소개글

Use of Data in Design

디자인에서의 데이터의 활용

DISCRETIZATION for SPATIAL INFORMATION &
CODIFICATION of DESIGN(DECISION-MAKING PROCESS) and METHODOLOGY

공간정보의 이산화 & 디자인 프로세스의 코드화

“데이터” 기반 사회

오늘날 우리는 인공지능, 자율주행, 로보틱스, 스마트시티, 디지털 트윈, 메타버스 등과 같은 혁신적인 기술들은 주도하는 시대를 살아가고 있다. 이러한 산업들은 겉으로는 서로 다른 형태를 보이지만, 그 본질을 보면 모두 데이터의 수집, 가공, 분석을 통해 기존 산업을 증강, 혁신하고 새로운 가치를 창출하는 데이터 중심의 패러다임을 공유하고 있다. 데이터 기반 사회로의 전환은 기존 산업에서 데이터 활용을 체계적, 명시적으로 도입함으로써, 더욱 높은 정밀도와 해상도로 기존의 산업을 발전시키며 다양한 융합을 촉진하고 있다. 이러한 근본적인 변화 속에서 디자인 산업은 어떤 진화를 겪으며 디자이너들에게는 어떤 준비와 역량이 요구될까?

“디자인 재료”로써의 “데이터”

역사적으로 새로운 재료의 등장은 항상 혁신적인 도구의 소개, 발전을 동반했으며, 다양한 가능성을 드러내며, 디자인 산업 진화의 촉매 역할을 해오고 있다. 특히 데이터라는 재료는 코드라는 도구를 통해 가공되며, 디자인 전 과정을 포함한 유지 관리에 걸쳐 그 데이터의 흐름을 씨줄과 날줄로 역음으로서 정보 기반으로 디자인 프로세스를 구체적이고 명시적으로 코드화할 수 있게 된다. 데이터는 디자인 산업에 혁신적 변화를 가져오는 방식과, 디자이너가 새로운 가능성과 창의성을 탐구할 수 있는 새로운 사고의 틀을 열어 주고 있다.

공간정보의 “이산화” 그리고 프로세스의 “코드화”

이번 발표에서는 디자인 요소와 과정을 코드화하여 이를 가공하고 활용하는 환경에 대해 이야기할 것이다. 특히, “현실 정보의 데이터화”, “디자인 프로세스의 코드화”와 “모델화”를 통해 정보들을 명시적으로 다루는 과정을 소개할 것이다. 다양한 실험과 분석, 피드백을 통해 디자이너가 효과적이고, 통합적이며, 창의적인 의사결정을 내릴 수 있는 디자인 데이터 다루는 방법과 사례를 학습을 통해, 데이터 기반 사회에서 디자이너에게 새롭게 요구되는 역할에 대해서 알아볼 것이다.

the use of data in design

디자인에서 데이터의 활용

V 2024 10

DESIGNER & SOFTWARE ENGINEER & EDUCATOR

이남주 / NJ Namju Lee

Design, Data, AI, Computation, Visualization specialist

Software engineer; ESRI, Ready.net

MDes;Harvard, MArch;UCB, B.S;SNUST, Research Fellow; MIT

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Director and founder of

NJSLabs/ https://namjulee.github.io/njs-lab-public

NJSTUDIO & NJSLAB

Since 2004

Software Technology for Design

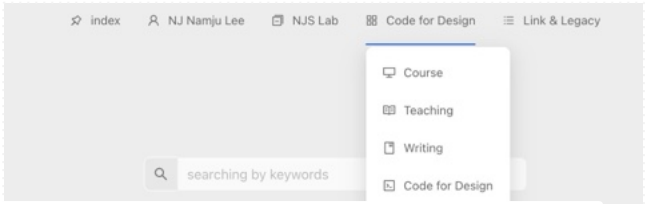
https://namjulee.github.io/njs-lab-public/

INDUSTRY & ACADEMIA

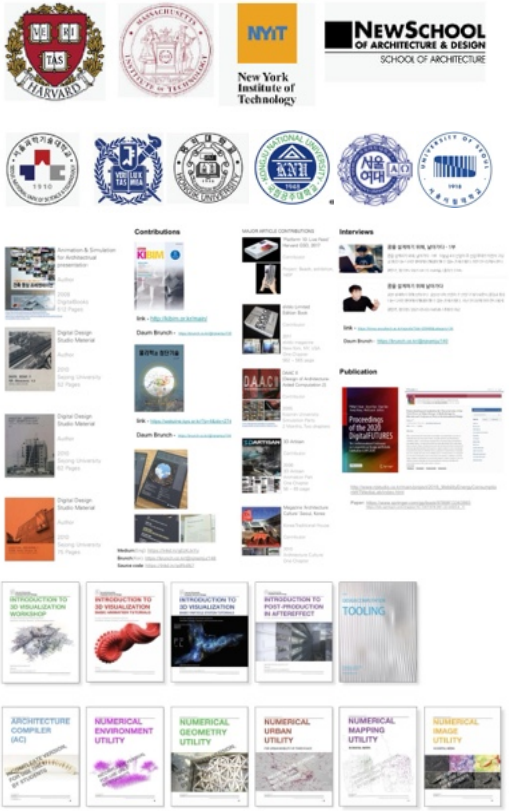
NJSTUDIO &

NJSLAB

INDUSTRY & ACADEMIA



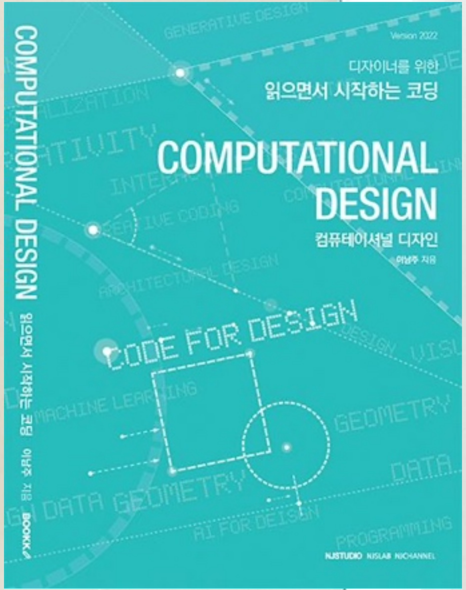
1,300 여 개의 영상 (강의 & 워크숍 & 상담 & 커리어전략), 150 여 개의 글(칼럼, 기고, 연구, 논문, 2권의 책), 140 여 개의 직/간접적은 프로젝트, 연구, 개발, 340 여 개의 워크숍 자료, 46 여 개의 수업들을 통해, 디자인과 컴퓨테이션 학습, 연구, 활용에 대한 지식과 경험을 나누고, 산업의 전문가/프런티어로서 그 역할을 충실히 해오고 있습니다. (2024년 9월 기준: 조회수 453,616명, 조회시간 25,200시간 / 1,050일)

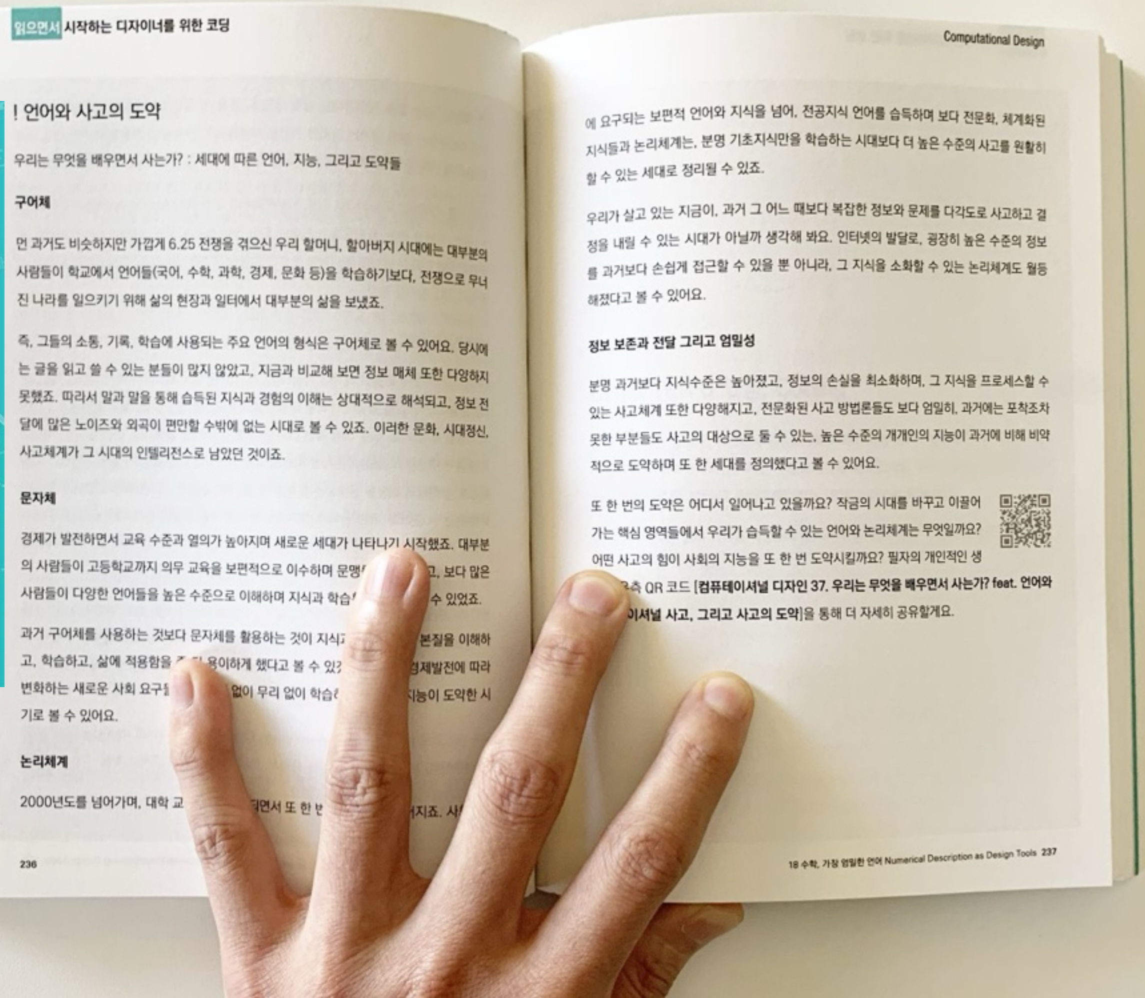


읽으면서 시작하는

디자이너를 위한 코딩

Computational Design





Daum Brunch - https://brunch.co.kr/@njnamju/144

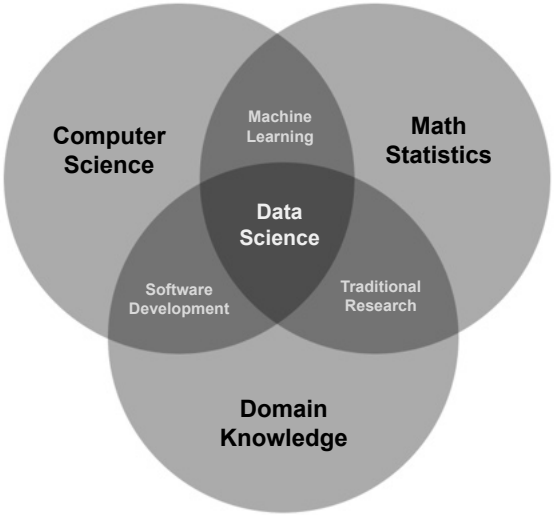
Book - https://www.bookk.co.kr/book/view/130128

EBook - https://www.upaper.net/njnamju/1148626

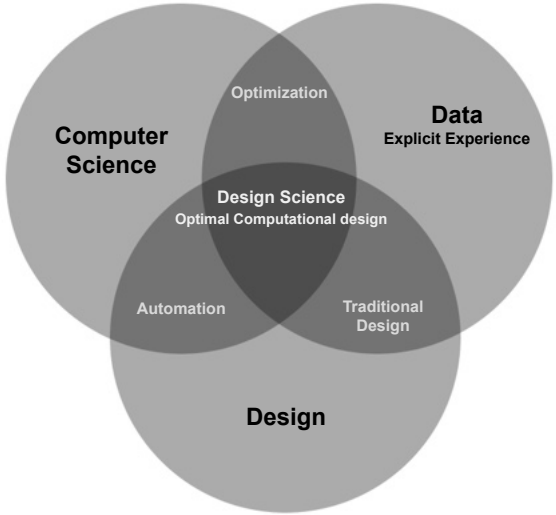
Audio book – https://www.youtube.com/playlist?list=PLweNYwGoDKEbH7RWcAPFd2uyDk3Lwel63

[컴퓨테이셔널 디자인] 37. 우리는 무엇을 배우면서 사는가? feat. 언어와 컴퓨테이셔널 사고, 그리고 사고의 도약]

DATA SCIENCE & DESIGN SCIENCE



Computational XXX
Data Engineering
Data Science
…



Computational Design
Design Engineering
Design Science
…

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NJSLabs/ https://namjulee.github.io/njs-lab-public

TOC

DATA & DESIGN

VECTOR & RASTER

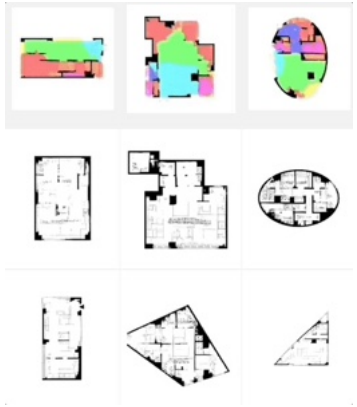
CASE STUDY

AlphaGo, Demis Hassabis, 2015

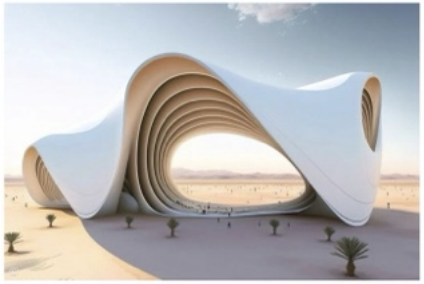
New era of technology, design

Théâtre D'opéra Spatial (Space Opera Theater)

Ref: Midjourney

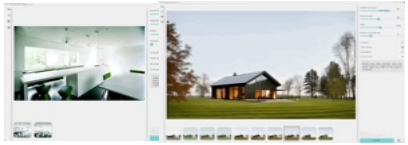


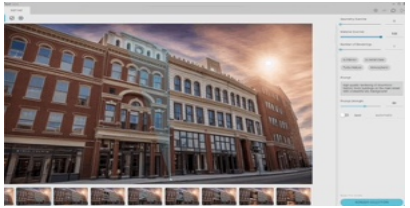
By Stanislas Chaillou



Written by Kaley Overstreet — Published on May 02, 2023

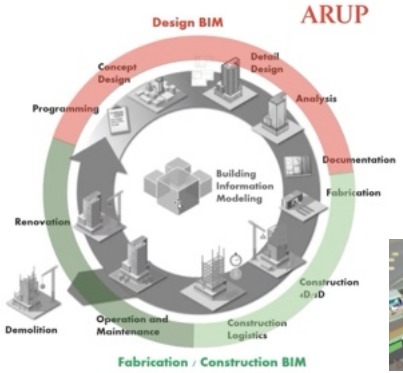
"Can you help me design my residential tower? It's 30 stories and located in Brooklyn, New York." ChatGPT's response may be surprising. Given that the bot has no architectural experience, and is certainly not a licensed architect, it was quick to rattle off a list of considerations for my building. Zoning codes, floor plan functionality, building codes, materiality, structural design, amenity spaces, and sustainable measures were just a few of the topics ChatGPT shared information about.

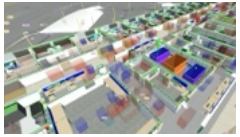




Veras

Prompt: A stylish woman walks down a Tokyo street filled with warm glowing neon and animated city signage. She wears a black leather jacket, a long red dress, and black boots, and carries a black purse. She wears sunglasses and red lipstick. She walks confidently and casually. The street is damp and reflective, creating a mirror effect of the colorful lights. Many pedestrians walk about.more





By Heechan Shin

Adobe

BIM, Smart City, Digital Twin …

AI, Machine Learning, LLM, Parallel Computing, Edge Computing ...

Drone, Autonomous Vehicle …

BIM, Smart City, Digital Twin …

AI, Machine Learning, LLM, Parallel Computing, Edge Computing ...

Drone, Autonomous Vehicle …

Data

Materials and Tools for Design

Stone, Glass, Plastic, Iron, Concrete ...

Materials and Tools for Design

Stone, Glass, Plastic, Iron, Concret ...

Data

DATA at

geometry

architecture

urban

landscape

computation

visualization

material

GIS

Interaction

building energy

fabrication

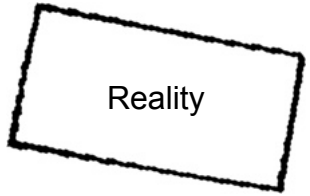
...

Quantitative & Qualitative

DATA

Vector & Raster

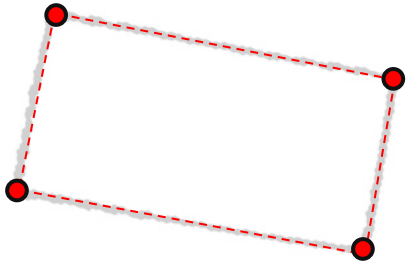
Vectorization & Rasterization

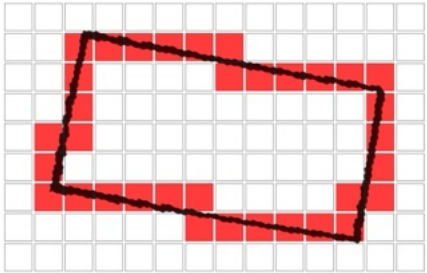


Vector

&

Raster





```
[
    [100, 50, 0],
    [50]
]
```

```
[
    pos: [100, 50, 0],
    radius: 50
]
```

```
[
    [ 0, 0, 0, 1, 0, 0, 0],
    [ 0, 0, 1, 0, 1, 0, 0],
    [ 0, 1, 0, 0, 0, 1, 0],
    [ 1, 0, 0, 0, 0, 0, 1],
    [ 0, 1, 0, 0, 0, 1, 0],
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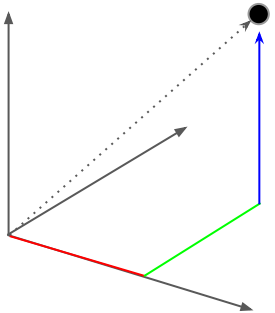
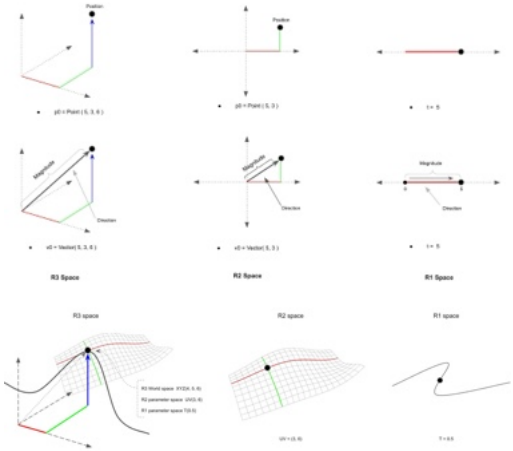
]
```

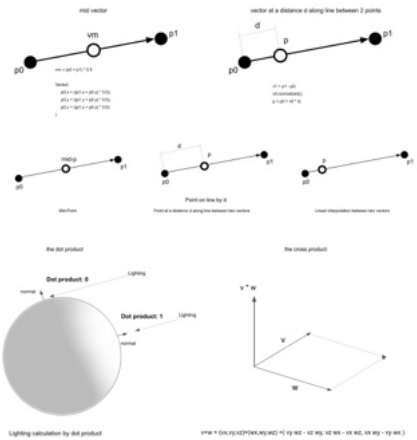
Vector

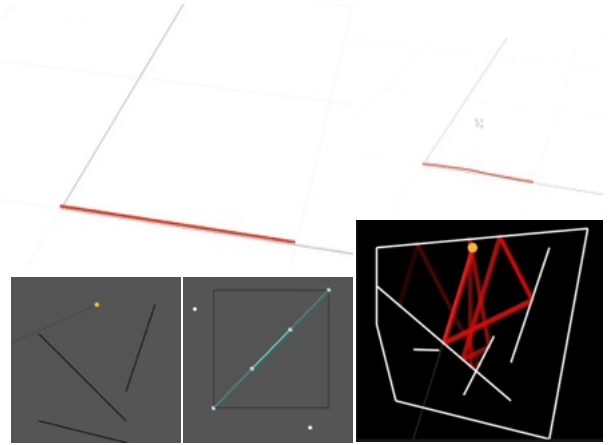
Cartesian (Euclidean) Plane R3



v0 = Vector(3, 5, 6)







https://namjulee.github.io/nis-lab-publiclab/tools/raytracer/

https://namjulee.github.io/nis-lab-publiclab/tools/bezier-interpolation/

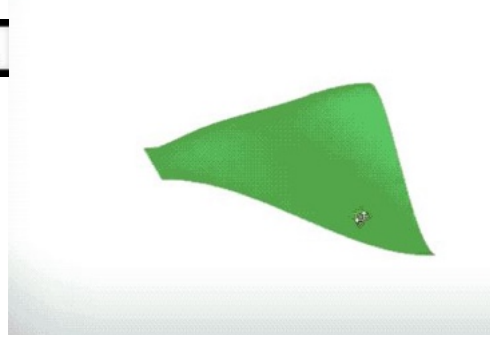
https://namjulee.github.io/nis-lab-publiclab/tools/raytracer-scene

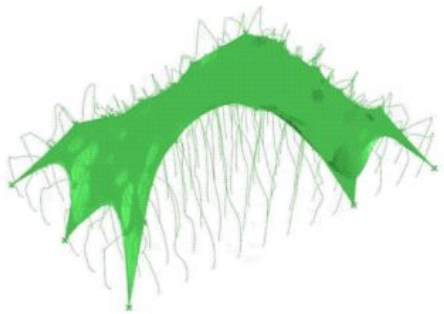
http://www.njstudio.co.kr/main/project/2015_NGU_Development/2015_NGU_Development.html

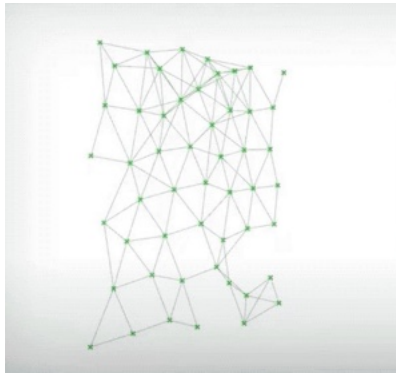
Geometry, Addon for Grasshopper
https://www.food4rhino.com/app/numerical-geometry-utility

Dynamics, Addon for Grasshopper
https://www.food4rhino.com/app/numerical-mapping-utility

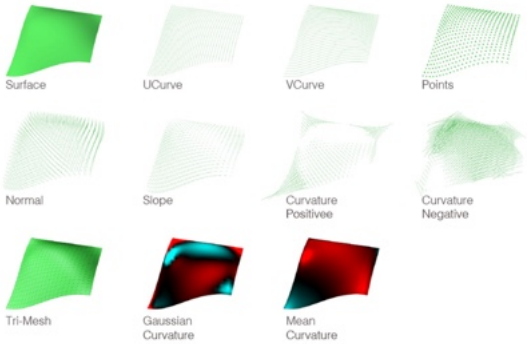
Geometry as Data Structure

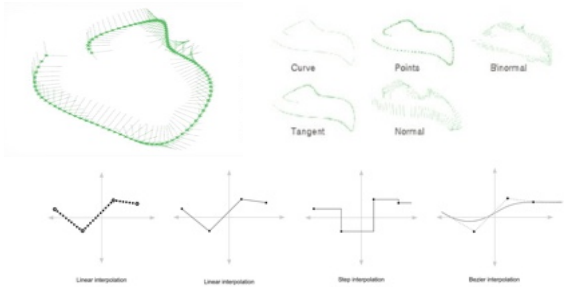




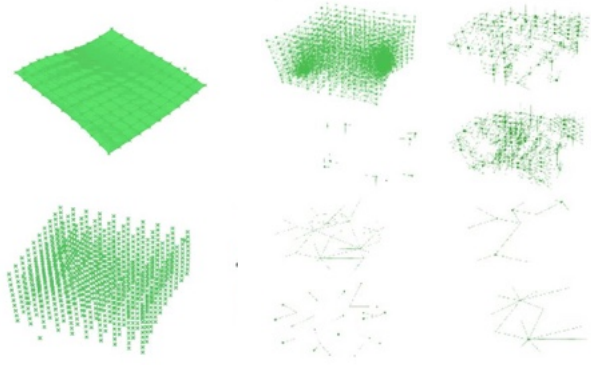


Data extractions



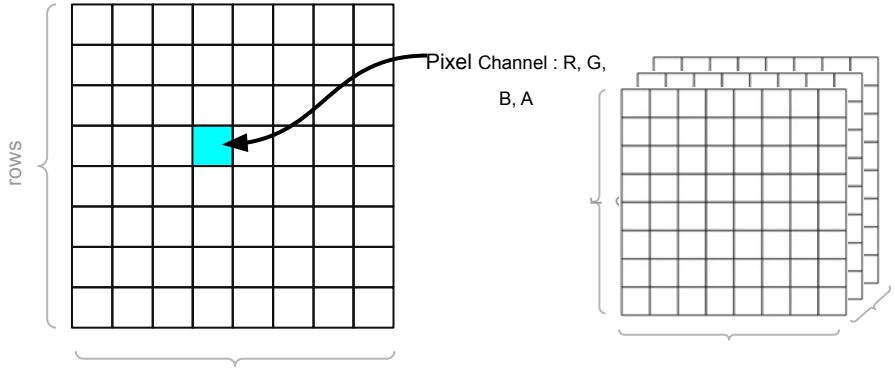


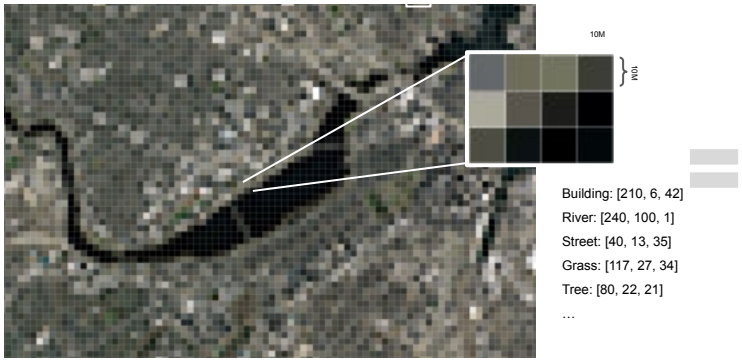
Connectivity



columns

Raster





Building: [210, 6, 42]
River: [240, 100, 1]
Street: [40, 13, 35]
Grass: [117, 27, 34]
Tree: [80, 22, 21]
…

```
[[[ 91  97  83]
  [ 82  90  69]
  [118 107  89]
  ...
  [ 98  98  96]
  [ 96  97 101]
  [101 101 101]]

 [[ 87 100  70]
  [124 122  97]
  [ 96  88  75]
  ...
  [ 85  87  74]
  [ 81  81  73]
  [ 99  95  92]]

 [[ 97 105  82]
  [124 122  99]
  [ 69  69  59]
  ...
  [ 65  65  55]
  [ 82  83  77]
  [ 84  89  83]]
 …
```

```
[[ 97 102  96]
  [ 64  68  54]
  [ 92  89  80]
  ...
  [ 53  51  52]
  [ 99 105 101]
  [103 104  98]]

 [[ 83  82  64]
  [ 69  71  58]
  [ 79  85  75]
  ...
  [ 51  52  54]
  [ 91  90  86]
  [ 82  79  74]]

 [[ 98  92  76]
  [ 97  95  80]
  [ 84  90  80]
  ...
  [ 69  70  62]
  [ 78  82  81]
  [ 94  93  98]]]
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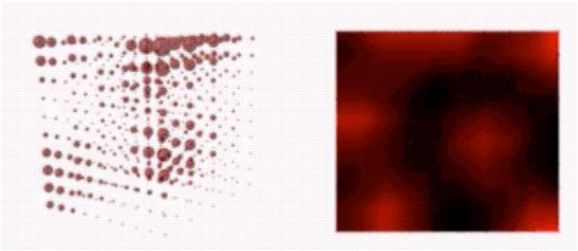
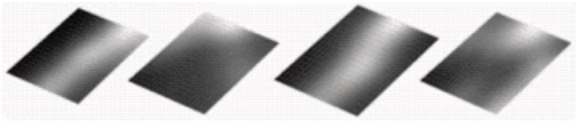
Voxel Structure



Layers



Discretizing information

Link: https://computationaldesign.tistory.com/67

numerical descriptions as design tools

data structure

graph

pixel

voxel

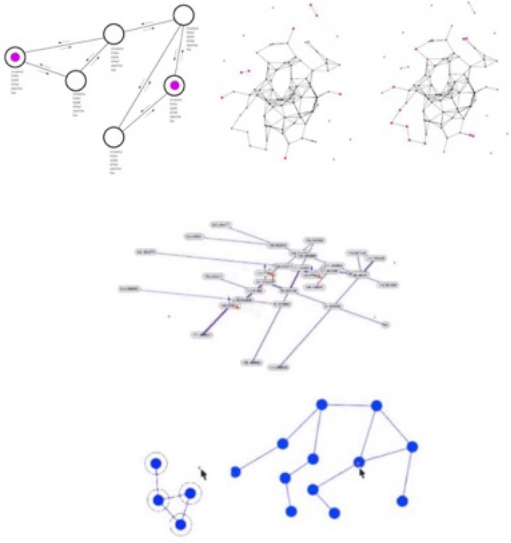
...

DATA STRUCTURE METHODOLOGY

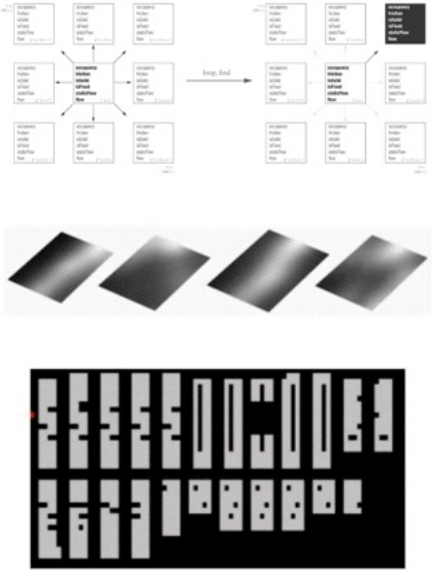
Data Structure and Algorithm for Design and Research Workshop

Type of Abstraction & Discretization & Resolution

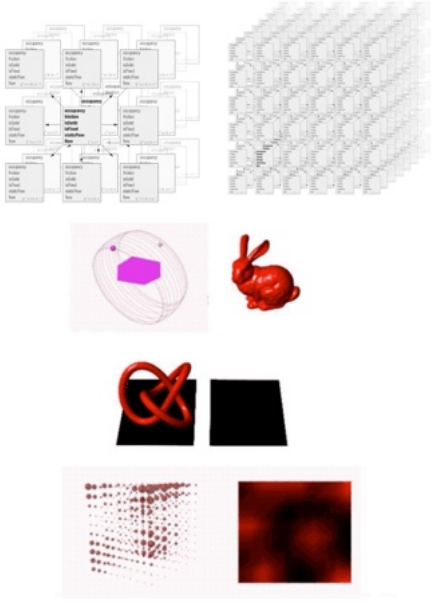
Graph



Pixel

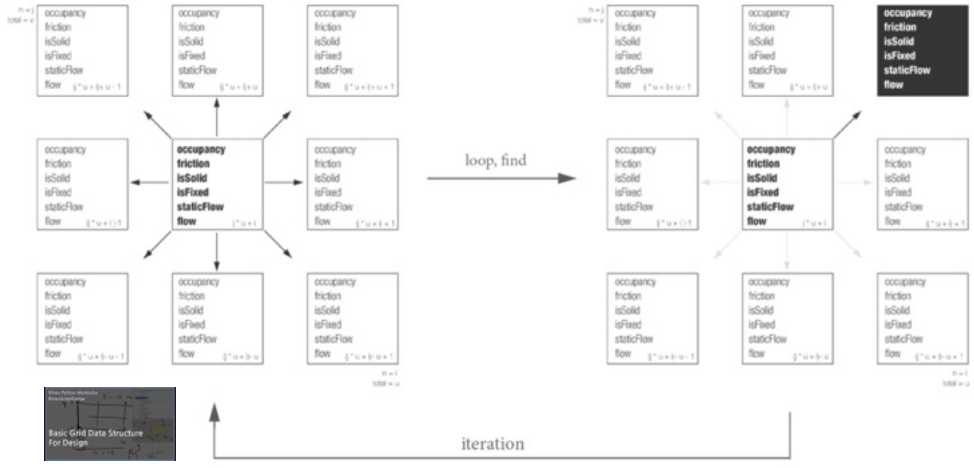


Voxel

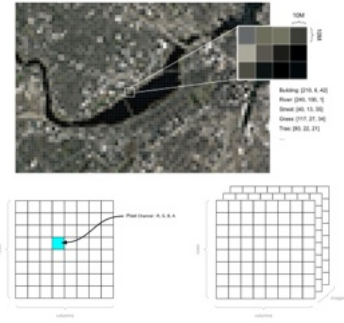


Raster Data Structure

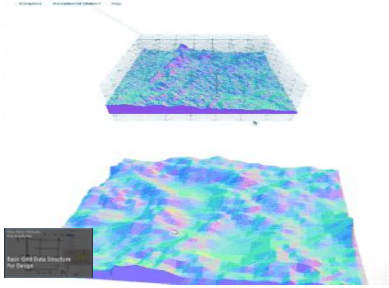
Grid System

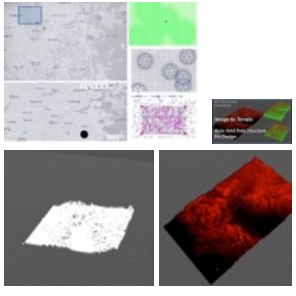


Discretization & Resolution

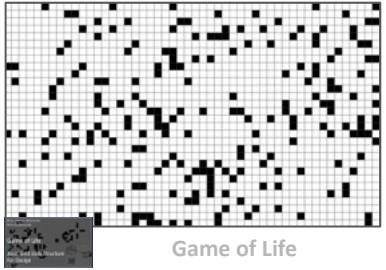


Grid Mesh

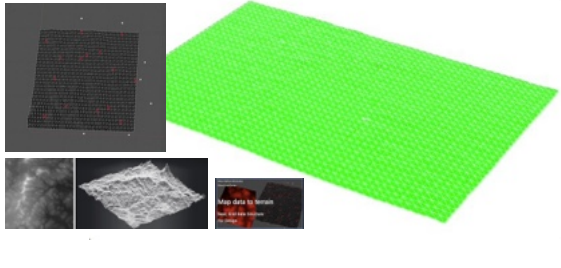




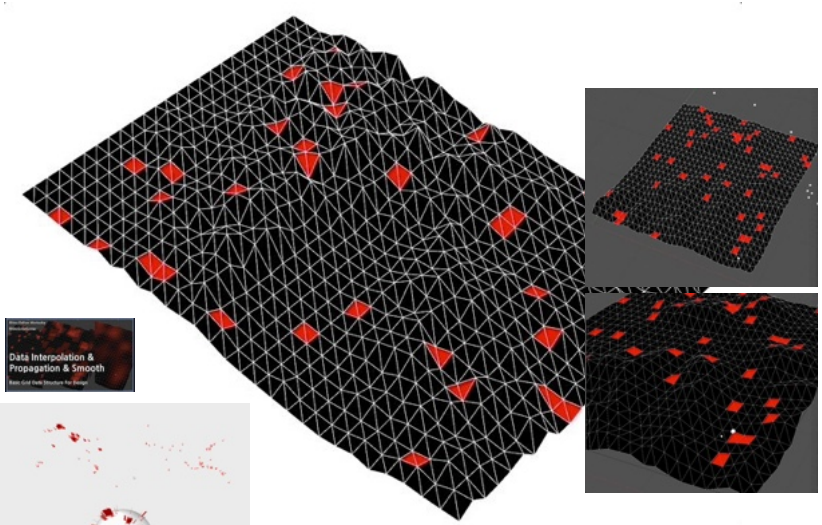
Connectivity



Data to Terrain

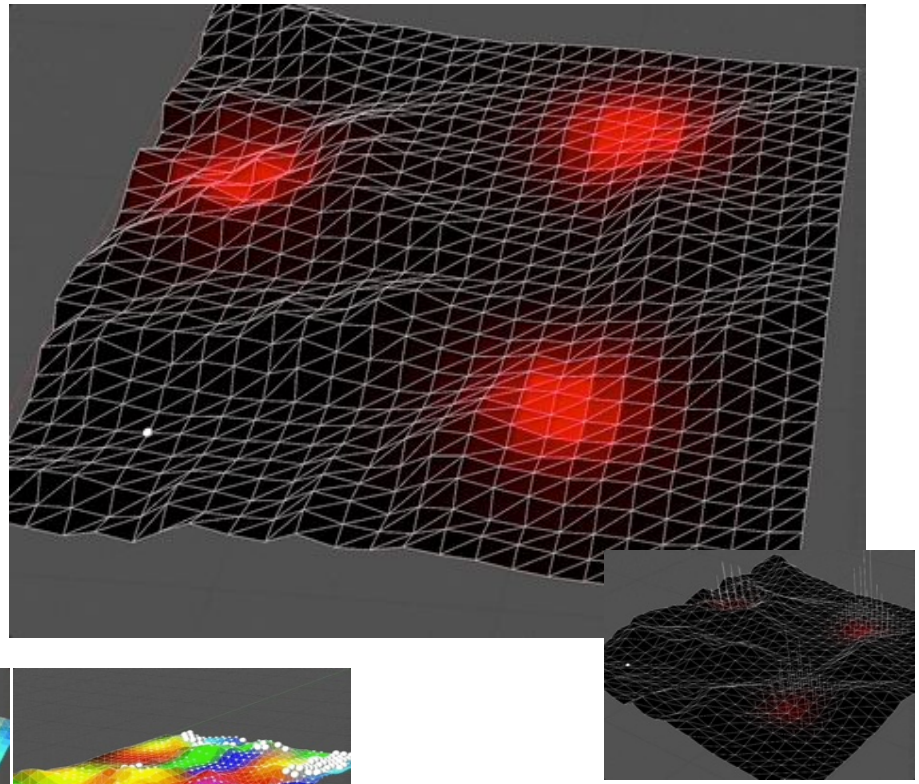


Propagation

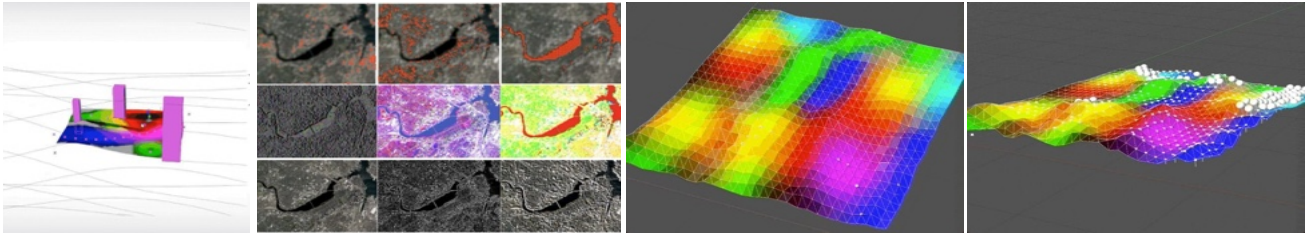


Numerical Descriptions as Design Tools

Data Falloff & Smooth

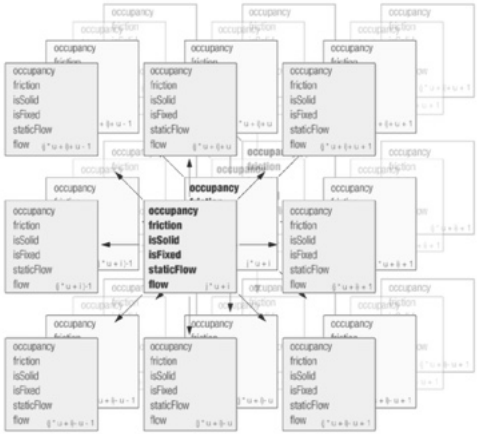


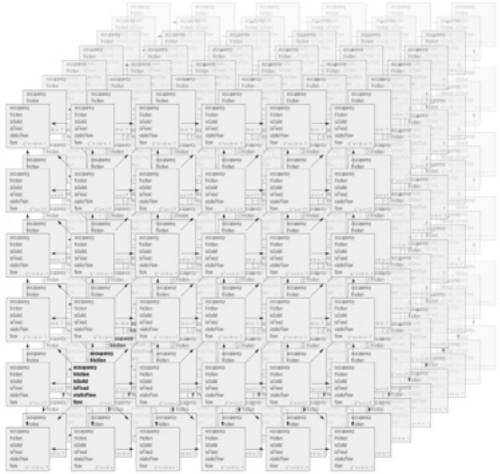
Data Channels



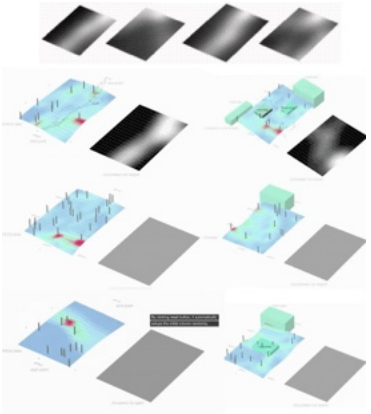
Voxel Map Data Structure

Voxel

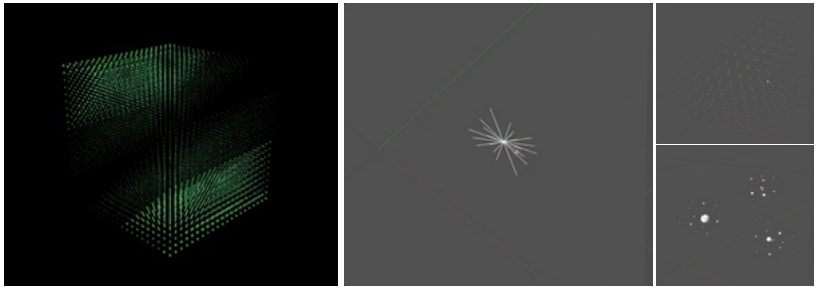


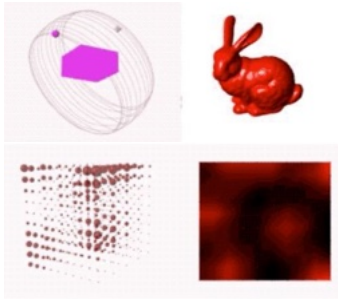


Data Interpolation

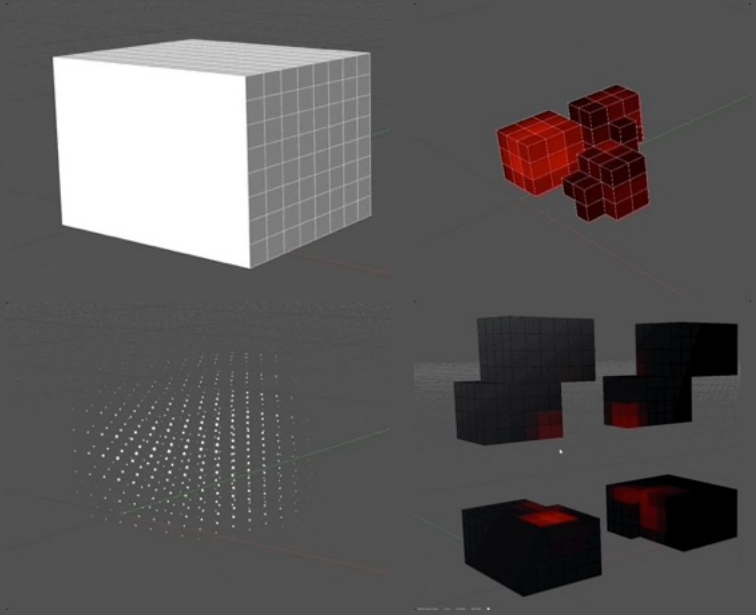


Connectivity

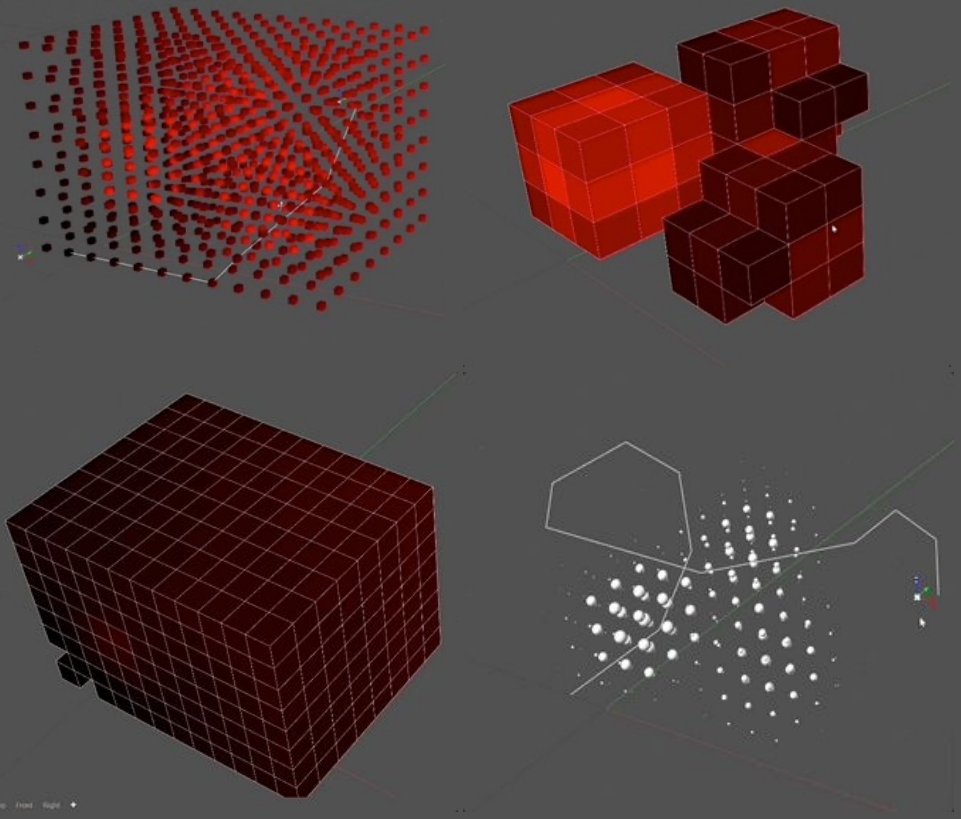




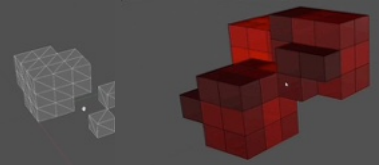
Voxel Data Visualization



Voxel, Path Finding

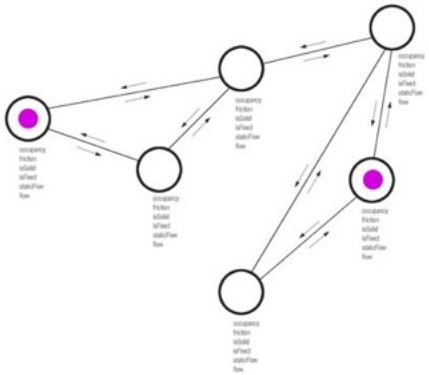


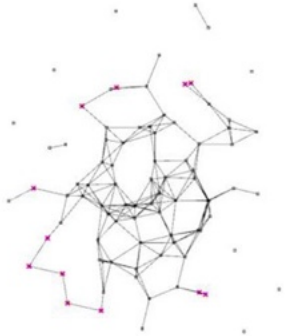
Voxel Mesh



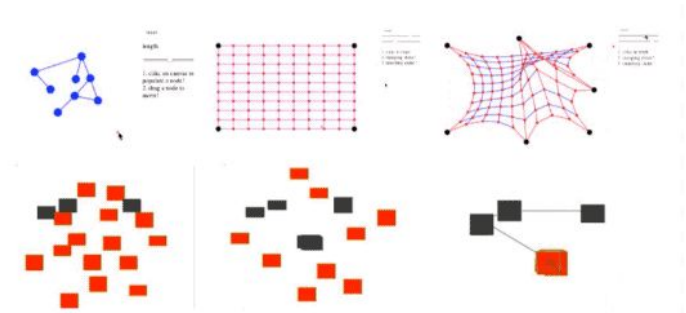
Graph Data Structure

Graph

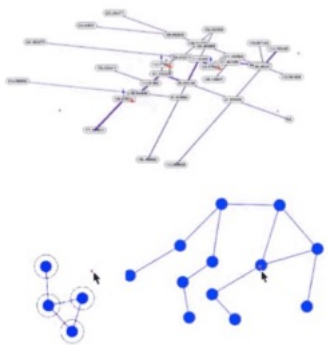


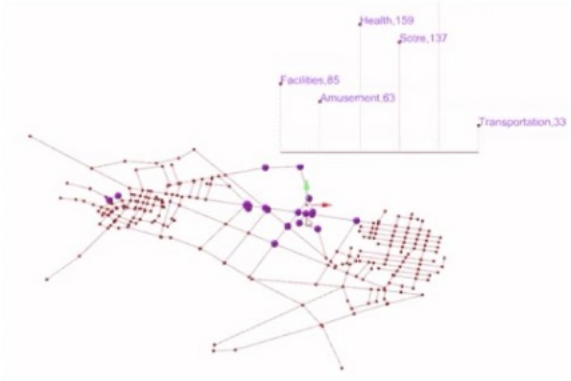


Graph Analysis
DYNAMICS



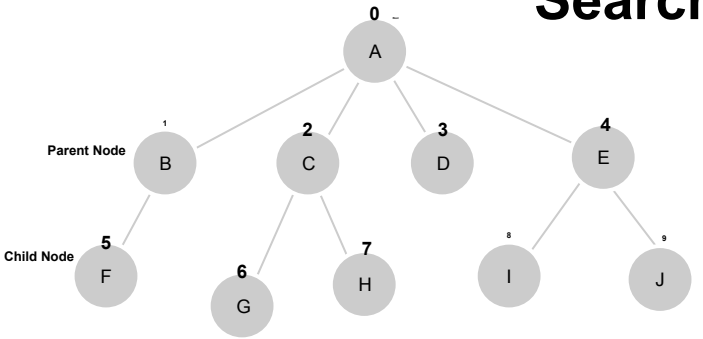
Network Analysis
DYNAMICS





Graph & Pixel & Voxel

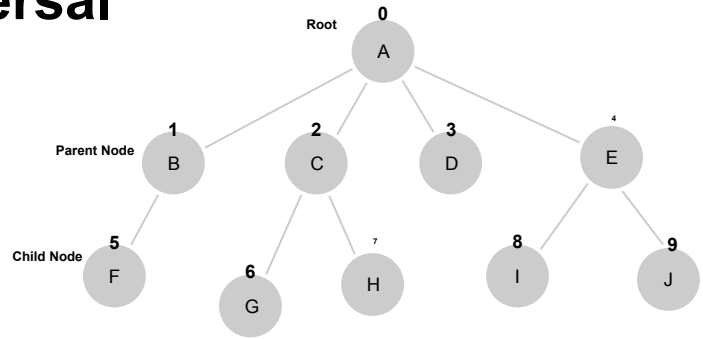
Search & traversal



DFS

Depth First Search Using a Stack

0,1,5,2,6,7,3,4,8,9



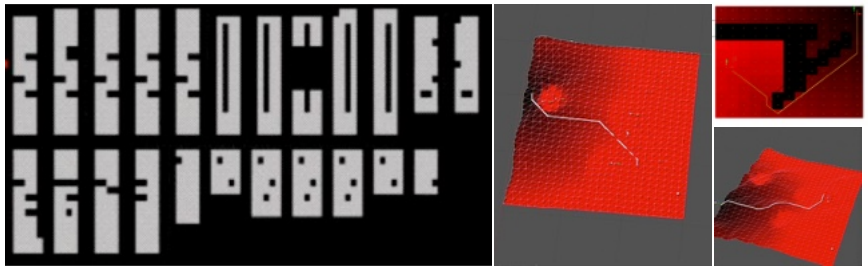
BFS

Breadth First Search Using a Stack

0,1,2,3,4,5,6,7,8,9

Reference:
https://codepen.io/NJStudio/pen/RwWxGXo?editors=1011

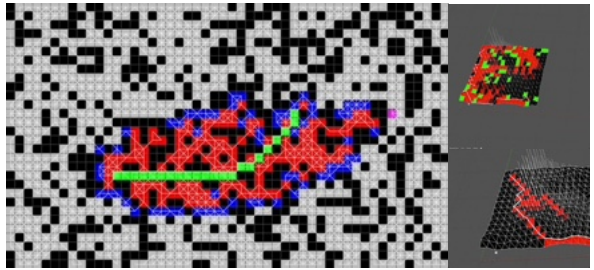
Path Finding & Dijkstra



Reference:
https://docs.google.com/presentation/d/1TJPG0EdP1JafMEbGzIYxTH8Kc9WE1PBSkH2PWxhW3Uo/edit#slide=id.g1b82a001364_0_258

https://codepen.io/NJStudio/pen/RwWxGXo?editors=1011

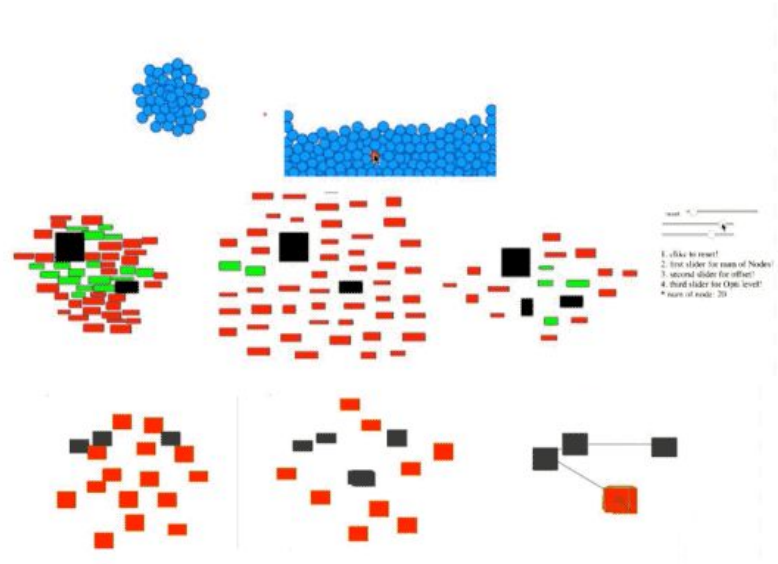
PathFinding A* concept

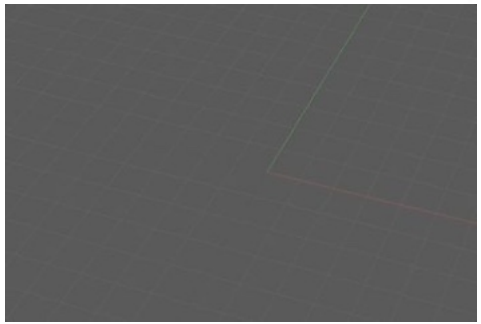


http://theory.stanford.edu/~amitp/GameProgramming/Heuristics.html

Particle

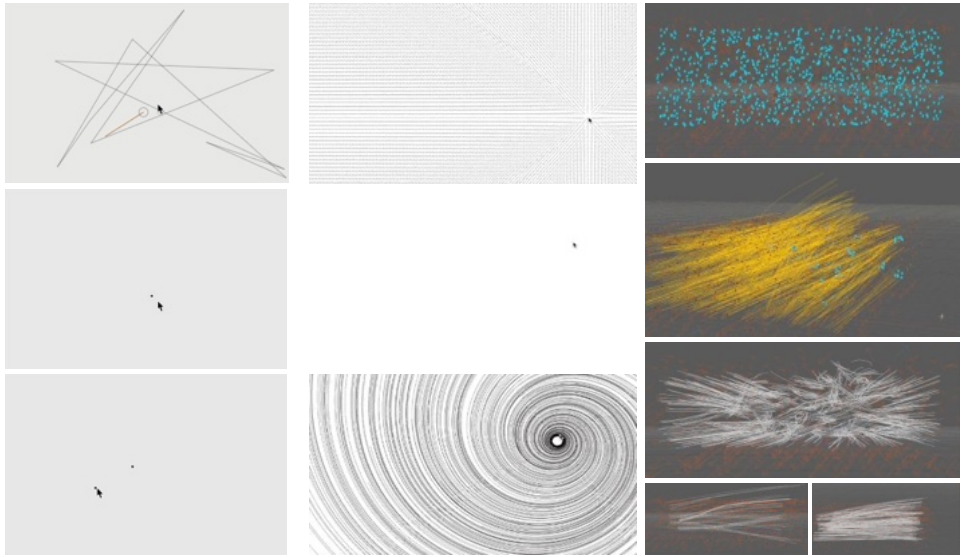
DYNAMICS

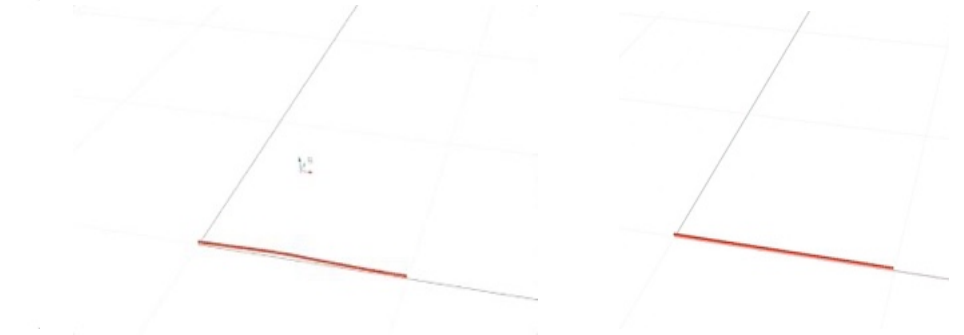




Field & Particle

DYNAMICS





SYSTEM FOR DESIGN

Translating information to insights for design decisions

Parametric, algorithmic design

Optimization & Automation

Agent-Based / multi agent based design system

Rule-Based & Generative Design System

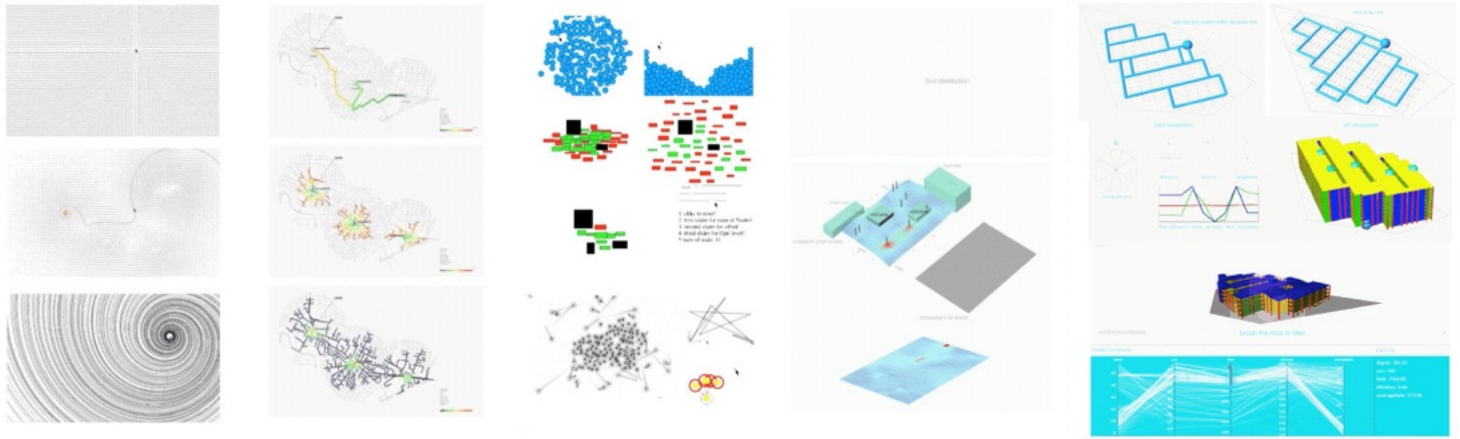
Interaction in design

Data driven decision making process

Complex system in design

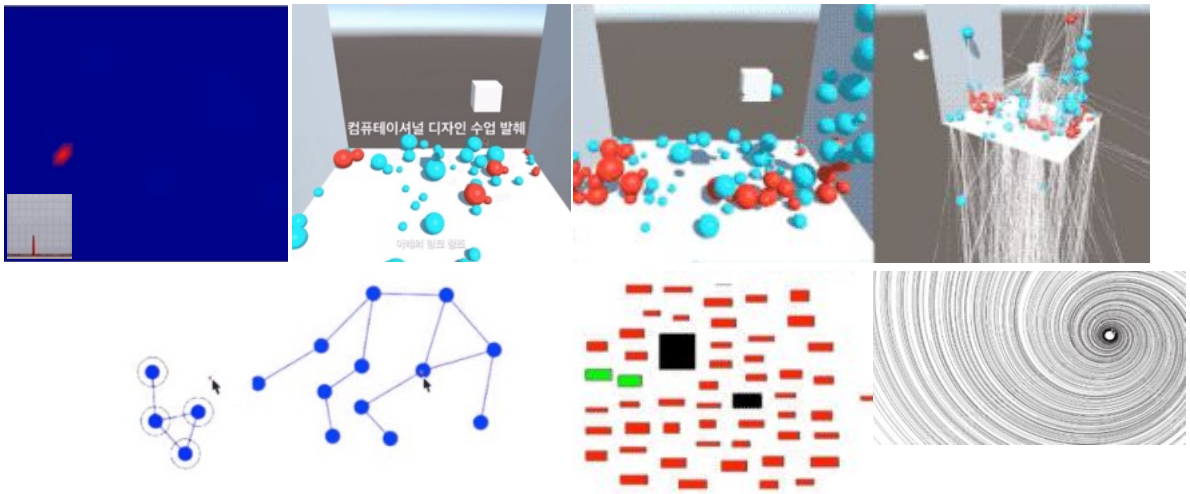
AI / ML / LLM / Generative model

BIM / BAM



Connectivity:

Dependency & Hierarchy & Relationship



COMPUTATIONAL THINKING

Problem solving & From implicit to explicit - 쉬운설명 https://brunch.co.kr/@ninamju/1

1.1. 암묵적(Implicit)에서 명시적(Explicit)로 – 분해(Breakdown), 추상화(Abstraction), 패턴(Pattern)

1.2. 변수(Variable) / 파라미터(Parameter)

1.3. 모듈(Module)의 재활용성(reusable)

1.4. 수 체계 –

1.5.. 프로그래밍 패러다임 (Programming paradigm)

1.6. 전공 영역(Domain)

! 컴퓨테이셔널 사고(Computational Thinking) 그리고 컴퓨테이셔널 디자인(Computational Design) - link

QnA 102 컴퓨테이셔널 디자인 프로젝트 피드백 & 컴퓨테이셔널 디자인 사고 - link

QnA 95 컴퓨테이셔널 사고 / 이분법적 접근 방자 / 문제 해결 방법 - link

QnA 94 랩바쉽오피스아워, 제품 디자인 학부생과 대화 그리고 컴퓨테이셔널 디자인 - link

QnA 93 랩바쉽오피스아워 - 데이터, 알고리즘, 학습방법, 기술과 디자인을 볼 때 - link

QnA 85. 건축학부2 컴퓨테이셔널디자인에대한3가지질문 - link

QnA 84. 건축학과2학년의질문, 컴퓨테이셔널디자인이뭘까, 이해하고, 공부하고, 적용할까? - link

SA 7.0 Lecture 2. 디자이너를 위한 컴퓨테이셔널 사고 / Computational Thinking For Designer - link

[#컴퓨테이셔널디자인 38] 4/6 학습 내용과 방향 (디자이너를 위한 컴퓨테이셔널 디자인 특강 2021) - link

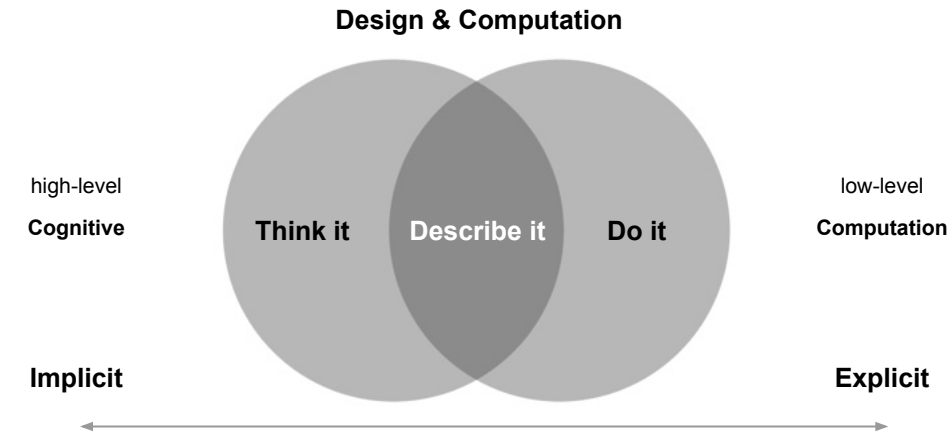
QnA 61 #컴퓨테이셔널디자인교육, 코딩 교육, 누가 가르쳐야 하나 - link

QnA 59. 가장 원반적인 오해, 컴퓨테이셔널 디자인 오해들 - link

QnA 56. 건축 컴퓨테이셔널 디자인 활용?, 응용범위?, 원래의 사고방식 ? - link

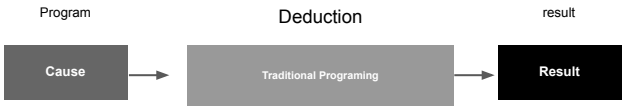
...

여기 QnA 채널에 가셔() "Ctrl + F"를 활용해서 키워드로 검색하시면 더 많은 자료를 찾을 수 있어요!



Codification of the design process

from **function** to **result**

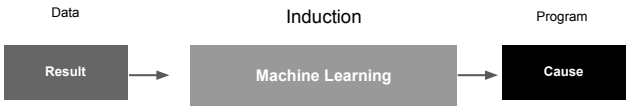


Traditional Programing, Software 1.0

3 + 3 = ?

VS

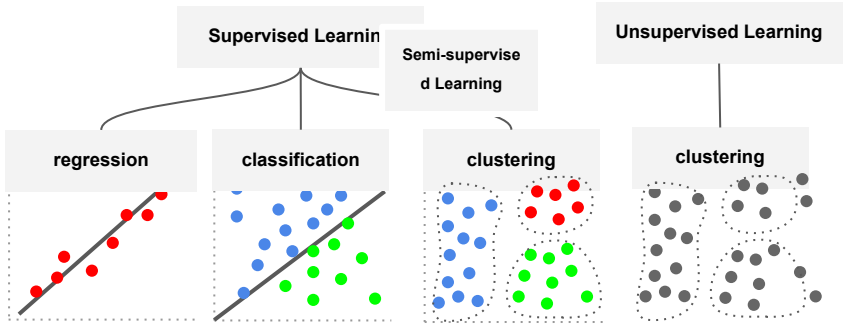
from **result** to **function**



Machine Learning, Software 2.0

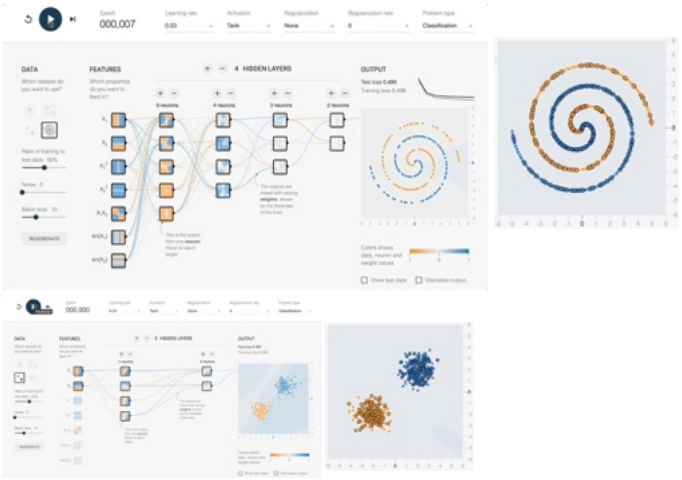
3 ? 3 = 6

Machine Learning

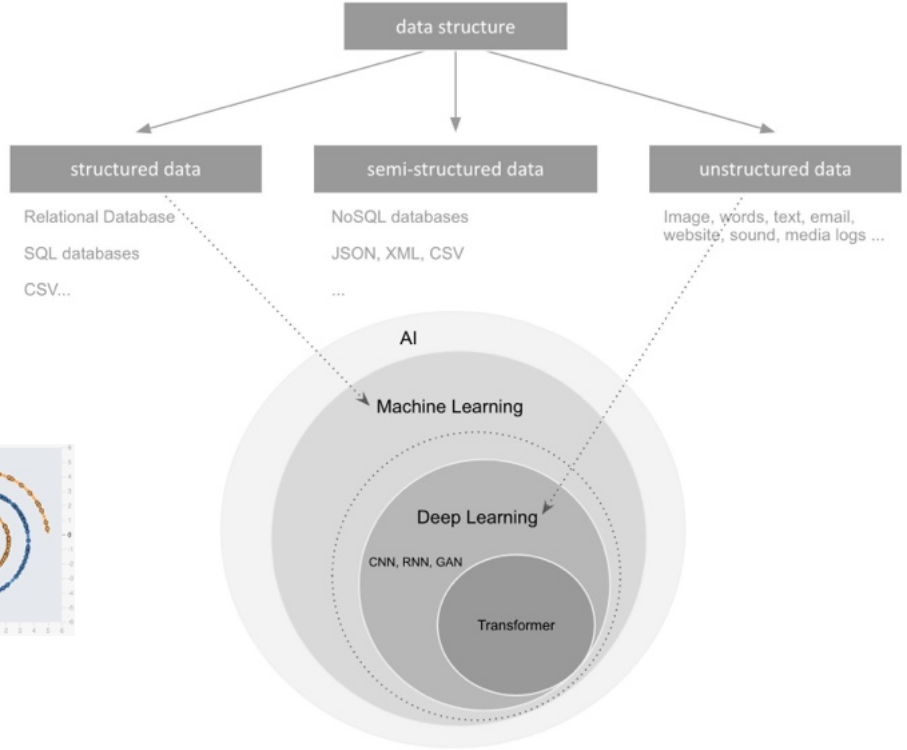


Reinforcement Learning

Ref: https://www.javatpoint.com/reinforcement-learning



https://playground.tensorflow.org/



Analytical AI VS Generative AI

Analyzes data to derive insights, identify patterns, make predictions, or inform decision-making.

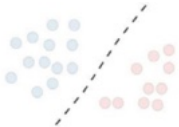
Methodology
Statistical models; Machine learning algorithms, and data analytics techniques

Creates new content; videos, images, text, or audio, by learning from existing patterns in data.

Methodology
Generative Adversarial Networks (GANs) or Transformer models (Generative Pre-trained Transformer:GPT)

Machine Learning

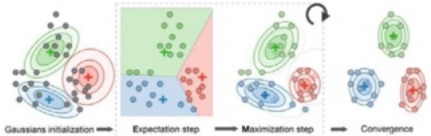
Supervised Learning



Discriminative model
Decision Boundary
Regressions, SVMs

Generative model
Probability distributions of the data
GDA(Gaussian Discriminant Analysis), Naive Bayes

Unsupervised Learning

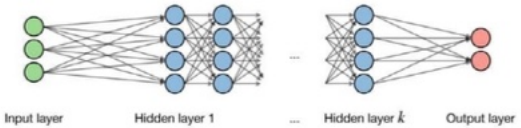


Clustering:
K-means clustering, Hierarchical clustering

Dimension reduction:
PCA (Principal Component Analysis), ICA(Independent component analysis)

Nonlinear dimensionality reduction:
t-SNE(t-distributed stochastic neighbor embedding)

Deep Learning

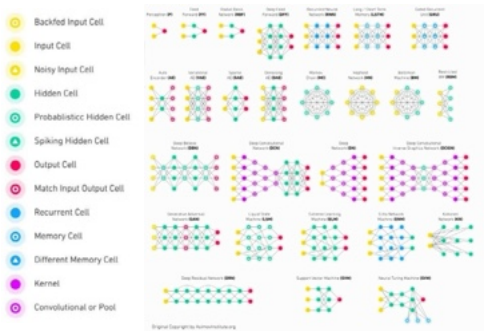


architecture

CNN (Convolutional Neural Networks)
RNN (Recurrent Neural Networks)
RL (Reinforcement Learning)

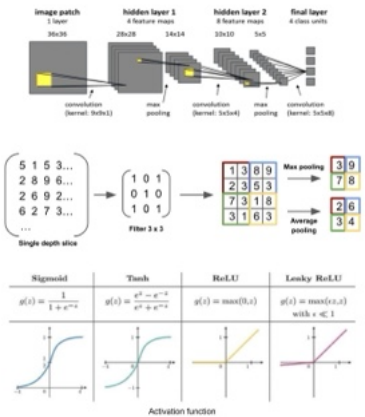
Reference: CS229 - Machine Learning, Stanford University

Neural networks basic architectures



Reference:
CS229 - Machine Learning, Stanford University
https://www.asimovinstitute.org/

Convolutional Neural Network



Codification of the design process

Computational Design Thinking

Writing, Medium - https://ni-namiu.medium.com/computational-design-thinking-for-designers-68224bb075c

Lecture Video - https://youtu.be/ioGSrqYoEm8

1. Question
2. Methodology & Approach
3. Policy
4. Implementation : algorithm

DATA & PROCESS

COMPUTATIONAL THINKING

THE QUESTION / IMAGINATION / HYPOTHESIS

Understanding *Problem, Concern & Issue*
Declaring *Inputs & Outputs*
Writing *Instructions*

. . .

THE METHODOLOGY & APPROACH

from ***Whole*** *to* ***Parts*** *&from* ***Part*** *to* ***Whole***
from ***Simple*** *to* ***Complex*** *&from* ***Complex*** *to* ***Simple***
from ***Generic*** *to* ***Specific*** *&from* ***Specific*** *to* ***Generic***

. . .

THE MANIFESTO & POLICY

Deterministic *or* ***Stochastic***
Converge *or* ***Diverge*** *— Design Space, Optimization, Pareto efficiency*
Top-down *&* ***Button-up***
Holistic *or* ***Partial***
Existing *or* ***Emerging*** *(Revealing)*
Oriented *or* ***Disoriented***
Centralized *or* ***Decentralized***
Procedural *or* ***Iterative***
Ultimate(Best) *or* ***Optimal***

. . .

THE IMPLEMENTATION

from ***Infinite*** *to* ***Finite*** *— FEM, Structure Analysis*
from ***Implicit*** *to* ***Explicit***
from ***Ambiguous*** *to* ***Certain***
from ***Entangled*** *to* ***Separated*** *— Pipeline*
from ***Inactive*** *to* ***Interactive*** *— Complex system*
from ***Phenomenological****(Observation)* *to* ***Predictable****(Model & System)*
from ***Intuition****(Imagination, Hypothesis)* *to* ***Implementation***

SPATIAL DATA MANIPULATION

Dumb *or* ***Smart*** *— Component Oriented Programming, React, Unity3d*
Reciprocal *(Mutual & Dependent)or* ***Isolation****(independent)*
Public *or* ***Protected*** *or* ***Private***
Abstract *or* ***Concrete*** *— Implementation and Inherent*
Connected *or* ***Disconnected***
Static *or* ***Dynamic(Instance)***

. . .

THE TOOL & THE PRINCIPAL

Analytic-Oriented & Object-Oriented & Functional & Procedural & Component...
Relational Hierarchy
Properties and Behaviors
Pure & Impure
Condition & Loop
Coordinate system, distortion, projection remap interpolation ...

. . .

1. Differentiating Issues, Problems, and Tasks
2. Developing Spatial Data Structures
3. Deploying Algorithms

Data & Design, Computational Design

Workshop: Introduction to Computational Design: Data, Geometry, and Visualization Using Digital Media - link

ENG: https://nj-namju.medium.com/data-design-c21457dc8dc

KOR: https://brunch.co.kr/@njnamju/88

Codification of design process (decision makings)

디자인 프로세스의 코드화

DESIGN & DATA

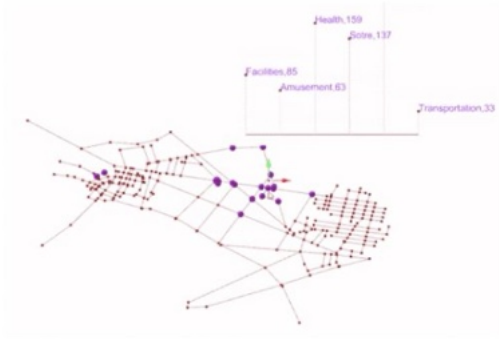
selected researches and projects

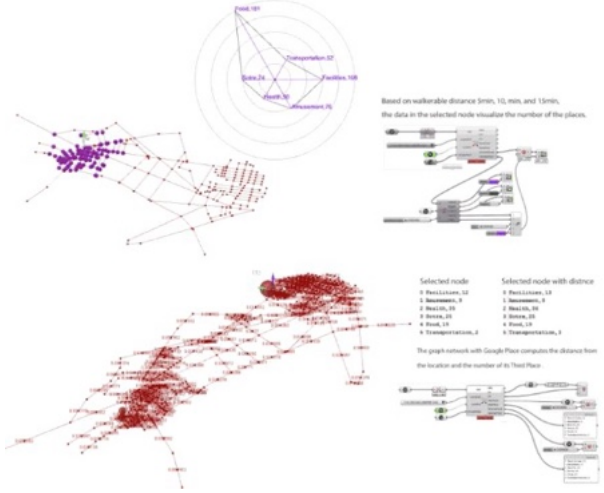
URBAN ANALYSIS & AI, ML

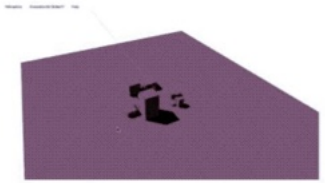
http://www.njstudio.co.kr/main/project/2016_MobilityEnergyConsumptionMITMediaLab/index.html

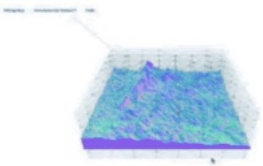
Addon for Grasshopper
https://www.food4rhino.com/app/numerical-urban-utility

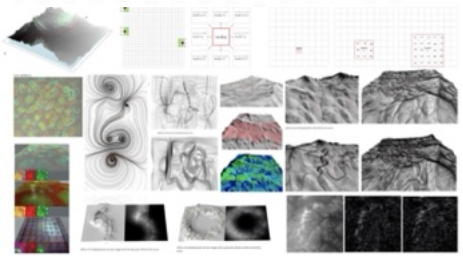
Paper: https://www.springer.com/gp/book/9789813343993
https://link.springer.com/chapter/10.1007/978-981-33-4400-6_11

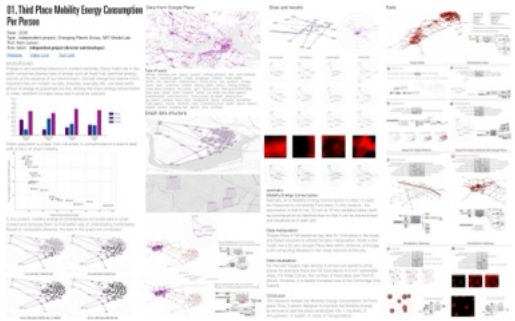


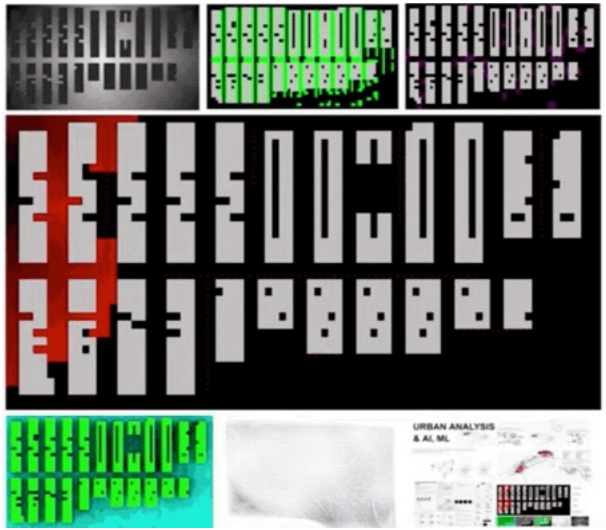












Properties

dist

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slop

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retai

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tree(

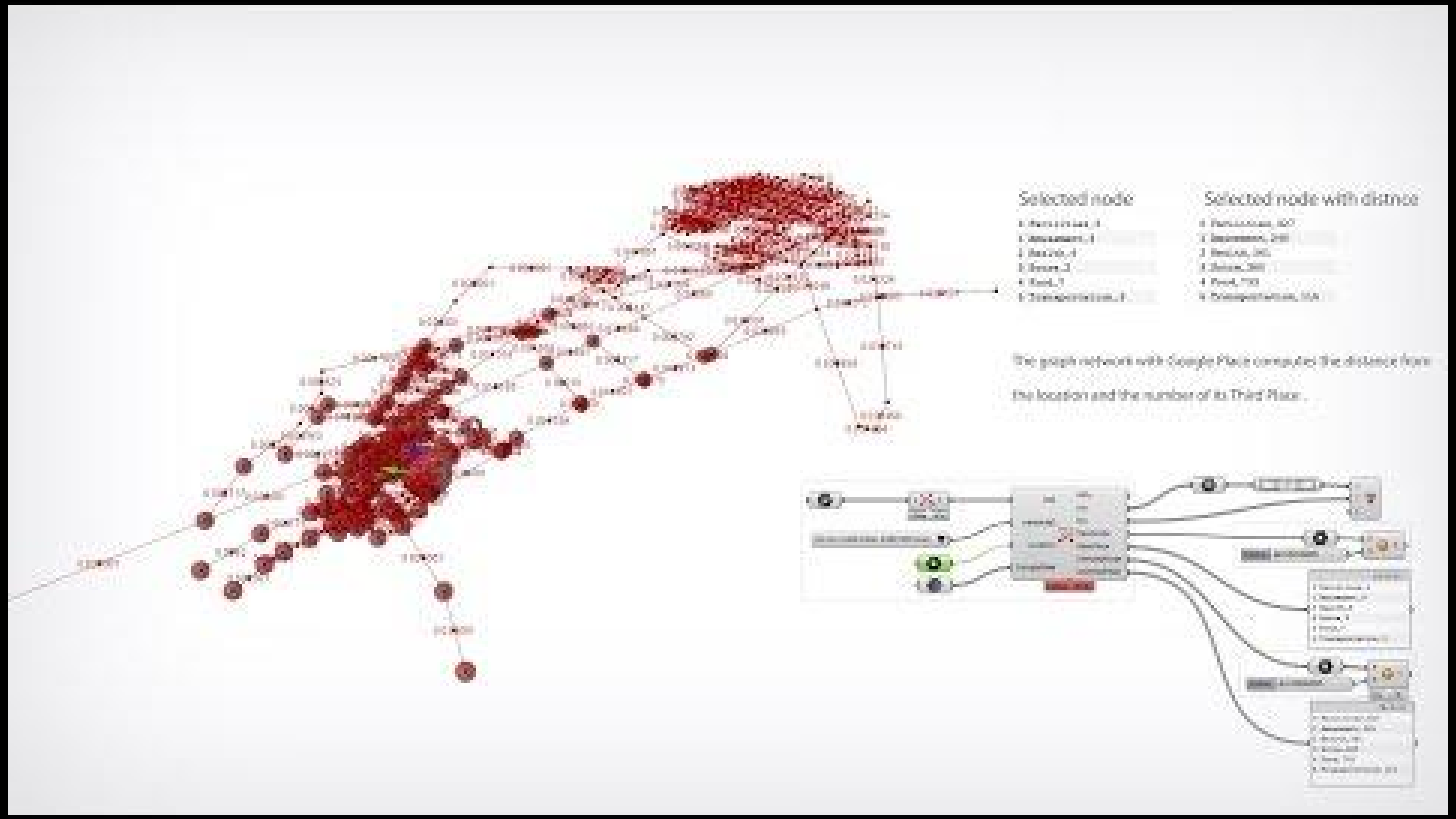
park)

outd

oor Thermal

Comfort

view


Selected node
Selected node with distnce
The graph network with Google Place computes the distance from
the location and the number of its Third Place.

Third Place Prediction model, Boston, LA, Redlands

Data process, Model A, Model B, Implementation

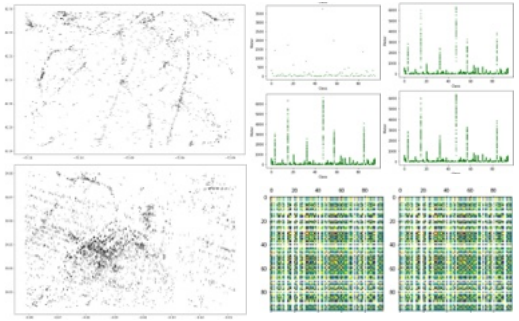
Medium(Eng): https://lnkd.in/gEzKJxYu

Brunch(Kor): https://brunch.co.kr/@njnamju/148

Source code: https://lnkd.in/gdf6d8j7

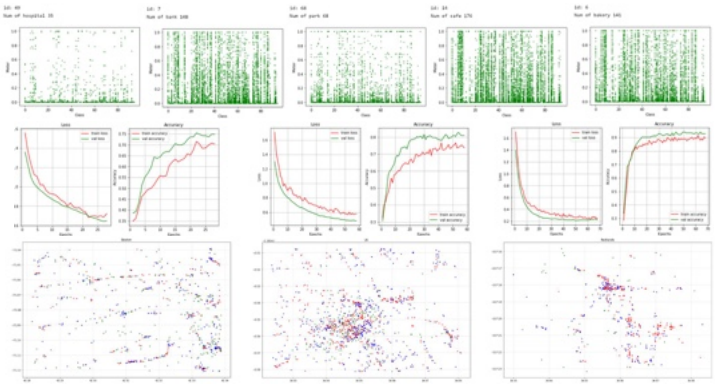
Lecture: https://namjulee.github.io/Data-Design-AI-for-Urban-Data-and-Viz-Harvard-GSD-public/

95 Class

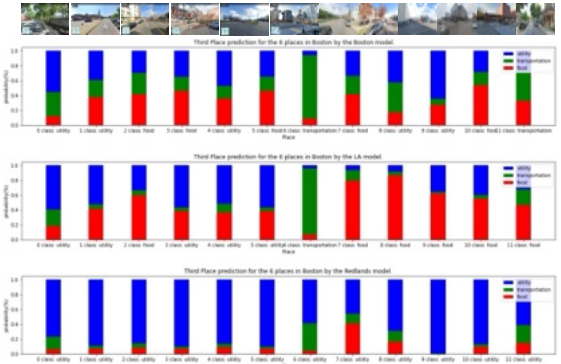


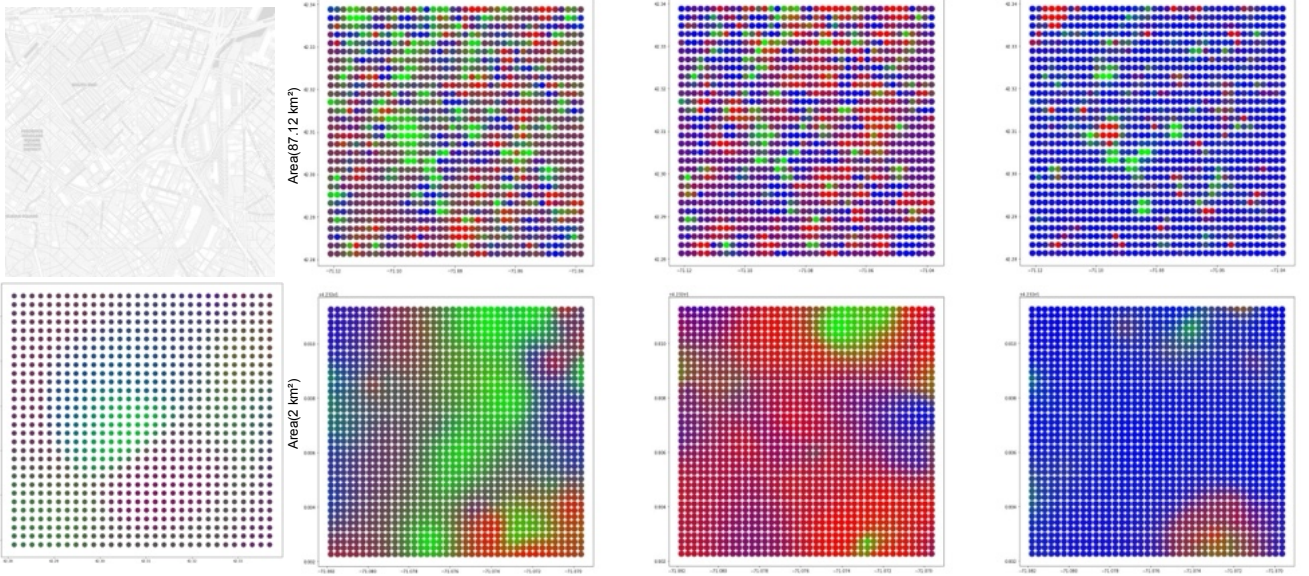
Third Place prediction results in Boston

South Station Boston, MA | 5 Southampton St, MA | 797 Columbia Rd, Boston, MA



Boston, MA | Los Angeles, CA | Readland, CA





Area(87.12 km²) | Area(2 km²)

Food | Transportation | Utility

Boston, MA | Los Angeles, CA | Readland, CA

02. Built Environment Assessment for the Housing Value Prediction

Date : 2016 Fall
Type : CS 109 Data Science, John A. Paulson School of Engineering and Applied Sciences, Harvard University
Role taken : **research, design, drawing ,modeling, visualization**
Critic : Prof. Pavlos Protopapas, Kevin Rader, Weiwei Pan
Team: Jia Gu, Eille Jungmin Han

http://www.njstudio.co.kr/main/project/2016_HarvardCS109_DataScience/index.html

Is there any relationship between Built environment and housing and rent prices?
This question motivates us to investigate to emerge the relationship between social economic aspect (housing and rent price data) and urban spatial data (Built environment data) in City of Boston.

Methodology
We define city infrastructural data such as the current housing price, energy consumption of the area, income of neighborhoods, transportation accessibility, green space in the neighborhoods, specific housing features, and crime rates as "top-down data". We also define informal crowd-sourcing data such as, twitter texts, Instagram tags, or yelp reviews as "bottom up data" . There is a third category of data that has not been widely deployed yet which we define as the "holistic visual data". It is the general impression to your visual surroundings when you at a specific spot that we believe can be captured by google street views.

By testing on the data of visual surroundings as dependant variables, we hope to capture missing information from the top down data and therefore tell if the visual environment is a significant feature in a housing prediction analytical model. We use machine learning methodology to pre process Google street views to give certain attributes. To combine different data sets (from top-down to bottom-up) into one file for machine learning, we use graph data structure. Basically, we collect information on different locations and merge them together in specific pixelized grid based data points utilizing graph structure.

Step 1 :Data Parsing
Parsing, clearing, and data structure

Step 2 :Data Exploration
Data Visualization and Exploration

Step 3 :Leraning Housing Price
Lasso, ridge, RandomForest Regression, and ETC

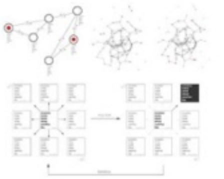
Step 4 :Leraning Renting Price
KNN, Lasso, ridge, RandomForest Regressor, PCA for Logistic Regression, Decision Tree, Random Forest Classifier, and ETC

Step 5 :Conclusion
the conclusion of the research

1. Data Parsing

There are two different data sets: 1) social economic data representing city of boston as a social aspect such as land price, crime, energy usage, and so on, 2) Urban spatial data representing city of boston as a urban.

Data Structure : Graph and Pixel Data



SOCIAL ECONOMIC DATA
Renting Prices Data From Trulia
data type : numeric and category
featrues: umber of room and bathroom, zip, address, date, rent price, SQFT(Square Foot/Feet)

Housing Prices Data From Zillow
data type : numeric and category
featrues: geographic coordinate, last_sold_price, number of bathrooms and bedrooms, zestimate amount, prices, property size, zip, tax year, status, address, last sold date, tax value, year built, home_size, home_type, property

Energy data in Boston from Boston Data
data type: numeric and category
featrues: Site EUI, geographic coordinate, Tax Parcel, Years Repo, Site Energ, ZIP, ShapeSTLen, Energy Star, Pct Gas, Reported, Pct_Elect, Address, GHG Intens, Year Built, Property T, Water Inte

Crime data in Boston from Boston Data
data type: numeric, string, and category
featrues: year, type of crime, geographic coordinate

Poperties Assessment in Boston from Boston Craigslist
data type: numeric, string, and category
featrues: average land values, geographic coordinate

House and Room post data in Boston from Boston Craigslist
data type: numeric, string, and category
featrues: date, title of post, content of post, geographic coordinate

URBAN SPATIAL DATA
google place from Google place API
data type: numeric, string, and category
featrues: geographic coordinate, type of places(school, food, MBTA, etc...)

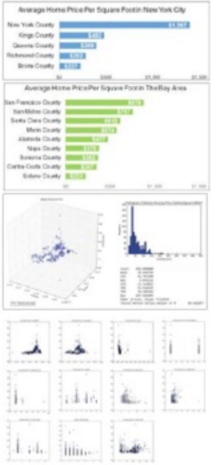
google street view from Google street API
data type: image
featrues: RGB values and mathematical numerical features

2. Data Exploration

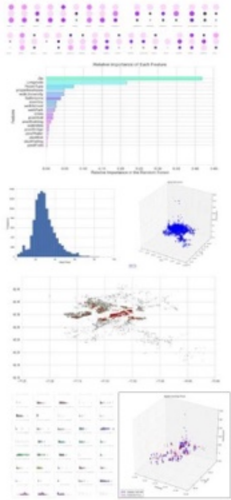
On top of the top down data (generated by the local government), the bottom-up data (post processing of Google Street Views, Google Places, and Craigslist Boston), and the top-down data(Crime data from Data Boston and hosing price data from Zillow) can be mapped and deployed for train and contrive the analytical model of predicting housing price. To process the google street view data, there are two data structures (pixel and graph data structure) where individual data are populated and calculated. Pixel data structure is a matrix, discretizing an urban or district into a finite setting for analysis, in which each pixel has the relationship with its neighbors, and each one computes its own data on the basis of neighbors' settings, so that urban data can be naturally addressed and computed in spatial context.

3. Learning Housing Price

We explored housing prices statistics and the relationshpi between Boston housing price and our dataset features. Boston's average housing price is around $58/m2 and the median is about $80/m2 while it has a range from $9.4/m2 to $447/m2, which ranks quite high nationally.According to Zillow home values report , the national average housin gprice is $13.2/m2.(http://www.zillow.com/home-values/)

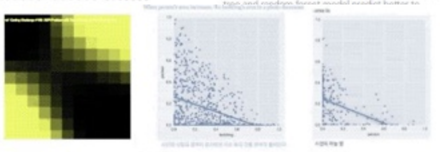


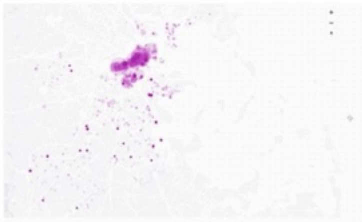
4. Learning Renting Price



5. Conclusion

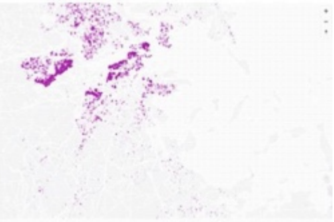
Intricated urban matrix needs to be organized such an order, but there are multiple factors effecting urban issues including land values and housing prices. From our project, it can be said that decision





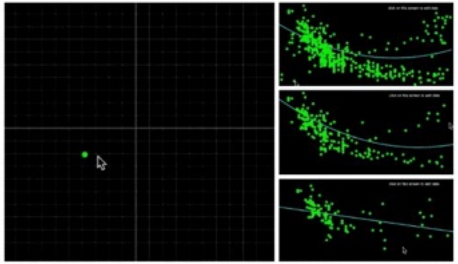
Housing Price data from Zillow

number of data used: 988 houses



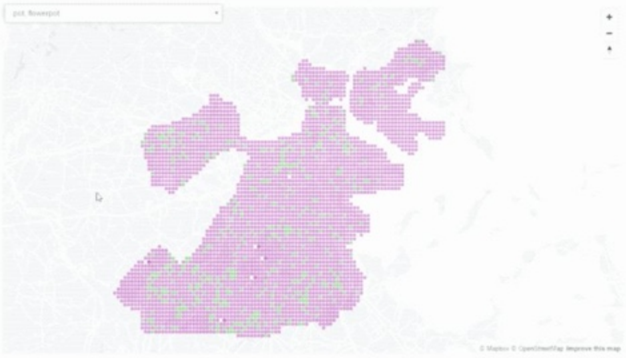
Rent Price data from Trulia

number of data used: 13049 rents



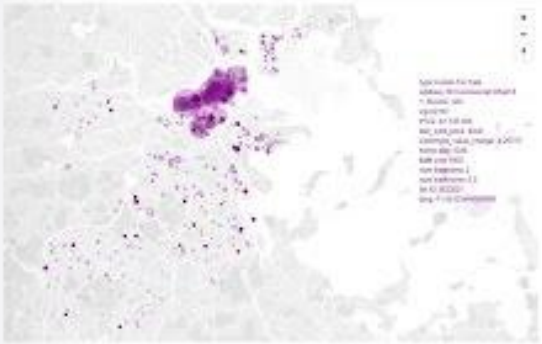
Crime Data from Boston Data

number of data used: 5,001 crimes



Data from Google street view + Deep Learning for semantic segmentation

Image data used: 18,588 images



Housing Price data from Zillow

number of data used: 988 houses

Rent Price data from Trulia

number of data used: 13049 rents

"Politics of Space and its Shadows" in the Seoul Biennale International Studios (SBIS):

Date : 2017
Type : architectural urban research exhibition
Role taken : **Research and Visualization**

Link

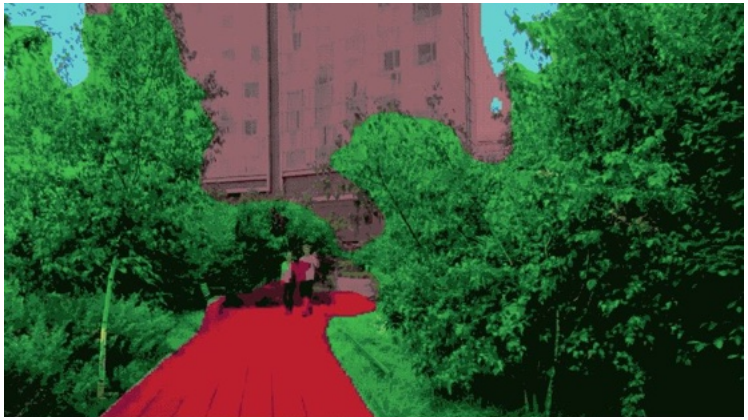
Overview of Project

This project examines how the changing urban environment is perceived by the public and how they are represented through new emerging technologies. I developed a design pipeline for the project that enabled analyzing and visualizing big-data available to the public.

There are an enormous amount of big data being produced by the public, images posted on Instagram is such example. In parallel, there are emerging computational algorithms that process such big-data. However, the urban design discipline has not been able to meaningfully bridge the gap between these emerging technologies and the accumulating big-data. This project attempts to bridge this gap by examining new methods to use big data to better understand public spaces.

The technical workflow is as follows: 1) parse data 2) process data 3) analyze emerging result from the raw data. In the first step, I developed a program to download all images that people upload on the web in the site. By using Deep Learning, I analyzed the image data and converted them into numerical data for processing. As the last step, I classified the results using important keywords associated with the images. The result of this research was invited and exhibited at the Seoul Biennale International Studios (SBIS) exhibition curated by John Hong (SNU) at the inaugural Seoul Biennale of Architecture and Urbanism directed by Hyungmin Pai and Alejandro Zaera-Polo.

Link:
http://www.njstudio.co.kr/main/project/2017_PoliticsofSpaceAndItsShadows/2017_PoliticsofSpaceAndItsShadows.html



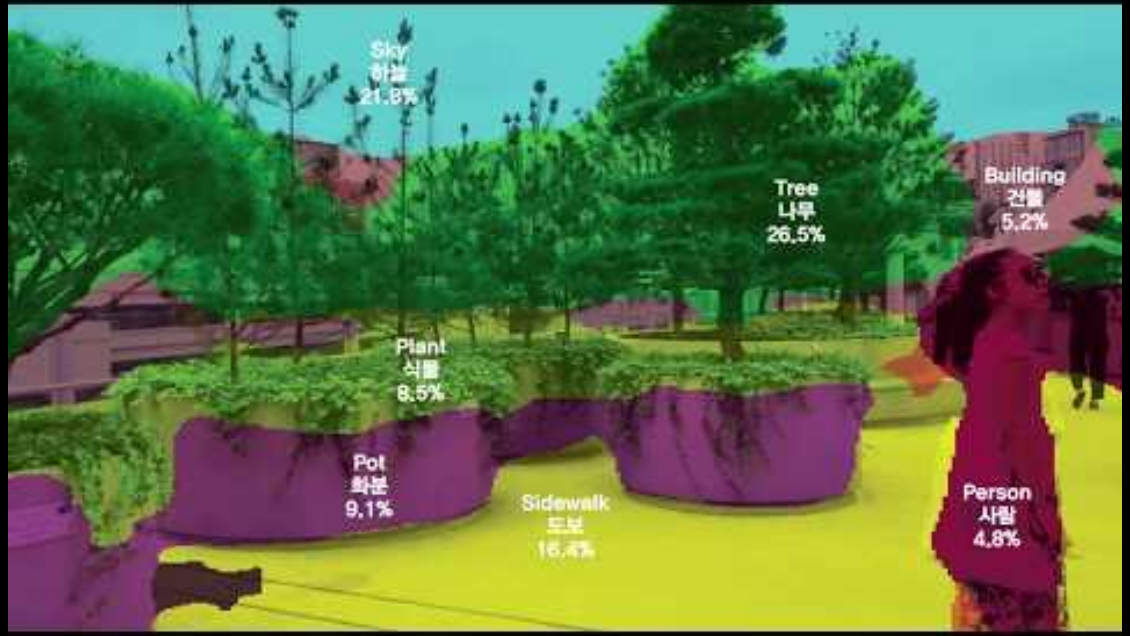
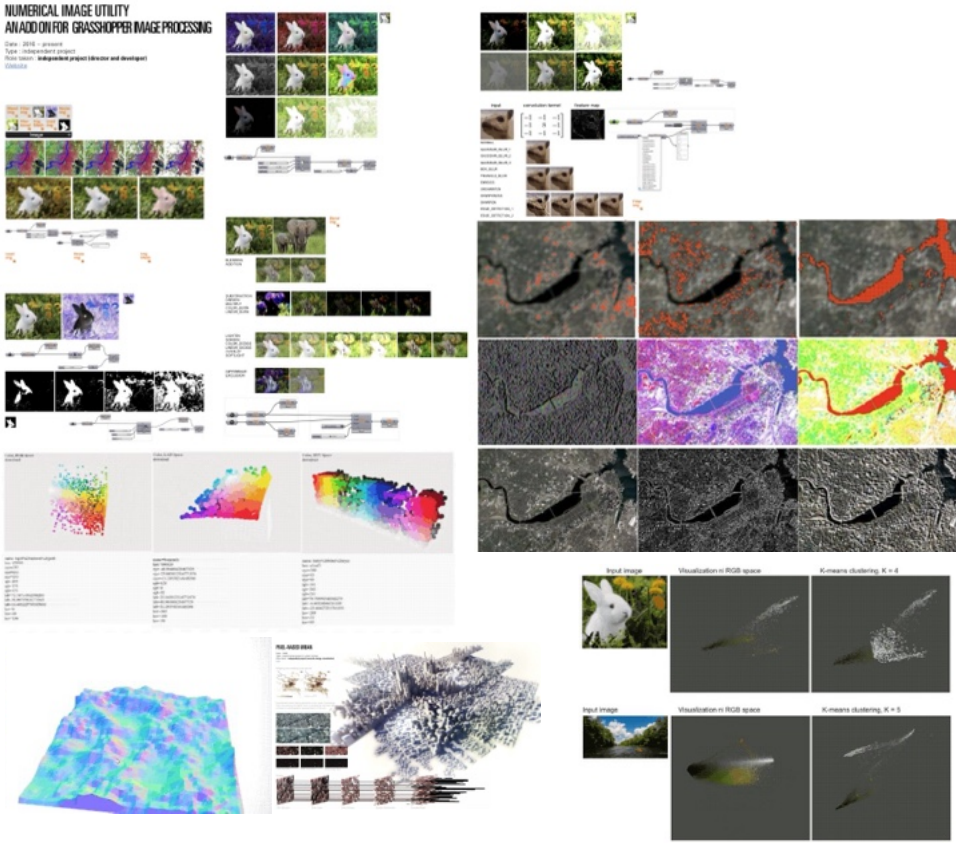

Sky
하늘
21.8%
Tree
나무
26.5%
Building
건물
5.2%
Plant
식물
8.5%
Pot
화분
9.1%
Sidewalk
도보
16.4%
Person
사람
4.8%

IMAGE PROCESSING

remote sensing / color processing

http://www.njstudio.co.kr/main/project/2018_NIU_Development/2018_NIU_Development.html

Addon for Grasshopper
https://www.food4rhino.com/app/numerical-image-utility



AERIAL SEMANTIC SEGMENTATION

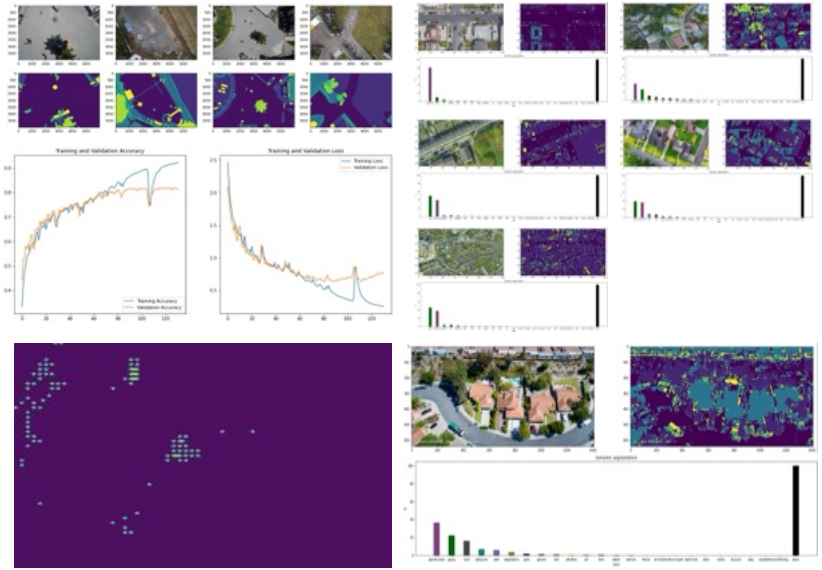
Machine Learning & Implementation

Link: https://computationaldesign.tistory.com/29

Reference: https://www.kaggle.com/datasets/bulentsiyah/semantic-drone-dataset

Classes

[unlabeled, paved-area, dirt, grass, gravel, water, rocks, pool, vegetation, roof, wall, window, door, fence, fence-pole, person, dog, car, bicycle, tree, bald-tree, ar-marker, obstacle, conflicting]

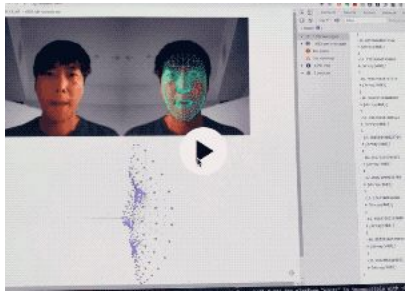


THE COLOR AI

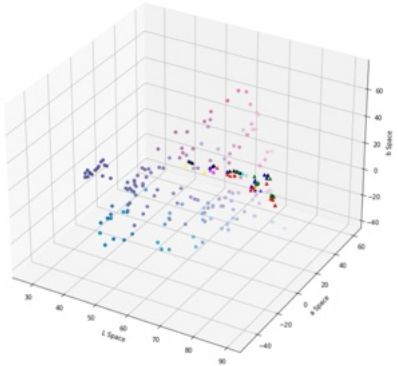
Machine Learning & Implementation

Link: https://computationaldesign.tistory.com/29

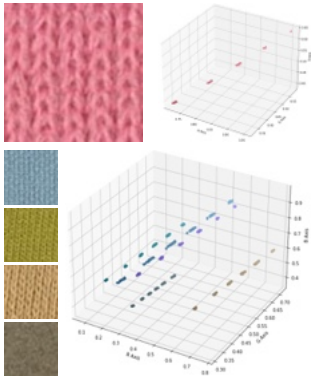
Personal Color & prediction and implementation

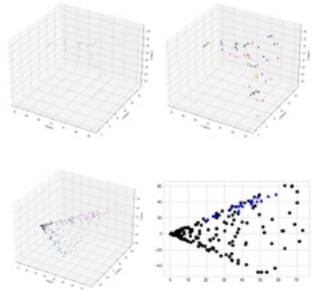


Demo



Texture detection



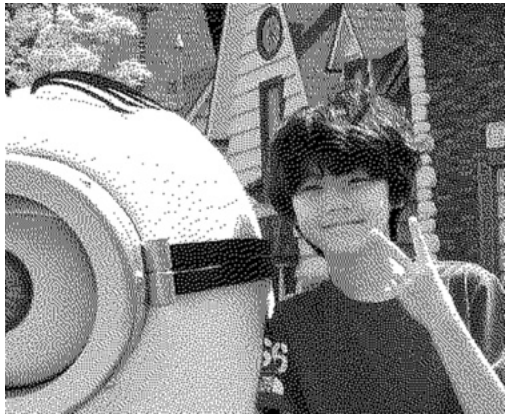


REST API and Image Processing

Machine Learning & Implementation

Link: https://computationaldesign.tistory.com/29

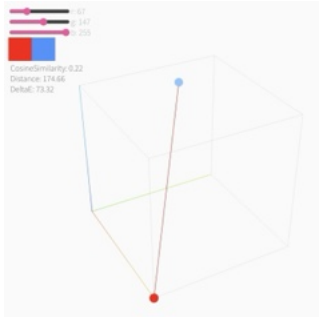
Demo



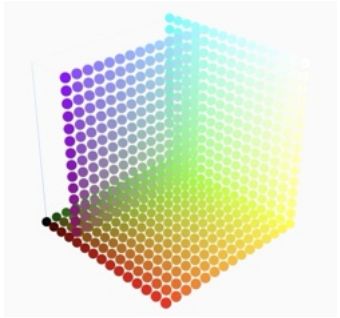
Demo

Demo

colors spaces

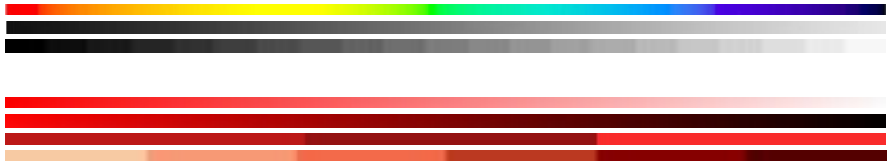


Color Difference



Color Space

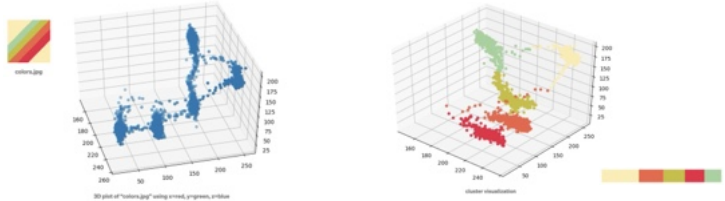
color as scales



https://namjulee.github.io/njs-lab-public/lab/color/color%20space?ui=0

Dominant colors

in an image using k-means clustering



Ref:: https://buzzrobot.com/dominant-colors-in-an-image-using-k-means-clustering-3c7af4622036

SMTracer

Sketch to Map Translator

ESRI Storymaps Hackathon
Link: https://computationaldesign.tistory.com/29

LANGUAGE
Python
Typescript

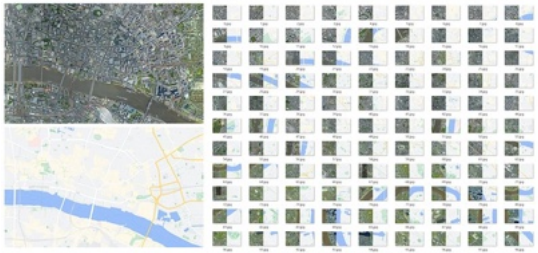
LIBRARY
Tensorflow, 2.5.0
CV2, numpy, PIL, ...
HTML Canvas, NJSCoreLib

MODEL(NETWORK)
pix2pix: Image-to-image translation with a conditional GAN (a modified U-Net)

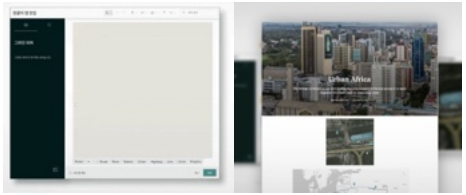
PROCESS
1. Data Collections and Preprocessing:
2. Trains and Validations for each model:
3. Design, Visualization and Video:
4. Development for Sketch App:

Sketch-to-Map Translator

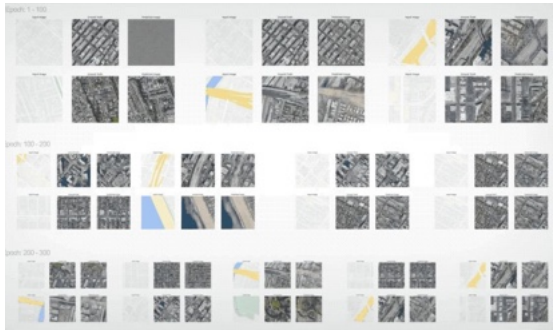
Data collection and preprocessing



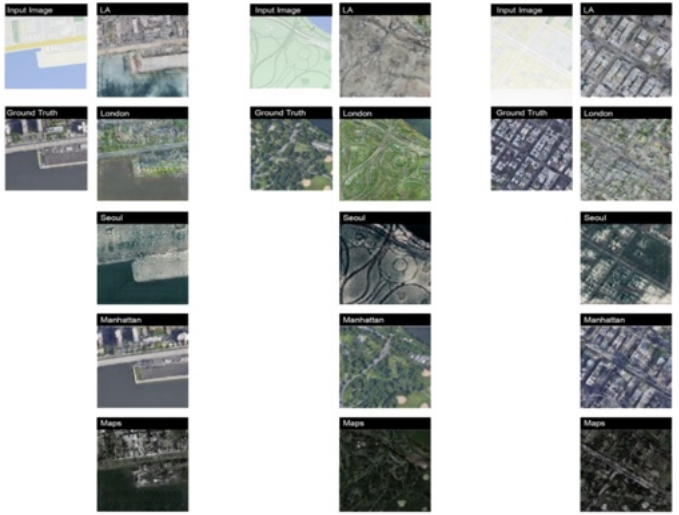
Sketch App



Training and Predictions



Generated maps by different city looks(Seoul, London, Manhattan, LA ...)



Generated maps by the machine

esri Hackathon

Generated maps by the machine

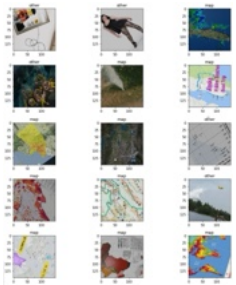
Map Classifier

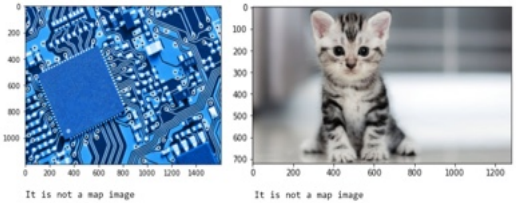
Machine Learning & Implementation

Link: https://computationaldesign.tistory.com/29

Classes

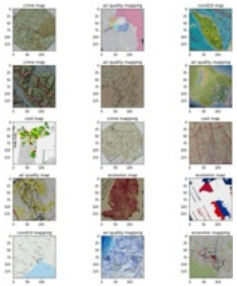
2 : [map, other]

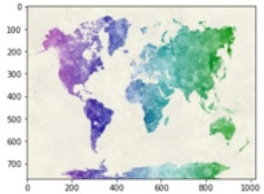




Classes

22: [air quality map, air quality mapping, cool map, cool mapping, covid19 map, covid19 mapping, crime map, crime mapping, economic map, economic mapping, fire map, fire mapping, forest map, forest mapping, national park map, national park mapping, population map, population mapping, traffic map, traffic mapping, weather map, weather mapping]





weather map

	air quality map	cool map	covid19 map	crime map	economic map	fire map	\
0	0.000885	0.000079	0.000001	0.005158	0.00055	0.000002	

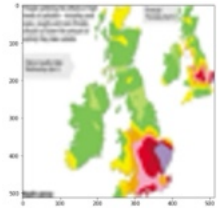
	forest map	national park map	population map	traffic map	weather map
0	0.000012	0.000017	0.00068	0.000472	0.992143

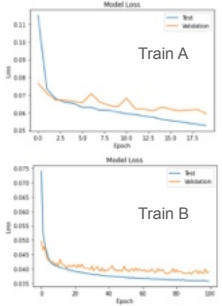
Map Super Sampling

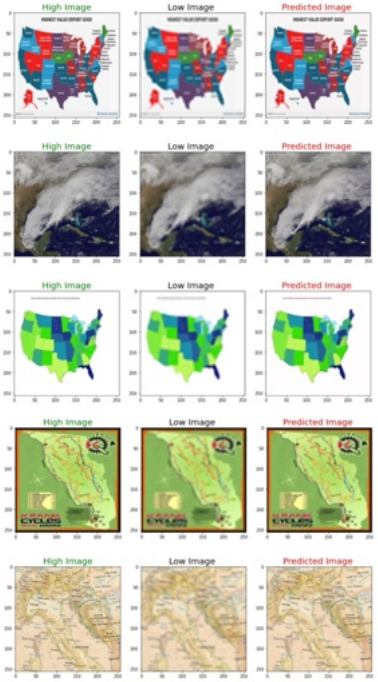
Machine Learning & Implementation

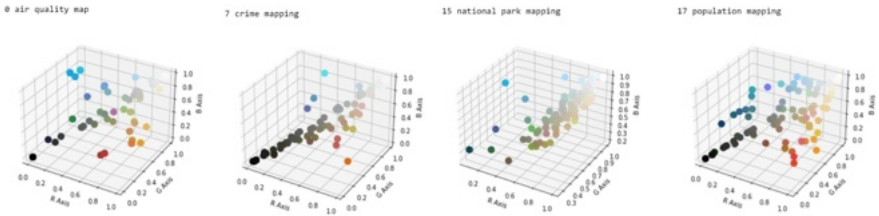
Link: https://computationaldesign.tistory.com/29

Train data : 3,000 (maps)









NNA, NUMERIC NETWORK ANALYSIS TOOLBOX

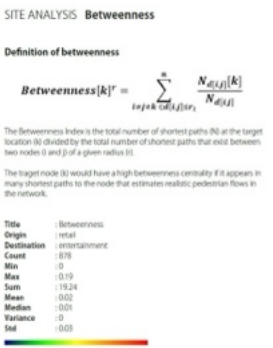
Medium:
https://nj-namju.medium.com/numeric-network-analysis-post-covid-19-urbanism-6-ft-rule-de267886b028

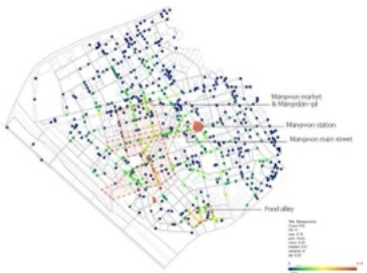
Addon For Grasshopper
https://www.food4rhino.com/app/numeric-network-analysis-nna

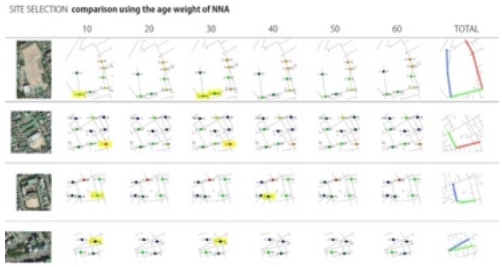
Lecture, NYIT
https://youtu.be/_9l7dp5q6A0

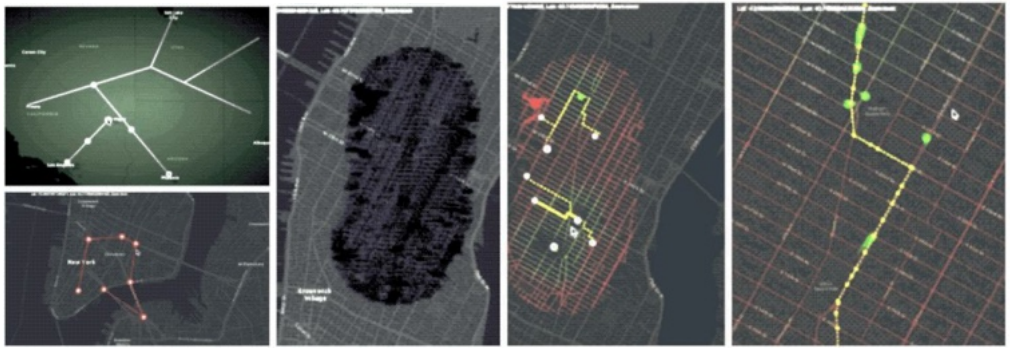
Accessibility Analysis
Reach, Gravity, Huff-model

Centrality Analysis
Betweenness, Closeness, Straightness, Degree

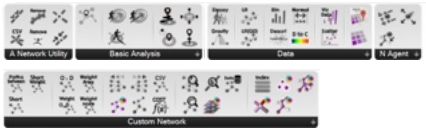


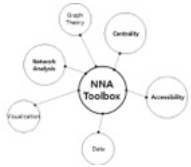






Graphic User Interface for the GH implementation

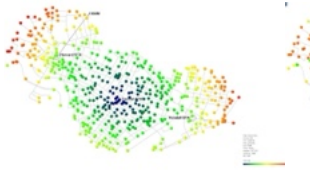




Degree
(No. connectivity at each node)

In graph theory, **Centrality** estimates to determine the **hierarchy of nodes or edge within a network**. The centrality analysis uses for diverse urban scales for local and global. A local centrality defines the distance between nodes within a given radius and a global centrality calculates the distance between nodes in a whole system. The Centrality Index is useful to understand the operational analysis of network flow tendency in transportation geographies, such as airline networks, road networks, and canal networks. As well as it measures to understand a node (location) importance in space.

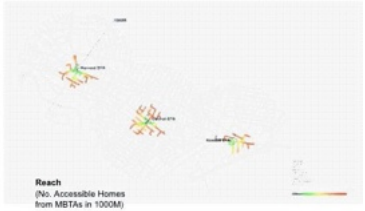
Betweenness
(Home to MBTAs)



Closeness
(Home to MBTAs)

Straightness
(Home to MBTAs)

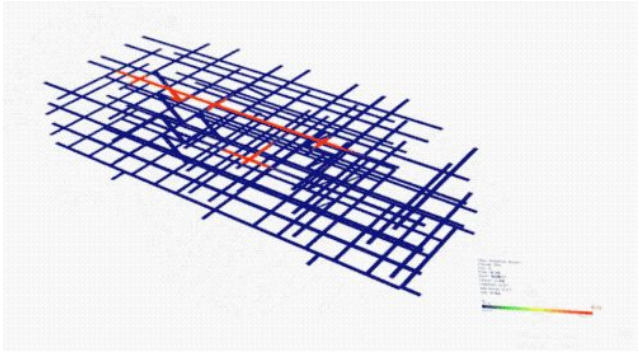
Huff
(Probability to visit locations)

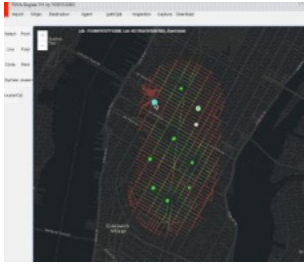


Reach
(No. Accessible Homes from MBTAs in 1000M)

Gravity
(Discounted No.accessible Homes from MBTAs in 1000M)

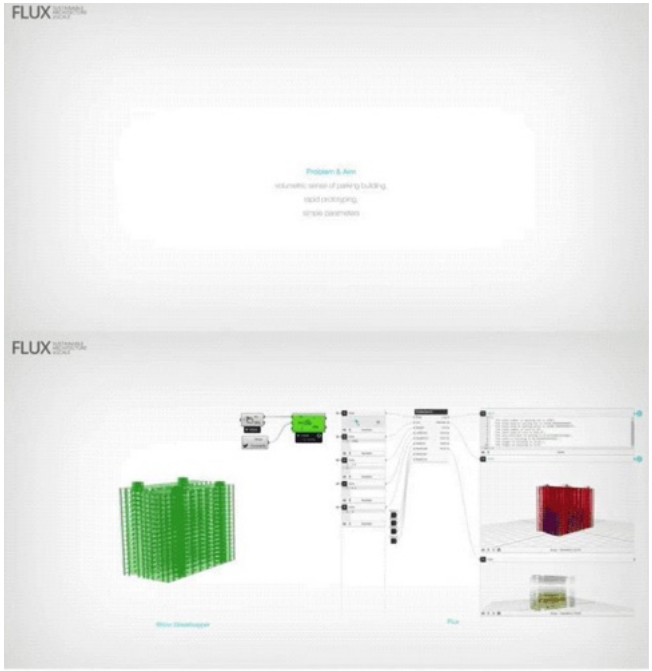
Accessibility analysis has been researched in the field of physical planning and spatial modeling for over 50 years. The concept of accessibility explains both **activity patterns in space** and the **connections between activities** linked to Newton's law of gravity. Hansen's "How Accessibility Shapes Land Use" (1959) was the first defined paper about accessibility as a potential of using urban planning.

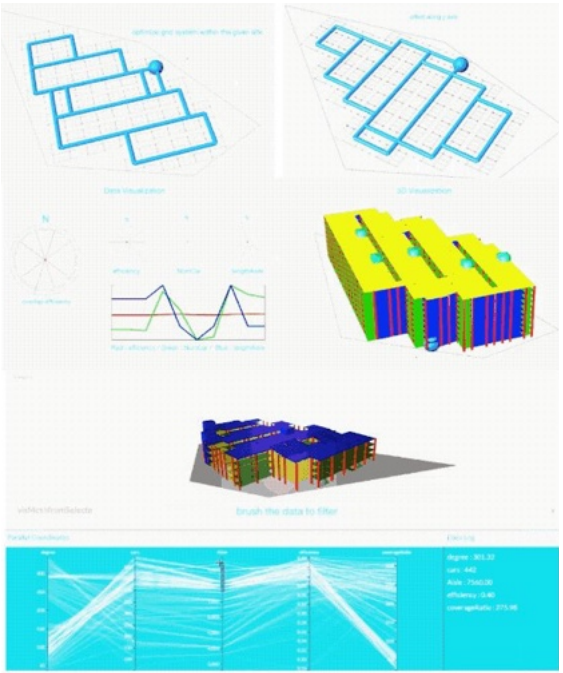


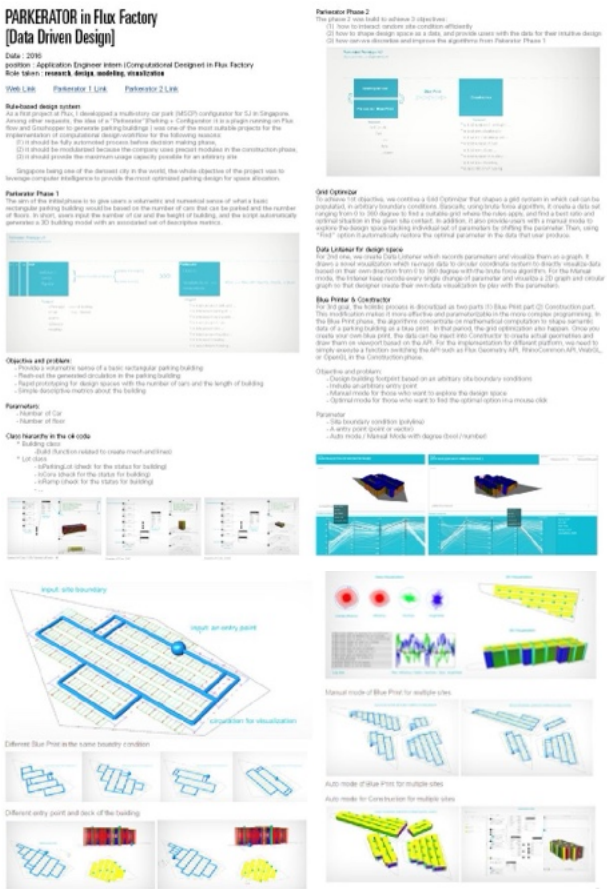


PARAMETRIC & OPTIMIZATION 2016

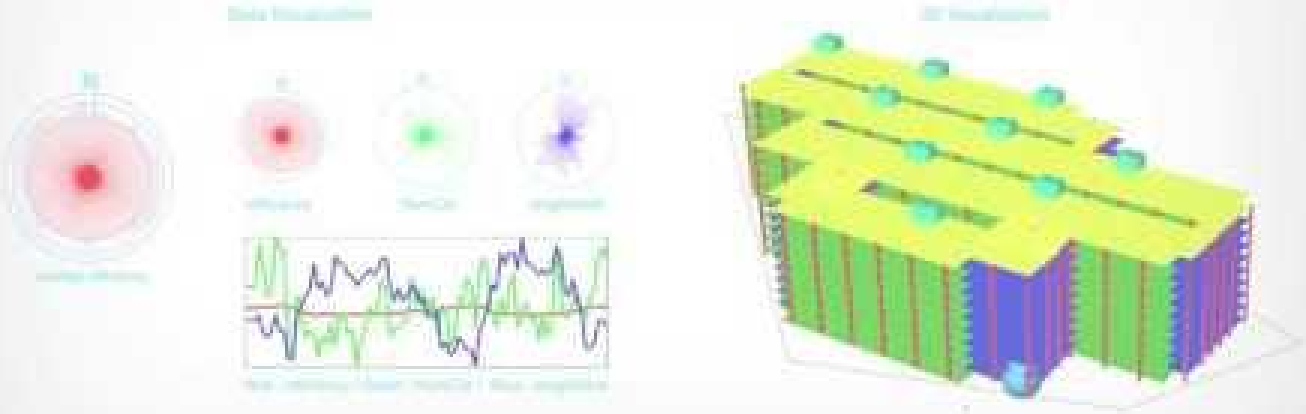
http://www.nistudio.co.kr/main/project/2016_FluxFactoryParkerator/2016_FluxFactoryParkerator.html





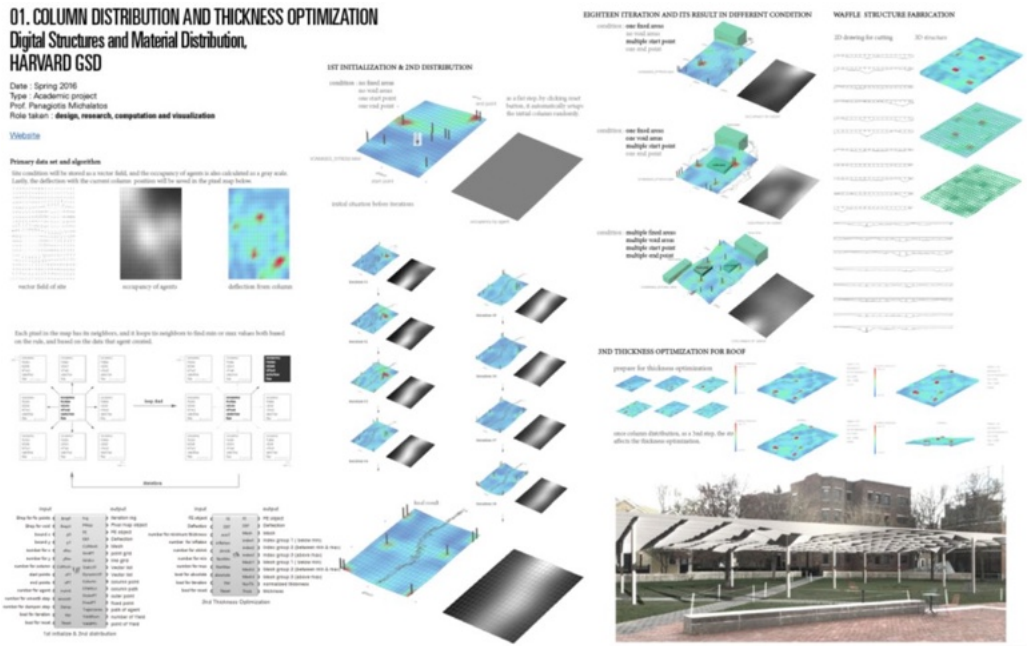


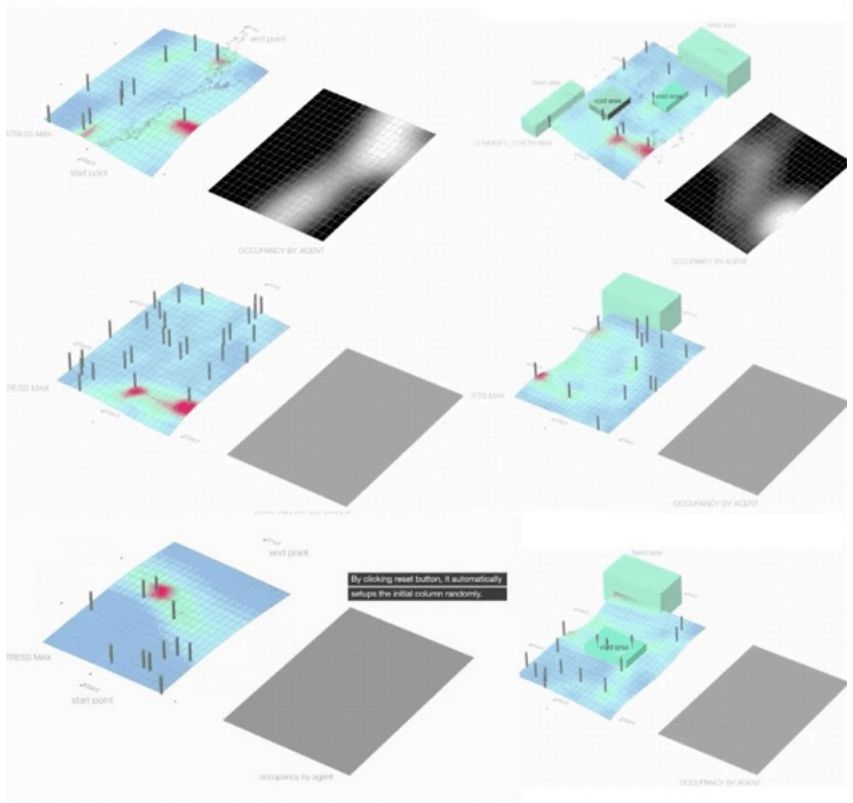
FLUX

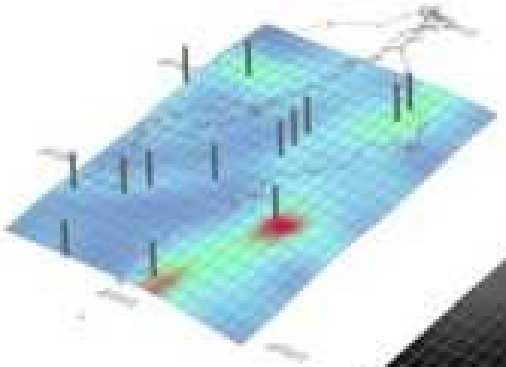


STRUCTURE & OPTIMIZATION

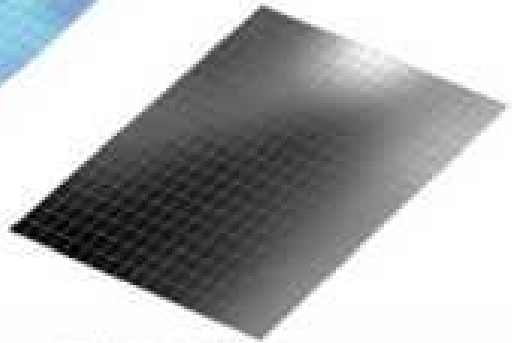
http://www.njstudio.co.kr/main/project/2016_ColumnDistribution/2016_ColumnDistribution.html







different number of inital column



OCCUPANCY BY AGENT

DESIGN SYSTEM & AI, ML
VOXEL REPRESENTATION

http://www.njstudio.co.kr/main/project/2017_thesisVoxelHarvardGSD/public/

REMIXING & RESAMPLING THREE DIMENSIONAL OBJECTS
Use of Volumetric Representations and Machine Learning in design

Date : 2016 – 2017
Type : thesis project at Harvard GSD
Role taken : **independent project**
Website

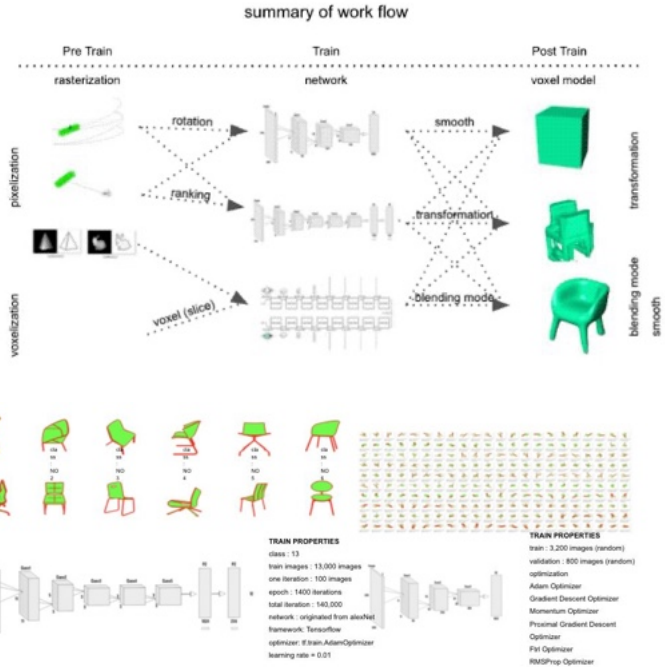
Digital Design Prize, class of 2017, Harvard GSD

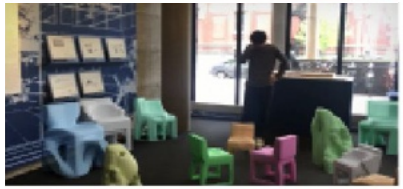
ABSTRACT

This thesis aims to explore the opportunities of remixing and resampling three-dimensional geometry data with the use of volumetric representations and machine learning in design. A voxel is a volumetric element representing a fragment of space. There are various types of implementations of voxel representations in different fields such as game design, simulations, architecture, fabrication, medical or computational design.

This thesis consists of the following parts: First, it introduces what voxel modelling is, compared to traditional modeling techniques. It looks at the advantages and disadvantages of a voxel representation compared to conventional digital modeling techniques such as Mesh or NURBS modeling paradigms. It also describes characteristics of voxel space covering as pixelated and voxelated space, as a dense representation (implicit relations) compared to sparse representation (explicit relations), and its data manipulation in relation to voxel space.
Similarities of voxel representations and two-dimensional images, enable us to leverage the developments of the past few years in the field of image analysis and machine learning and extend them into the third dimension. Therefore, the second part of the thesis investigates the use of machine learning techniques with the opportunities for pixelated and voxelated representation of 3D geometry by analytical inference, numerical modification, and blending multiple volumetric geometries.

The thesis examines several prototypical implementations of proposed design systems or workflows, as a series of experiments based on the process from rasterization, (1) pixelated, (2) voxelated (3) depth, of 3D geometry with machine learning, (1) convolutional neural network(CNN) and Generative Adversarial Networks(GAN), in order to show new types of geometries by voxel blending.





voxel by slicing

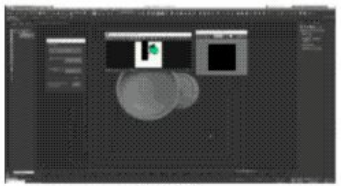
blend modes

blend A to B

voxelated geometry

smooth

smooth



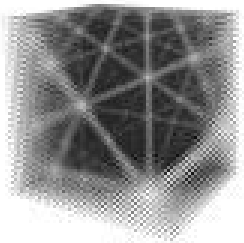
rendering

slice mesh with Monolith

Harvard University
Graduate School of Design

Design workflows integrating Machine Learning and voxel representations

Remixing & Resampling Three Dimensional Objects
Use of Volumetric Representations and Machine Learning in Design



Advisor: Prof. Panagiotis Michalatos, Harvard GSD

Advisor: Prof. Takehiko Nagakura, MIT

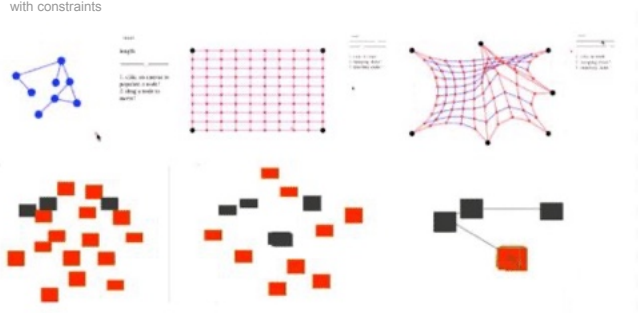
NU Namju Lee

Thesis project, MDes

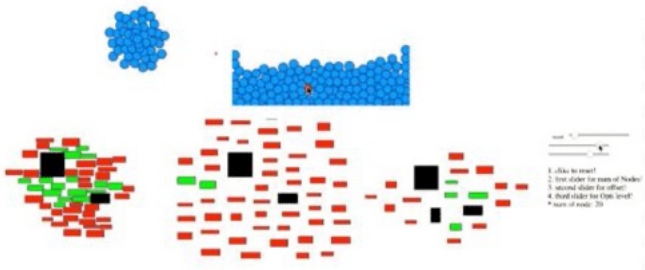
Geometry and Position Optimization

based on graph and spring model physics

Position Optimization
based on graph and spring model physics
Experimentation for overlapping text boxes
with constraints

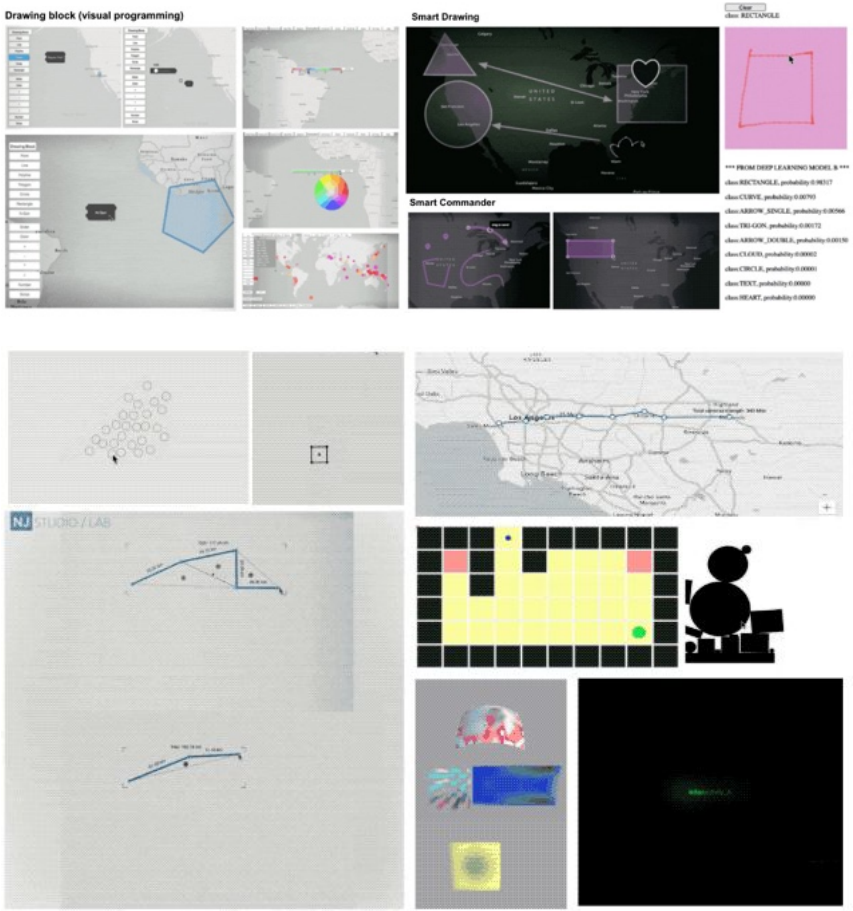


Position Optimization, Second
agent-based optimization
and physics engine
with different level of optimization and offset



Advanced Geometry manipulations

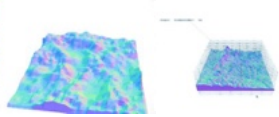
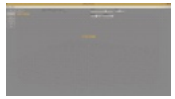
Dynamics, Spring, Voxel, Shader ...

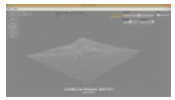


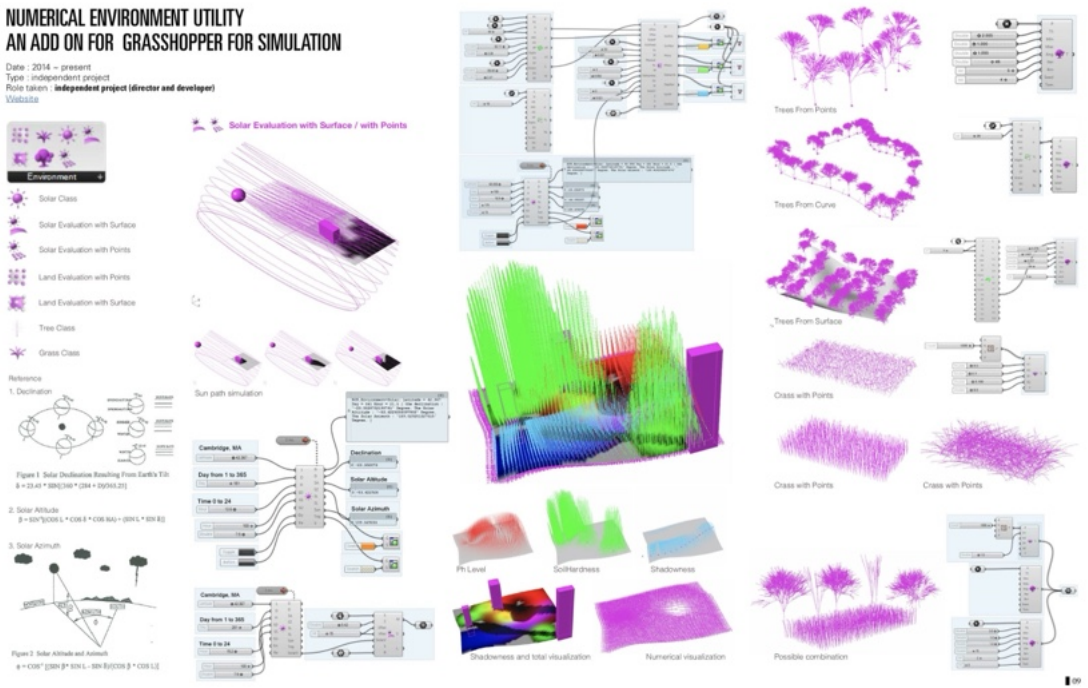
LANDSCAPE & ENVIRONMENT

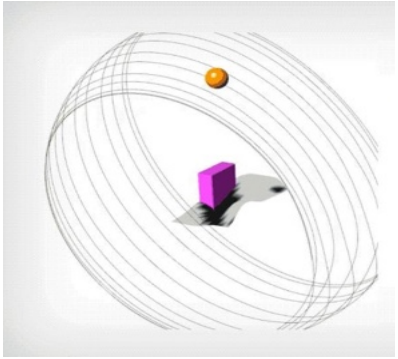
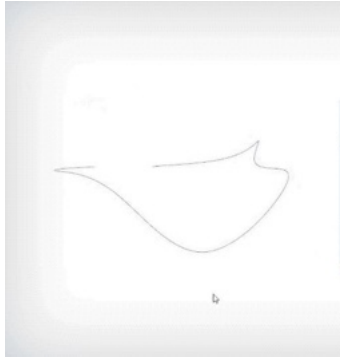
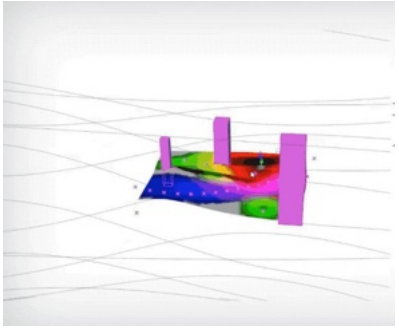
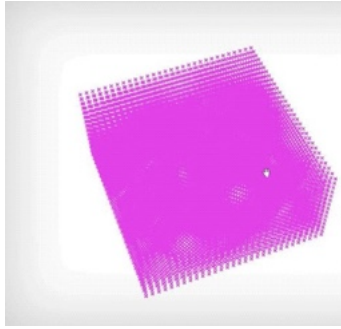
http://www.njstudio.co.kr/main/project/2015_NEU_Development/2015_NEU_Development.html

Addon for GH
https://www.food4rhino.com/app/numerical-landscape-utility





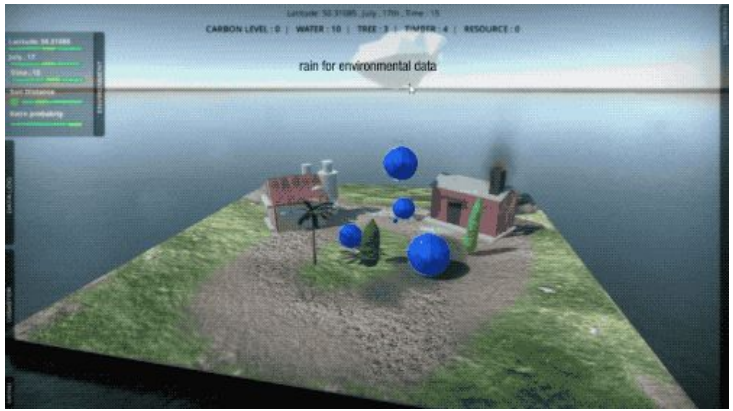
Numerical Environment Utility

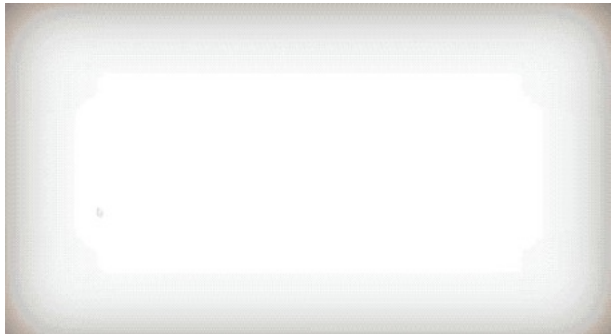
data in pixel and voxel, Version 2015

www.nstudio.co.kr

DESIGN SYSTEM & COMPLEX SYSTEM

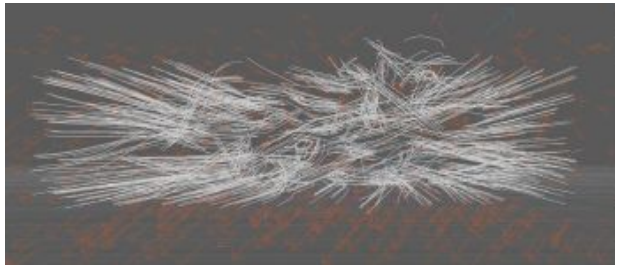
http://www.nistudio.co.kr/main/project/2016_SmallEnvironments/2016_SmallEnvironments.html

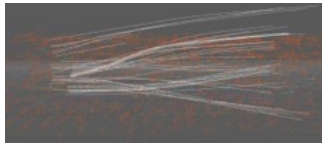


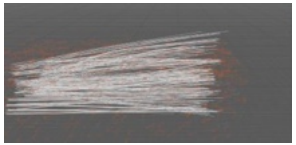


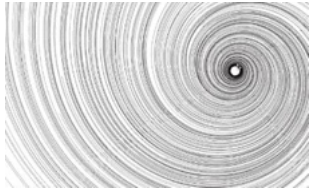
Field & Particle

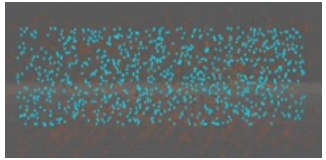
DYNAMICS

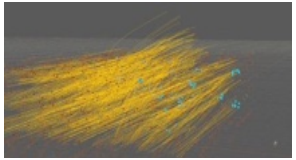


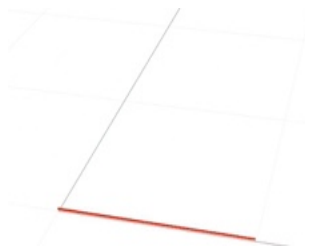


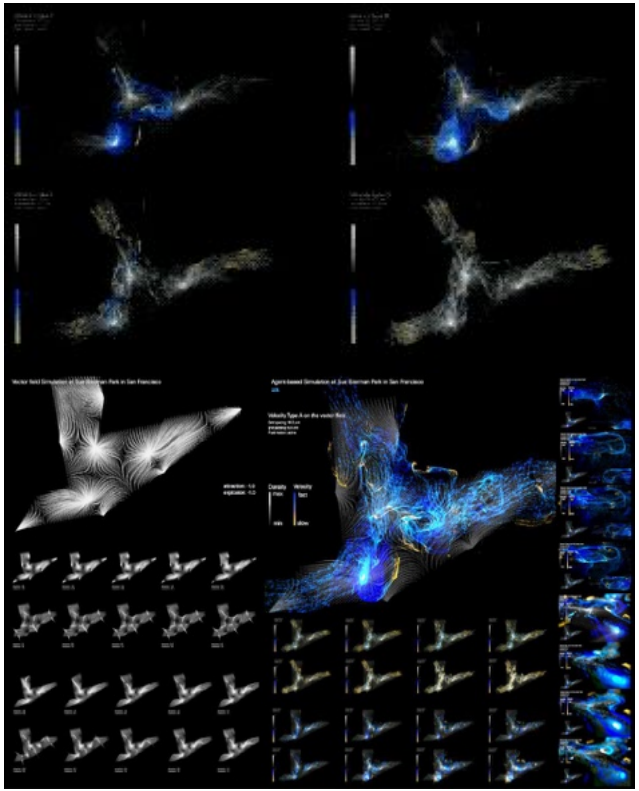




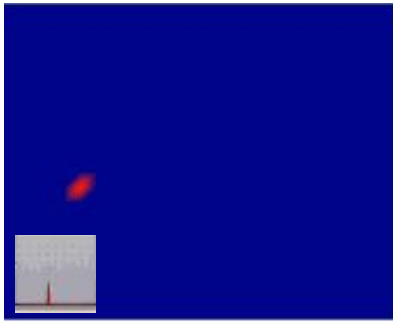


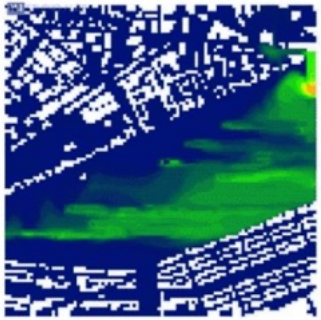


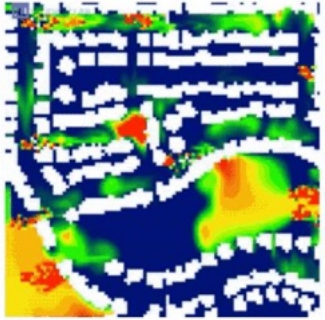


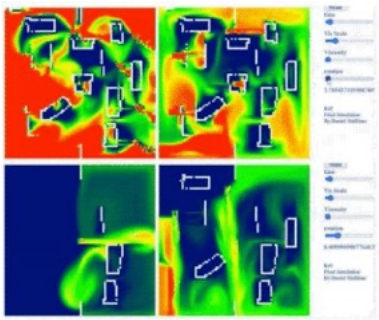


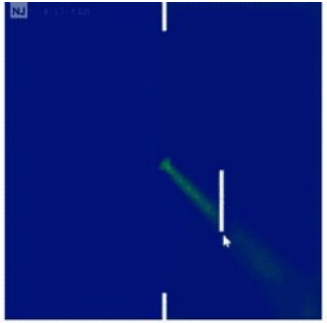
Fluid dynamics simulation

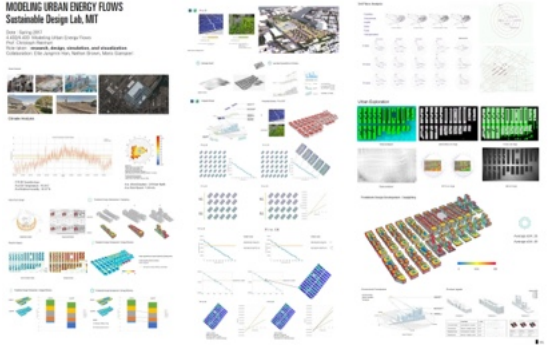


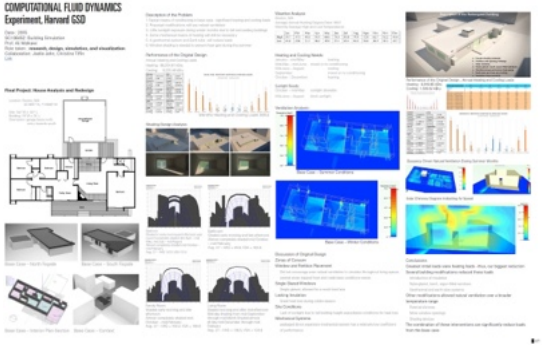










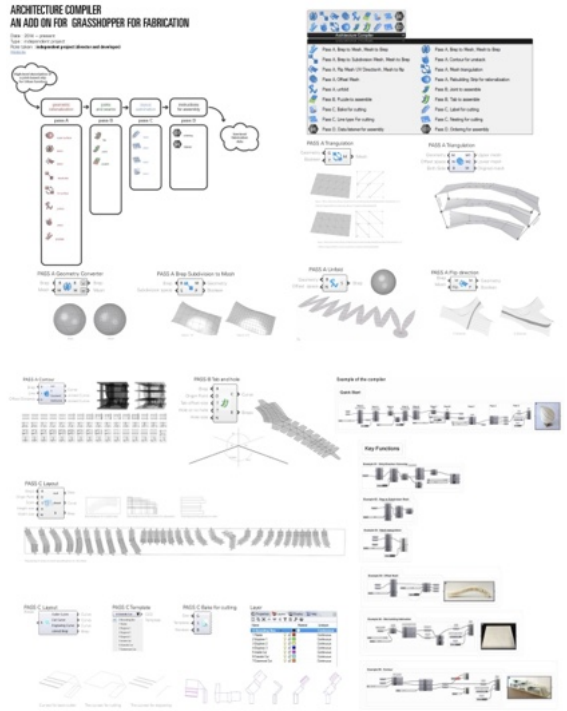


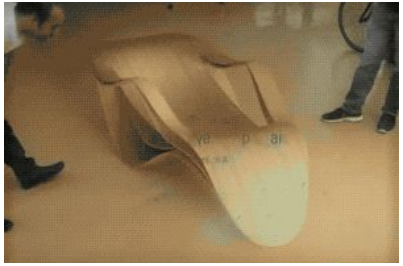
FABRICATION & DIGITAL MOCKUP

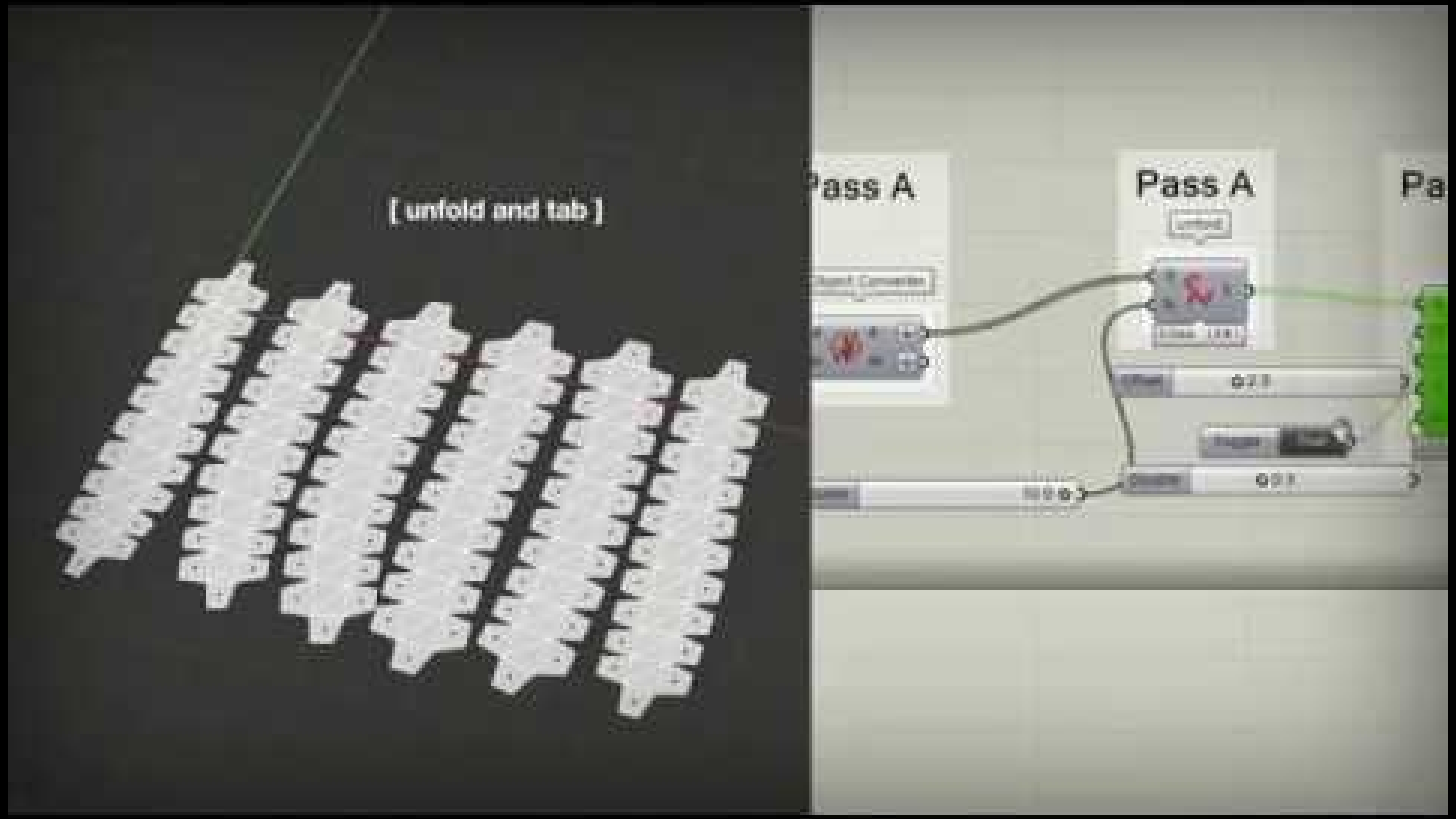
http://www.njstudio.co.kr/main/project/2015_AC_Development/2015_AC_Development.html

http://www.njstudio.co.kr/main/project/2015_STRIP-BASED_FABRICATION[RESEARCH]/2015_STRIP-BASED_FABRICATION%20[RESEARCH].html

Addon for GH
https://www.food4rhino.com/app/architectural-compiler-digital-fabrication






[unfold and tab]
Pass A
Pass A

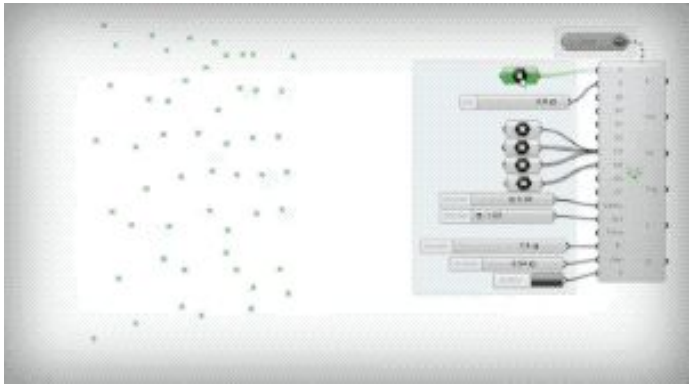
NJSTUDIO 2015 DIGITAL MOCKUP DEMO REEL

FIFTH EDITION, SELECTED WORKS SINCE 2004

n.ninja@gmail.com
www.njstudio.co.kr

MATERIAL & COMPUTATION

http://www.njstudio.co.kr/main/project/2015_NanoMicroMacro/2015_NanoMicroMacro.html

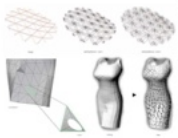


TRMORESPONSIVE FABRIC AND BLIND

Nano Micro Macro: Adaptive Material Laboratory, HARVARD GSD

Date : Fall 2015
Type : Academic project
Prof. Martin Bechthold, James Weaver
Role taken : **design, research, computation and visualization**
Collaboration : Ji Hyuk Choi, Taehyun Jeon

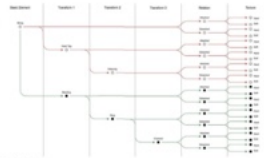
Website Link

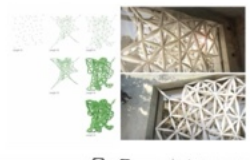


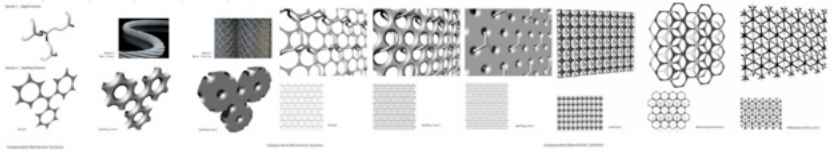
Concept
This design responds to thermal changes by varying the scale of porosities. The system consists of two separate membranes: one is rigid and the other is swelling. Basically, as the second membrane swells, cavities within the surface gets smaller to respond to outside thermal conditions.

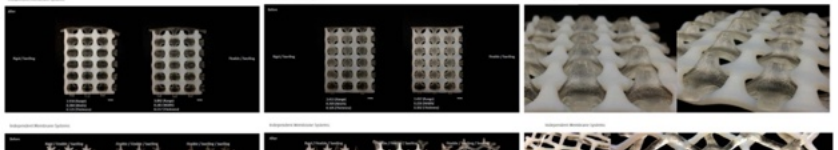
Core Technology
Thermo-responsive Swelling

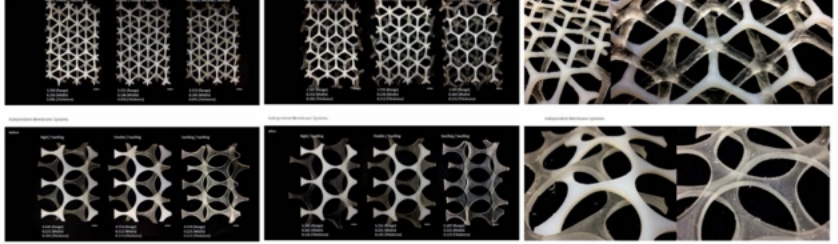
Material & Process
This experimentation is mainly done by 3d printing with the swelling materials. It was started from a basic shape for measuring the capacity of swelling toward more complex structures to maximize transformation by catalysis. Then, the computational model was created based on the measured data, and it was simulated in the digital setting.

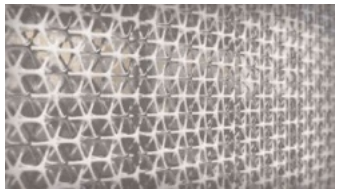


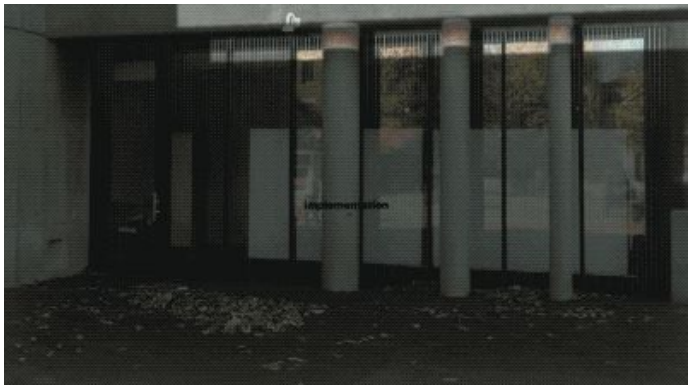


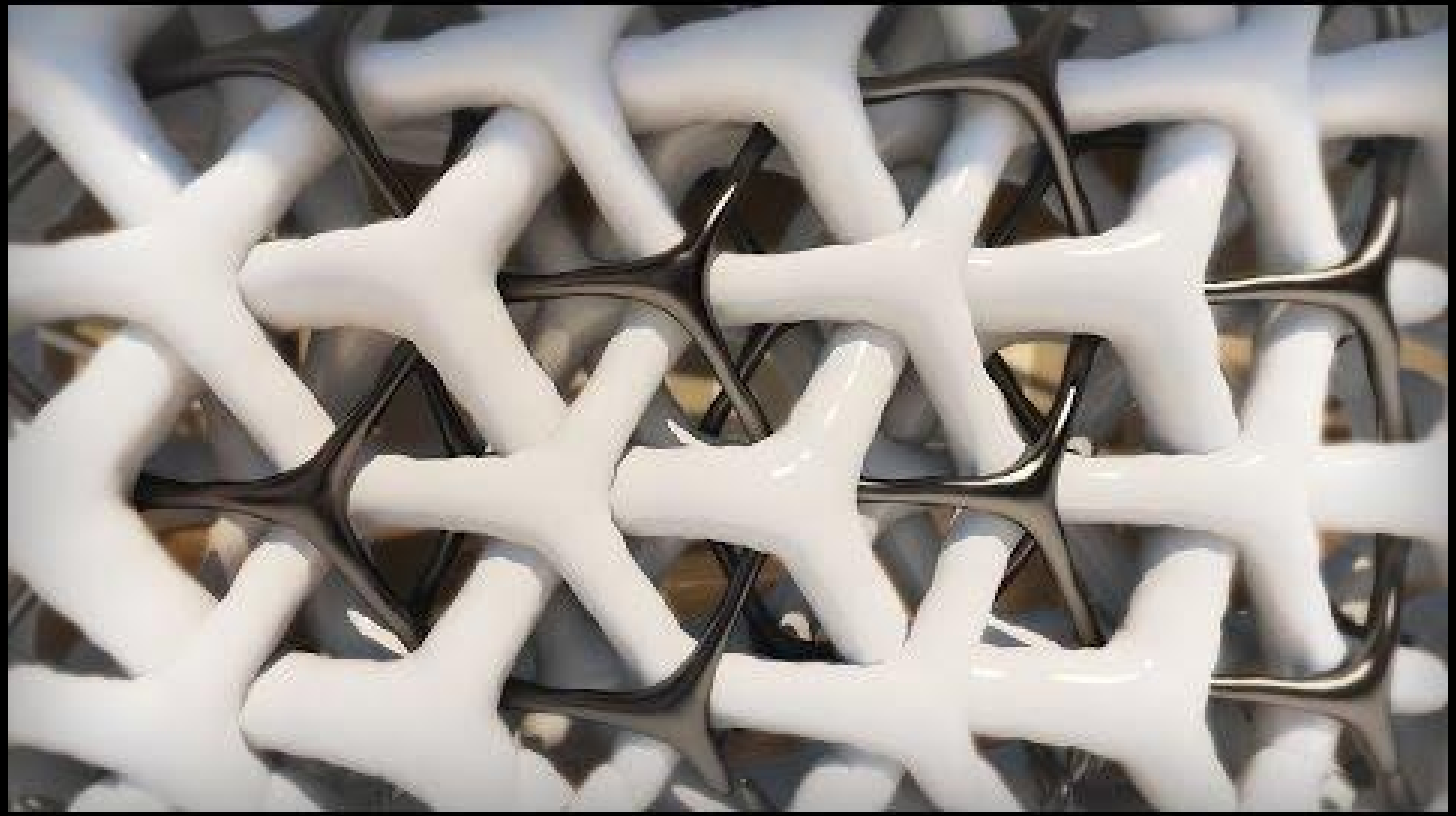












FABRICATION & COMPUTATION

https://research.gsd.harvard.edu/maps/portfolio/cevisama-2017/

CERAMIC MORPHOLOGIES
Cevisama Installation 2017
HARVARD GSD

Project Team: Professor Martin Bechthold, Director; Salmaan Craig, Lecturer in Environmental Technology; Nono Martínez Alonso; Jose Luis García Del Castillo; Tiffany Cheng; Kevin Hinz; Namju Lee, Zhiwei Liao; Matan Mayer; Saurabh Mhatre; Zach Seibold; Santiago Serna González; Juan Pablo Ugarte.

Role taken : **computation design and visualization**

Sponsor: ASCER Tile of Spain & Cevisama

Coordinator: ITC, Javier Mira Peidro

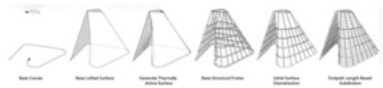
Production: Instituto de Tecnología Cerámica, Pilar Gómez Tena, Carmen Segarra Ferrando, Aroa García Cobos

Installation: Grupo on Market

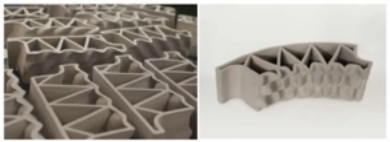
Documentation: Fernando García del Castillo López

Link

Ceramic Morphologies explores the design opportunities of a novel ceramic 3d printing strategy. The project was developed by researchers and students from the Material Processes and Systems (MaP+S) Group at the Harvard University Graduate School of Design. Supplemented with production and material research by the Instituto de Tecnología Cerámica in Castellón, Spain, the project is a prototype for the additive manufacturing of ceramic building components at the industrial scale

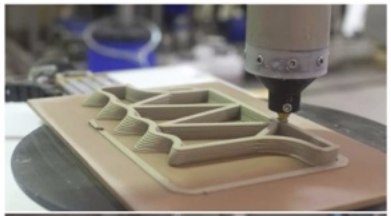


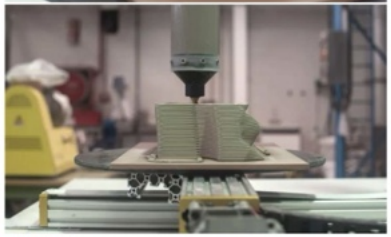
The pavilion is meant to showcase the expressive potential of ceramic 3d printing, and test the adaptation of principles of thermodynamic heat transfer to 3d printed geometry. The shape and design are products of current research related to the thermal performance of naturally ventilated spaces – the result of our collaboration with our colleagues Salman Craig and Matan Mayer from the Harvard Center for Green Buildings and Cities. While the exterior surface of the pavilion is smooth and uniform, the interior surface is heavily contoured and 3d textured. In addition to creating a unique relationship between interior and exterior space, the geometry of this undulating surface relates to research on the optimal dimensions for thermodynamic heat transfer.



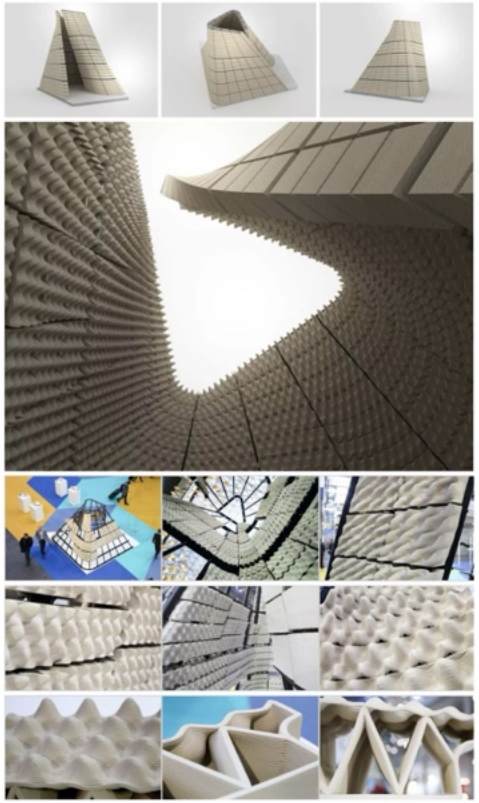
The thermal agenda is embedded in the logic of both the pavilion's interior surface geometry and the configuration of its overall form. Its pyramidal shape facilitates upward air movement, and the interior geometry impacts the thermal exchange between ambient air and the interior mass/surface. The contoured, sinusoidal texture of the interior surface is designed to optimize the ratio of surface area to thermal mass, and maximize the potential for cooling through natural ventilation and buoyancy effects. The project team has created mathematical models to predict the thermal behavior of the system.

The project utilizes a proprietary clay extrusion system and 3-axis armature to produce each of the pavilion's 552 unique ceramic elements. Each element is sized according to its position within the structure, the dimensional constraints of the printing bed, and a maximum allowable toolpath length. The team developed a novel computational approach to generate the surface geometry of the pavilion, discretize the form into individual bricks, and accommodate for the structural metal frame. Toolpath geometry and machine code is also generated directly within the parametric model. The digital workflow enabled the research team to account for shrinkage during the drying and firing process, reduce overall printing time and material consumption, and tune the stability of individual bricks.



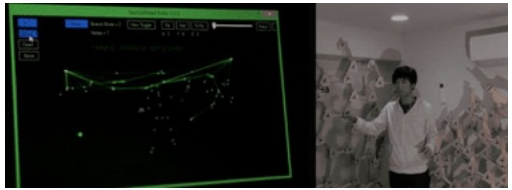


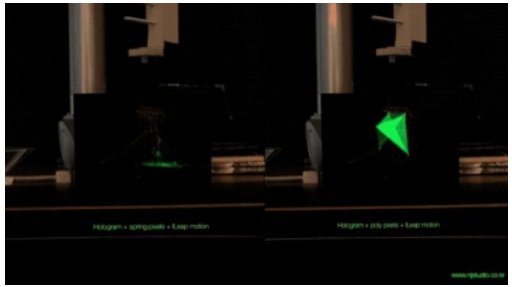
Measuring 3 m tall, with a footprint of 3.2m x 3.6m, the pavilion consists of 552 unique elements ranging from 260-545 mm in length, and 70-150 mm in height. 184 elements, representing 1/3 of the entire structure, are displayed in the current configuration shown at the 2017 Cevisama Fair in Valencia, Spain. Gaps between pieces allow for tolerances in the production. The modules can be bonded with mortar for permanent installations or, for temporary applications such as Cevisama 2017, can be dry-stacked and secured to a support frame. In total, the 184 printed elements displayed required 358 hours of printing time, and include 19.84km (12.33 miles) of extruded clay bead.

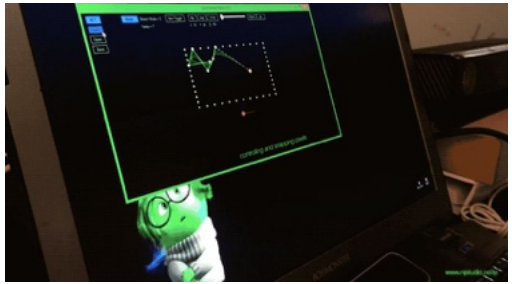


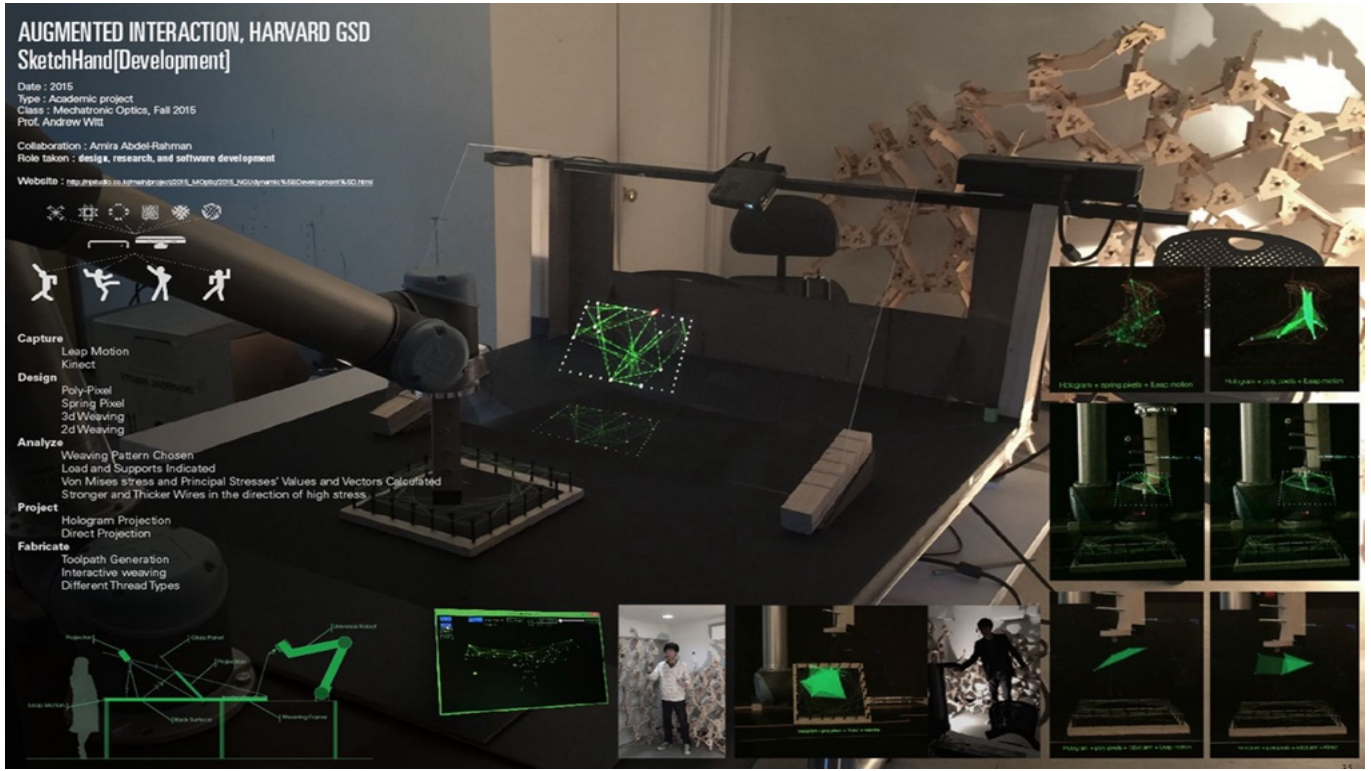
INTERACTION & ROBOTICS

http://www.njstudio.co.kr/main/project/2015_MOptic/2015_SktechHand_Development.html









Harvard University GSD

Mechatronic Optics (SCI 0945000)

SKETCHHAND

beta 0.0.5 , version for hologram

EXTRA

Information

WRITING & WORKSHOP

EDUCATION

Medium
https://nj-namju.medium.com/

https://medium.com/me/stories/public

Codepen:
https://codepen.io/NJStudio/collections/

Daum Brunch (Korean)
https://brunch.co.kr/@njnamju

Tistory (Korean)
https://computationaldesign.tistory.com/

Data & Design

Computational Design, NJSTUDIO

https://nj-namju.medium.com/data-design-c21457dc8dc

Computational Design Thinking for Designers

Computational Design

The keywords could help designers to start thinking like a computational design specialist. Computational thinking in design asks you holistic approaches to resolve a small design problem while also asking you an extremely isolated process to fix a comprehensive design concern. These different levels of the approach become buddies to understand computational design processes for designers.

The keywords could guide you, who have no computer science backgrounds, to deal with the dilemma, and you would be able to get a sense of understanding of developing computational design process in manifold circumstances in your design practices.

THE QUESTION / IMAGINATION / HYPOTHESIS

***Understanding** Problem, Concern & Issue*
***Declaring** Impact & Outputs*
***Writing** Instructions*

THE METHODOLOGY & APPROACH

*from **Whole** to **Parts** & from **Part** to **Whole***
*from **Simple** to **Complex** & from **Complex** to **Simple***

https://nj-namju.medium.com/computational-design-thinking-for-designers-68224bb7f7fc

6 Digital Mapping using ArcGIS JSAPI

DigitalFUTURES WORLD : ARCHITECTS UNITE Workshops

Day 6: Digital Mapping using ArcGIS JSAPI
Introduction to JSAPI and the Development of a Mapping App

Keyword
Projection, Remap, Interpolation, Generalization, ArcGIS JSAPI, Gestalt Principles, Principles of Graphical Integrity, Bertin's Visualization design space

Research Overview:
** Third Place Mobility Energy Consumption*

Lecture:
1) Projection, remap, interpolation
2) Generalization
3) Understand modify Object-oriented programming(OOP) pattern

***Workshop:** Codepen, Github*
1) develop a mapping app with JSAPI based on the boilerplate code

Additional note:
1) data visualization using d3
2) data visualization using Amcharts

https://nj-namju.medium.com/6-digital-mapping-using-arcgis-jsapi-626e108d624b

Introduction to Computational Design: Data, Geometry, and Visualization Using Digital Media

DigitalFUTURES WORLD : ARCHITECTS UNITE Workshops

Subtitle: Introduction to Computational Design for Geometry Visualization and Data Visualization for Digital Mapping on Web

Short Description:
This is a hands-on workshop and lecture series about the Introduction to Computational Design for Data and Geometry Visualization for Digital Mapping on Web. For those who are interested in developing both the ideas and skills of data and geometry visualization to understand the data in architectural or urban contexts, this workshop is yours. The workshop consists of three key parts: (1) processing and visualizing data (2) constructing geometries (3) developing a pipeline for an interactive

https://nj-namju.medium.com/introduction-to-computational-design-data-geometry-and-visualization-using-digital-media-14161fdfd922

Geometry as Data Structure and Visualization

Introduction to Geometry as Data Structure and Visualization

Keyword
Class, Computational Geometry, Data Structure, Projection, Remap, Interpolation, Generalization, Gestalt Principles, Principles of Graphical Integrity, Bertin's Visualization design space

Lecture:
1) File format(CSV , JSON, GeoJSON, Image)
2) Geometry as Data Structure
2) Remap, Interpolation, Generalization
3) Object-oriented programming(OOP) pattern
4) Visualization

DATA STRUCTURE

Structured data: CSV
Semi-structured data: JSON, GeoJSON — link
Image: Remote Sensing, DEM — link

Programming Paradigm / Typescript Classes
Software design pattern: link, (Gof) Design Patterns
Inheritance (object-oriented programming): link

https://nj-namju.medium.com/geometry-as-data-structure-and-visualization-48bcfdea3851

Discrete Urban Space and Connectivity

SA(Social Algorithms) 2020, Computational Design

Subtitle: Partition & Relationship

Keyword
Data Structure, Graph, Matrix, Pixel, Voxel, Discretization, Partition, Connection, Search

Workshop Reference
1. *Computational Design Thinking for Designers — link(Eng)*
2. *Data & Design — link(Eng) — link(KR)*

Data by Wisdom, The Information Factory S.A.

We are able to answer these questions below.

how to capture and process spatial data in design

https://nj-namju.medium.com/discrete-urban-space-and-connectivity-492b3dbd0a81

APPENDIX

EDUCATION

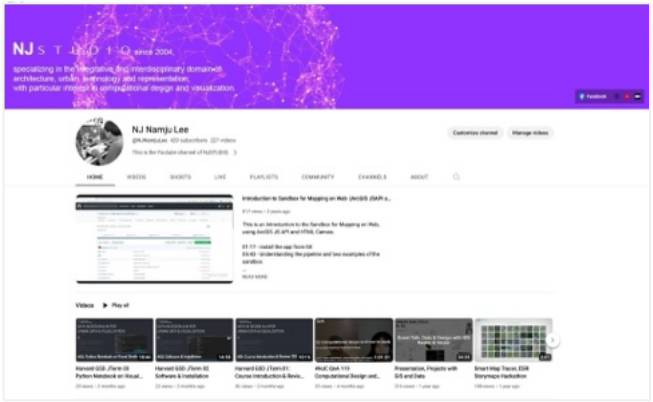
http://www.njstudio.co.kr

Youtube English
https://www.youtube.com/channel/UCP4g3a4ogJN1-SbJclJR3Ww

Youtube Korean
https://www.youtube.com/channel/UC3Z42uoe9C7Et39h5cLK1dw

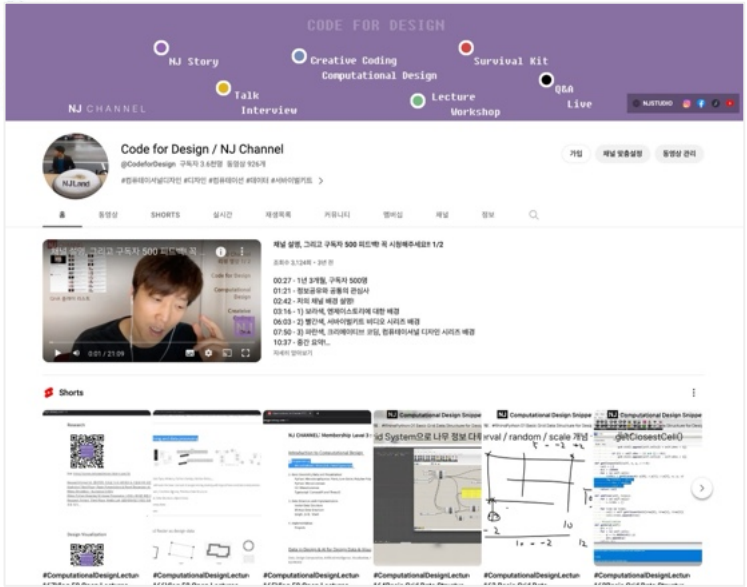
NJSTUDIO project and portfolio channel

Date : 2011 ~ present
Type : independent project
Role taken : **director**



Education Channel

Date : 2011 ~ present
Type : independent project
Role taken : **director**



NJCHANNEL PROJECT

Education

NJCHANNEL PROJECT

EDUCATION

처음 코딩을 접하는 디자이너에게 - link

NJ Channel Project, 콘텐츠 & 학습 자료 인덱스 - link

Daum Brunch - link

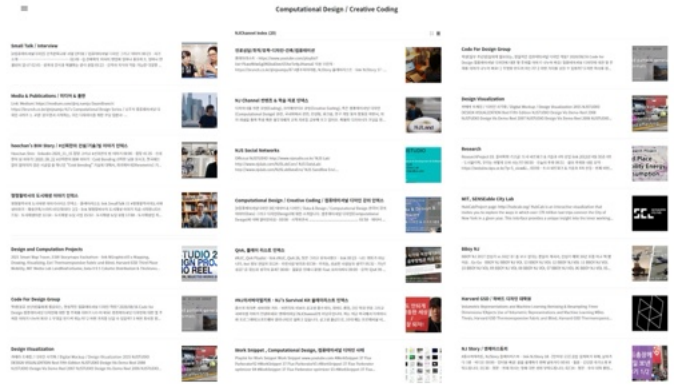
NJ's Computational Design Series

초급: 읽으면서 입문하는, 모두의 디자인 코딩

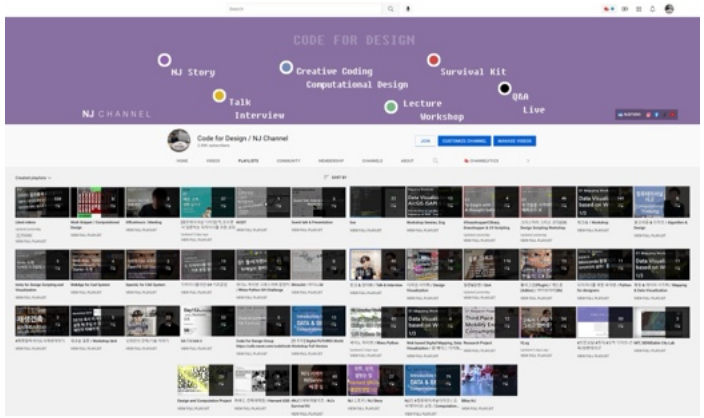
중급: 따라 하며 입문하는, 모두의 디자인 코딩

고급: 데이터 & 디자인 컴퓨테이셔널 디자인

Tistory - link



Youtube - link



Computational Design Lecture Series:

Tistory Search - https://computationaldesign.tistory.com/3?category=937138

NJ's Computational Design Lecture series - http://bit.ly/2SqBRq0

37. 우리는 무엇을 배우면서 사는가 feat. 언어와 컴퓨테이셔널 사고, 그리고 사고의 도약 - link
36. 코딩공부와 수학 그리고 공부할것 Feat. 4차 산업혁명 그리고 디자인 - link
35. 함수호출 By Reference, By Value - link
34. 소프트웨어 어떻게 공부할까? 변할것 변하지 않을것, Feat VR AR AI - link
33. 디자인 엔지니어링 / Design Engineering - link
32. 궁극의 테크트리! 컴퓨테이셔널디자이너로 살아 남기!! - link
31. SA 7.0 Lecture 5. 데이터 구조로서의 지오메트리 그리고 시각화 - link
30. SA 7.0 Lecture 4. 이산 도시공간과 연결성 (그래프)/Discrete Urban Space and Connectivity (Graph) - link
29. SA 7.0 Lecture 3. 캐드, 데이트의 흐름 / CAD data pipeline - link
28. SA 7.0 Lecture 2. 디자이너를 위한 컴퓨테이셔널 팅킹 / Computational Thinking For Designer - link
27. SA 7.0 Lecture 1. 데이터 & 디자인 / Data & Design - link
26. 곱하기 어떻게 볼까? 추상을 통한 상상? 컴퓨테이션/크리에이티브 코딩 - link
25. 힙합문화로 보는 새로운 패러다임 그리고 컴퓨테이셔널 디자인의 운명 - link
24. 정규화 & 보간 & 이상치 / normalization & interpolation & outlier - link
23. 프로젝션 & 리맵 / Projection & Remap - link
서바이벌키트 11. 디자이너에게 코딩이란 / 나에게 코딩이란 / 코딩을 하는 이유 - link
22. 코딩공부 어떻게? (잔소리포함) / 제발 타이핑해보자!! - link
21. 내가 생각하는 컴퓨테이셔널 디자인 / 워크숍 강좌를 만드는 배경 / 디자인 데이터 / Design & Data - link
20. 컴퓨테이셔널디자인을 바라보는 시각과 오해 - link
19. 건축 3D 랜더링에 관한, 어느 건축가의 질문들.../ 건축 시각화 - link
18. 매핑 (건축, 도시) / Mapping for Urban and Architecture - link
17. 도시, 건축 랜더링 팁 / Architectural & Urban Rendering tips / 건축 시각화 - link
16. Mouse Event / 마우스 이벤트, CAD System - 캐드시스템 - link
15. Active Command - 엑티브 커멘드, CAD System - 캐드시스템 - link
14. Harvard GSD Technology 그리고 MIT Computation 지원준비, 프로그램 비교 , 및 컴퓨테이션 공부 준비 방법 - link
13. 자료구조, 픽셀, 복셀 / Data Structure for design , pixel and voxel data structure 2/2 - link
13. 자료구조, 그래프 / Data Structure for design , Graph 1/2 - link
12. 라이노 파이썬 / Rhino Python, 공부법 - link
11. HTML Canvas, 데이터 시각화, 크리에이티브 코딩 - link
10. 건축 시각화 / Architectural Visualization - link
09. 데이터 시각화 / Data Visualization - link
08. 디자이너를 위한 프로그래밍 언어 2/2 - Typescript(Javascript) - link
08. 디자이너를 위한 프로그래밍 언어 1/2 - C# - link
07. 파이썬 (Python) 배워야 할까? 장단점을 알아보자! - link
06. 쉽게 이해하는 클래스(Class) - link
05. VR / AR 꼭 해야 할까? 2019 버젼 - link
04. 건축 도시 디자이너를 위한 프로그래밍 테크트리 - link
03. 컴퓨테이셔널 사고 (띵킹) / Computational Thinking - link
02. 파라메트릭 디자인? / Parametric Design - link
01. 컴퓨테이셔널 디자인? / Computational Design - link

QnA

Tistory Search - https://computationaldesign.tistory.com/2

Video Playlist - https://www.youtube.com/playlist?list=PLweNVwGqDKEYzuT2sezSsQCP-me-1Tb7e

3.1 디자인 그리고 컴퓨테이션

QnA 01, 어느 고등학생의 질문 / 건축 파라메트릭 디자인 예제
QnA 02, 건축가의 일반적인 질문 2차 (건축컴퓨팅실무)
QnA 04, 건축컴퓨팅을 공부하고 싶으신 건축가형님과의 대화
QnA 05, 코딩과 건축컴퓨팅에 관심이 많으신 건축가형님과의 대화
QnA 06, 건축가의 일반적인 질문 (건축컴퓨팅실무응용)
QnA 11, 어떤 젊은 건축 디자이너의 질문
QnA 15, 복셀(Voxel)과 컴퓨테이셔널 디자인 그리고 건축 디자인
QnA 16, 파라메트릭(Parametric Design)과 미적분
QnA 17, 내가 생각하는 그라스하퍼(Grasshopper)의 단점과 개인적인 생각
QnA 19, 파라메트릭 디자인 배우려면 어디서부터 어떻게 시작해야하나요?
QnA 21, 5G기술과 건축산업(설계 협업 및 시각화 VR), 정말 유용 하나?
QnA 22, 내가 생각하는 그라스하퍼(Rhino Grasshopper)의 장점
QnA 23, 디자인 소프트웨어 어떻게 공부할까? / 그 많은 것 언제 다 해요?
QnA 24, 디자인 소프트웨어 어떻게 공부할까? 두 번째, NURBS , Mesh(Polygon)
QnA 25, 디자인 소프트웨어 어떻게 공부할까? - 알고리즘 공부 방법 / 그리고 브런치!
QnA 31. 대학생의 질문, 대학교, 대학원, 파라메트릭 디자인 스튜디오 어떻게 접근 할까?
QnA 36, 파이썬 그리고 그래픽 툴(맥스, 마야, 라이노...)
QnA 37, 프로덕트디자인 위한 코딩 그리고 3D 소프트웨어 공부 질문, 그리고 개인적인 생각
QnA 43, SA 7.0 Unit 2 관련 질문 / 스스로 공부하는 방법

3.2 코딩

QnA 33, 코딩 시작 시에, 필요한 수학? 과연 뭐가 필요할까?
QnA 38, 너는 어떤 프로그래밍 언어를 쓰니?
QnA 39, 데크니컬 아티스트 공부 방법? 책? 학원?
QnA 44, 네이버 카페, 그래서호퍼 챌린지 질문 / 코딩을 공부하는 자세

3.3 인공지능, 데이터 그리고 시각화

QnA 07, 데이터 시각화 도구(tools) 그리고 개인적인 생각
QnA 12, 데이터시각화가 꿈인 카이스트 학생의 질문
QnA 14, 디자인(건축), 빅 데이터, 그리고 인공지능(머신러닝)에 대한 질문
QnA 42 시각디자인 전공, 학생의 질문, 데이터 시각화 어떻게 공부할 것인가?
QnA 46 지도위에 데이터 시각화, 어떤 제품으로 개발을 하면 좋을까?
QnA 47, AI, ML(머신러닝), GL(그래픽), CV(비전), 컴퓨테이셔널 전공을 시작하는 학생 질문

3.4 취직 / 진학 / 유학

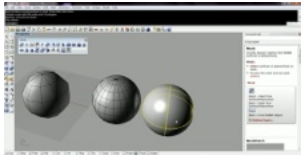
QnA 08, 컴퓨테이션 직업군 및 준비 자세
QnA 09, 직장상사가 내 미래에 도움이 안될 때, 회사를 떠나야하나? 존윅에서 배울점
QnA 13, 미국, 호주, 유학준비와 그에 따른 생각들...
QnA 20, SOP 작성 유의사항 (취직 커버레터 / 자기소개서)
QnA 26, 대학원 진학, 유학에 대한 질문, 그리고 개인적인 생각, feat MIT Media Lab
QnA 28, 건축과 학생의 질문, 건축, 디자인 유학 준비 그리고 주관적 생각
QnA 29, 건축 & 디자인, 포트폴리오 그리고 취직, 유학
QnA 30. 건축 유학 & 학비 그리고 개인적인 생각
QnA 32, 건축/컴퓨테이션/뉴미디어/디자인 직업군, 어떻게 준비하면 좋을까요?
QnA 34, 유학 고민 많을 때, 실내건축학과 전공자의 M.Arch 유학에 대한 고민
QnA 35, 컴퓨테이셔널 디자인 유학을 준비하는 학생의 질문
QnA 40, 건축 컴퓨테이셔널 유학 그리고 파이썬 코딩 공부
QnA 41, 데이터를 활용한 도시 설계? 공부 전략? 그리고 (MIT SENSEable City Lab 연구소
QnA 45, 컴퓨테이셔널 직장 구하기? 마음가짐?
QnA 48, 유학? 얻는 이익이 있나?
QnA 49, 스페셜리스트가 되기 위한 어느 학부생의 전공고민

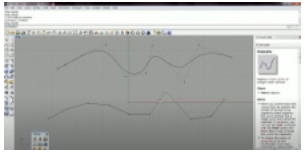
Rhino3d, Concept, Basic Workshop

Tistory index - https://computationaldesign.tistory.com/35
Video, Playlist - https://www.youtube.com/playlist?list=PLweNVwGoDKEYZVe4KRhecvCbNQivMK2uH

- 라이노 문법이해

1. 라이노(Rhino3d) 기초 워크숍 / 소개 영상
2. 라이노 개념 잡기
3. 시작하기 그리고 Curve / 커브
4 Curve Tool /커브 수정하기
5. Surface / 서피스 만들기
6. Surface tool / 서피스 수정하기
7. Curve from Object Tool 오브젝트에서의 커브
8. 그라스하퍼(GH) 시작하기 / 개념 이해

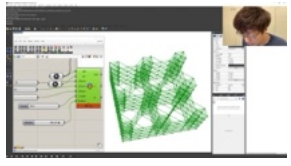




Rhino3d Python Workshop

Tistory - https://computationaldesign.tistory.com/21
Video, Playlist: https://www.youtube.com/playlist?list=PLweNVwGoDKEYVSpbROuzG4zHLpnfd4sUU

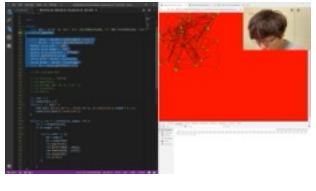
1. 라이노 파이썬 워크숍 / Rhino Python, Rhinoscriptsyntax workshop
2. Point Grid Basic (rhinoscriptsyntax) -
3. Help File & Tutorials / 헬프 파일 & 온라인 튜토리얼
4. Function 1D / 라이노 파이썬 04 1차원 함수 2/2
5. Point Grid 2D / 2D포인트 그리드
6. Point Grid Pattern / 2D, 3D 포인트 그리드 패턴
7. Point Cloud - Random / 포인트 클라우드 - 랜덤
8. Point Cloud - Random Normal Distribution/ 포인트 클라우드- 정규분포
9. Point Cloud - Linear Regression / 포인트 클라우드- 선형 회기
10. Point, Line, Polyline / 포인트, 라인, 폴리라인
11. Line, Intersection, Length / 라인, 라인교차, 라인의 길이



Python For Designers

Tistory Search: https://computationaldesign.tistory.com/20
Video Playlist - https://www.youtube.com/playlist?list=PLweNVwGoDKEYw_lL0Roe04kPhsUT9sSQd

Python For Designers 미니콘다(Miniconda) 설치(2020)
디자이너를 위한 파이썬 가상환경 설치법 – link
01 Jupyter notebook / 디자이너를 위한 파이썬 01 주피터 노트북 – link
02 Python Basic / 디자이너를 위한 파이썬 02 파이썬 기초 1/2 – link
03 Python Basic / 디자이너를 위한 파이썬 03 파이썬 기초 2/2 – link
04 Class/ 디자이너를 위한 파이썬 04 파이썬 클래스 – link
05 Graph / 디자이너를 위한 파이썬 05 파이썬 그래프 – link
06 Graph Visualization / 디자이너를 위한 파이썬 06 파이썬 그래프 시각화 – link
07 Graph to JSON/ 디자이너를 위한 파이썬 07 파이썬 그래프 JSON – link
08 Graph to CSV / 디자이너를 위한 파이썬 08 파이썬 그래프 CSV – link
09 Graph HTML Canvas Vis / 09 파이썬 그래프 HTML Canvas 시각화 – link



Rhino C# Scripting

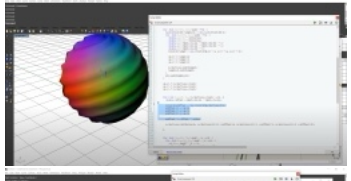
라이노(Rhino) 그라스하퍼(Grasshopper)와 c#코딩(coding) 동시에 공부하자

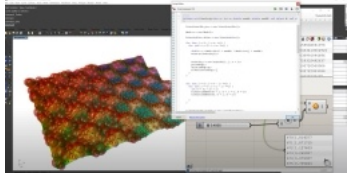
Tistory Search/
Video Playlist - http://bit.ly/2u4kH7d
Episode A - https://computationaldesign.tistory.com/14?category=937139
Episode B - https://computationaldesign.tistory.com/15?category=937139

01. 워크숍을 시작하면서
02. 라이노의 문법 그리고 그라스하퍼
03. 그라스하퍼 공부자료 & 레퍼런스
04. Point & Line 그리고 Data
05. Point 그리고 Data
06. Point List 그리고 Curve
07. Point Grid & Surface
08. Point, Curve 그리고 Brep(Closed Extrusion)
09. Point, Curve 그리고 Brep(Loft) - Optimization & Design Space
10. Point 그리고 Solid Brep - Primitive, Box, Cylinder, Cone
11. Point 그리고 Solid Brep - Primitive, Sphere, Indexing, Connectivity
12. Point, 그리고, Tri Mesh - Vertices, Faces, Colors, Barycentric coordinate
13. Point 그리고 Mesh Sphere
14. 에피소드 A 종료 - 요약 그리고 이런저런 생각

01. Episode B, 워크숍을 시작하면서, 그리고 몇 가지 생각
02. Surface, Paneling A - Normal Vector, Points, Lines
03. Surface, Paneling - Curvature, Project, Split
04. Tree Data 구조, 데이터 추출과 Tree data 만들기

구독자 질문 Q01 - *( )*는 뭐지? 또 new 는 뭐지?
구독자 질문 Q02 - C# 컴포넌트, 저 아이콘은 뭐지??
구독자 질문 Q03 - Brep Boolean(Union, Difference, Intersection...) 문제?
구독자 질문 Q04 If else 중괄호의 의미 그리고 double의 의미?
....





Rhino3d, Python, Mapping Workshop

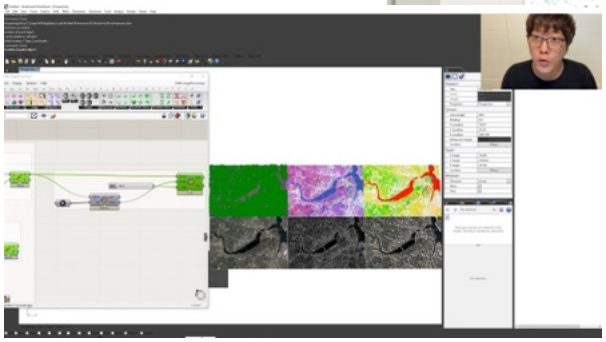
Tistory - https://computationaldesign.tistory.com/18?category=937139
Video Playlist - https://www.youtube.com/playlist?list=PLweNVwGgDKEYoRlA355KsGDS5x9nkzalF

Rhino Python Mapping 01 Basic Syntax / 라이노 파이썬 매핑 01 파이썬 기초

NYIT에서 진행했던 매핑 워크숍 입니다. 궁금하신 점은 질문 주세요. :)
Rhino Grasshopper Python, NJS Numerical Tool kit

01. **Basic Syntax** / 라이노 파이썬 매핑 01 파이썬 기초 – link
02. **Data Manipulation CSV** / 라이로 파이썬 매핑 02 CSV 데이터 – link
03. **Data Manipulation JSON, GeoJSON** / 라이노 파이썬 매핑 03 JSON, GeoJSON 데이터 – link
04. **Data Manipulation OSM, Shapefile** / 라이노 파이썬 매핑 04 OSM, Shapefile데이터 – link
05. **Data Manipulation DEM** / 라이노 파이썬 매핑 05 DEM데이터 – link
06. **Image Processing** / 라이노 파이썬 매핑 06 이미지 프로세싱 – link

[#컴퓨테이셔널디자인 18] 매핑 (건축, 도시) / Mapping for Urban and Architecture
건축 도시 디자인 프로세스에서 매핑을 많이 활용하죠. 매핑에 대한 생각을 공유합니다.
01:20 – 트레이싱
02:05 – 매핑
02:26 – 매핑 가능한 데이터
06:02 – 데이터의 타입 (top-down, bottom-up data)
09:11 – 매핑의 프로세스
12:35 – 매핑의 해석

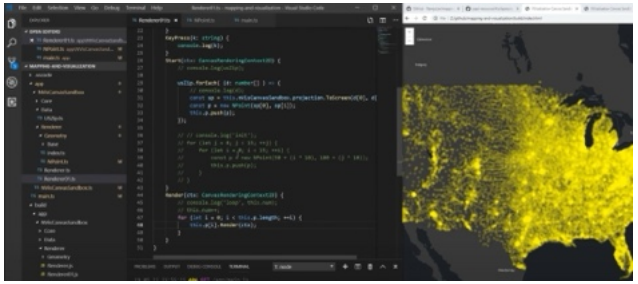


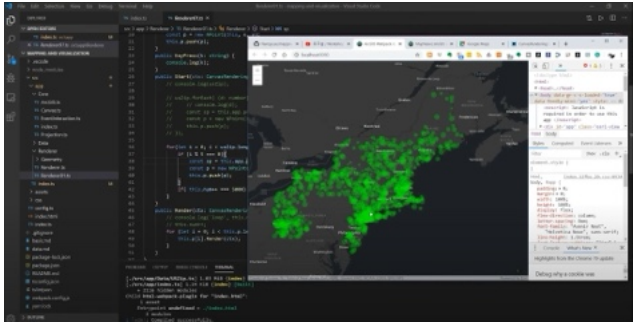
Digital Mapping Workshop, JSAPI

Tistory - https://computationaldesign.tistory.com/17?category=937139

Github :
https://github.com/NamjuLee/mapping-and-visualization
https://github.com/Esri/jsapi-resources

ArcGIS JS API reference: https://developers.arcgis.com/javascript/latest/api-reference





Stand-alone & GH Addon

Tistory - https://computationaldesign.tistory.com/36
Playlist: link

래빗(Revit) 다이나모(Dynamo) c# 디자인 스크립팅, 어떻게 플러그인을 만들까? - link
나만의 라이브러리 만들기 Zero Touch

어떻게 라이노의 기능을 유니티(Unity)에서 활용할 수 있을까? - link

라이노 플러그인 어떻게 만들까? - link
템플릿 파일 https://marketplace.visualstudio.com/items?itemName=McNeel.RhinoCommontemplatesforv6

라이노 그라스하퍼 애드온 어떻게 만들까? - link
템플릿 링크 https://marketplace.visualstudio.com/items?itemName=McNeel.GrasshopperAssemblyforv6

라이노 그라스하퍼 (Rhino Grasshopper) 플러그인을 소개해 드립니다.
특별히 어떤 데이터들이 디자인할 때 사용할 수 있을까요

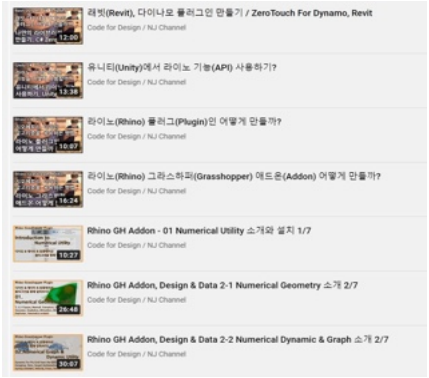
Rhino GH Addon - 01 Numerical Utility 소개와 설치 1/7 - link
Link https://www.food4rhino.com/app/numerical-geometry-utility

Rhino GH Addon, Design & Data 2-1 Numerical Geometry 2/7 - link
Link https://www.food4rhino.com/app/numerical-geometry-utility

Rhino GH Addon, Design & Data 2-2 Numerical Dynamic & Graph 2/7 - link
Link https://www.food4rhino.com/app/numerical-geometry-utility

Rhino GH Addon, Design & Data 3. Numerical Environment Utility 3/7 - link
Link: https://www.food4rhino.com/app/numerical-landscape-utility

Rhino GH Addon, Design & Data 4. Numerical Urban Utility 4/7 - link
Link: https://www.food4rhino.com/app/numerical-urban-utility



Numeric Network Analysis

SA 7.0 Unit 2

Daum Brunch : https://brunch.co.kr/@njnamju/91

Video Playlist - https://www.youtube.com/playlist?list=PLwsNVwGqDKEbGYBBPoKxHdMohJW245o38

Medium : https://nj-namju.medium.com/numeric-network-analysis-post-covid-19-urbanism-6-ft-rule-de267886b028

유튜브 한국어 전체강좌(수업, 워크숍, 미팅, 프레젠테이션) – 플레이 리스트
유튜브 영어 전체강좌(수업, 워크숍, 미팅, 프레젠테이션) – 플레이 리스트

원문 링크 Numeric Network Analysis: Post-COVID-19 Urbanism, 6 ft rule – link
선수 공부 자료 – link

이남주 / NJ Namju Lee / nj.namju@gmail.com
우정현 박사 / Junghyun Woo / axuplatform@gmail.com

SA 7.0 Unit 2 한국어 강좌

0. Introduction Unit 2 – Medium link
유닛 2수업 소개 – 전체 버전 (Eng)

1. Lecture, Data and Design – Medium link
데이터 그리고 디자인 – 전체버전 – 편집버전

2. Lecture, Computational Design Thinking for Designers – Medium link
디자이너를 위한 컴퓨테이셔널 사고 – 전체버전 – 편집버전

3. Lecture, Pipeline for Interaction, Data, and Geometry Visualization – Medium link
CAD 소프트웨어의 구조 그리고 데이터의 흐름과 시각화 – 전체버전 – 편집버전

4. Lecture, Urban Design Quality and Walkability – Medium link
도시디자인과 보행환경 – 전체버전

5. Lecture, Spatial Network Analysis in Transportation Geography – Medium link
교통계획 분야에서의 공간 네트워크 분석의 활용 – 전체버전

6. Lecture, Examples of Numeric Network Analysis using the NNA Toolbox – Medium link
NNA toolbox를 활용한 도시 공간정보 분석 예시 – 전체버전

7. Lecture, Discrete Urban Space and Connectivity – Medium link
이산 도시 공간과 연결성 – 전체버전 – 편집버전

8. Lecture, Geometry as Data Structure and Visualization – Medium link
데이터 구조로서의 지오메트리 그리고 시각화 – 전체버전 – 편집버전

9. Workshop, Pedestrian Volume Studies– Medium link / Post-COVID-19 Urbanism –Medium link
보행자 이동성 정보 수집 방법 / 포스트 COVID-19을 대비한 도시 환경 계획 및 아이디어 – 전체버전

10. Workshop, Data Visualization, Numerical Image Utility
데이터 시각화 / 이미지 툴 – 전체버전

Discrete Urban Space and Connectivity

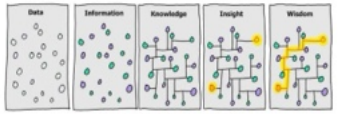
NJ Namju Lee Jul 10, 2020 · 3 min read

SA(Social Algorithms) 2020, Computational Design

Subtitle: Partition & Relationship

Keyword
Data Structure, Graph, Matrix, Pixel, Voxel, Discretization, Partition, Connection, Search

Workshop Reference
1. *Computational Design Thinking for Designers — link(Eng)*
2. *Data & Design — link(Eng) — link(KR)*



Data to Wisdom, The Information Factory S.A.

!We are able to answer these questions below.

how to capture and process spatial data in design

Relationship among data in a space

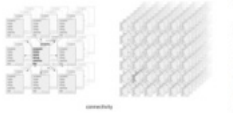
Discrete a space into parts

1. Graph

Graph is a mathematical object that consists of set of points and edges, dealing with discrete information.

Graph is widely used for computation, discrete mathematics or representing relational data structures, and It has explicit relationship among vertices by edges visualizing the topological aspect such as street network of urban, highway or the subway map, whose graphs closely resemble their physical form due to its characteristics.

2. Pixel / Voxel (Volumetric Element)



- Voxel could be considered as a set of image(pixel)

Voxel is a 3 dimensional grid containing pixels can have rich data set including R, G, B, A values. It is frequently utilized for visualization of scientific or medical data which is needed for volumetric representation.

Voxel for geometry in space is a discretized space of geometry where it has a beam or node are connecting but as a continuous map in space. This is basically an idea that an object become a 3 dimensional map.

3. Partition

Linear regression, KNN , Support vector machine, Random Forest, CNN, Tensorflow Playground

Delaunay triangulation / Voronoi diagram

Discrete space — Space Partitioning

Quad Tree / Octree / Bin System

Axis(AABB) / Distance

Clustering Points: Collision-Based Dynamic Graph method — link

4. Connectivity

GRAPH — link
Graph Data Structure for Spatial data — link(KR)

Social network as Graph — link
Transportation as Graph (Street, freeway(highway), subway, sky way,...)
Folder structure as Graph — link
Programming executions as Graph — link
Zoning as Graph — link
Associative geometry — link
Interface — link / link
Network for ML — link

Structure — link, link
Mesh(Polygon) as Graph — link
Mesh from Rhino3d: link

NJSTUDIO Presentation slide

Data structure as Graph
JSON /GeoJSON as Graph
Matrix (link) Pixel(link) and Voxel(link) as Graph

AI & Data for Design

Link: https://computationaldesign.tistory.com/29

AI and Data for design / 데이터 그리고 디자인 / 디자이너를 위한 인공지능

J-Term 2017, Harvard GSD :

Title: Introduction to Data Science for Building Simulation

1 Python Basic
2 Data process & Visualization
3 Train modes & Predict missing values

Data Process

Numpy, Pandas, CV

Workshop

Temperature Conversion
Multiplication Table 1. regression model 2. cnn model
Smart Drawing 1. Data process 2. Model A 3. Model B
Smart Commander
Semantic Segmentation
Third Place Prediction
Map Classifier
Super Resolution
Smart Map Tracer
Texture Prediction
Color Prediction
3D Volumetric Representation and Machine Learning in Design

Python Basic

Typescript Basic, Tensorflow JS

Project

Project, **Smart Map Tracer, ESRI Storymaps Hackathon** - video
Project, **Smart Drawing** - Writing / Video / Demo
Project, **Remixing & Resampling Three Dimensional Objects, Use of Volumetric Representation and Machine Learning in Design** - link / video
Project, **Politics of Space and Its Shadows** - link / video
Project, **Built Environment Assessment** - link / video **Analytical hosing prediction model with spatial observation in City of Boston**
link 4-Smart Drawing
link Linear-regression , Polynomial Regression , Regression Model , XOR
Codepen - Tensorflow playground stater, Typescript

Introduction to Computational Design

Digital FUTURES World Workshop 2020

Tistory Search: https://computationaldesign.tistory.com/16?category=937139

Video Playlist - https://www.youtube.com/playlist?list=PLweNVwGqDKEZZyedJi632ULMJ6allmz2s

DigitalFUTURES Word link https://www.digitalfutures.world/workshops-asia-pacific-blog/nilee-kr

Medium link https://medium.com/@nj.namju/introduction-to-computational-design-data-geometry-and-visualization-using-digital-media-14161fdfd22f

1 Python Basic

2. Data Visualization, RhinoGH Python

3. Typescript & HTML Canvas Visualization

4. Computational Geometry & Geometry Class & Visualization

5. Pipeline for Interaction, Data, and Geometry Visualization

6. Digital Mapping using ArcGIS JSAPI

Introduction to Design Visualization

Harvard GSD, MIT SA+P

Link - https://namjulee.github.io/3d-visualization-harvard-gsd.github.com/
Video - https://youtu.be/3VeLfmt2N-0
Git - https://github.com/NamjuLee/Harvard-GSD-Workshop

Download:

Content(pdf)

Example files

BasicAnimation.pdf

BasicParticleSystem.pdf

DATA & DESIGN, JTem at Harvard GSD

NJSTUDIO & NJSLab

https://namjulee.github.io/njs-lab-public/data-for-design

https://namjulee.github.io/njs-lab-public/teaching

Index

LECTURE & WORKSHOP

Introduction to Computational Design

Design Process & Geometry
Rhino Python / C#
Lecture 80% Project 20%

Introduction to Data Structure and Algorithm for Design:

Data & Design Engineering
Rhino Python / C#
Graph, Pixel, Voxel
Lecture 70% Project 30%

Data Visualization & Mapping

Lecture 70% Project 30%
C# JAVA Typescript
HTML Canvas & OpenGL & WebGL & WebGPU

ML for Design

Data(Vector & Raster) for design
Python, Typescript
Lecture 70% Project 30%

Thesis

Project / Method
Design Process / Data-driven process

대중과 미디어가 보는 미래

Reference: link

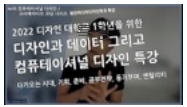
21 세기 데이터 기반 사회

1. 변화하는 것 & 변화하지 않는 것

"전략은 변하지 않는 것에 토대를 두어야 한다. 사람들은 나에게 5년 후나 10년 후 무엇이 변할 것인지는 묻지만, 무엇이 변하지 않을 것인지는 묻지 않는다." 아마존의 창업자 제프 베조스(Jeff Bezos)는 말한다. 우리가 무엇을 예측할 때, 변하지 않는 것에 기초해야 한다.

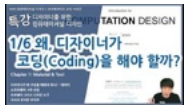
Reference : https://webzine.kps.or.kr/?p=4&idx=274

서울여자대학교



link

연세대학교 특강



link

도구와 창의성

Arithmetic >>> ! Addition

감사합니다 :)

NJ Namju Lee

nj.namju@gmail.com

NJ Design Studio - http://www.njstudio.co.kr

NJS Lab - https://namjulee.github.io/njs-lab-public

github - https://github.com/NamjuLee

Linkedin - https://www.linkedin.com/in/nj-namju-lee-926b3252/

Medium(Eng) - https://nj-namju.medium.com/

Daum Brunch(Kr) - https://brunch.co.kr/@njnamju#articles