CELLA HOTEL

Kuma+Obuchi+Ichikawa Studio
Rafael Pacheco Gonçalves

1. Develop an Hotel using Genetic Algorithms for Optimization.

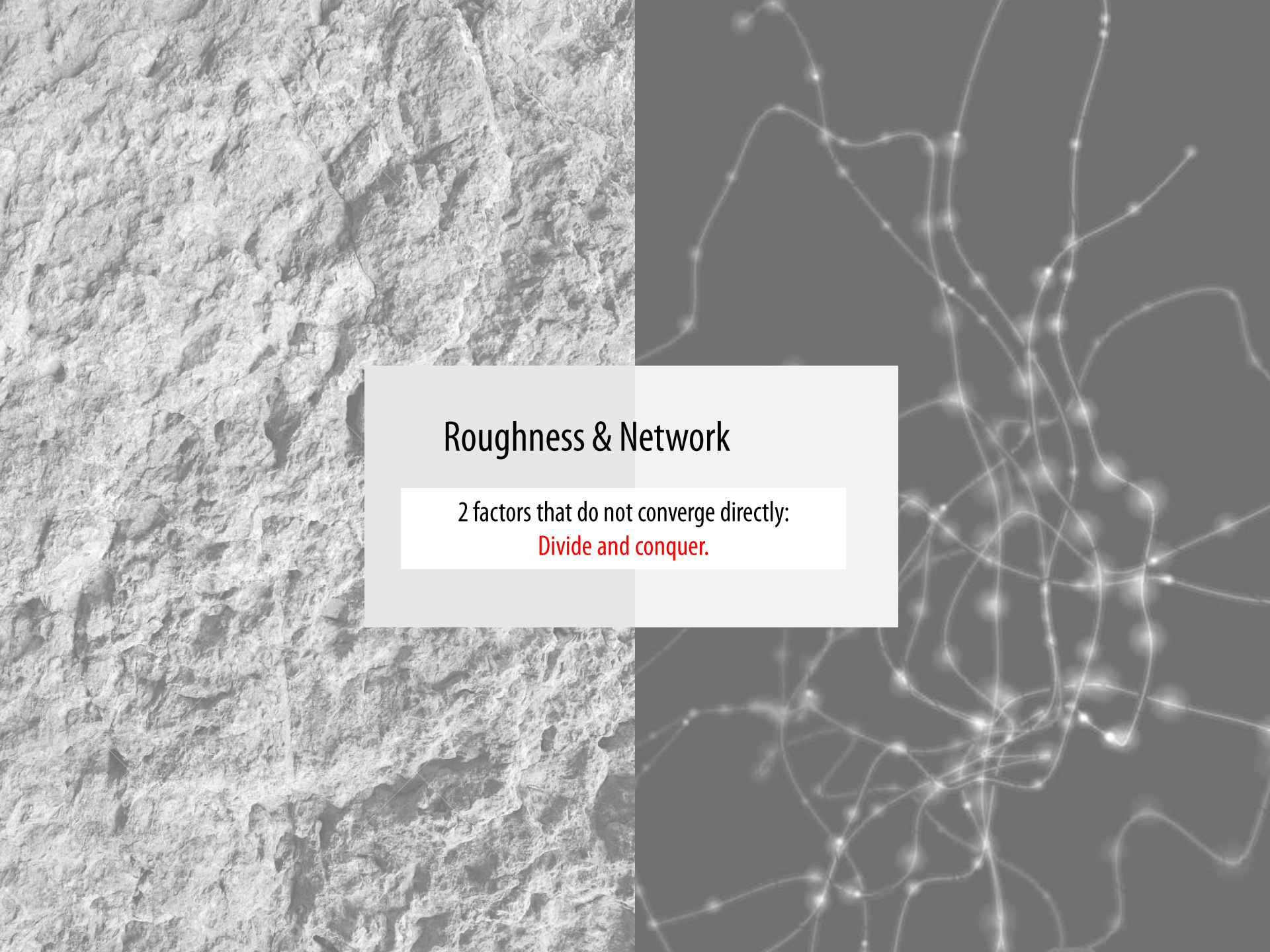
---

2. Create a recycleable workflow and algorithm.

GaienMae station // Tokyo 2020 Olympic Stadium // Gaien House

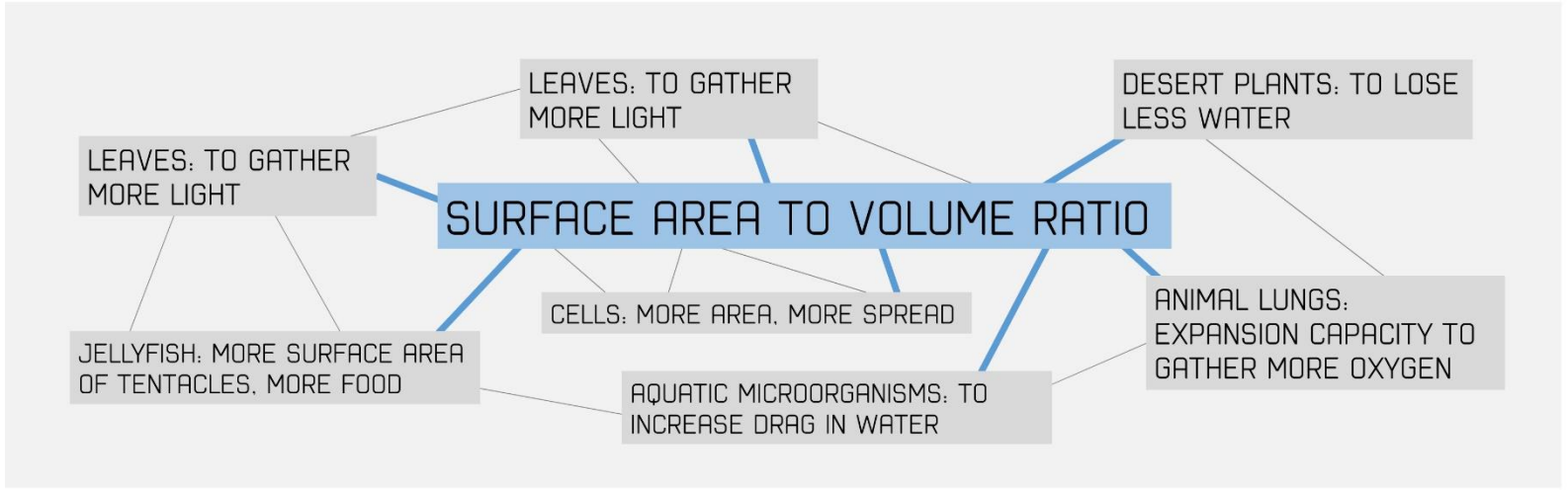
Rooms for groups of travelers willing to visit
Tokyo / Small Business rooms. All 1K layout.
AIR BNB management inspiration: Price per room.

500 guestroom sized Hotel.



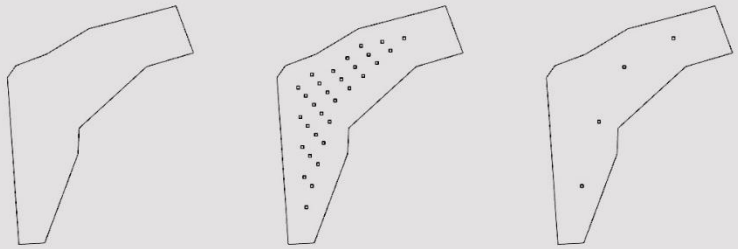
Roughness & Network

2 factors that do not converge directly:
Divide and conquer.



ROUGHNESS IN NATURE

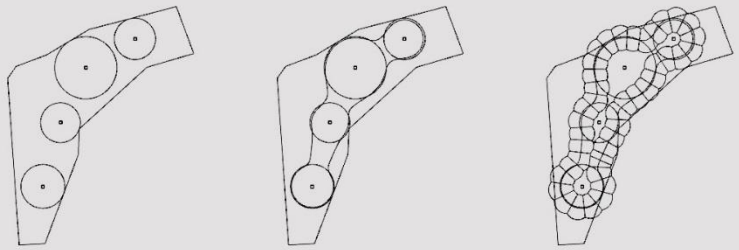
Shape Generation Rules: Use GA to maximize rooms and find EV cores.



1. Create a grid inside regulated boundaries
2. Select random points of this grid.

These points are elevator cores.

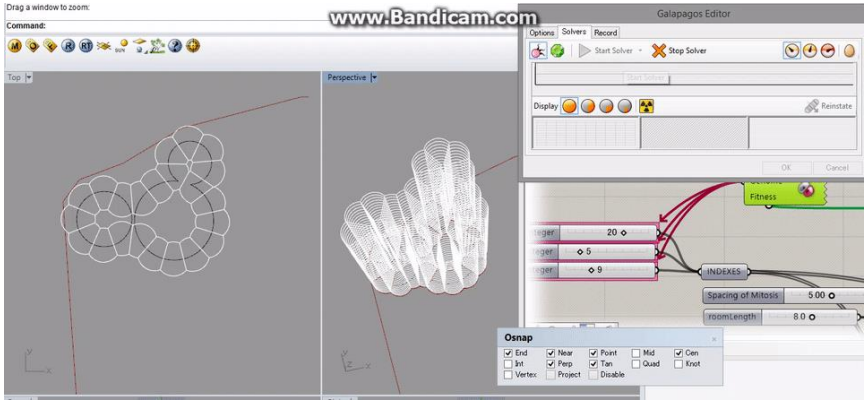
1.1



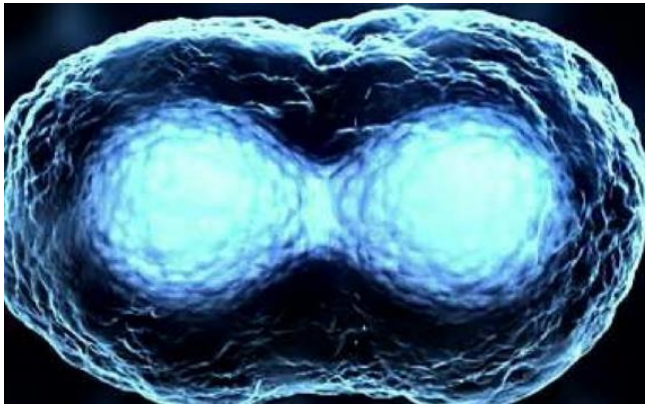
3. Create circles with center on selected points and tangent to regulated boundaries
4. Join them in one single master curve.
5. Based on this curve, get the number of rooms of the solution.

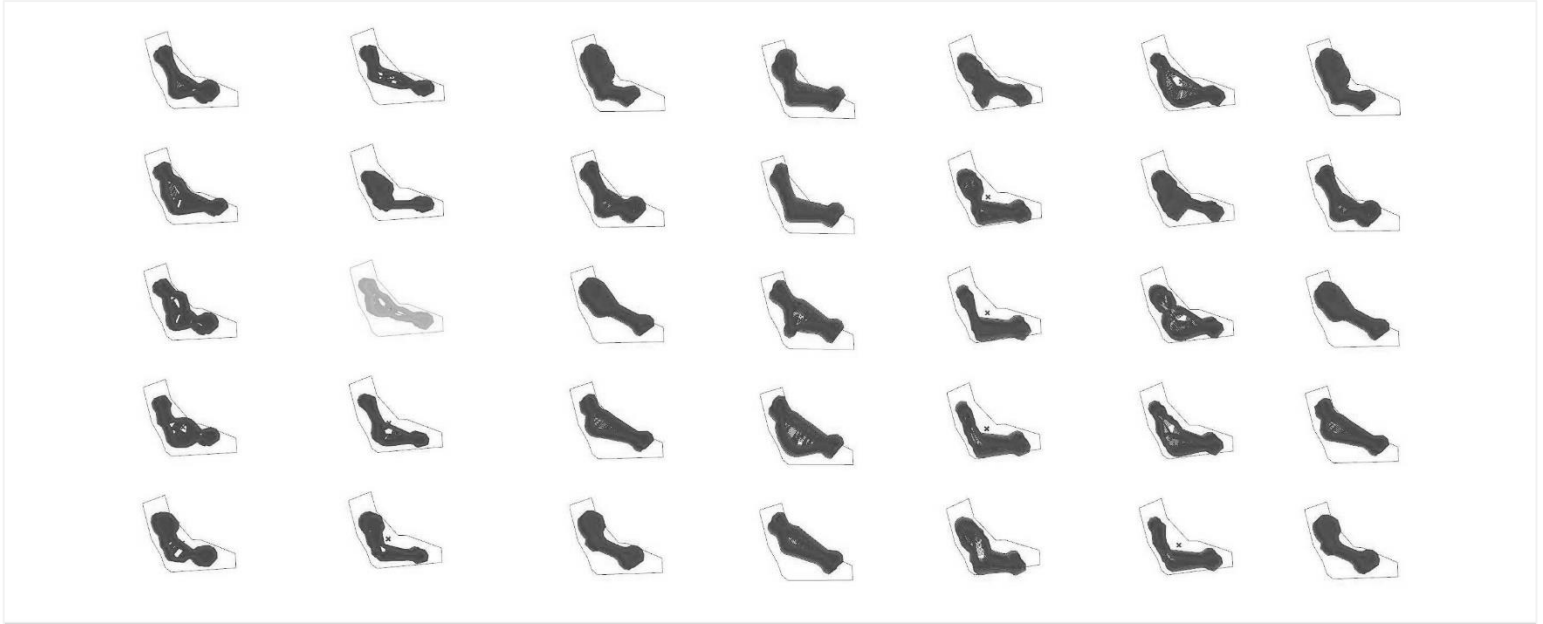
1.2

STEP 1: EXPLORING ROUGHNESS



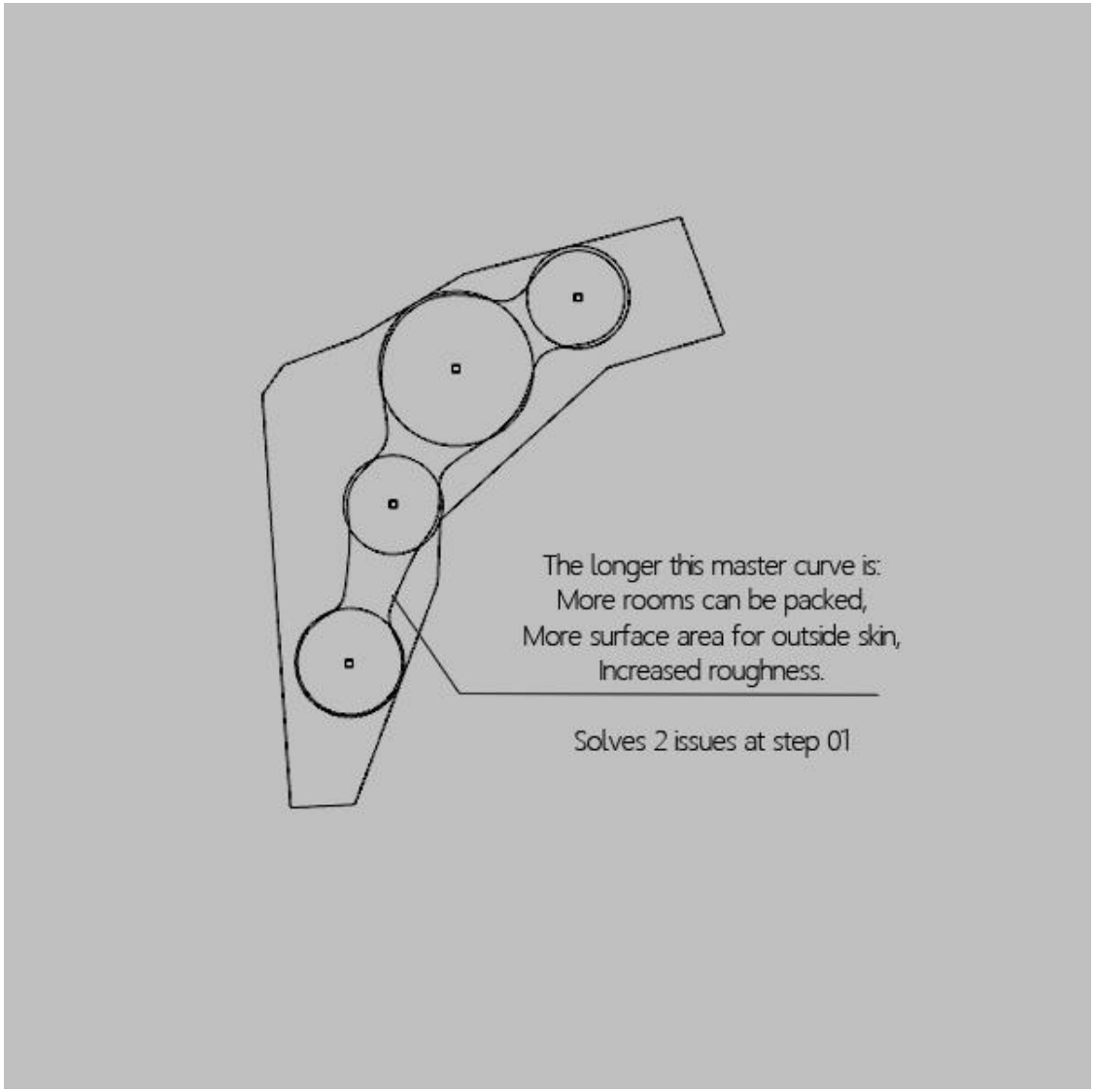
www.Bandicam.com





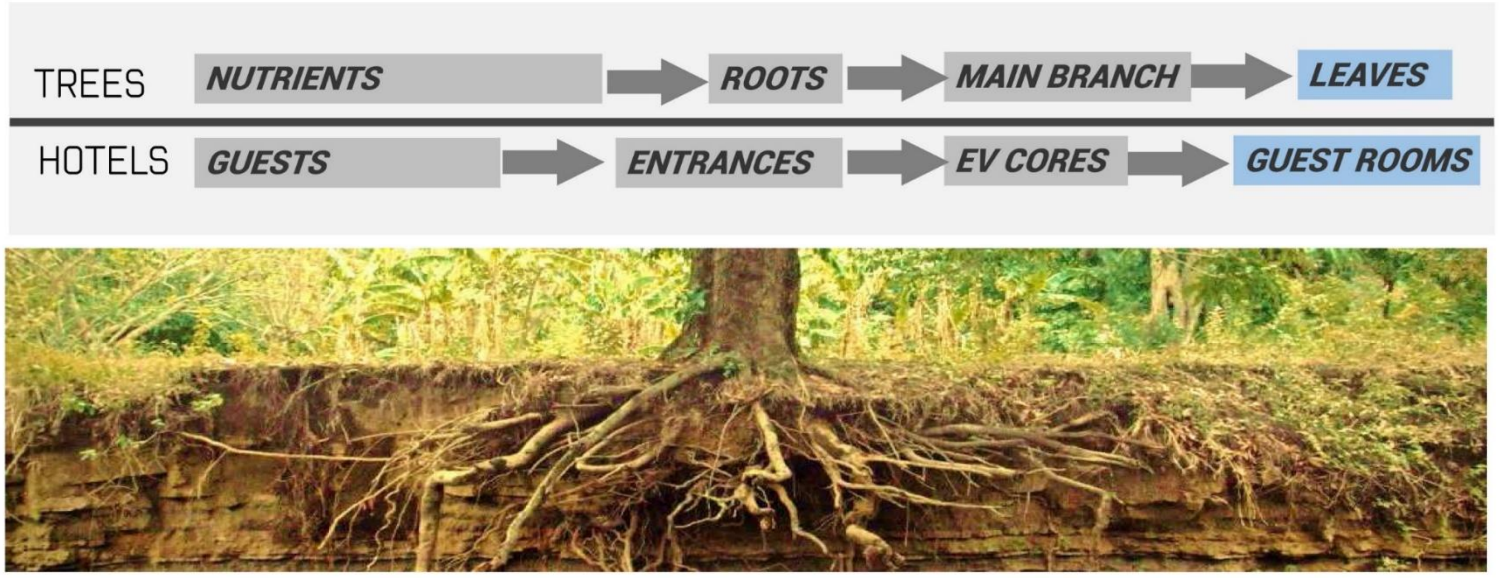
Step output: Several shapes with 43-47 rooms per floor.

STEP 1: EXPLORING ROUGHNESS



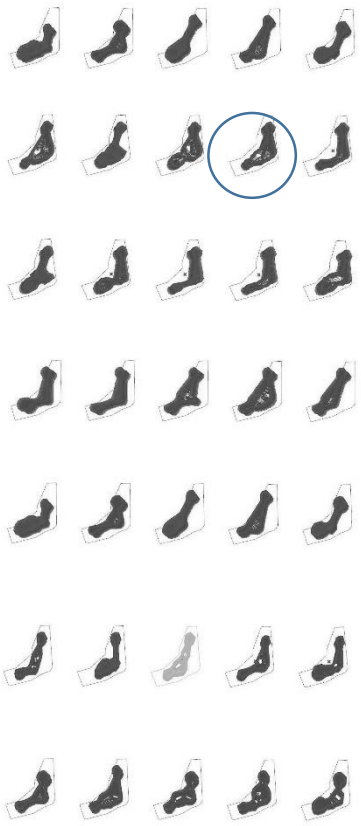
STEP 1: EXPLORING ROUGHNESS

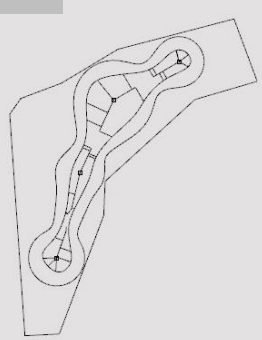
MAIN FLOW OF TREES AND HOTELS' NETWORK

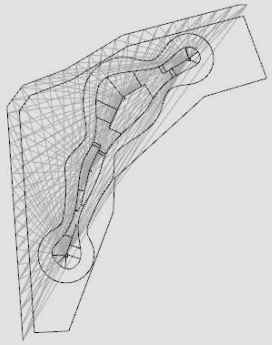


Nature's networks tend to seek for less energy spending shape generation rules.

Evaluate the best solutions from step 01:







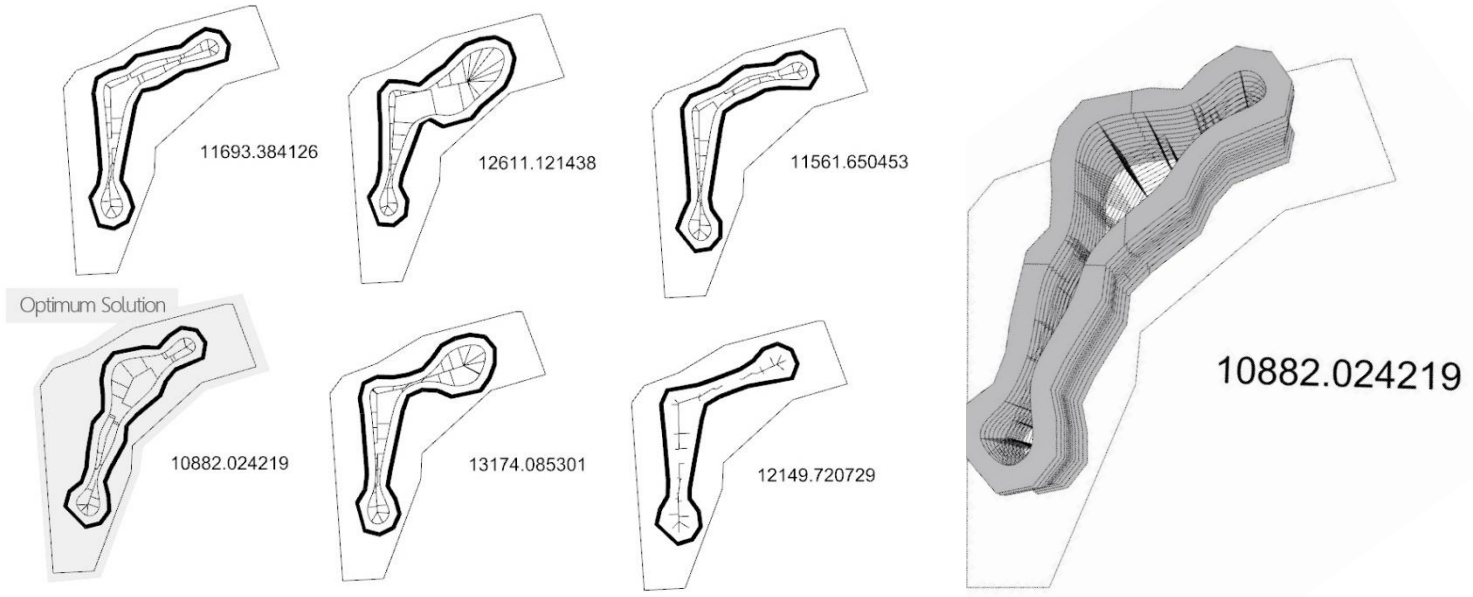
3. Get the path from each room to the closest elevator. Get the vertical path to the first floor. Get the path from ev on first floor to all possible entrances.

2. Do this for all the guestrooms of a 500 room hotel configuration. sum the length of these curves. Get the network size.

2

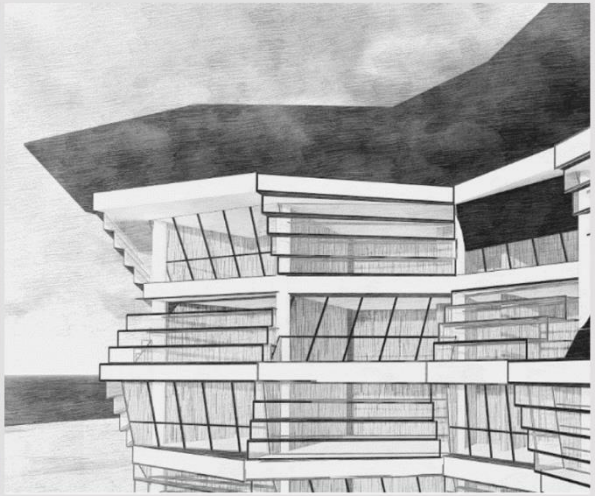
Get the smallest network, which will be also the most compact one

STEP 2: EXPLORING NETWORK



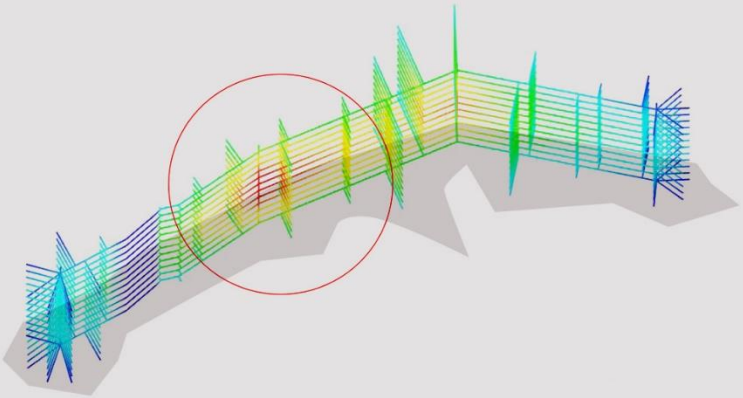
Core number input	Core number output	Guestroom Number	Network Size	Elevator configuration
4	4	42	10882m	3x2x2x2
4	4	45	11561m	3x2x2x2
5	2	44	12044m	4x5
4	3	44	12149m	3x3x3
4	3	44	12611m	3x3x3
4	2	41	12878m	4x5
5	3	44	13467m	3x3x3
4	2	41	13794m	4x5

STEP 2: EXPLORING NETWORK



Grasp the idea from the Benchmark model to increase roughness by adopting similar strategy. Replace the original concrete solution with a glass solution to give more light to rooms.

3.1

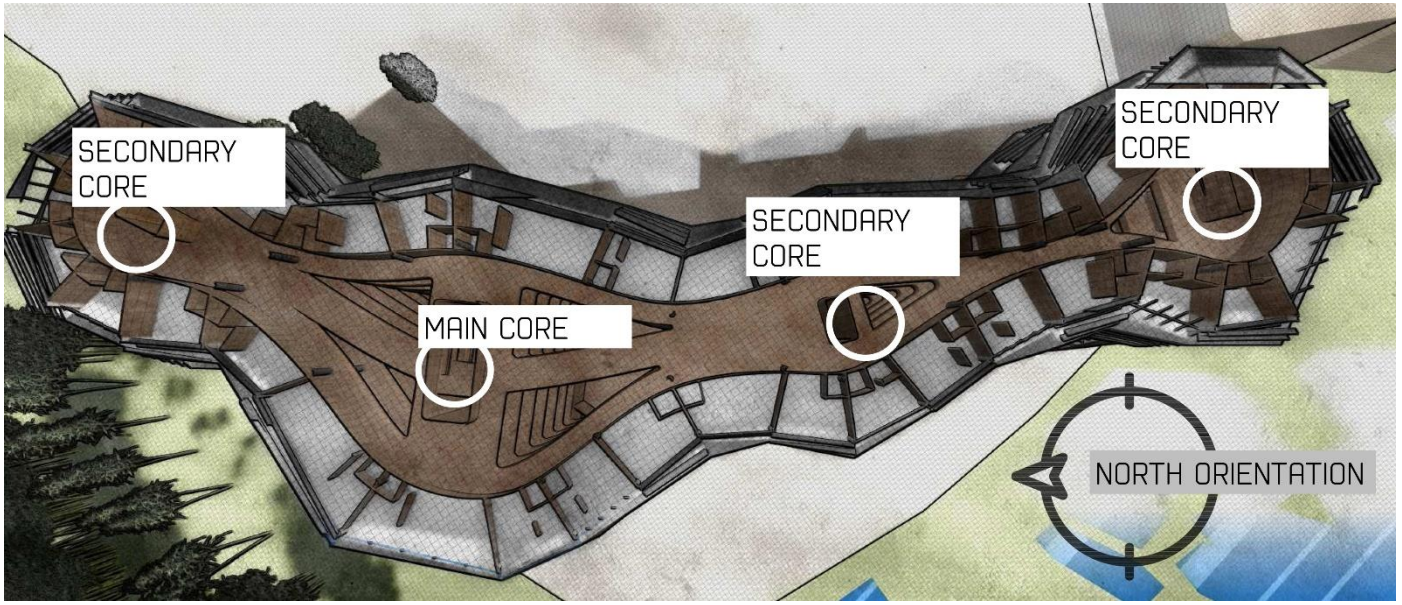


Use the first floor as common facilities for non-guests. Seek for the highest traffic point in the building for the common facilities for all guestrooms.

3.2

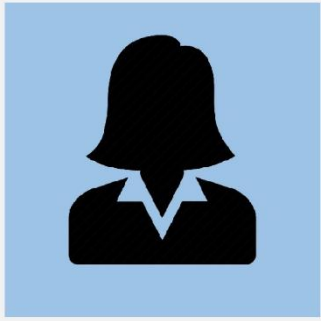
STEP 3: DEVELOPING THE OPTIMUM SHAPE

CELLA HOTEL:
DEVELOPED SHAPE

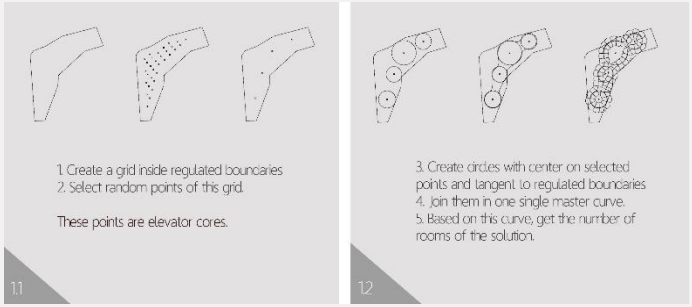


SITUATION> BUSINESS WOMAN THAT WILL MOSTLY USE GINZA LINE AS SHE ARRIVES IN TOKYO.

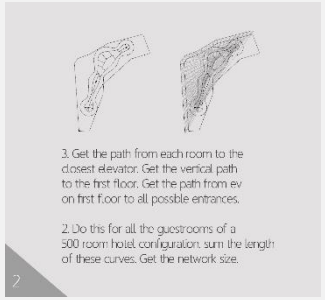
HOTEL USES GRAPH THEORY TO FIND THE BEST ROOM TO REDUCE WALKING DISTANCE.



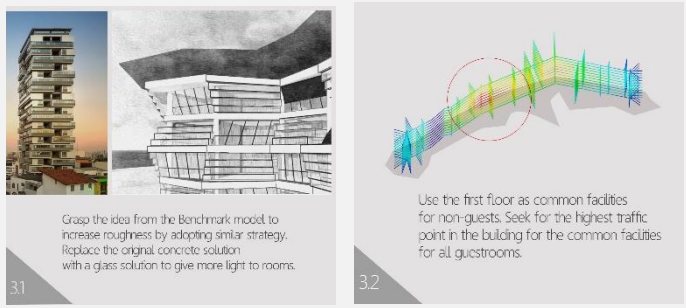
STEP 4: SUGGEST MANAGEMENT SOLUTION FOR CLIENT



1 GENETIC ALGORITHM (GALAPAGOS)



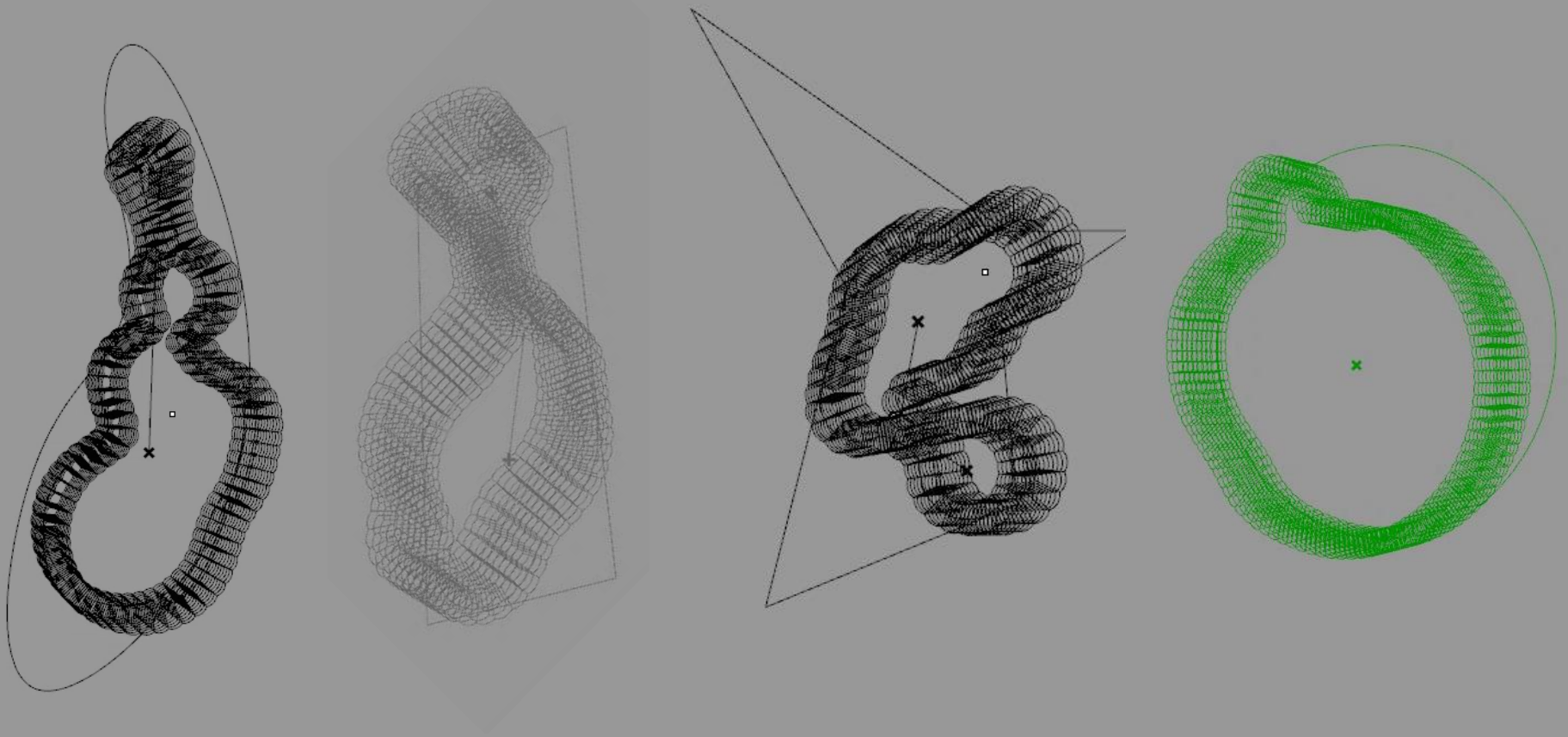
2 SORTING BY LENGTH ALGORITHM



3 GRAPH THEORY ALGORITHMS / DESIGNER'S PERSONAL TASTE AND WILL

REVIEWING DESIGN STEPS

FINAL RESULT



RECYCLEABILITY OF THE WORKFLOW