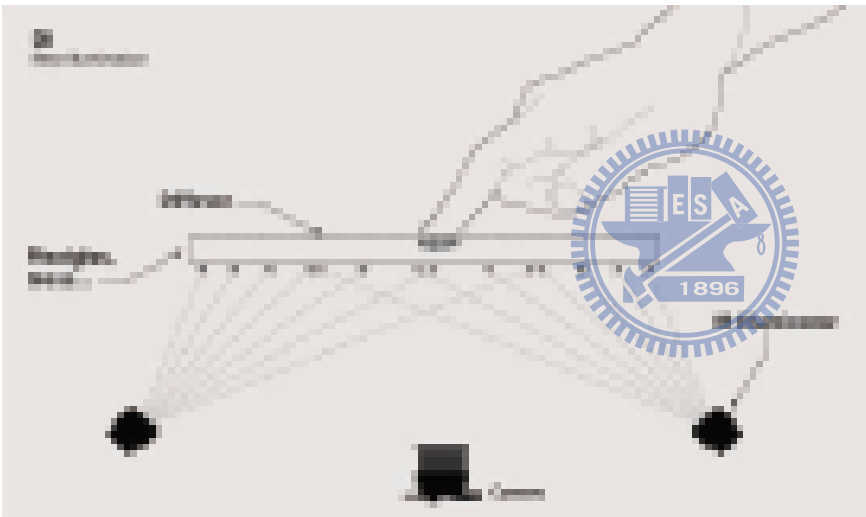


Multitouch Table

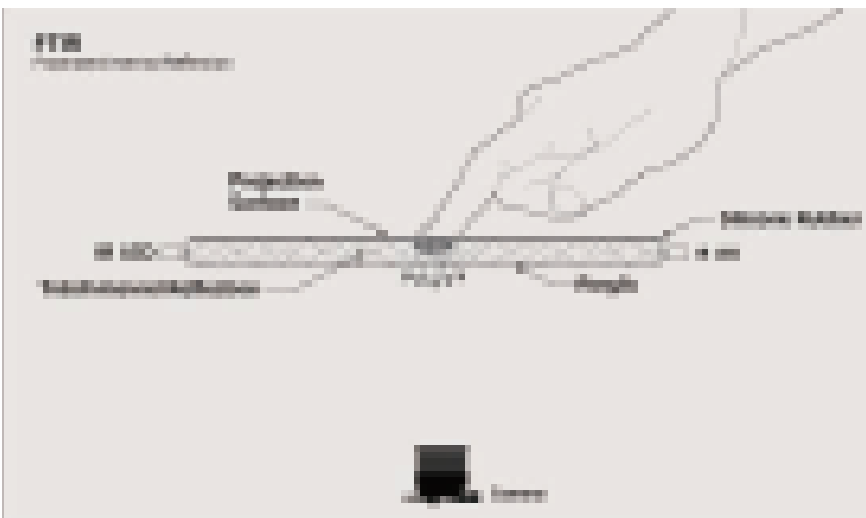
Interaction

Select Type Of Multitouch Table

Two Mainstream



Slip



Press

DIY Hardware

Required materials and Production process



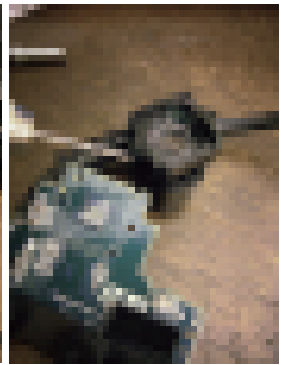
Glass



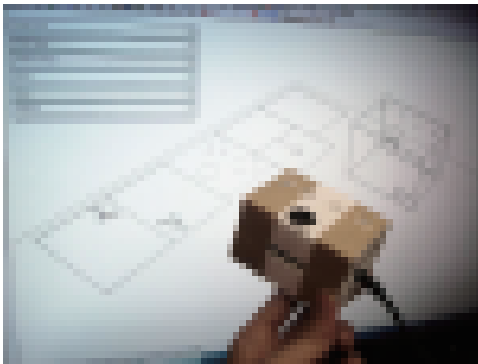
Tracing paper



IR Webcam (PS3 eyes Webcam)



Film



Surface of box



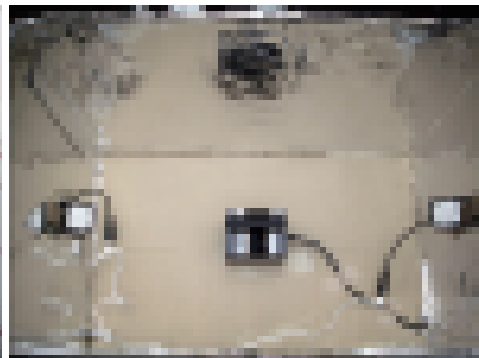
Surface of box



Cube test box



IR LED (850nm 120 degree)



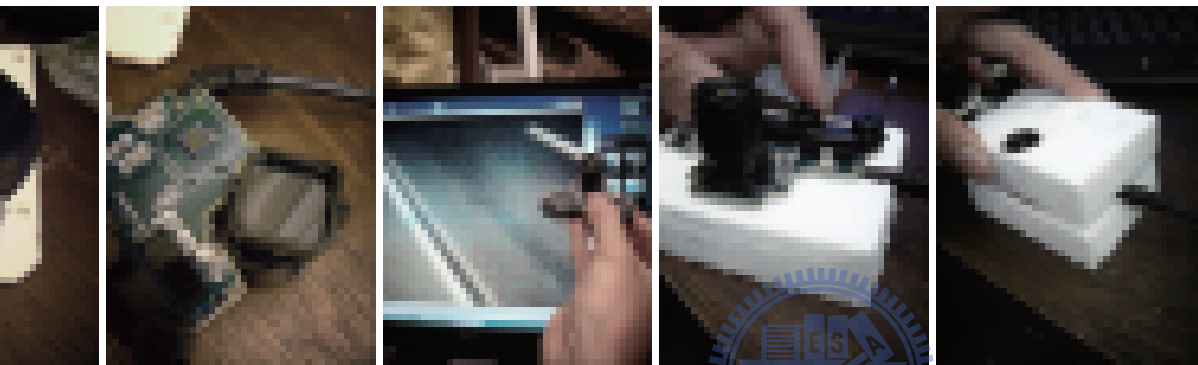
Cube test box



Cube test box

Multitouch Table

Interaction



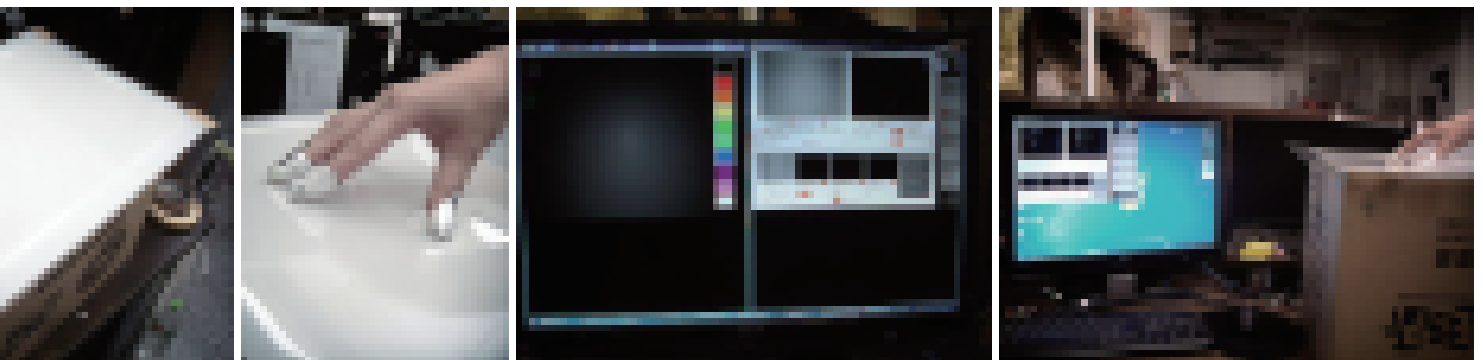
Camera

Make a box for camera



Mirror (Reflection)

Fan (Air cooling)



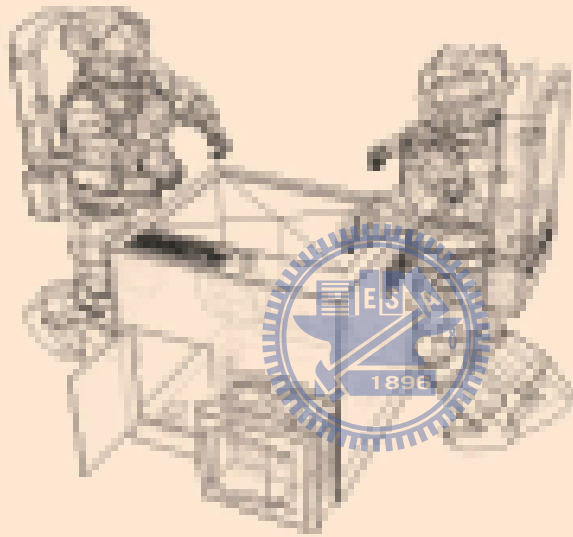
Test setting

Test software

Formally Simulate For Multitouch Table

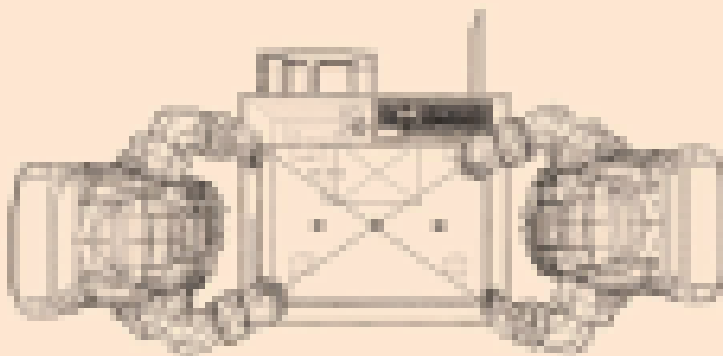
Design and facilities for the size

Perspective



First in painting software to simulate

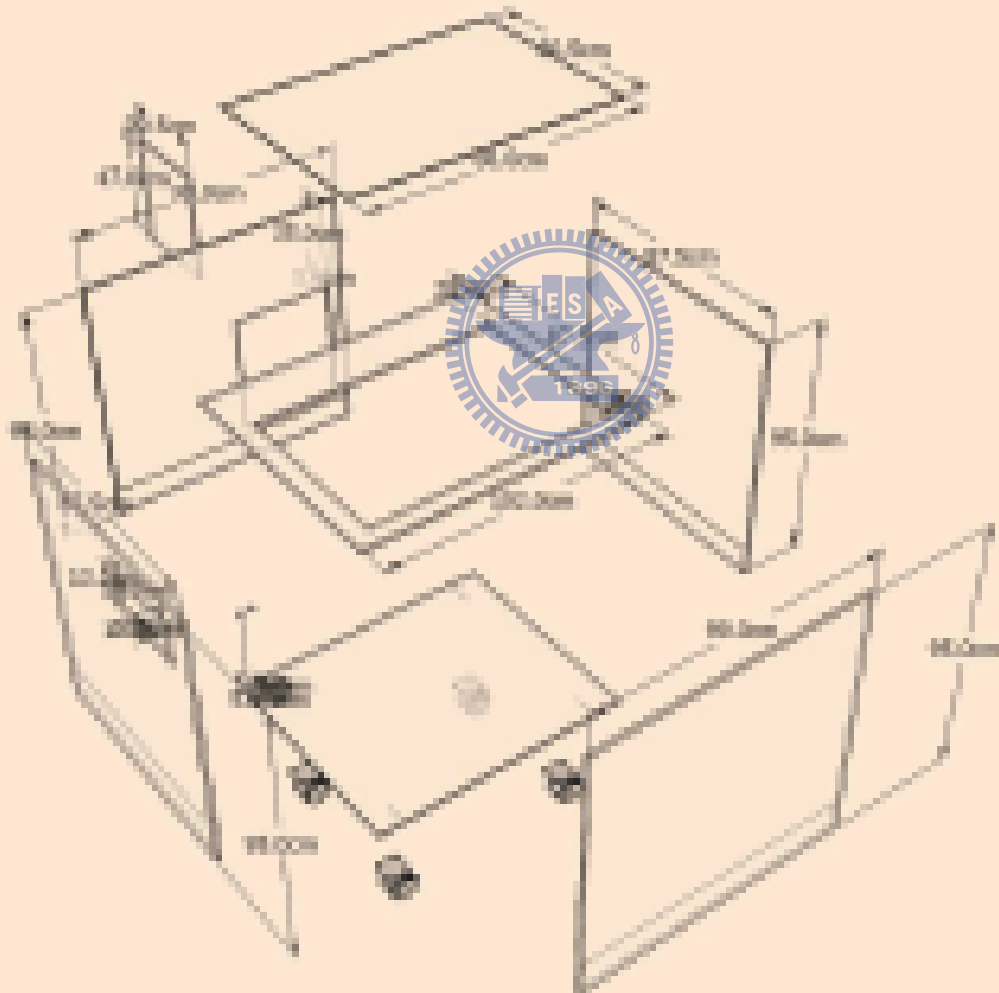
Top



Multitouch Table

Interaction

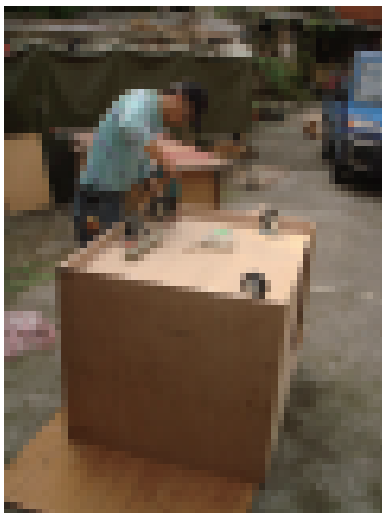
In scale



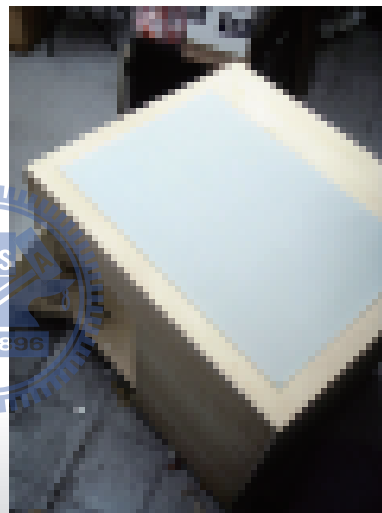
Use of wood raw material
for the actual manufacturing of the material

Formally Simulate For Multitouch Table

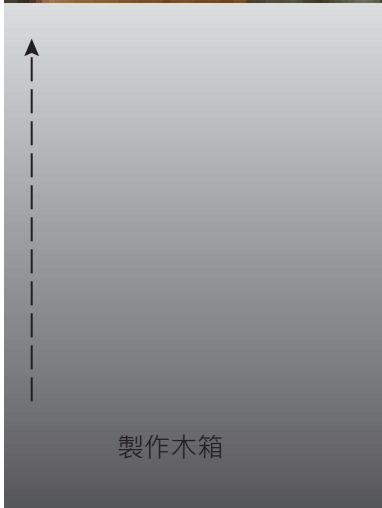
Fabrication



裝設抽風扇



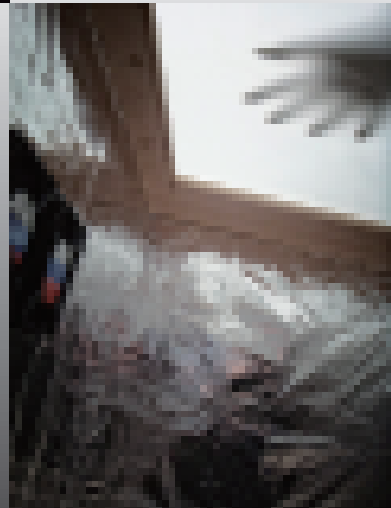
測試透光程度且
植入反射鏡片



製作木箱

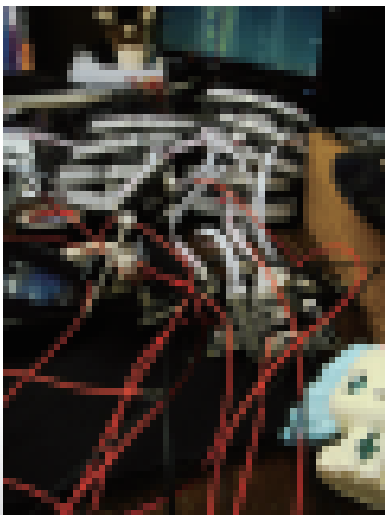


張貼鋁箔紙



Multitouch Table

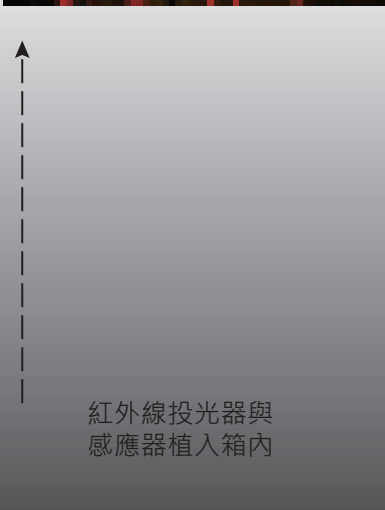
Interaction



植入短焦投影機



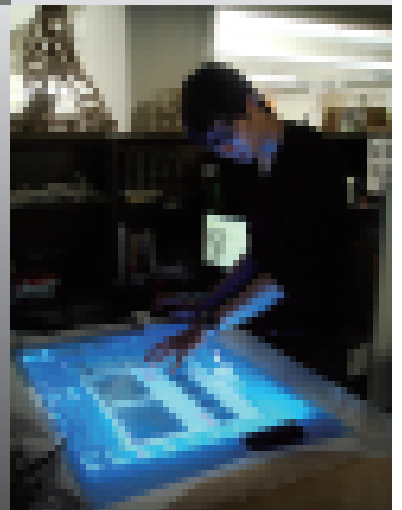
開啟多點觸控軟體測試



紅外線投光器與感應器植入箱內

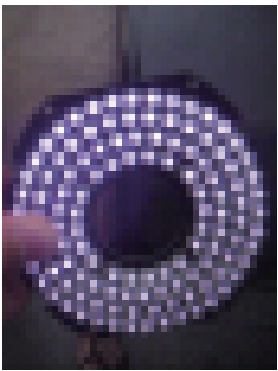


開始與電腦連結



Formally Simulate For Multitouch Table

Problem For Test



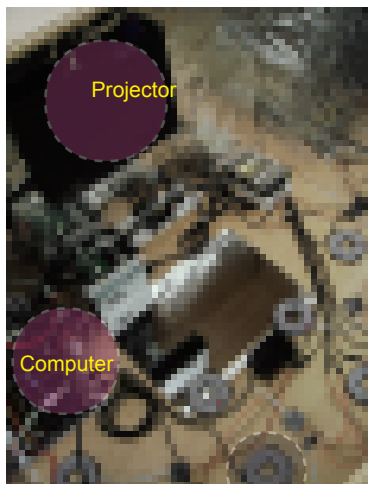
Insufficient number of IR LED

Increase of 8 IR LED



Currently, there are 16 IR LED

Object in the box

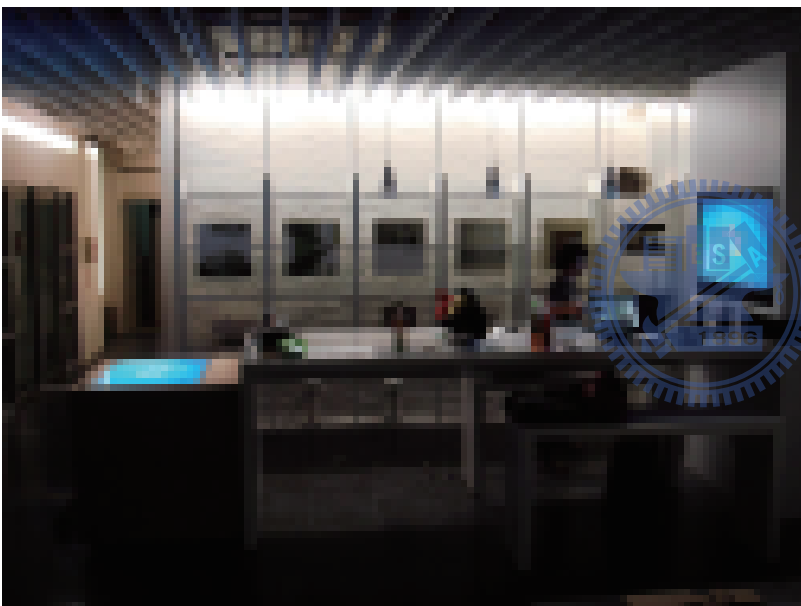


Increase height
Enhancing the sense of light

Multitouch Table

Interaction

Testing



Formally Simulate For Multitouch Table

Achievement

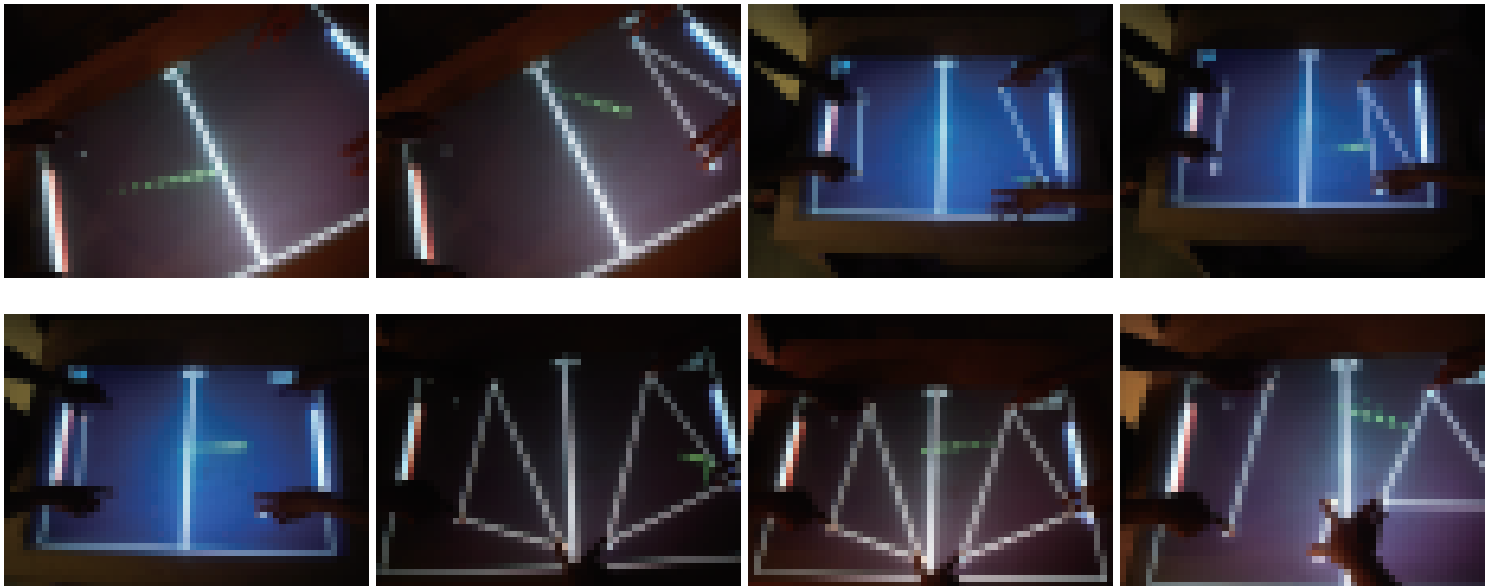
Correction



使用校正軟體(CCV1.4)·進行感應器
接收多點訊息之位置·將數據輸入電
腦中·作以互動行為的前置作業。

Achievement

Interactive table tennis game (EASY)



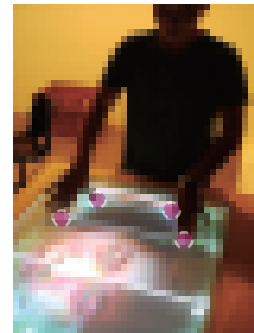
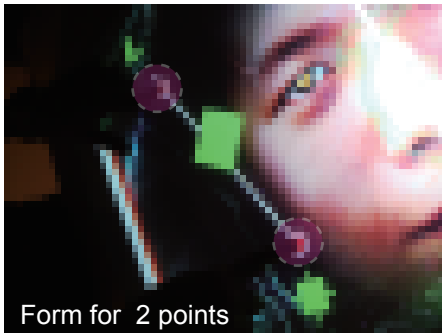
Multitouch Table

Interaction

Achievement

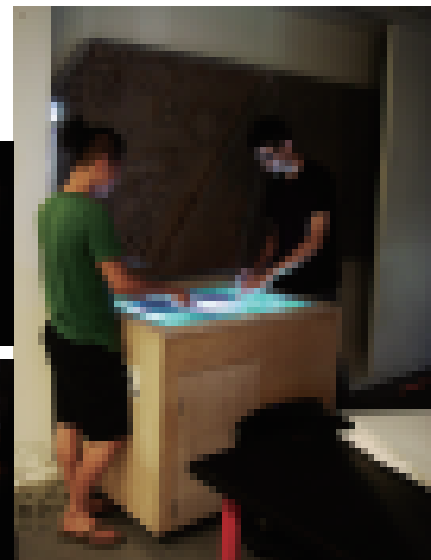
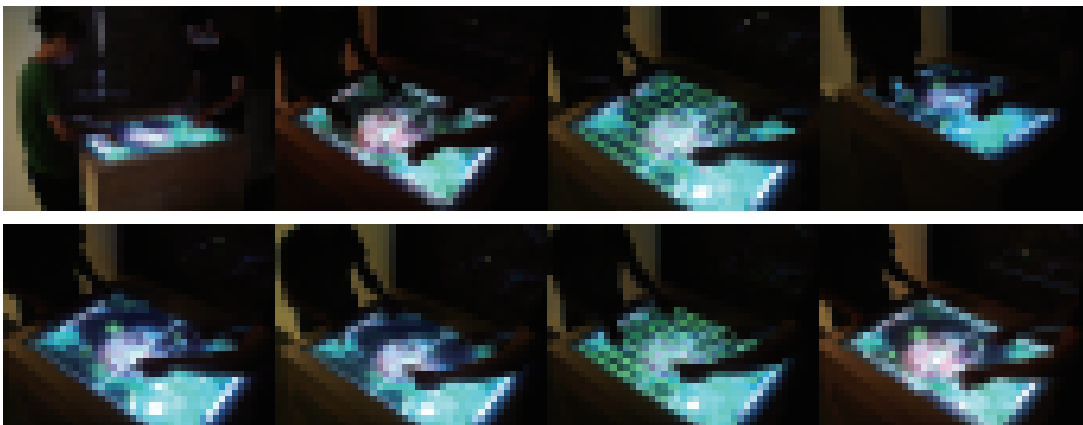
Interactive table tennis game (HARD)

Rules of the game



Changes in the game

增加影響視覺的阻礙物，用以增加遊戲進行中的趣味程度，而影響的視覺的圖形變化一共為4種，此遊戲目前為雙人遊戲。



Information Architecture

Integration of Information
and Architecture

Parking Space

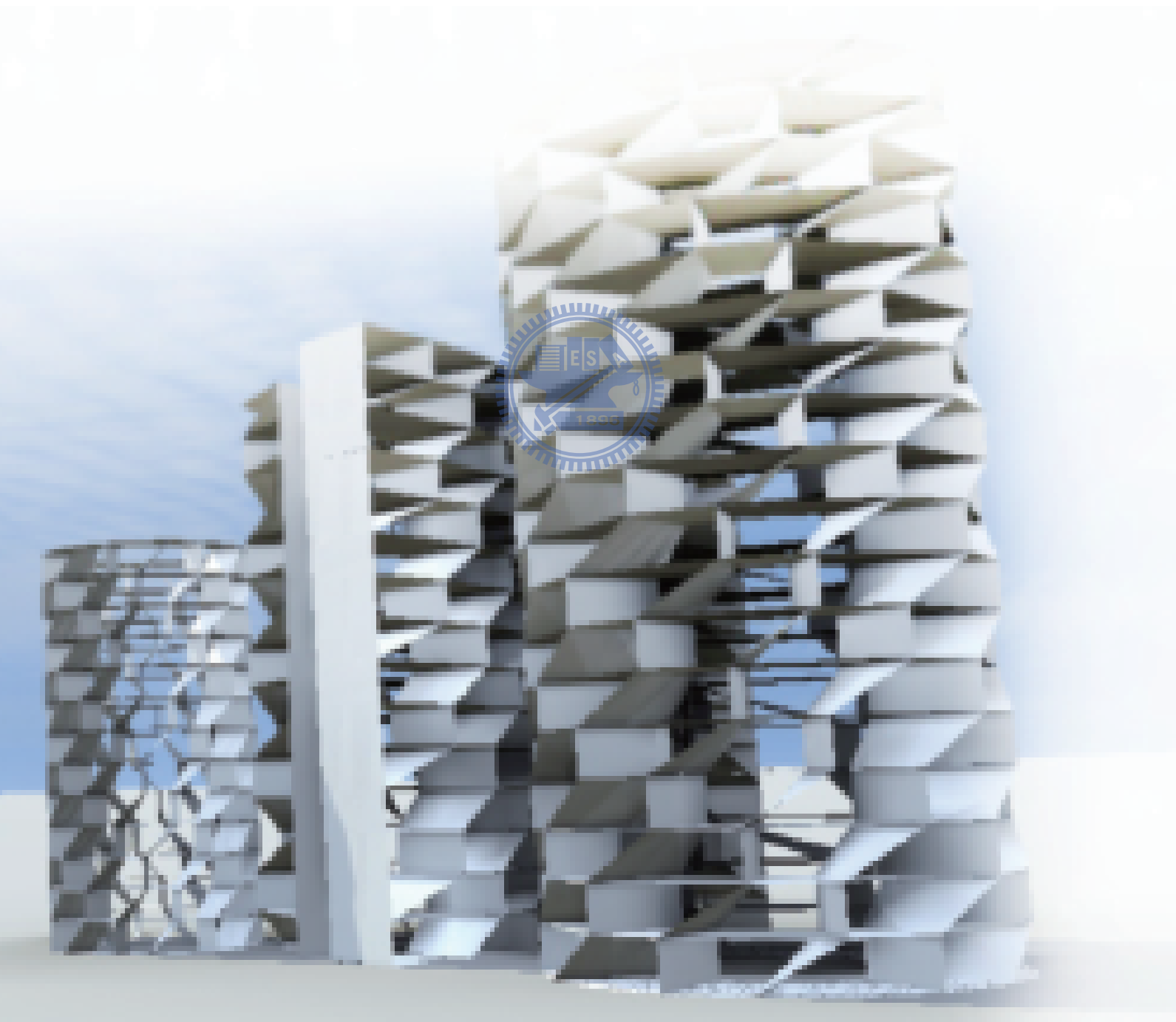
Smart Parking System

Advisor : June-Hao Hou

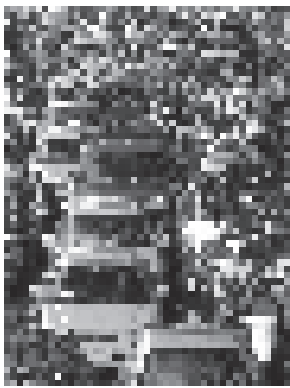
2009 Fall



各種形式的交通工具氾濫地佈滿整個地層表面，而大都市的停車空間亦常常呈現供不應求，面對這樣的社會現象，使得停車空間區分為水平式與垂直式兩類型，用以解決停車之問題。針對停車空間作以討論於停車場空間時，尋找停車位及找車時，因視線為維水平視線，且停車空間為停留短暫的場域，容易忘記停留位置與迷失方向感。而停車空間的使用量亦有時間上的差異，使用量少時，此空間容易流為閒置或是不安全之場域。此設計提出一個新系統以空間與資訊作以整合，為停車空間設計一套新系統流程與程序。



Real-life Problem Of Parking Space



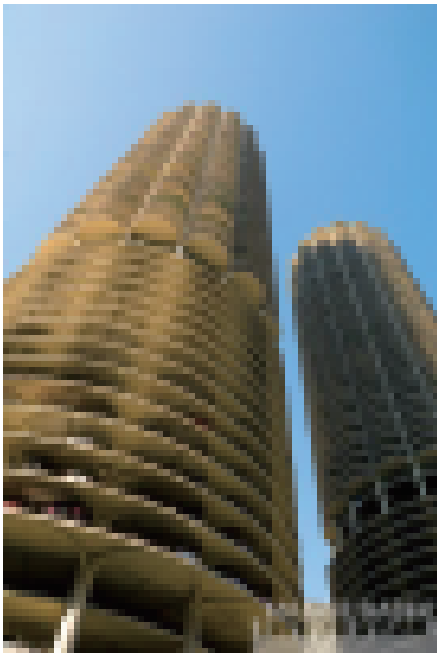
For Taipei
Parking for car : 540000
Lack : 100000
Parking for motorcycle :
470000
Lack : 600000

Problem For Street Parking



Problem For Vertical Parking

- 短暫滯留空間
- 空間記憶短淺
- 空間相似度高
- 空間機能單一
- 取車時不易找尋車位
- 迷失空間方向感 (水平視線)



在擁擠的道路停車空間下，要停好一輛車的時間至少需一分鐘
(不包括找尋車位的時間)

Problem For Horizontal Parking



Parking Space

Smart Parking System

Propose A Solution To The Problem

Study Automation Systems



Reduce the time to
find car and park

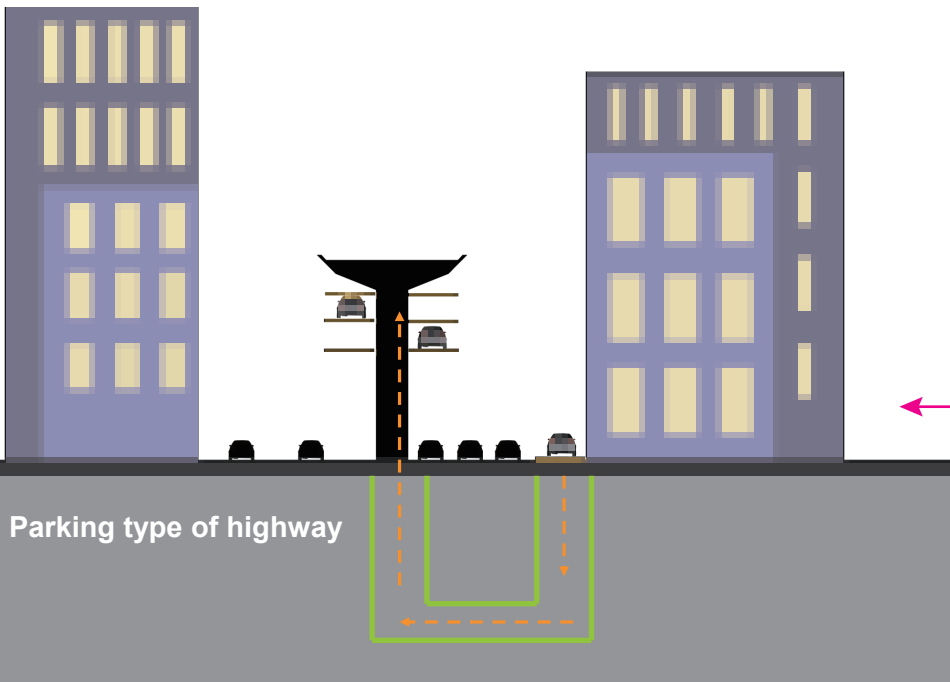
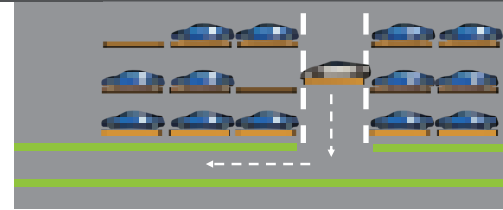
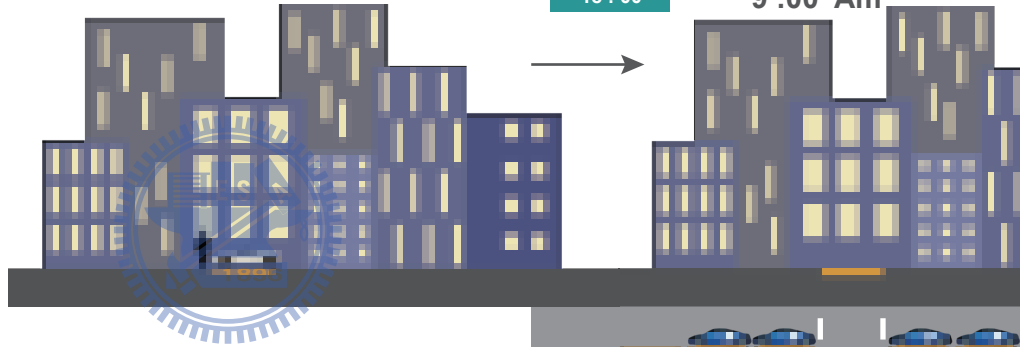
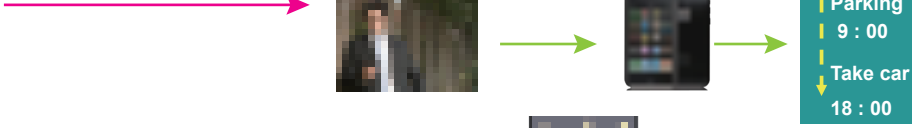
Be systematic to
planning and management

Process For
Automation Systems



Design A New System For Parking

Ground system

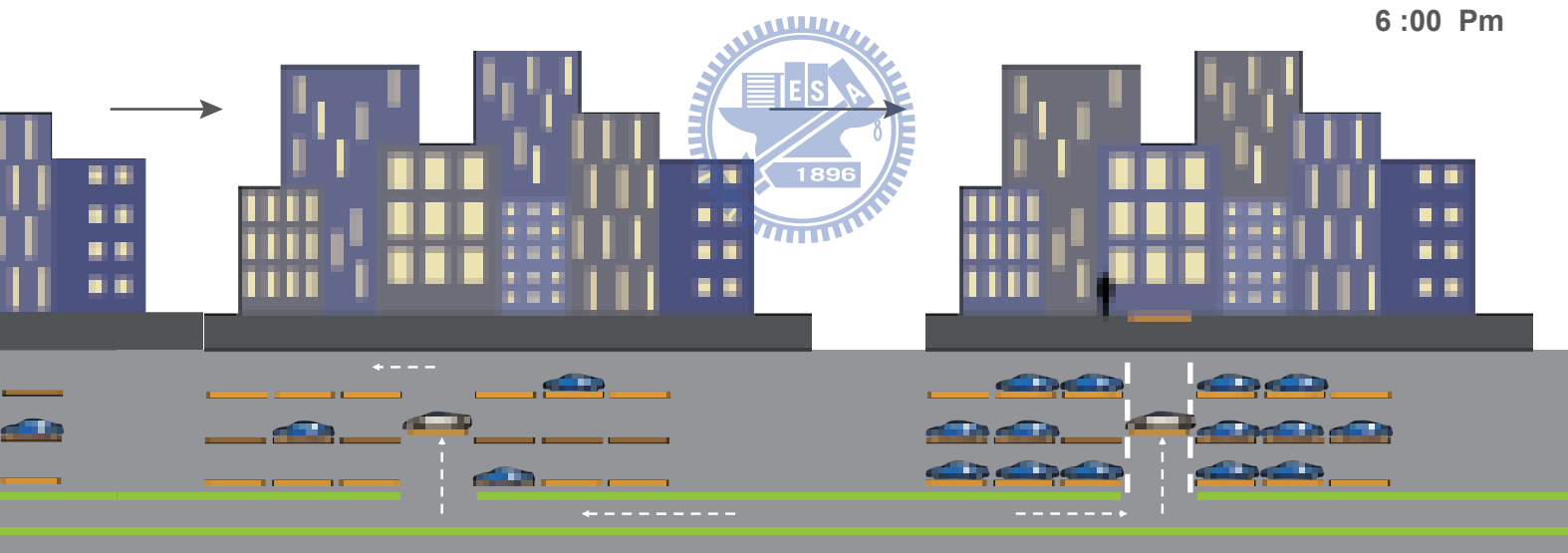
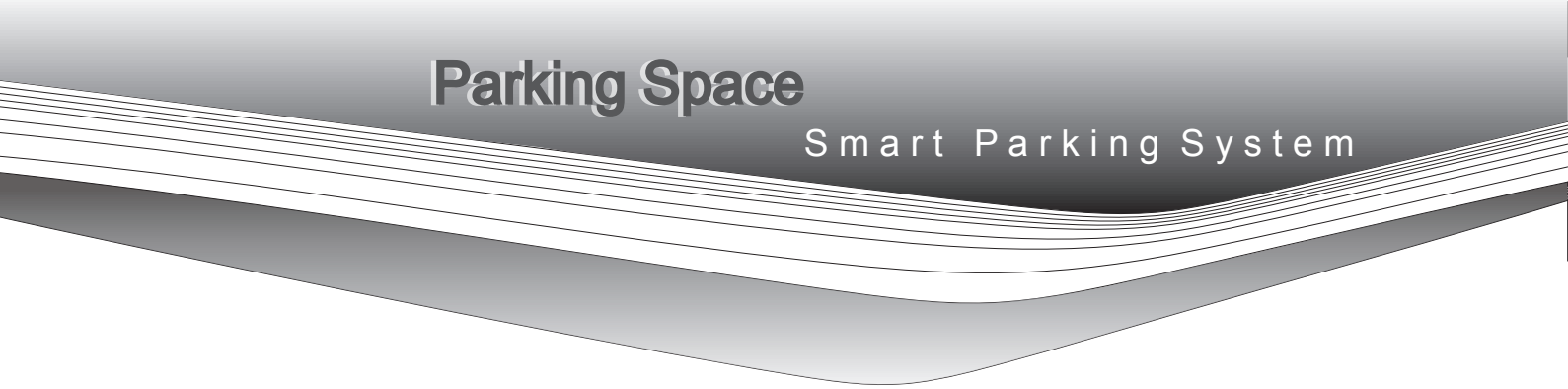


Design A New System For Parking

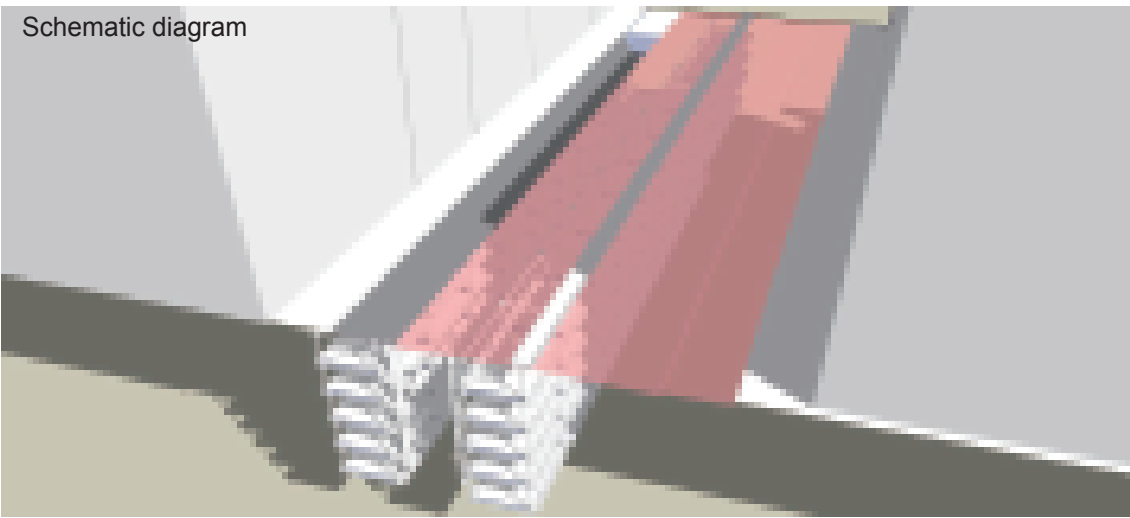
Under-floor system

Parking Space

Smart Parking System

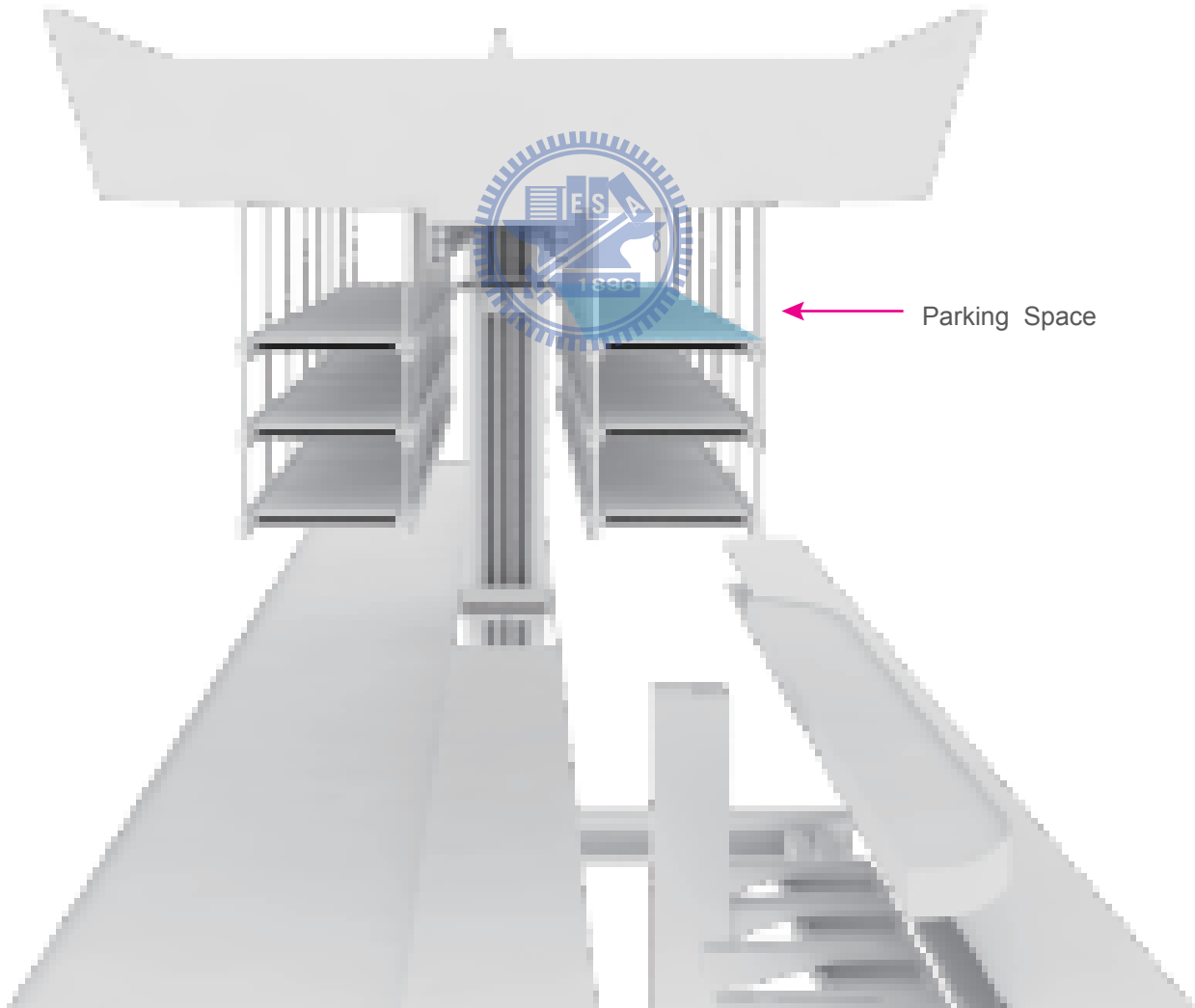


Schematic diagram



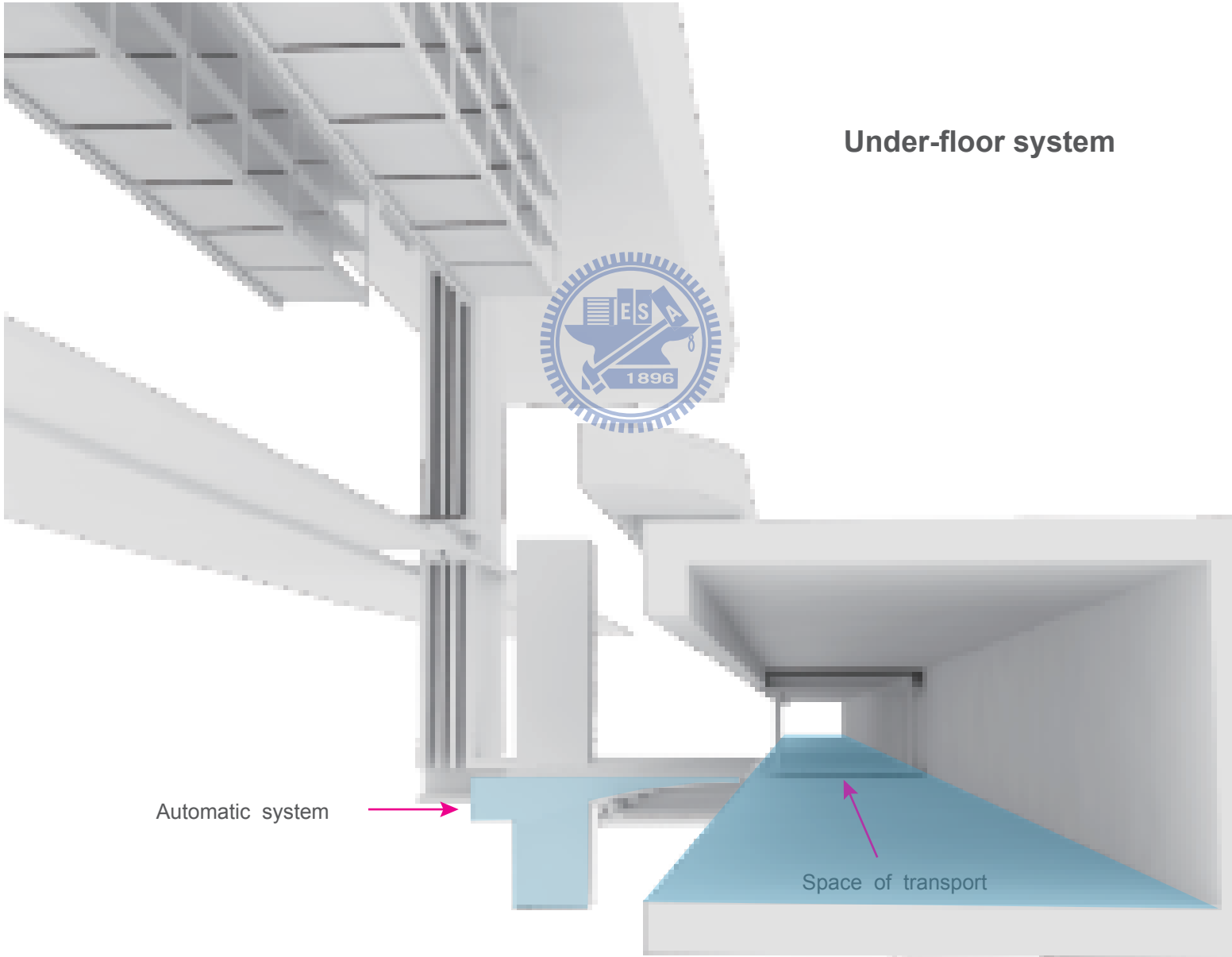
Design A New System For Parking

Under-floor system



Parking Space

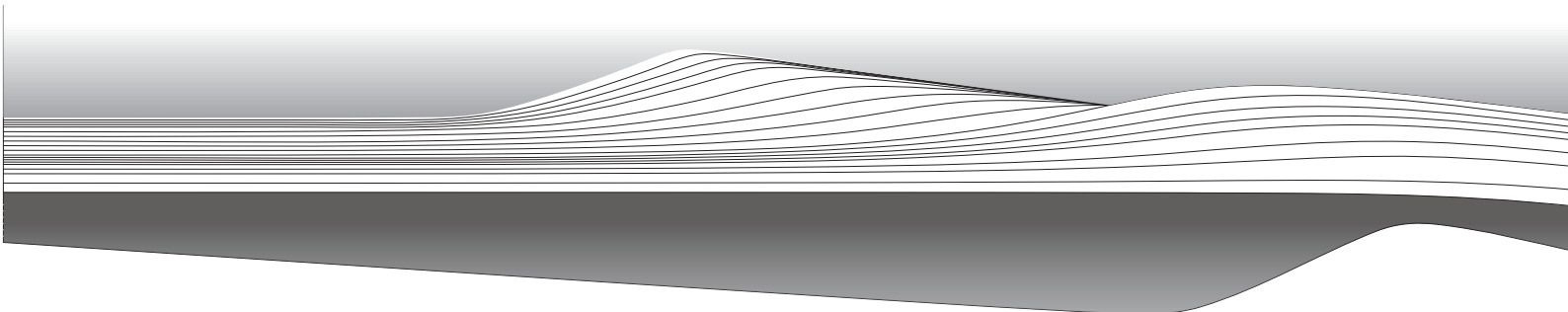
Smart Parking System



Under-floor system

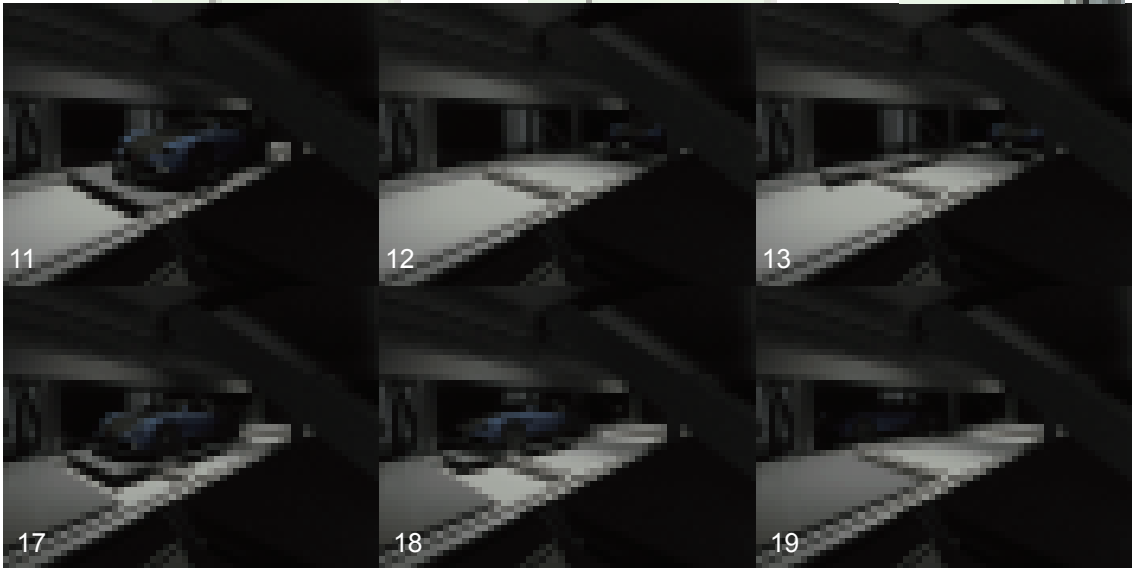
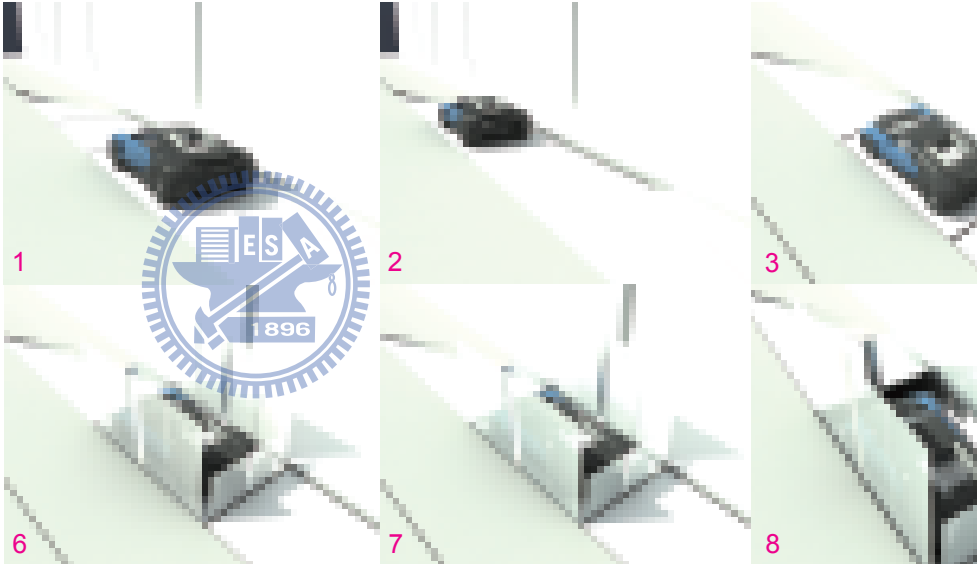
Automatic system

Space of transport



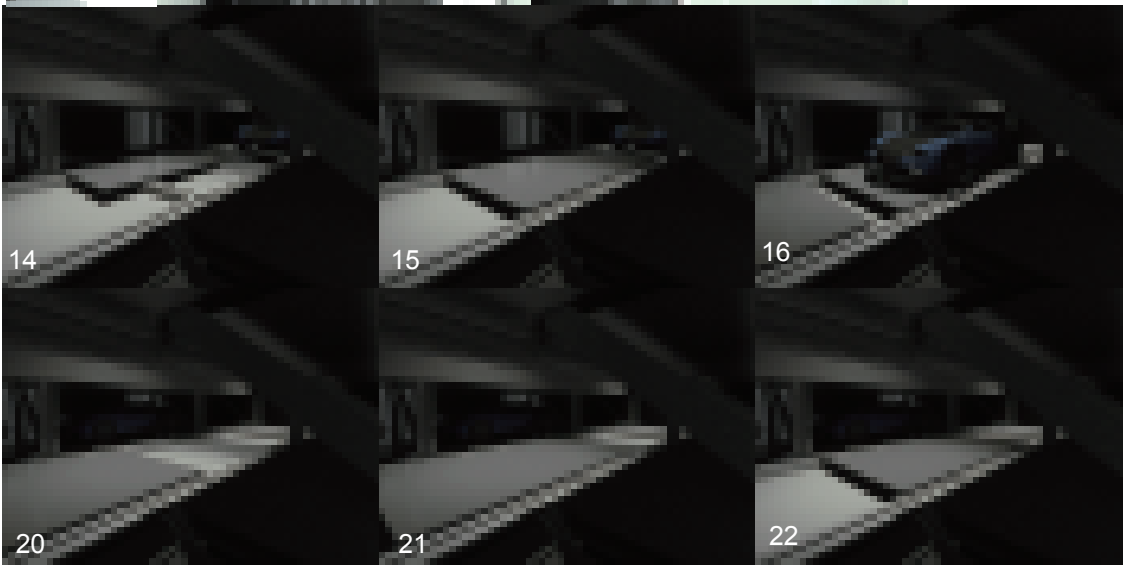
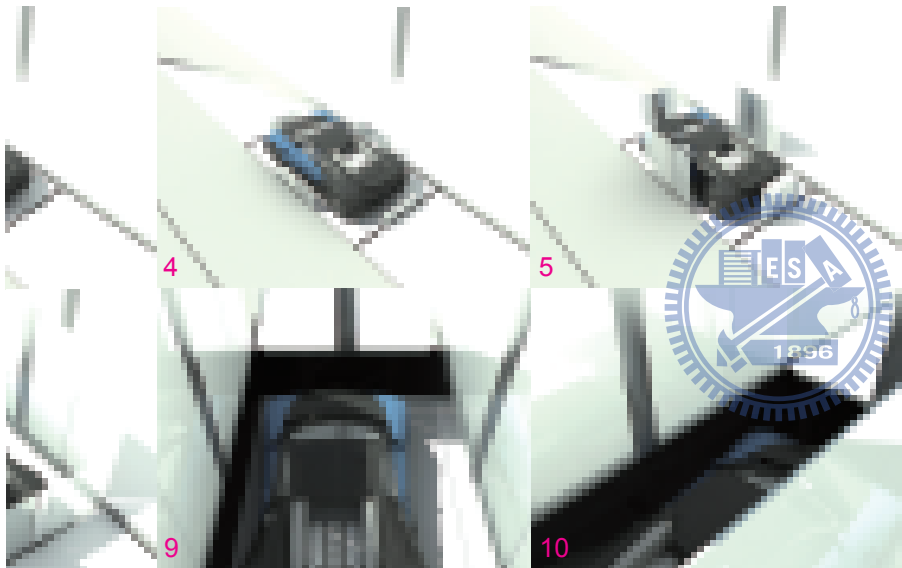
Design A New System For Parking

Process of ground system



Parking Space

Smart Parking System



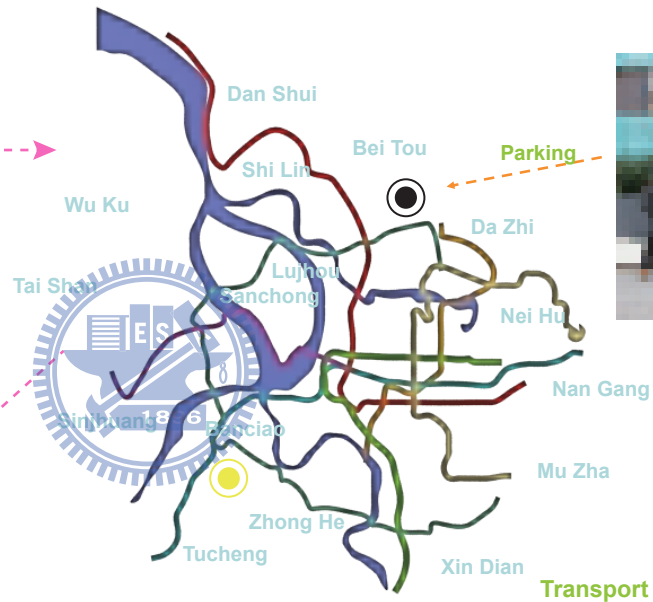
Parking Space

Smart Parking System

Combined with the MRT Connect



Schematic diagram

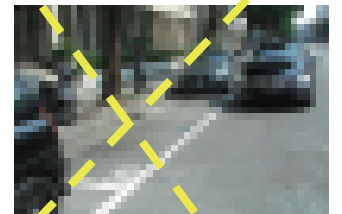


- MRT station
- parking
- parking

The Effect Of New System On The City



Increase sidewalk and greenbelt



Disappear

Virtual Architecture

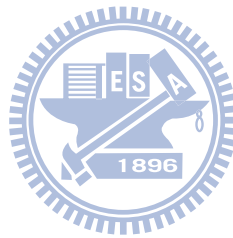
Designing Experience in Virtual Space
of Communication and Information

Transformation

Dream Space

Advisor : Pei-Hsien Hsu

2010 Fall



虛擬建築一詞從問世以來，被予定義虛幻、不真實、無法體會體驗的紙上建築，過去虛擬建築的呈現，大都用以紙筆製圖與文字呈現，導致無法精準正確地體會其空間感受，於是人們對於需你的認知充滿無限的想像。然而隨之科技軟體地引領，將虛擬建築跳脫紙上建築的框架，以軟體電腦運算技術，來呈現設計者想詮釋的空間意象，且更為真實與準確地使空間體驗者了解其空間感受。而資訊亦隨科技的發展，與虛擬建築相互結合，成為一種空間資訊讀取的場域或是介面，使虛擬空間開始不同於實體空間資訊解讀的方式，固然進階了虛擬空間資訊存在的多樣性與必要性。而虛擬建築在無材料限制的條件下，顛覆了建築空間形式的創作與設計的發想，使建築空間的呈現與討論，可在任何的情形下作以討論與檢視然而此設計，以夢境空間作為空間設計的思考方向，所以截取 TRON 的空間形式作為空間設計的發想，來作以此設計的發展雛型。



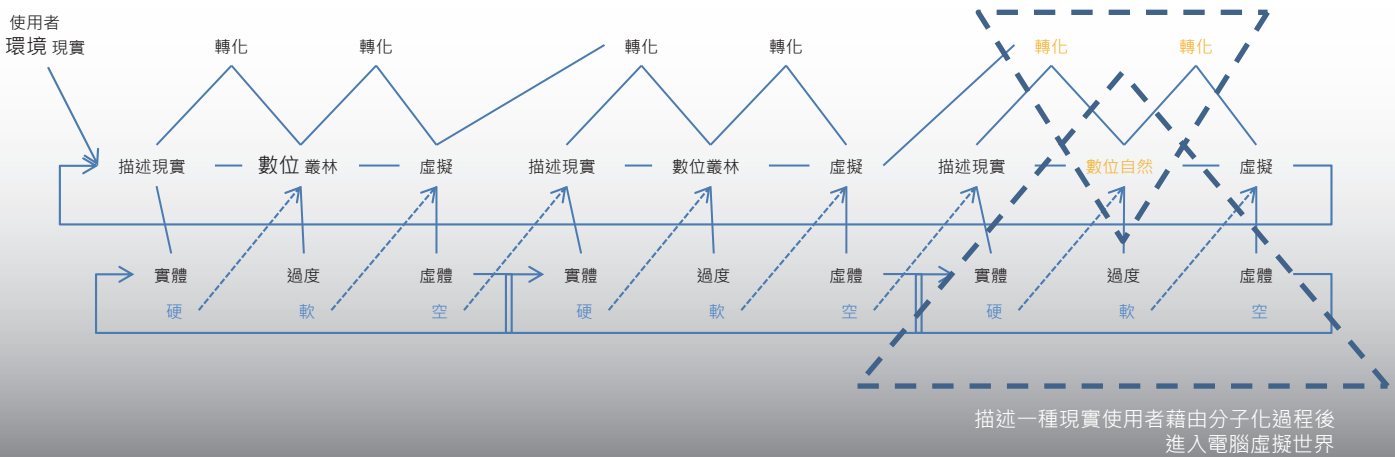
Transform
Real Digital Design Studio 2010 UnReal
Master of Science in Architecture

Concept - TRON

TRON images

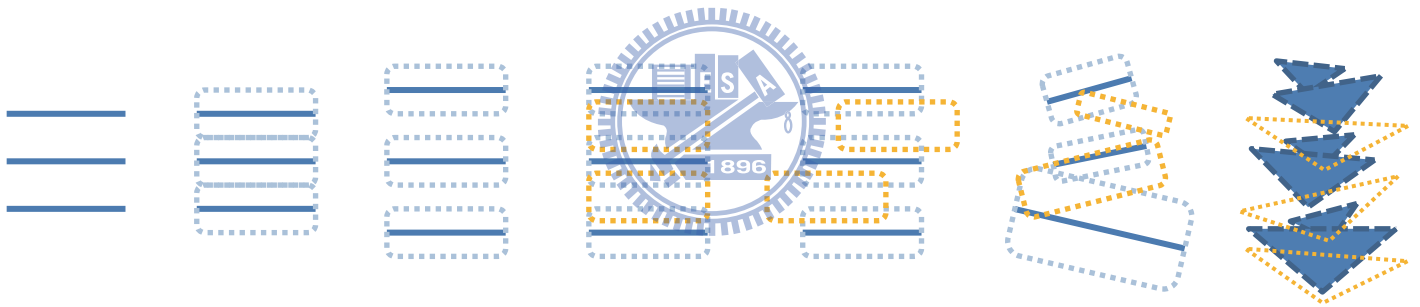


Architecture Program For Spatial Order



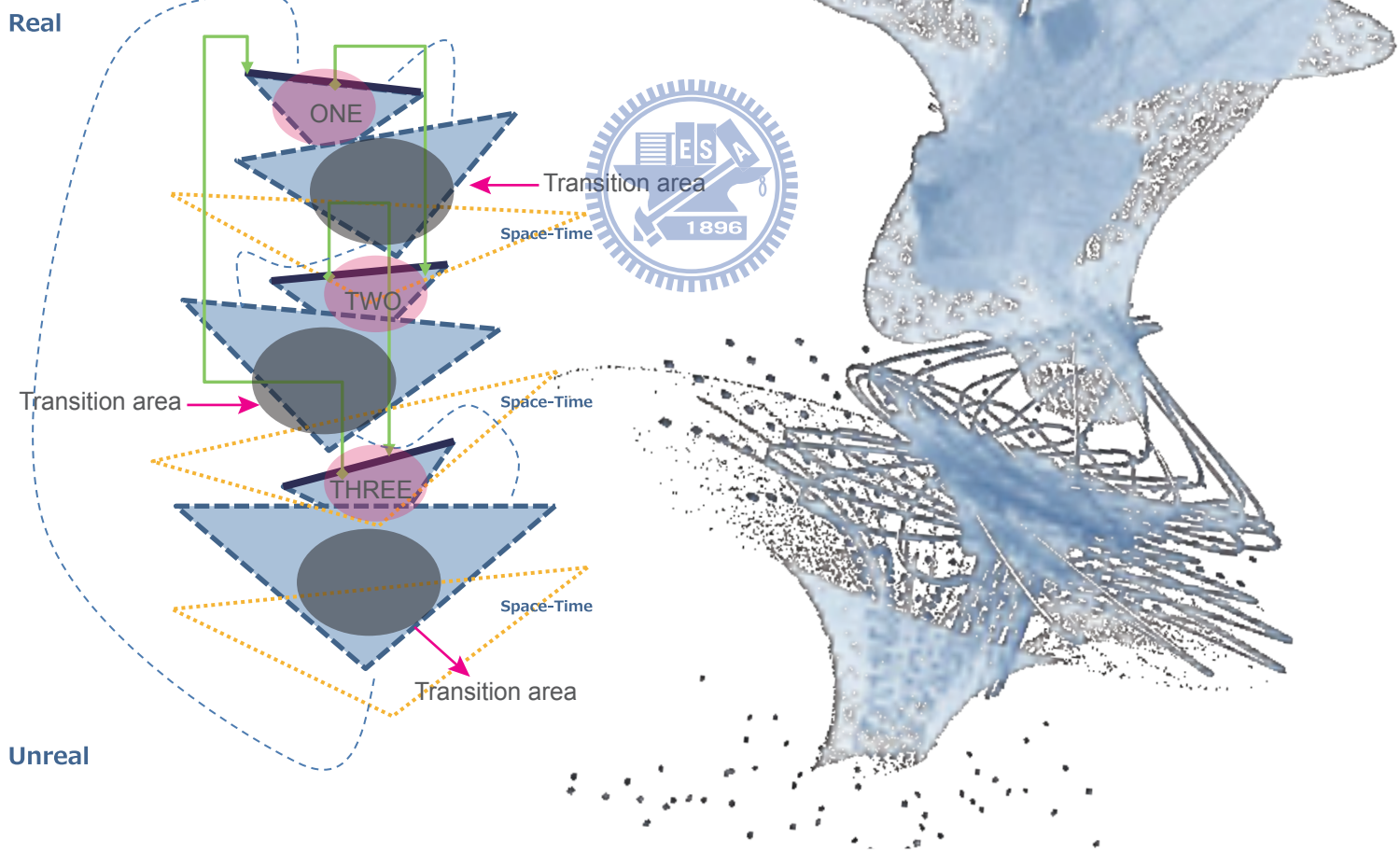


The process of
spatial development



The structure of the virtual space

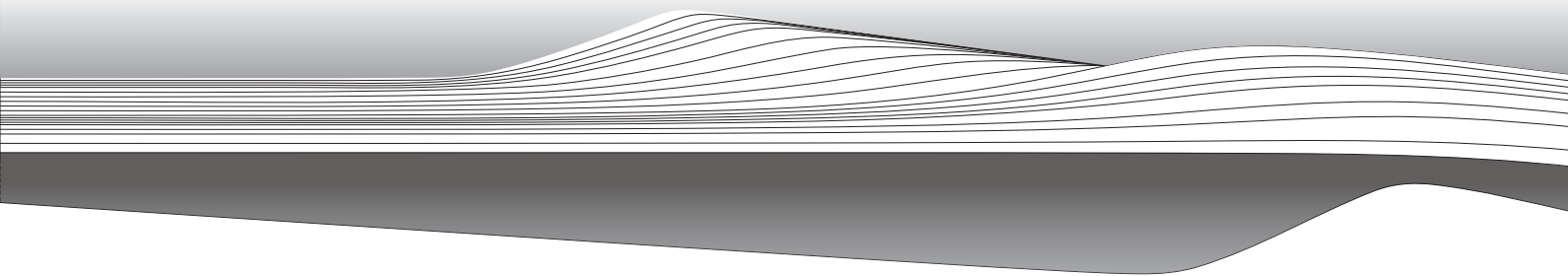
Design images



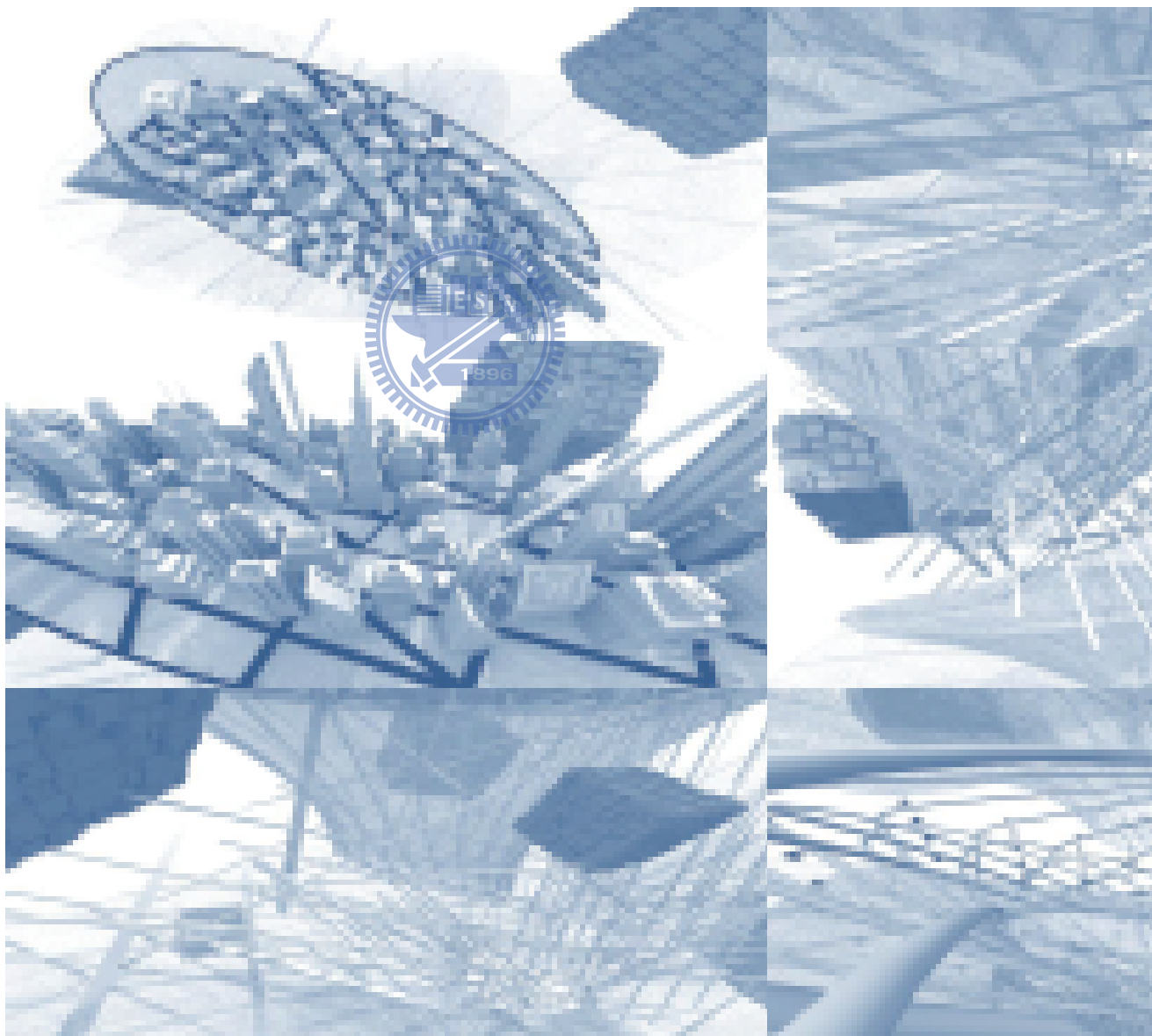


Schematic diagram





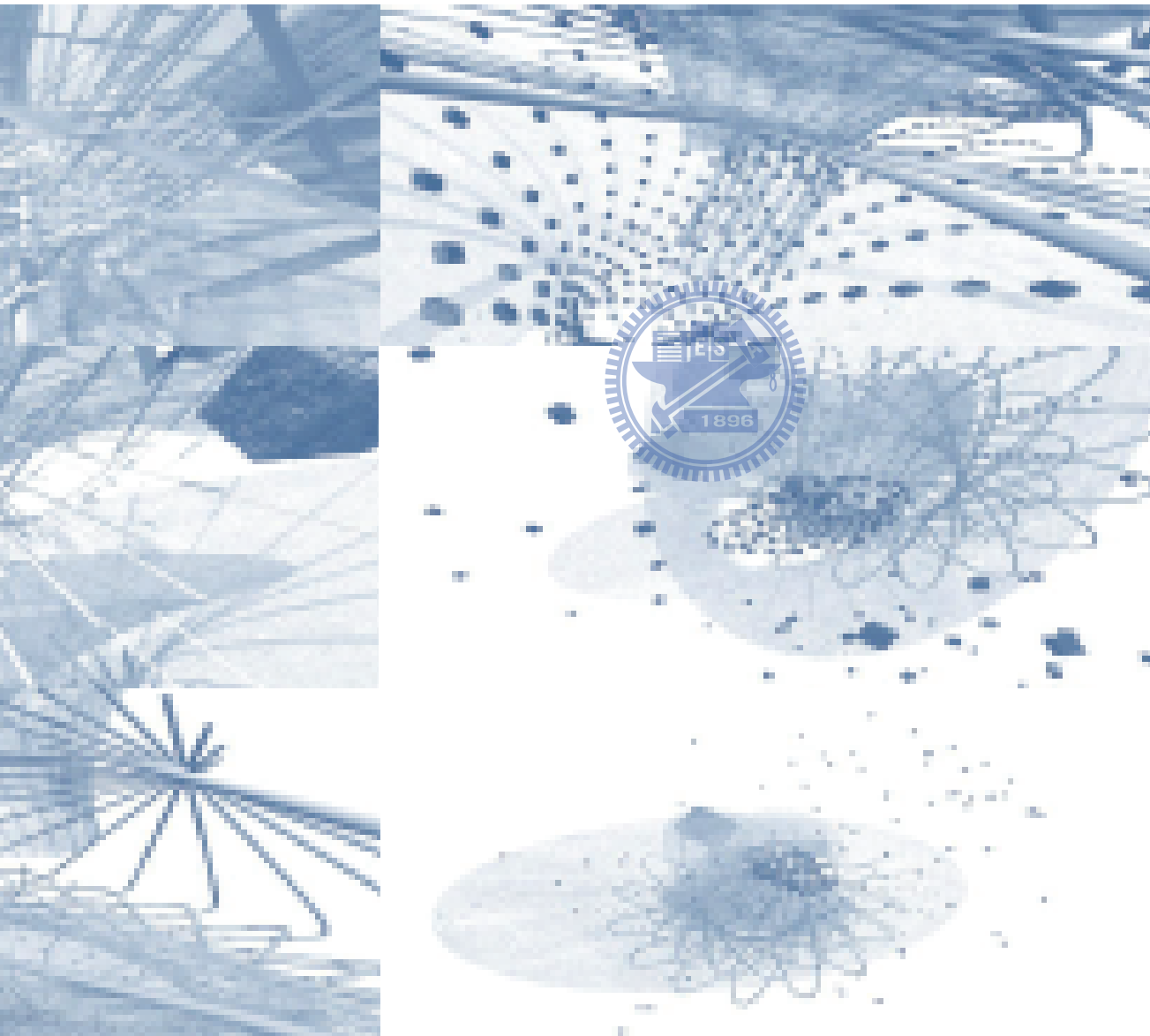
Perspective

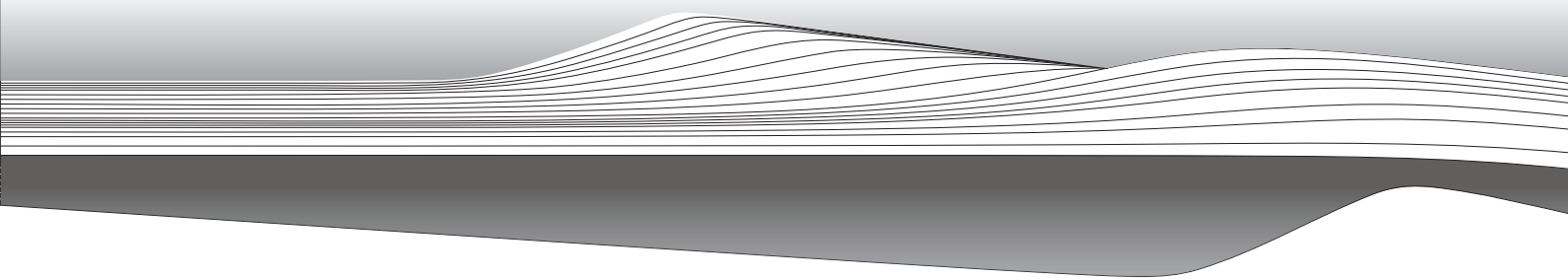


Transformation
Dream Space

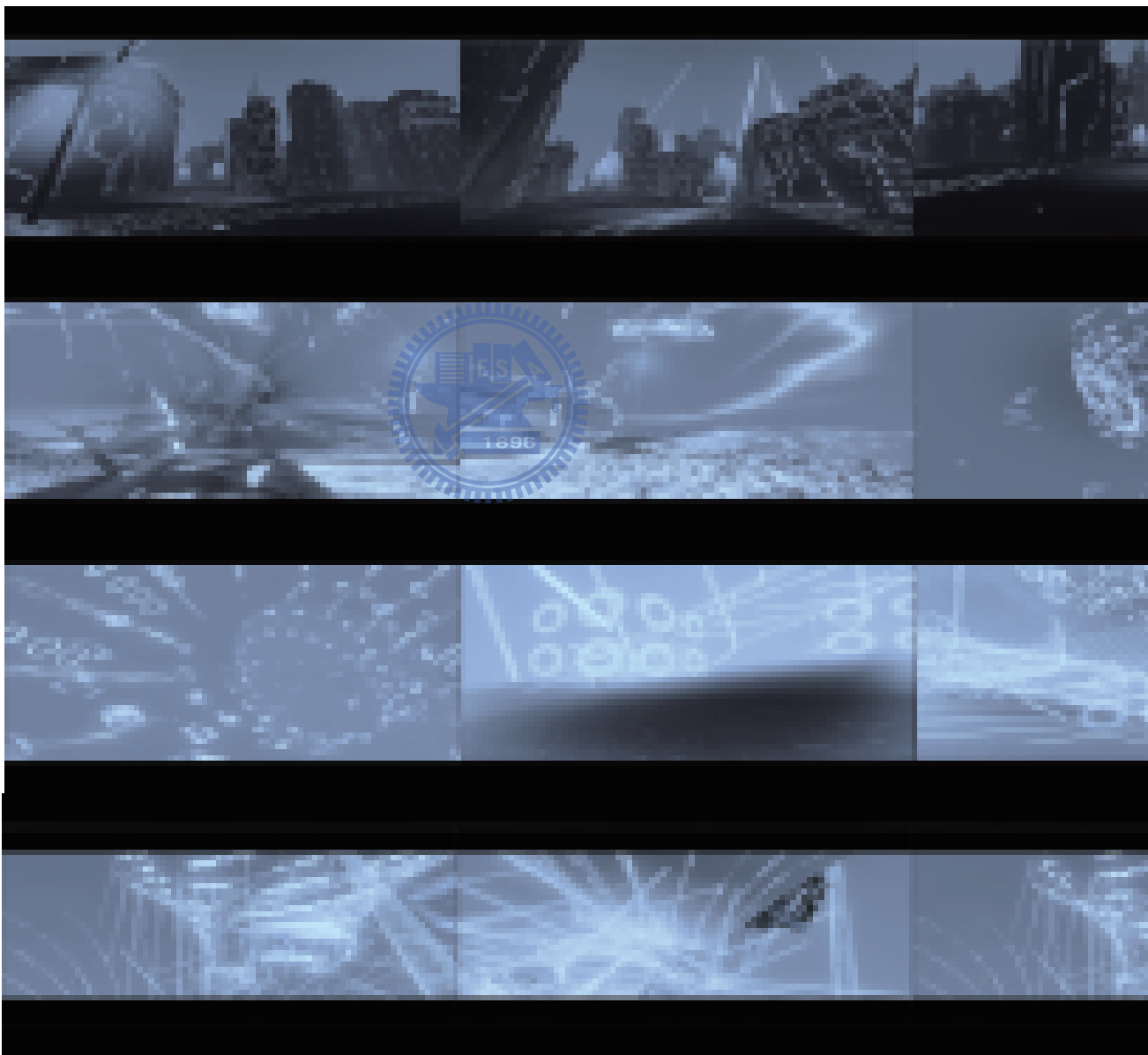


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Real Digital Design Studio 2010 Unreal
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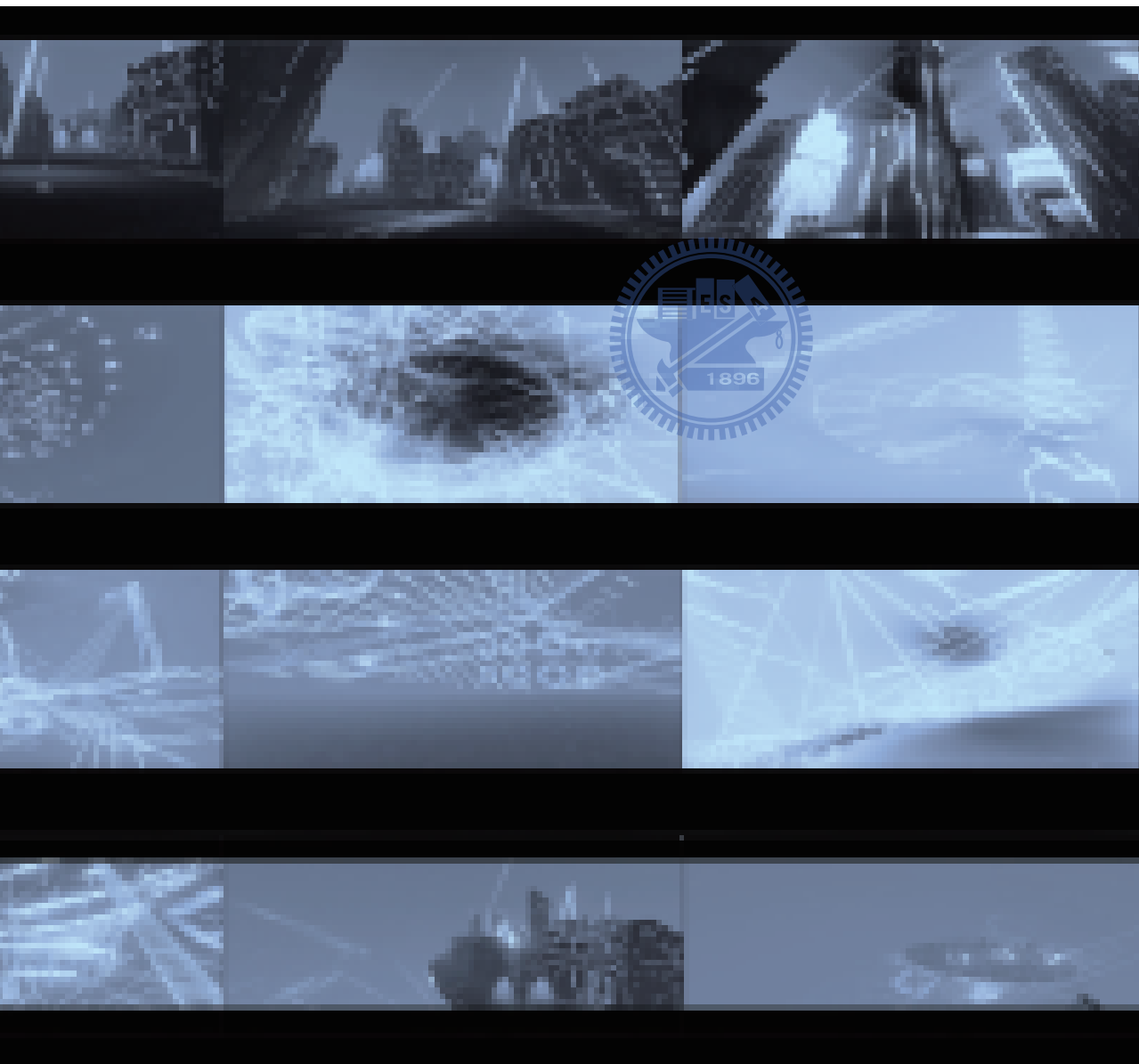
UDK - Perspective



Transformation
Dream Space



Transform
Real Digital Design Studio 2010 UnReal
Master of Science in Architecture



Virtual Architecture

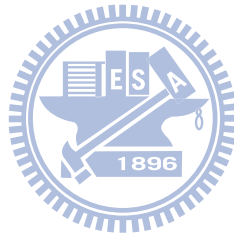
Designing Experience in Virtual Space
of Communication and Information

Museum Of Poly-Information

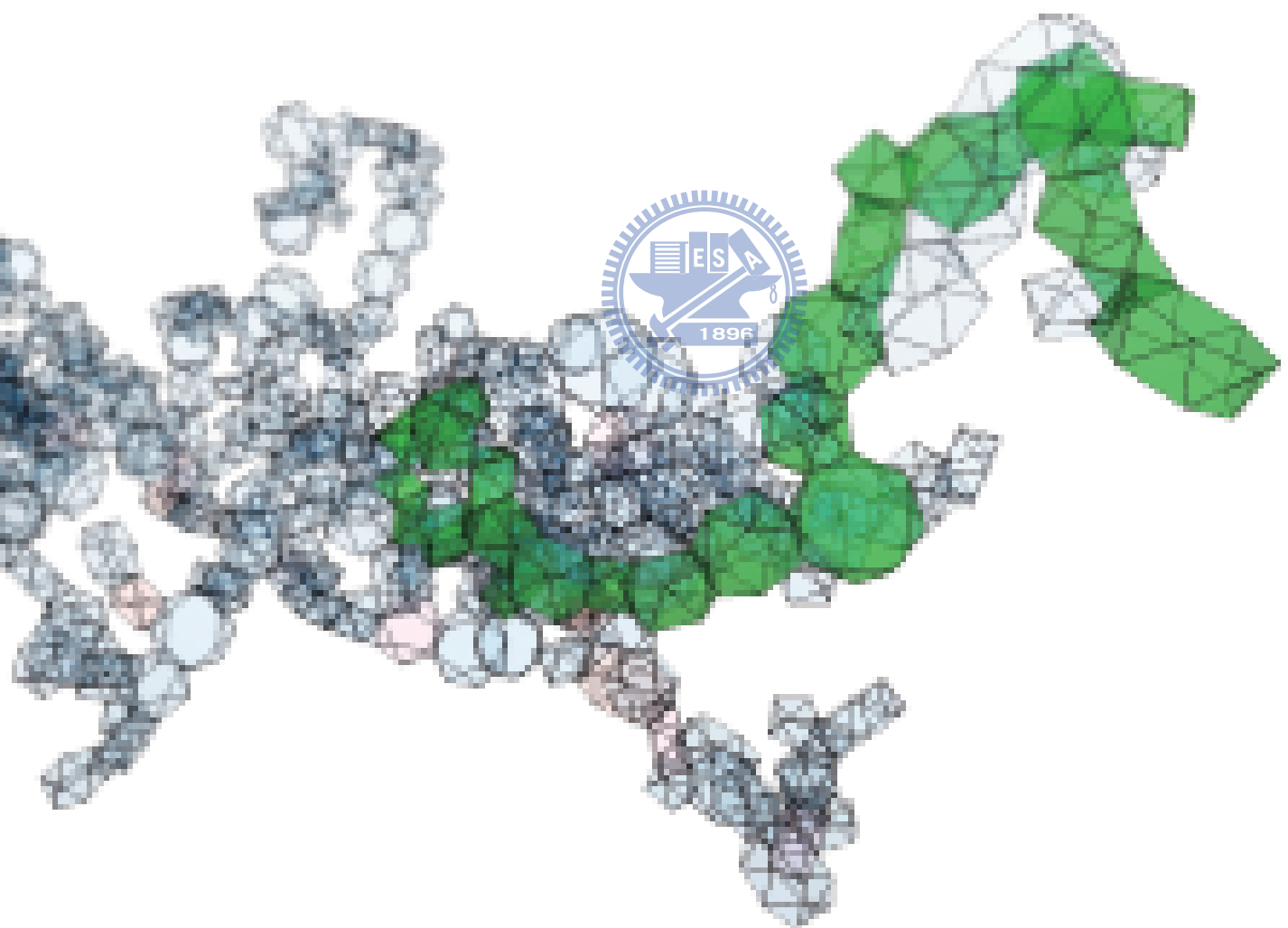
3D Interface for
Virtual TOYOTA Showroom

Advisor : Pei-Hsien Hsu

2010 Fall



虛擬建築一詞從問世以來，被予定義虛幻、不真實、無法體會體驗的紙上建築，過去虛擬建築的呈現，大都用以紙筆製圖與文字呈現，導致無法精準正確地體會其空間感受，於是人們對於需你的認知充滿無限的想像。然而隨之科技軟體地引領，將虛擬建築跳脫紙上建築的框架，以軟體電腦運算技術，來呈現設計者想詮釋的空間意象，且更為真實與準確地使空間體驗者了解其空間感受。而資訊亦隨科技的發展，與虛擬建築相互結合，成為一種空間資訊讀取的場域或是介面，使虛擬空間開始不同於實體空間資訊解讀的方式，固然進階了虛擬空間資訊存在的多樣性與必要性。而虛擬建築在無材料限制的條件下，顛覆了建築空間形式的創作與設計的發想，使建築空間的呈現與討論，可在任何的情形下作以討論與檢視然而在此設計中，將虛擬空間結合資訊的形式，提供一種空間瀏覽取得空間訊息的新介面，用以取代大量大眾型式的網頁資訊呈現。



Differences in Virtual space and Entity space

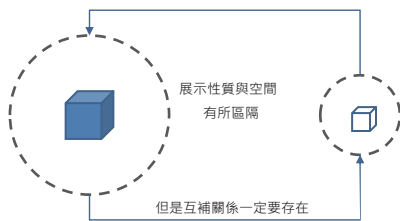
Virtual space and Entity space



容易受損消耗
資訊提供有限

缺

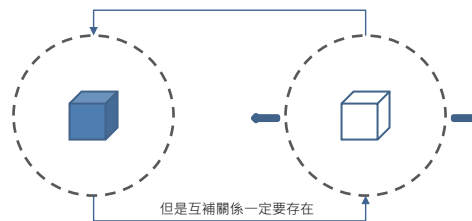
動線較制式化
缺法絕對真實性



真實感
人與人的關係
動線與使用自由

優

高想像力與創造
沒有容量與時間限制
連結性高



真實感
人與人的關係
動線與使用自由

優

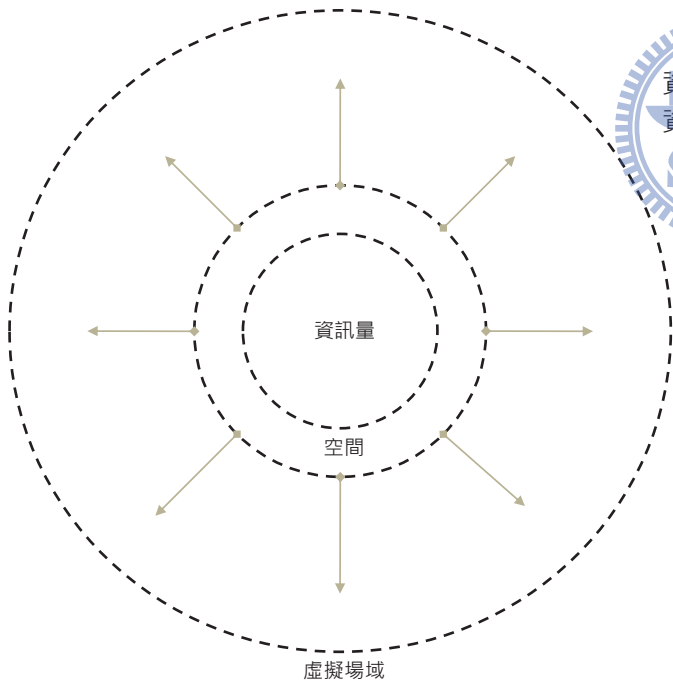
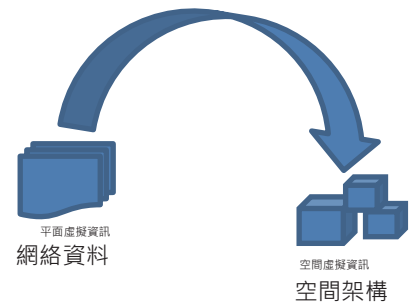
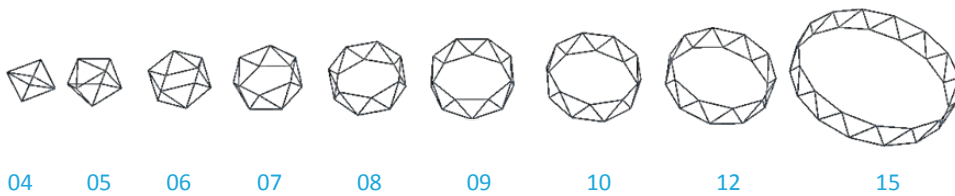
高想像力與創造
沒有容量與時間限制
連結性高

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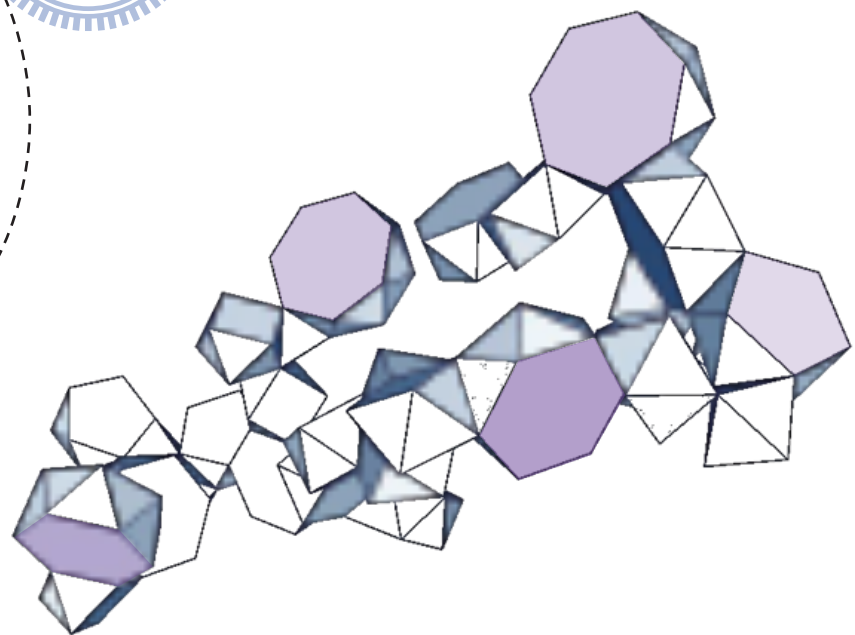
3D Interface for Virtual TOYOTA Showroom

Process of Design

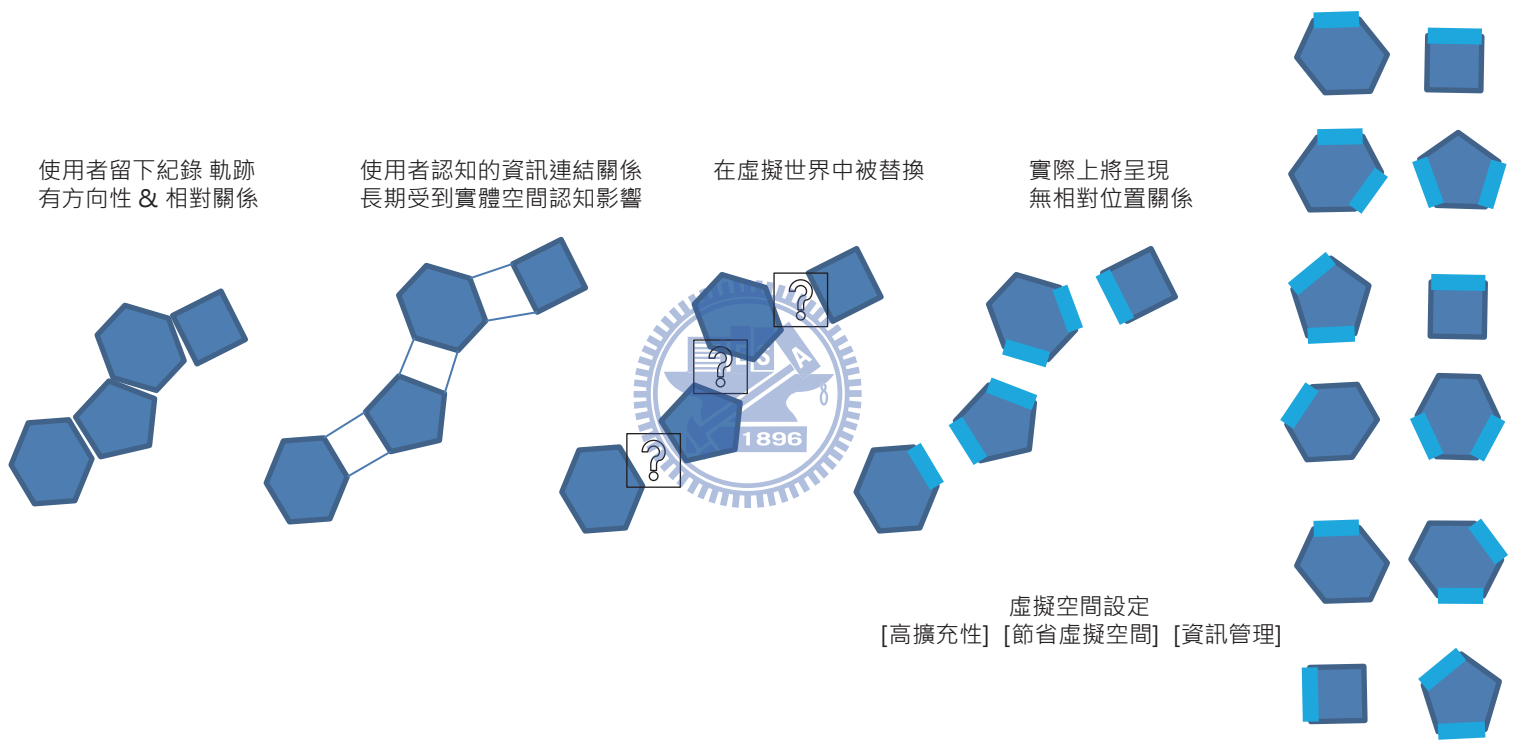
資訊空間量面量可影響多面體



資訊量是無限的 由眾多資訊量所構成資料庫
資訊量應該影響空間量 [並依照規則發展形成MAP]



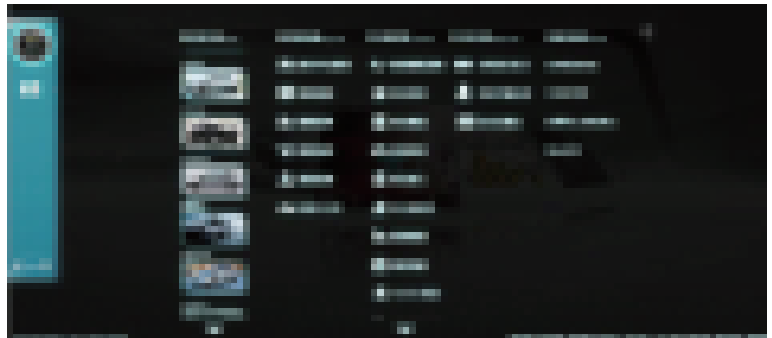
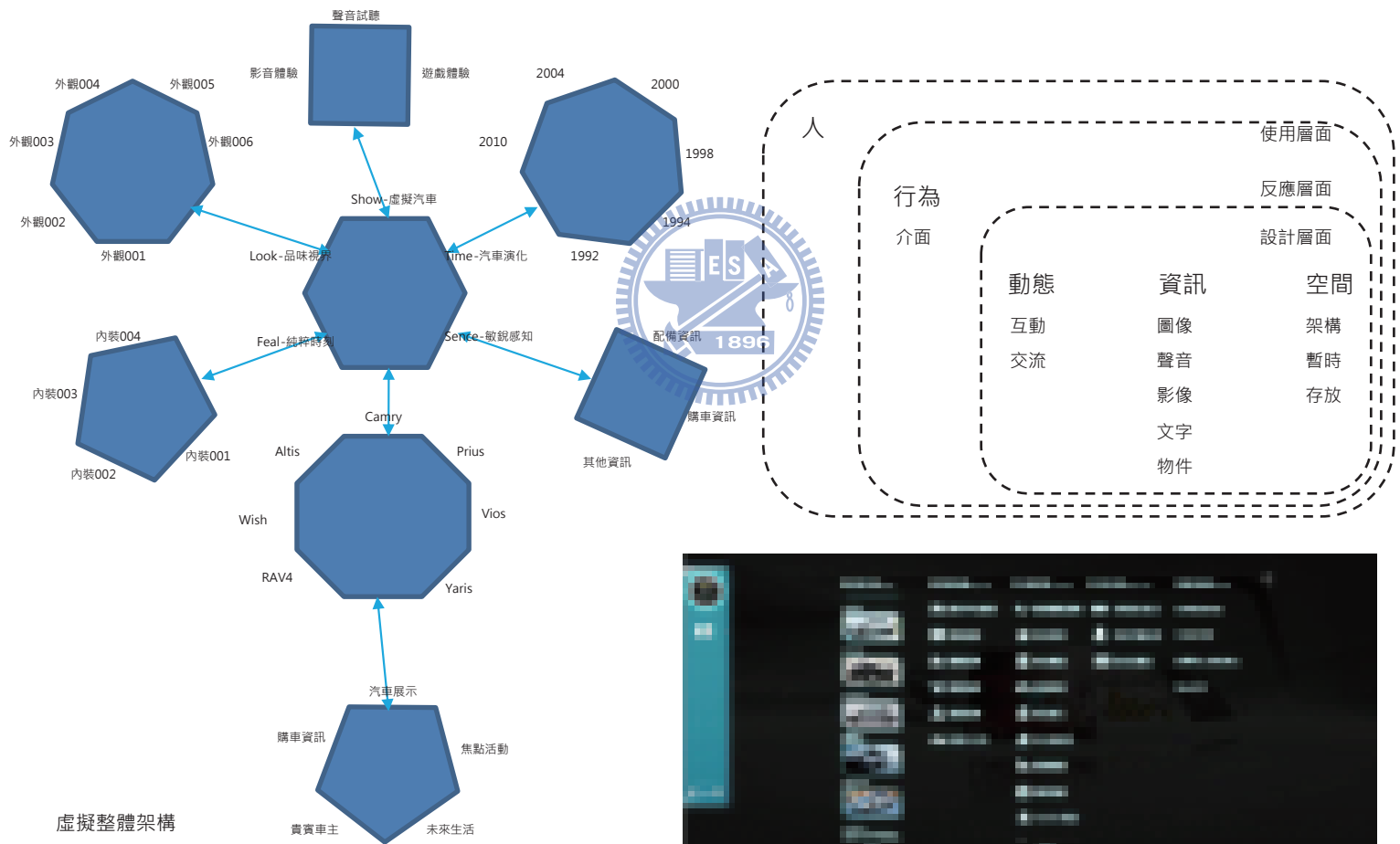
Design Description

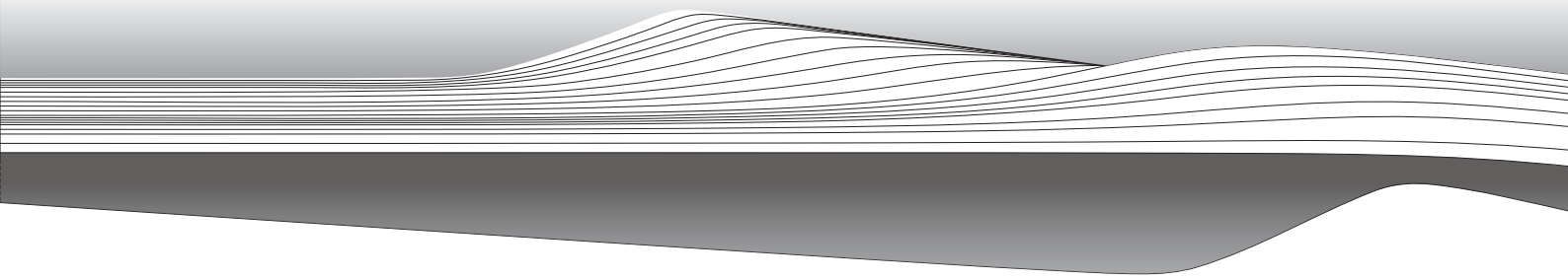


迅速的重點呈現 [省時,效率] ex.快速搜尋與總覽
資訊清楚且需豐富多元 [多樣性連結]
空間跟資訊有強烈關聯性 [空間型態]
資訊提示與指引 並使使用者留下紀錄 軌跡

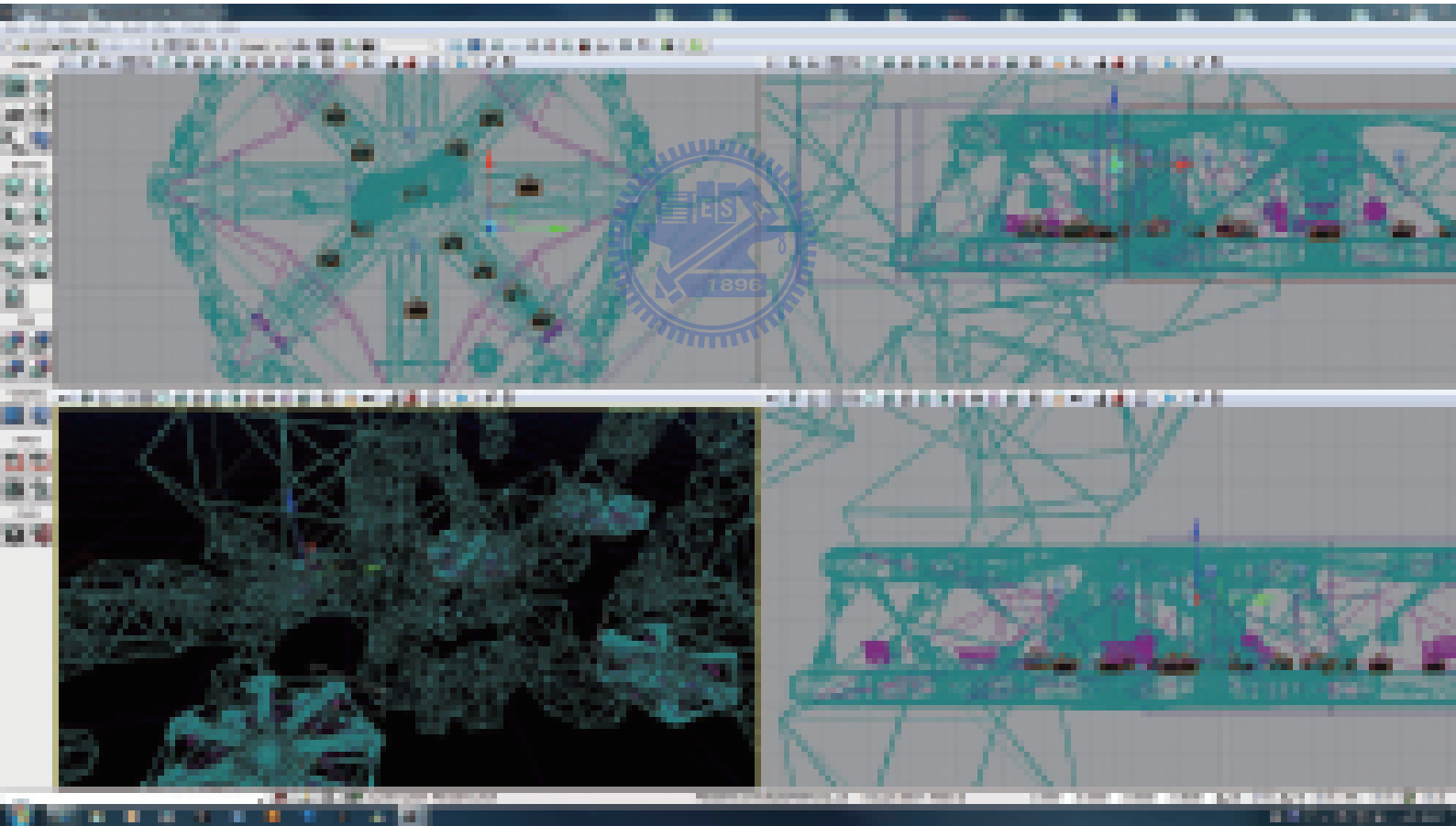
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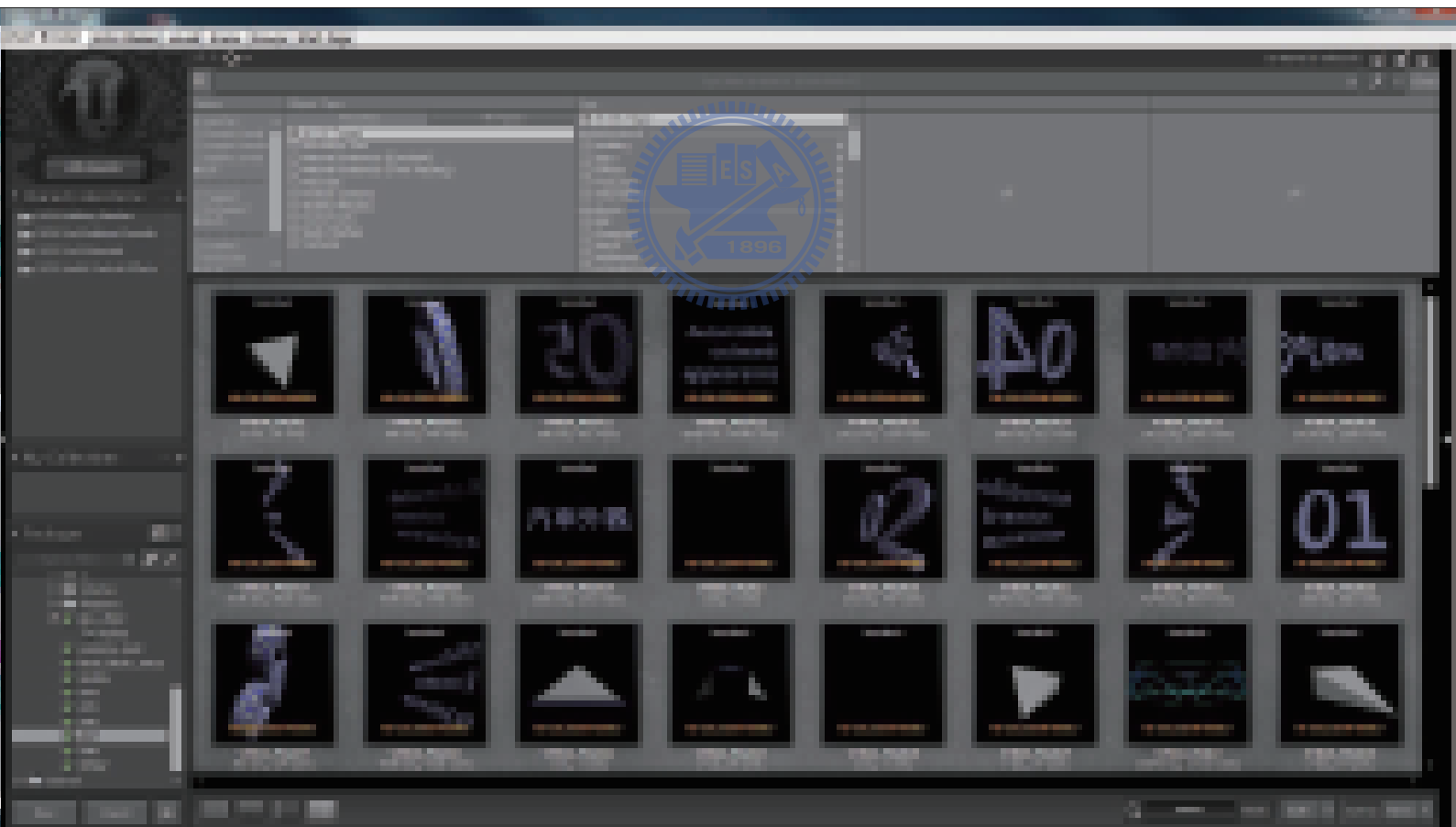


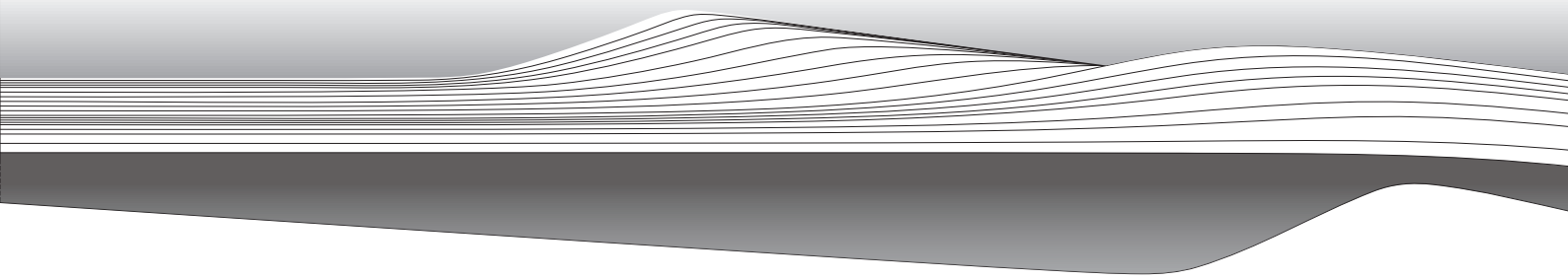
UDK - Interface



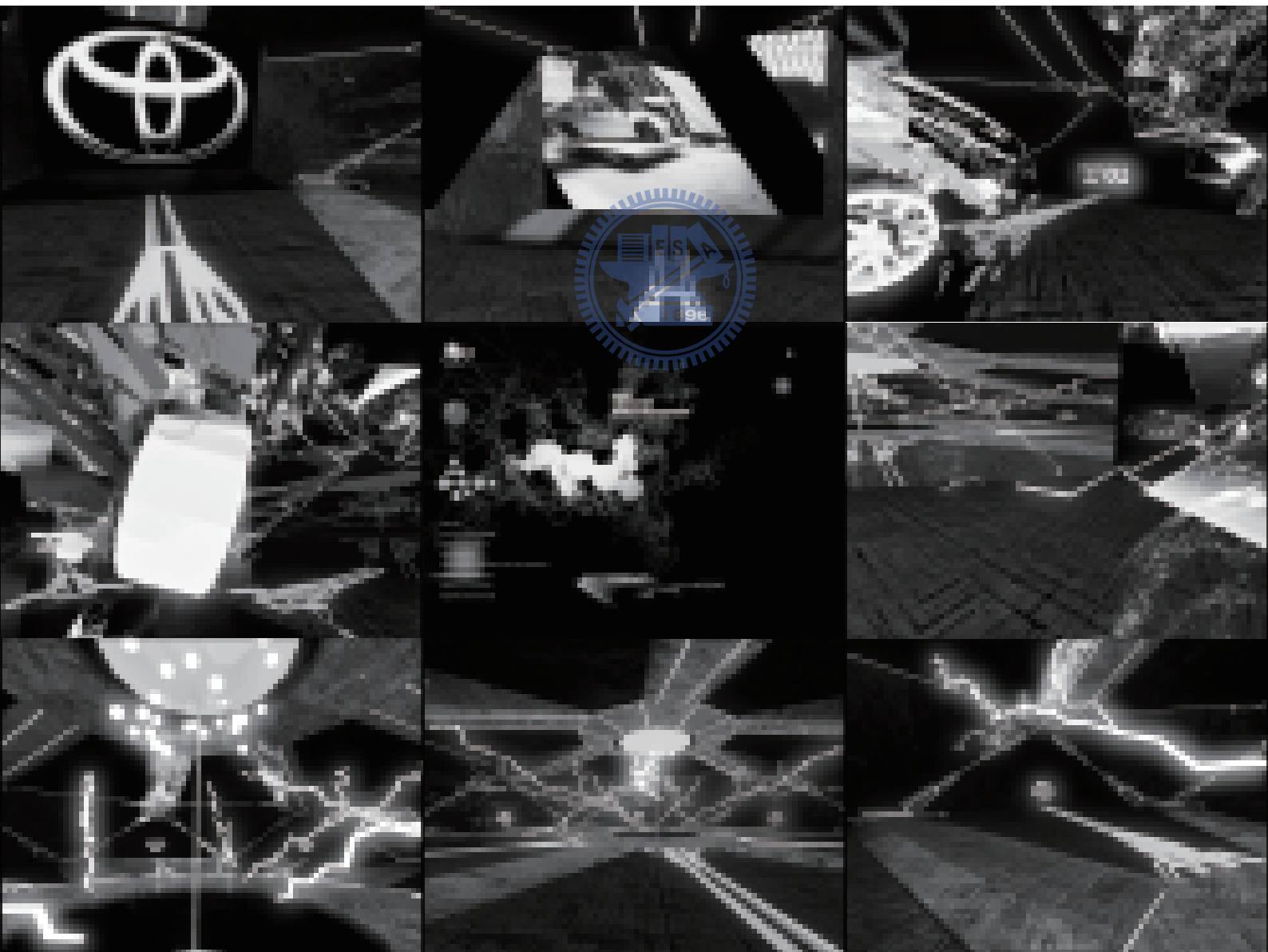
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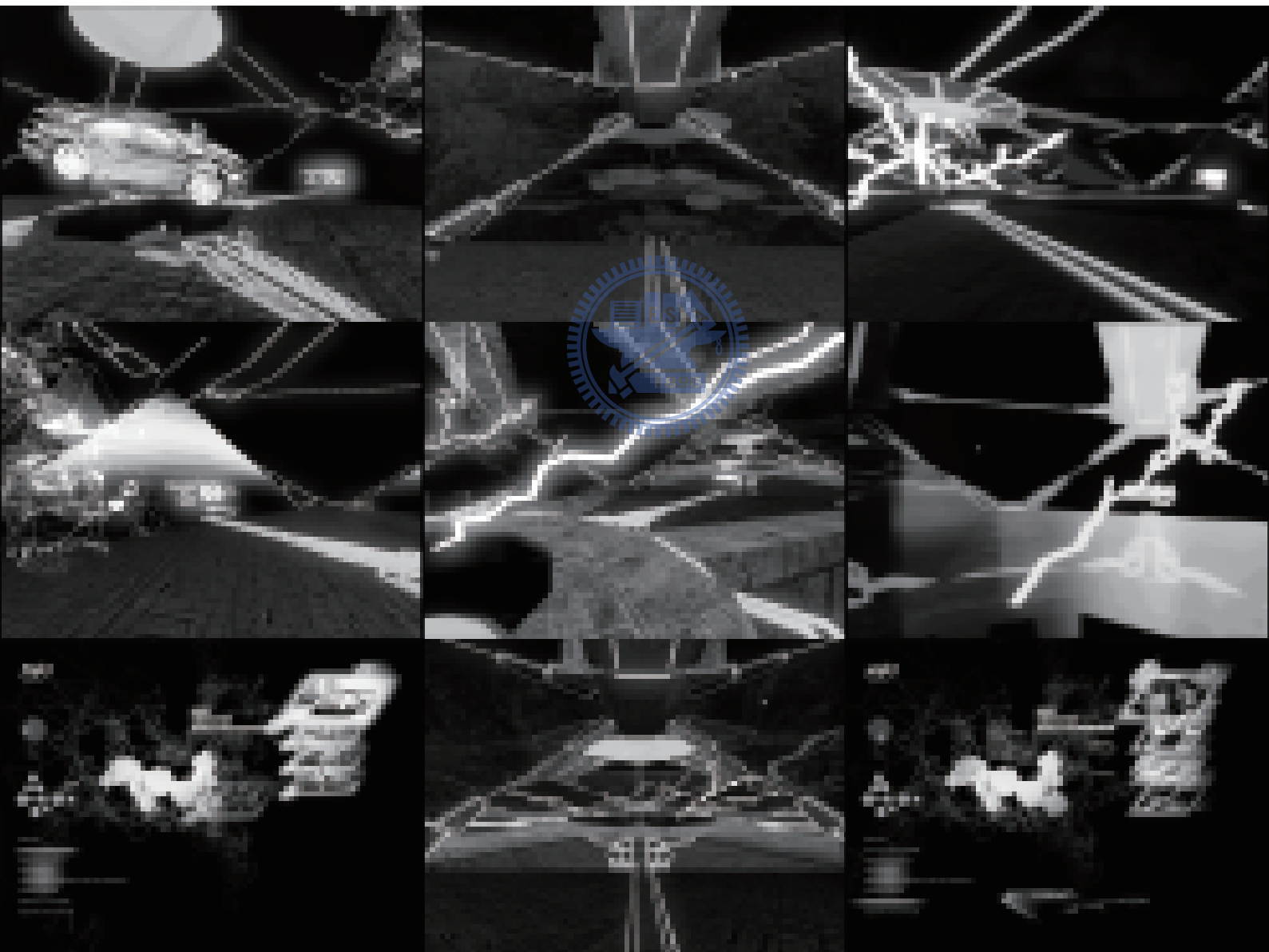


UDK - Perspective



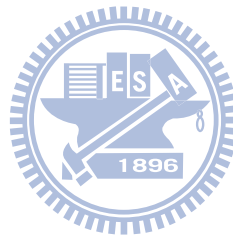
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文獻(圖片資料來源)

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- <http://www.gettyimages.com/>
- <http://www.trtc.com.tw/ct.asp?CtNode=24569&mp=122031&xItem=1015926>
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高雄流行音樂中心競圖

台中機場設計競圖

新北市美術館競圖

