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Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

iA Chair of Information Architecture
Chair of Information Architecture

Reinhard König, Estefania Tapias and Gerhard Schmitt

# New methods in urban analysis and simulation

*< documentation of the teaching results // spring semester* 2015 >

iA Chair of Information Architecture

Teaching
Reinhard König, Estefania Tapias, and Gerhard Schmitt

Syllabi
http://www.ia.arch.ethz.ch/category/teaching/archive/hs2014-new-methods-in-urban-analysis-and-simulation/

Seminar
New Methods in Urban Analysis and Simulation

Students
Wilko Potgeter, Yasmine Priore, Danielle Griego, Randi Nanayakkara, Pascal Ryser, Tsung Hsung Ku, Petra Pfaff, Peter Ortner, Chunhui Liu

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Cover picture
Alma Grossen

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# New methods in urban analysis and simulation

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# Course Description and Program

In this course students analyze architectural and urban design using current computational methods. Based on these analyses the effects of planning can be simulated and understood.

An important focus of this course is the interpretation of the analysis and simulation results and the application of these corresponding methods in early planning phases.

The students learn how the design and planning of cities can be evidence based by using scientific methods. The teaching unit convey knowledge in state-of-the-art and emerging spatial analysis and simulation methods and equip students with skills in modern software systems. The course consists of lectures, associated exercises, workshops as well as of one integral project work.

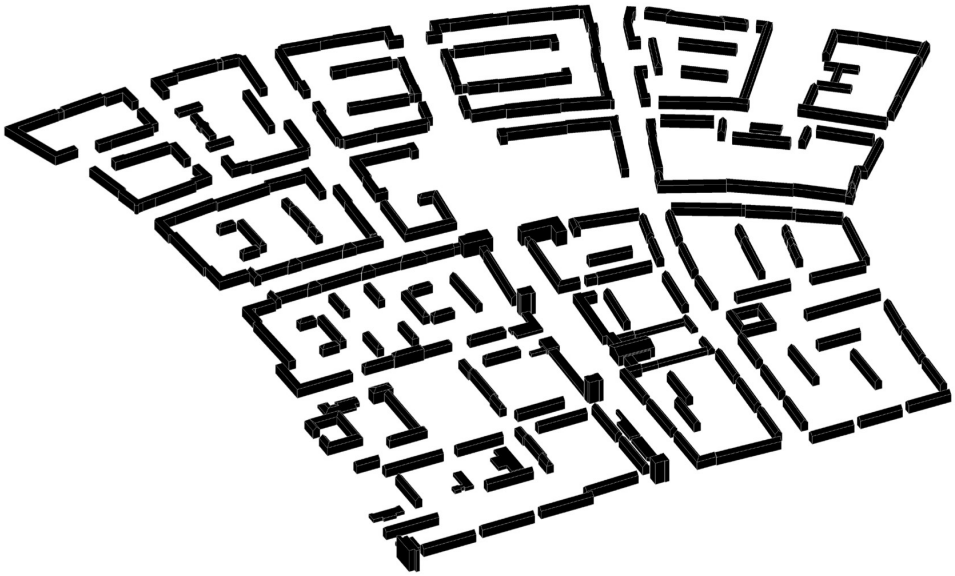
# Eisenhüttenstadt

Wilko Potgeter

The following project takes place in Eisenhüttenstadt, the first founded city of the GDR. Following the 16 rules for urban de- sign announced earlier and oriented at soviet developments and ideas of urbanity, the city is functionally seperated in pro- duction and dwelling. Dwelling units are linear housing blocks with big spaces between them to assure light and green for alle the population, following the very unified logic of planning common in the GDR and the Sowjet Union.
Today Eisenhüttenstadt is a shrinking city. From around 50'000 habitants at the fall of the GDR its population sunk to around 25'000. As a result of this negative growth, the periphery decays, what remains is the monofunctional inner dwelling core.

My project focuses on the idea of accepting the decay of the periphery while at the same time revitalizing the inner core of the city by adding new buildings with social functions.
The development of the project is done within a design process which tries to benefit from the use of software for the analysis of space and microclimate.
The goal should be, to develop a building which does not conflict with the existing city but tries to follow the same ideas.
In a first step I used space syntax analysis to understand the structure of the city which then led to two different approach- es for placing a building using a parametric design process evaluated with the use of an evolutionary solver.

Axonometric View
Eisenhüttenstadt



# 1 < *environment* >

As a first step, I took a look at the structure of the city itself. I wanted to find out where the best place for a public build- ing would be. Following the idea, that the new project should work as a social place it should be located at a very integrated site.

For the integration and choice analysis of the city I extracted two different networks. The first network is extracted as a segment map from a fewest lines axial map, the second net- work is a cleaned street network extraced from openstreet-map with elk.

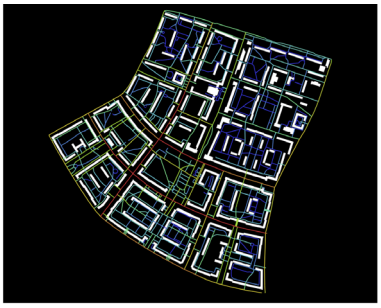
The integration analysis shows, that the empty part at the city center shows the highest integration. At the same time, the choice analysis shows, that it further more is located at the place with the most potential for traffic, which in Eisenhütten- stadt should be mostly pedestrian traffic.

# 2 < environment >

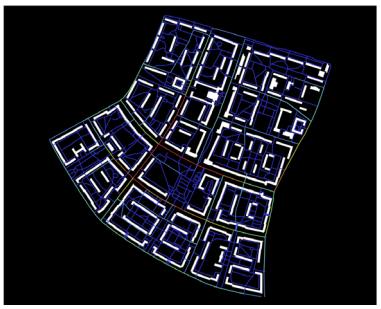
Axonometric View
Eisenhüttenstadt

After finding a good position for the new building the next step is taking into consideration the environmental aspects, which for Eisenhüttenstadt should be mainly the question of shading, because the city is developed in a very functional way so to prevent shading onto the houses. Using ladybug for grasshopper and extending its functional- ity by culling vectors with a low angle between vector and ground plane a solar envelope for the site is created.

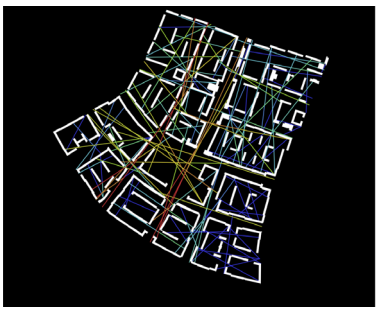
Pedestrian street
network integration



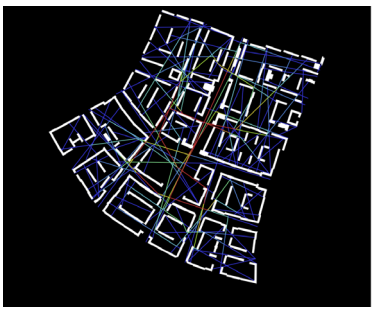
Pedestrian street
network choice



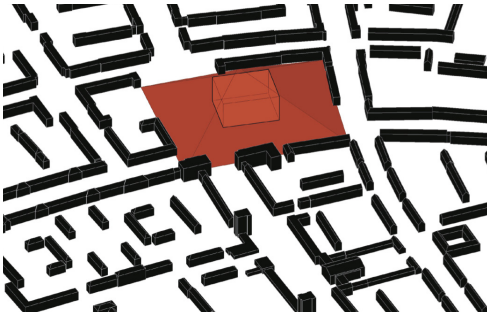
Fewest lines
segment map integration



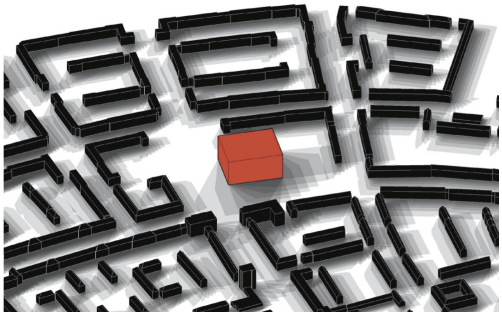
Fewest lines s
segment map choice



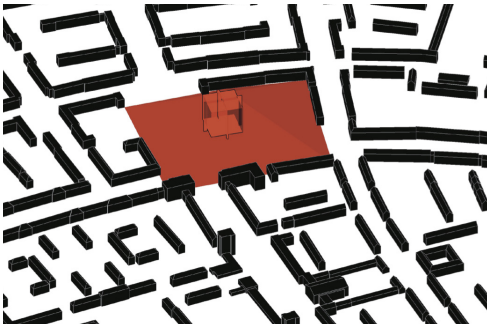
Decay of the periphery



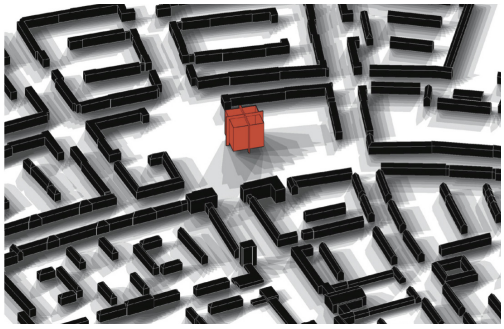
Empty space at city center



Decay of the periphery



Empty space at city center



# 4 < geometry >

The first approach to finding a design solution is by generat- ing geometry completly through a grasshopper definition. The definition creates a box controled by different param- eters. Then this box is evaluated through a fitness function taking different design aspects into consideration for further optimization and comparasion between different possibilities. Those are: alignment with the rest of the city, general volume, centrality, fitting inside the solar envelope and compactness.

The fitness function tries to level them out so they all have an ideal value around 1 and are all to be maximized. For further control of the result I inserted possibilities for weighting the aspects differently and disabling them so to be able to esti- mate their effect on the outcoming geometry. The definitions are shown on a later page.The final result of the optimization process is shown on the top of this page.

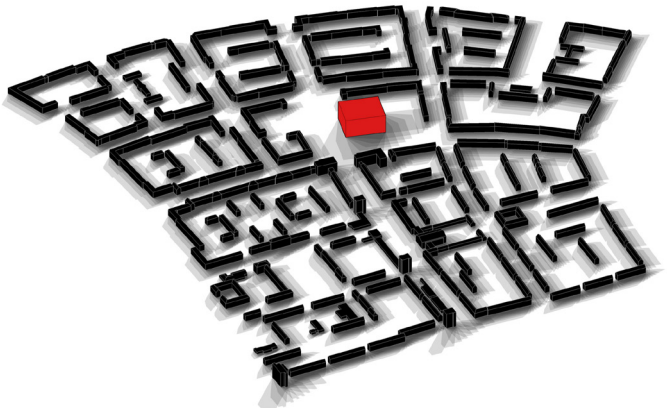
The second approach to finding a design solution is by not generating the geometry but placing a given shape. A grass- hopper definition manipulates the location, size and rotation of the given shape. In a second step a fitness function is used to evaluate the possible solutions by taking into consid- eration the centrality, alignment and overall size.

As in the previous approach, the fitness function tries to level them out so they all have an ideal value around 1 and are all to be maximized. For further control of the result I inserted possibilities for weighting the aspects differently and disabling them so to be able to estimate their effect on the outcoming geometry. The definitions are shown on the next page. The final result of the optimization process is shown on the top of this page.

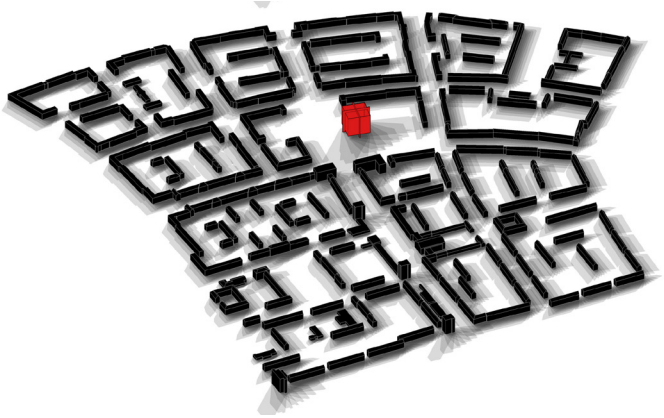
# 5 < *spaces*

As mentioned before, for further control over the output of the evolutionary solver, the equaled fitness aspects have the possibility to weight them by multiplying them with a slider from 1 to 10. They can also be turned off by a boolean toggle. As an evolutionary solver I used galapagos, which comes with grasshopper. The Problem with galapagos is that it only takes one fitness value, so you manually have to combine the different values and calculate one overall fitness value from them.
As you can see from the definition above, there is a lot of manual work in leveling the different aspects against each other and detecting their influence on the final result.

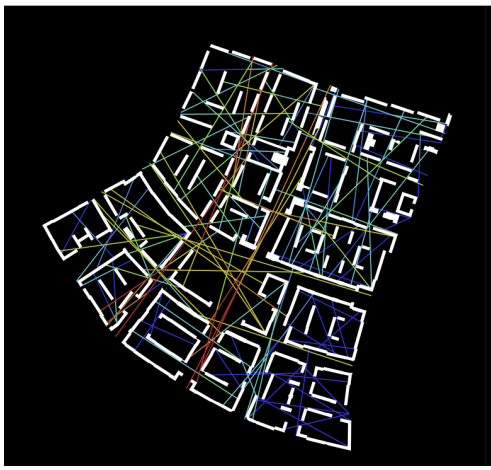
Decay of the periphery



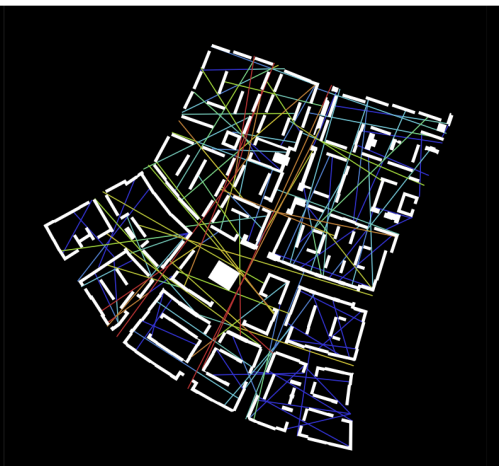
Empty space at city center



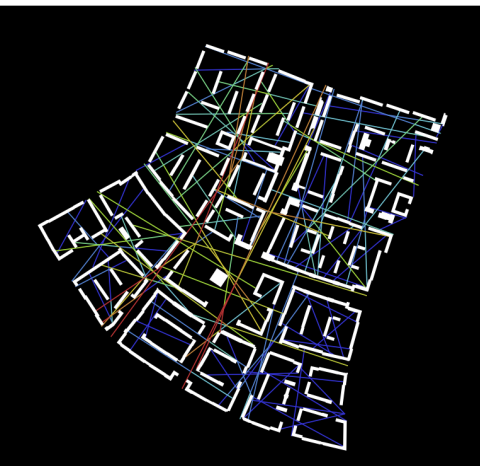
Decay of the periphery



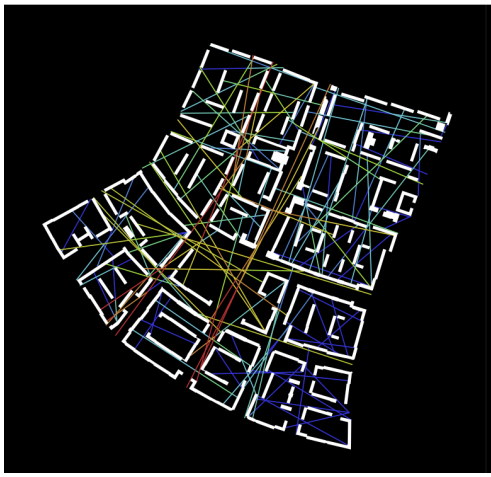
Decay of the periphery



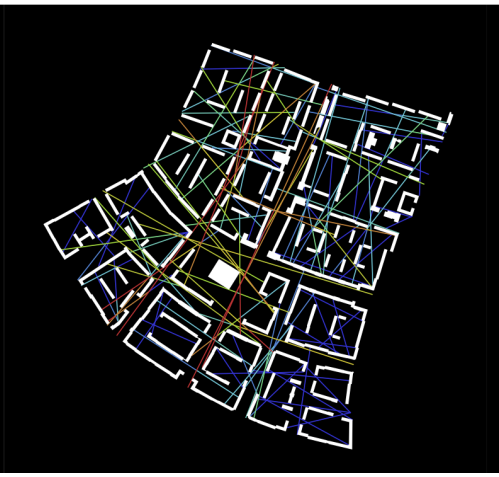
Decay of the periphery



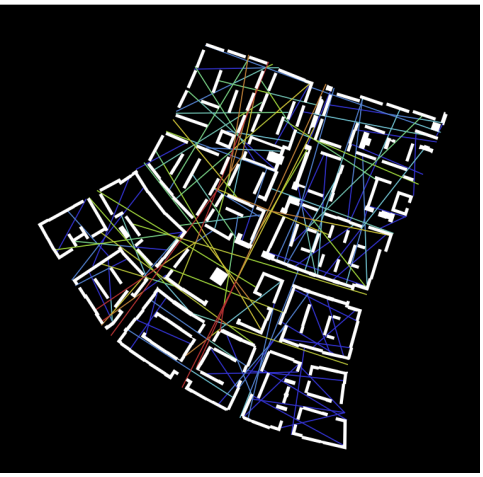
Decay of the periphery



Decay of the periphery



Decay of the periphery



# 6 < conclusion >

In a last step I checked if the initial spatial conclusion about the ideal position for the new building is still correct. For the new shapes I also calculated the fewest lines maps and made a segment analysis, which is leveled in the same scale for better comparison. Even though there are small changes to the resulting segment map, the overall impression is very much the same.
Thus the analysis shows, that for both design solutions the initial conclusion is still correct so we can deduce that the overall setting of the city is not beeing disturbed or changed to much through the intervention.

Annotation:

I did not go into detail for describing the use of the software because of the requested document length. I printed all the essential grasshopper definitions for which only the python parts are not visible.
For the segment analysis in Depthmap I always used angular analysis, tulip 1024, radius n, without weighting.

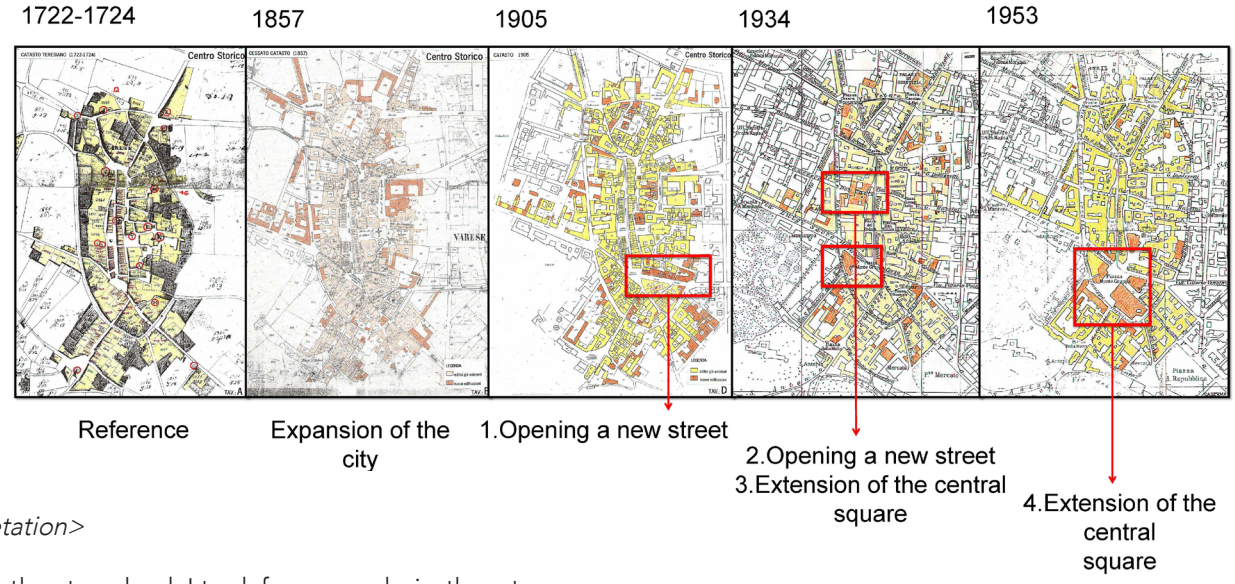
# Understand the past to build the future

YASMINE PRIORE

*< summary >*

Varese is a city in north-western Lombardy, northern Italy, 55 km north of Milan. The city lies at the feet of various Mountains and look over the lake of Varese.
This city has a very high immigrant population owing to both its economy ( many multi-national companies and the nearby EU institution) and its location (proximity to Milan makes it an ideal place for the latter city's workers).

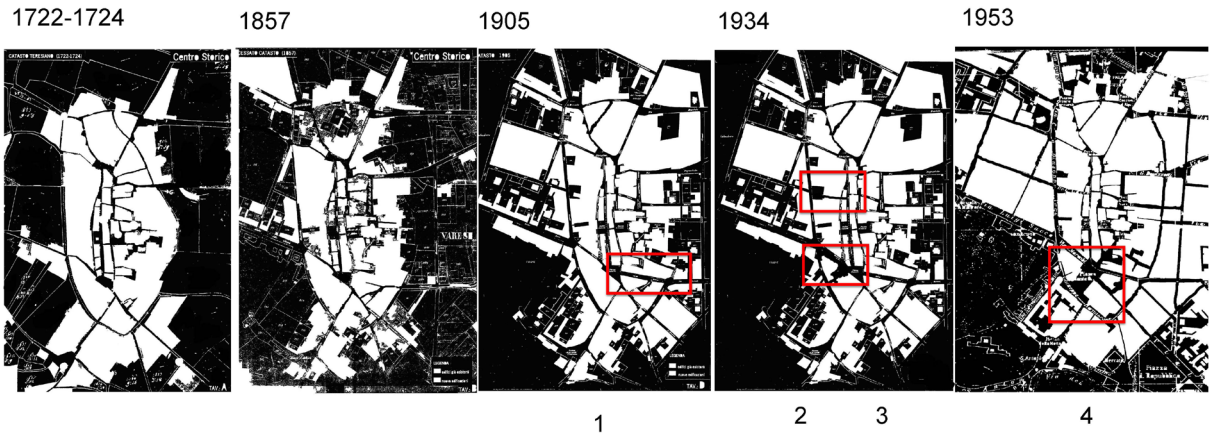
The Title "Understand the past to build the future" is for me of extreme importance, especially in Italy where there is a high percentage of heritage buildings. Furthermore I think National Identity should not be sacried in the name of modernity.



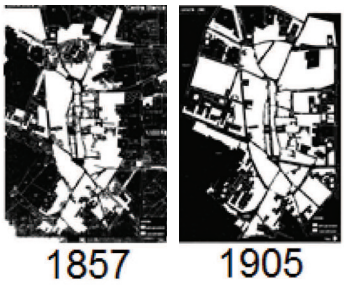

# 1

*< interpretation>*

Those are the steps back I took for my analysis, the rst one will stay as a reference point. In the second step is nice to see the expansion of the city's borders. From 1905 to 1953 I focused on 4 main points that are interesting for the changes in the spatial network of the actual city. First one the opening of one of the main streets in the center, second another new street in the central area, third a rst expansion of the main square and nally the ultimate expansion of this fascist square.

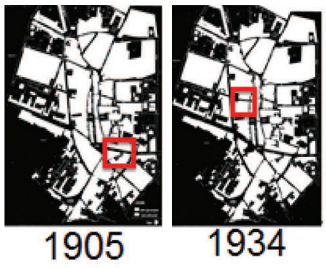



Here I just have a dierent visualization of the city's steps, trying to pointing out the street's network,in black we have open areas, while in white are the built areas. From 1722 to 1953 we can see  an increase in complexity of the network and an expansion of the city's border.
The city center is characterized by tight streets. e main road going around the city kind of closes the city in 1722, while in future years this disappear but the main road remains visible and dened.



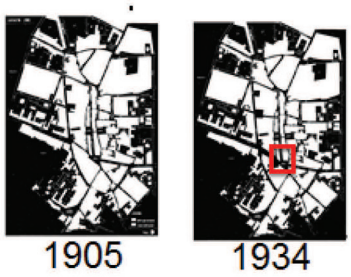
## 2 *< 1st zoom in >*

First Zoom in, opening of one of the main streets.
From the axial map analysis we can see that all three factors: (connectivity, integration and choice) show that this street has a major importance and centrality, so it might be interesting to see behind this urban change a need to connection in this part of the city.



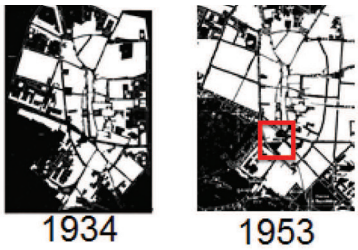
*< 2nd zoom in >*

Second zoom in, an other new streent more into the pedestrian area, it's a minor street so doesn't really inuence and we don't really see the importance of the street, although it actually has it's importance in connecting the outside border (where the cars run) to the internal pedestrian network.



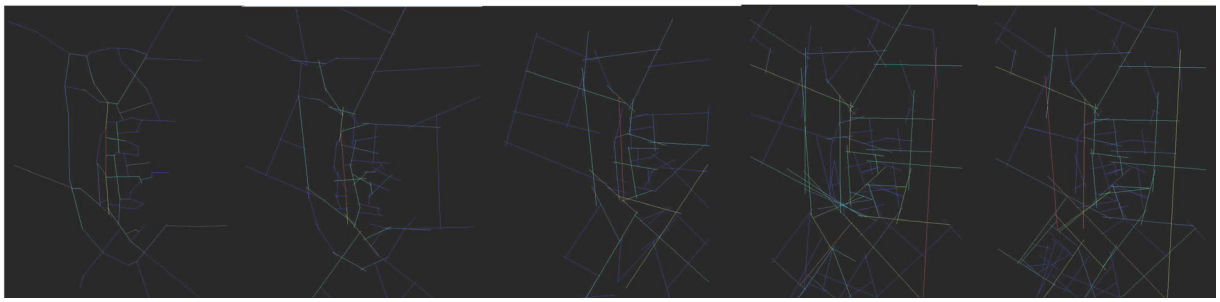
*< 3rd and 4th zoom in >*

Third and fourth zoom in, expansion of the main square of the city. is is one of the major and more signicant intervention made there. From the axial map analysis we really see how this expansion really creates a central space and a very dense network in these point at the first attempt.
In the second expansion this focal point gets more distributed that for me sounds strange, because the space is getting bigger but the values of integration and connectivity are lower. To do that they actually completely destroyed the neibourhoodt that was there.
I think the planning decision wasn't only driven by needs and planning thoughts but knowing the period and the output of the city's design, I think the renovation was mainly driven by the fascist regime, and fascist needs.

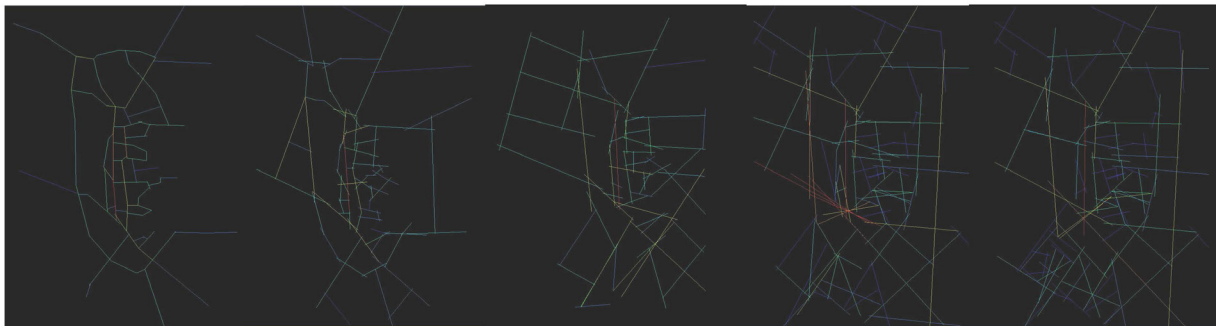


Representation of the continuous structure of open space.

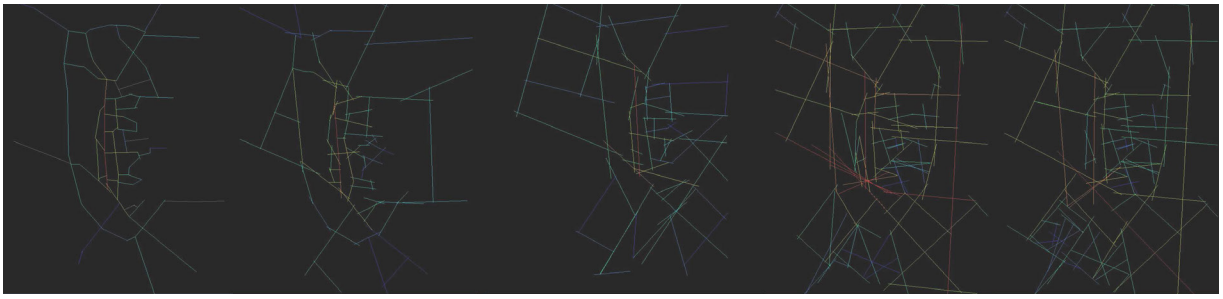
Choice:
Measurement of the "how" through a space. A street have a strong choice value when many of the shortest paths, connecting all streets to all streets of a system, passes through it.



Integration:
Describes the average depth of a space in the system. e spaces of a system can be ranked from the most integrated to the most segregated.



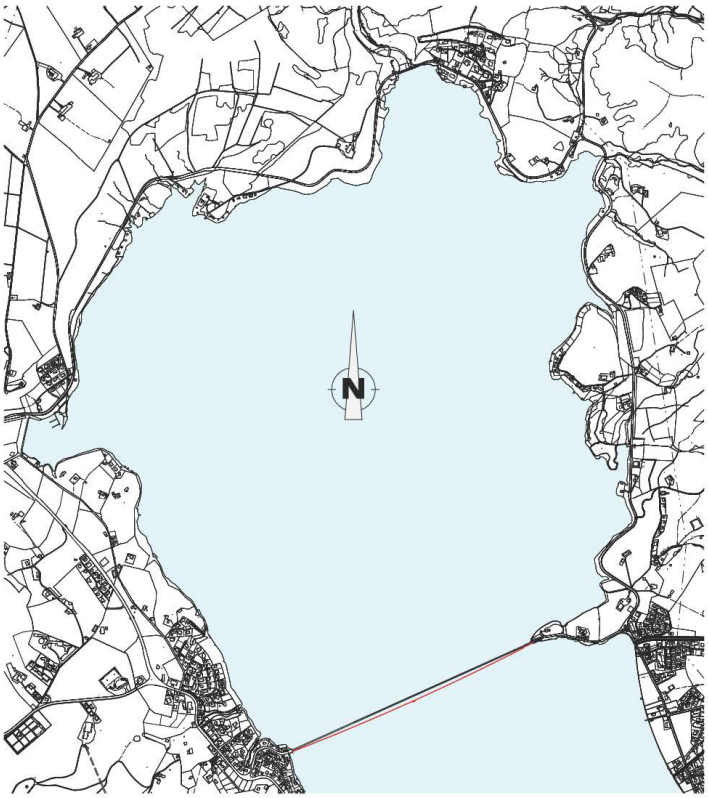
Connectivity:
Measurement of the number of immediate neighbours that are directly connected to a space.



# 4 < conclusions>

I want to conclude linking my analysis to the concept of sustainability of a city. In ancient times, sustainability was strictly correlated at the way the city and the buildings were built. Giving particular attention to the location of the city, orientation of axes and buildings taking into account solar cycles, dominant winds and resources availability.
So in planning modernity we have to be aware that probably previous deep analysis were made and just one single building or a new street opening can aect drastically the distribution of integration, choices and connectivity of the network.

Case study: PV System Installa5on at Holzsted Bridge, Einsiedeln Switzerland




# Climate Analysis Aided Design

Danielle Griego

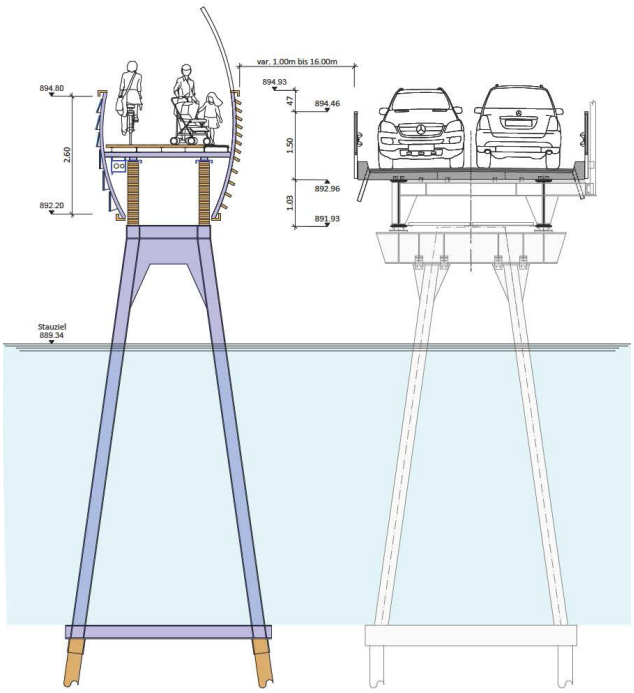
*< summary >*

Varese is a city in north-western Lombardy, northern Italy, 55 km north of Milan. The city lies at the feet of various Mountains and look over the lake of Varese.
This city has a very high immigrant population owing to both its economy ( many multi-national companies and the nearby EU institution) and its location (proximity to Milan makes it an ideal place for the latter city's workers).

The Title "Understand the past to build the future" is for me of extreme importance, especially in Italy where there is a high percentage of heritage buildings. Furthermore I think National Identity should not be sacried in the name of modernity.

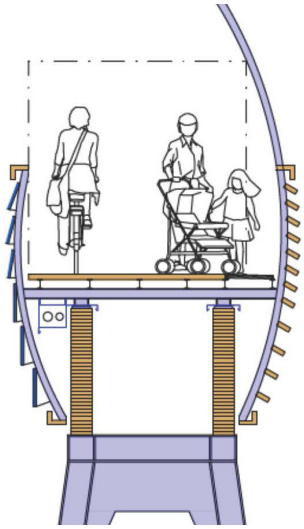
Design Considerations

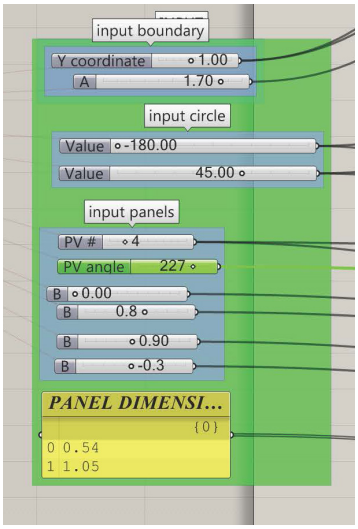
1. Integration with pedestrian bridge design
2. PV system power output
3. Maintenance and ease of installation

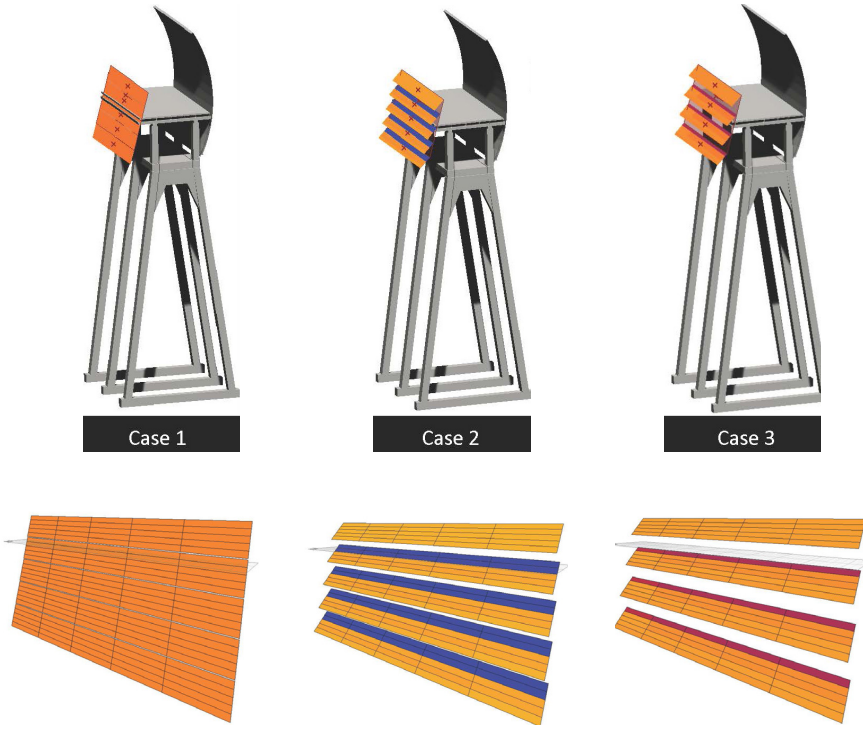



Integration with pedestrian bridge design

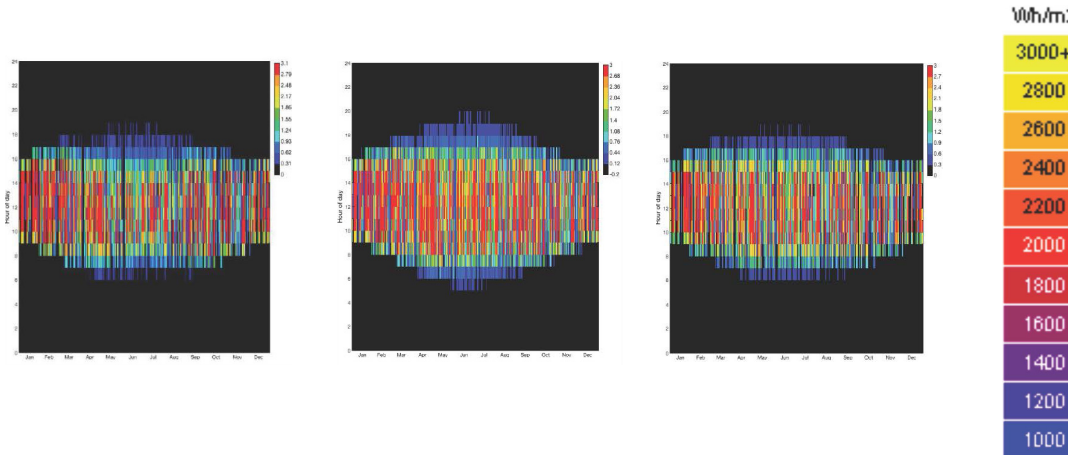
- 15 degree angle from ver5cal normal to maintain pedestrian walkability
- 47 degree PV panel moun5ng angle (la5tude) for max annual PV output



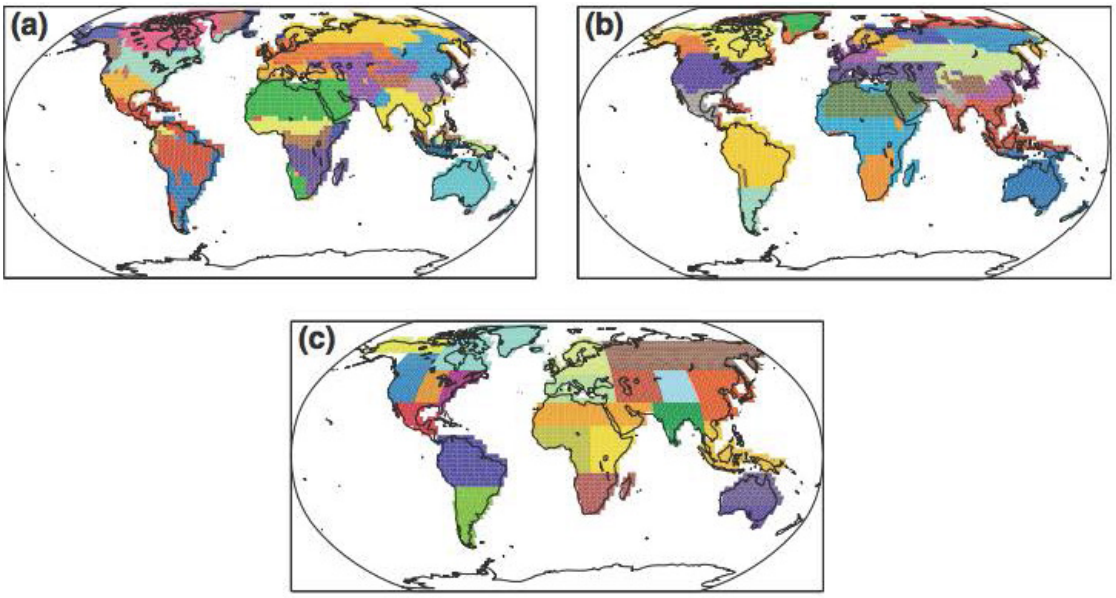




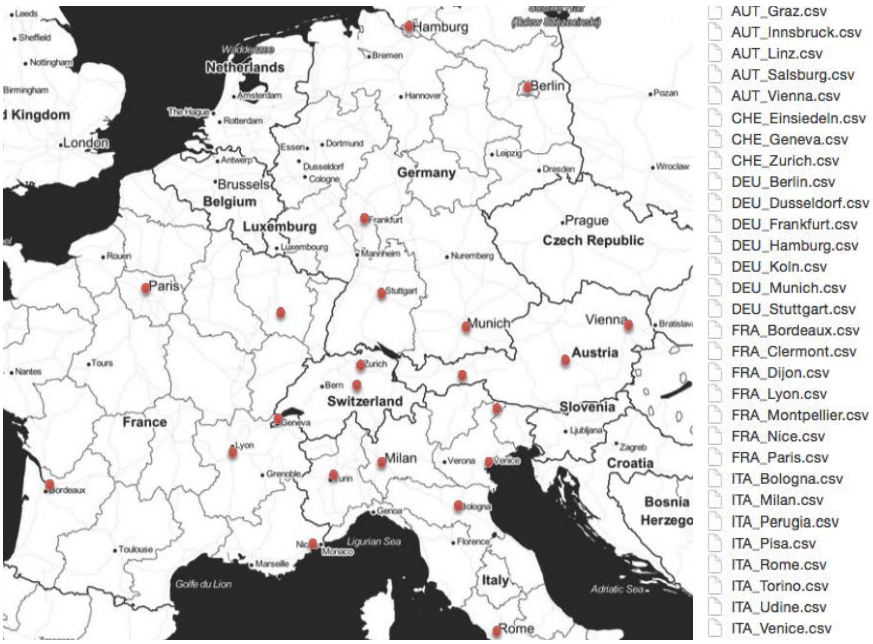

What is the impact of Self-shading on annual PV output?



Climate Clustering,
a Preliminary Design Tool



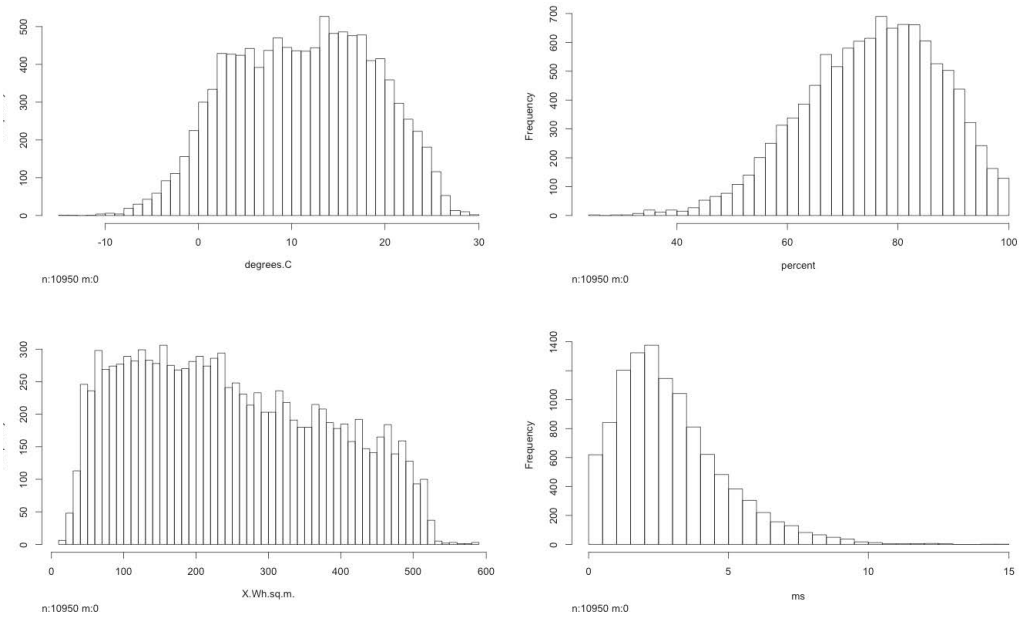

30 cities of Europe



Evualation Parameters:

- Temperature (C)
- Relative Humidity (%)
- Global Horizontal Radiation (W/m2)
- Wind Speed (m/s)

**4** *< daily resolution>*



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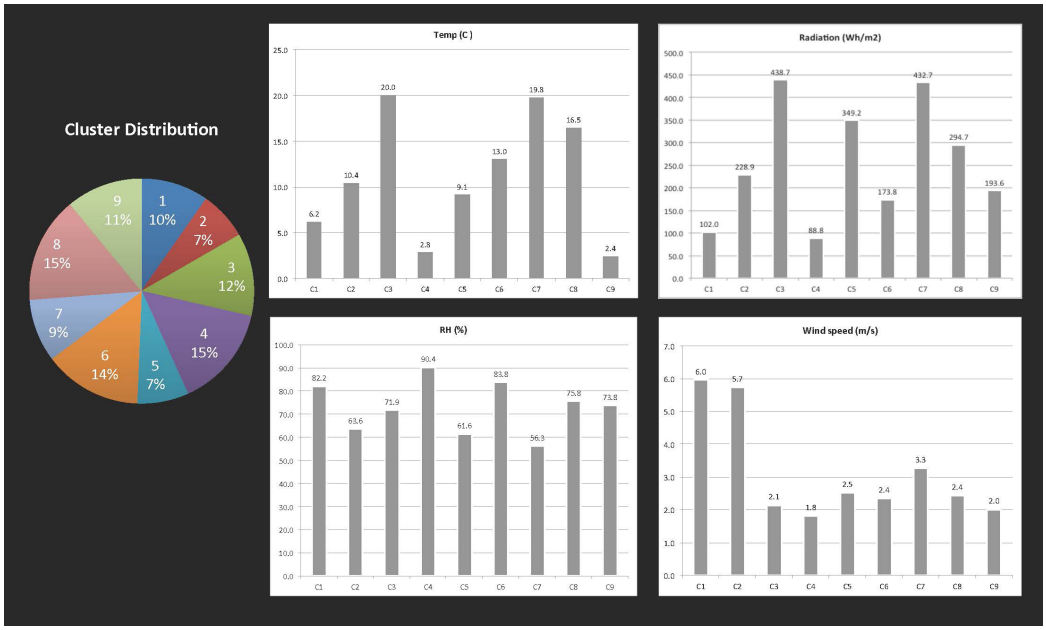


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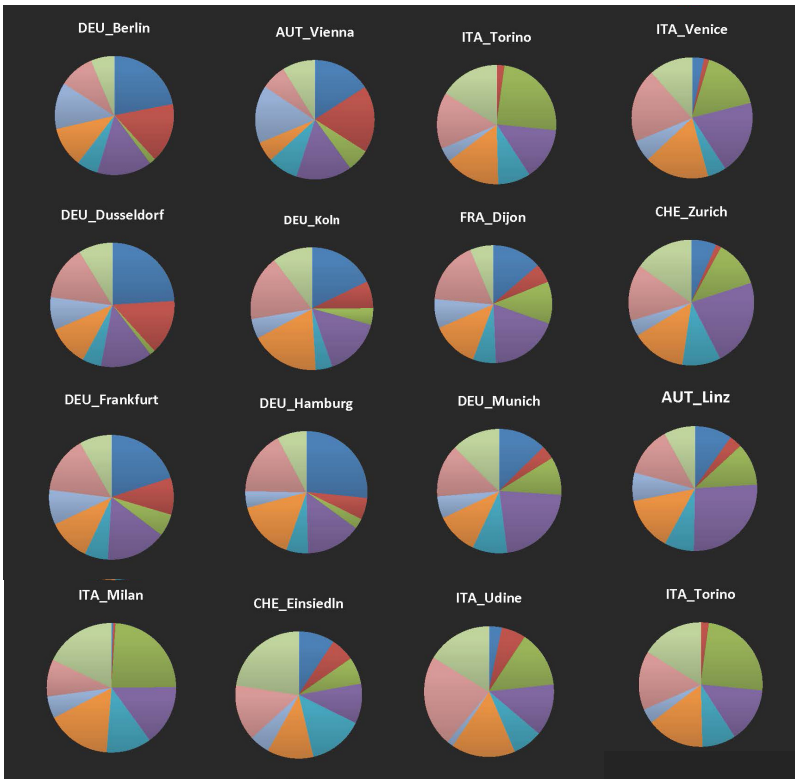


# Digital Urban Simulation, Harlem, NYC

Randi Nanayakkara

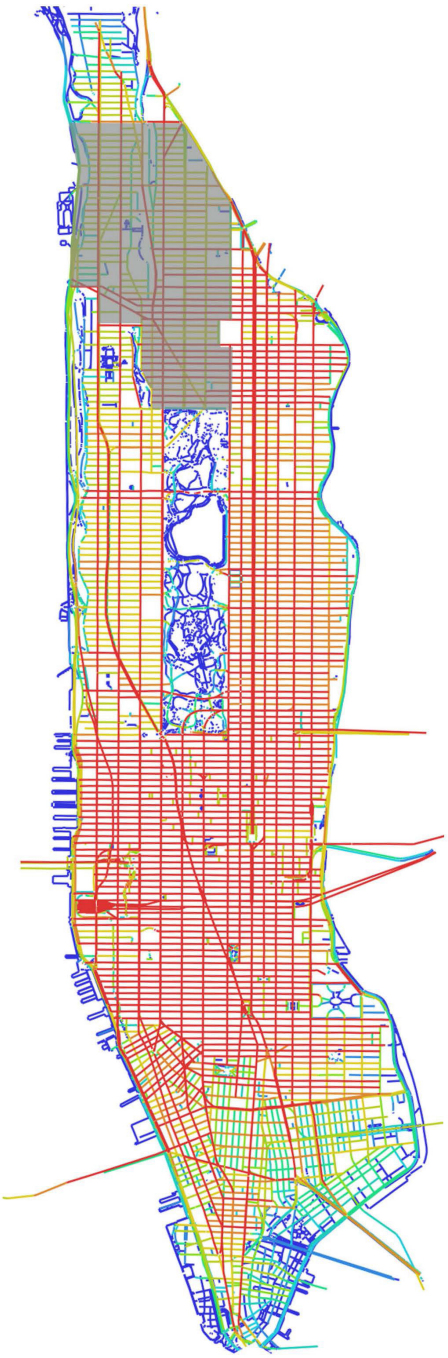
*< summary >*

The basis of these analysis is an architectual studio by Prof. Alejandro De Castro at Columbia University, NYC. In the centre of Harlem at W125th and Lenox Av is an empty piece of green land that becomes the backdrop of a busy intersection of Harlem. This empty land is valuable for two reasons, it is likely that ithis intersection maybe the busiest centre in Harlem as well as being eaisily accessible to all parts of Harlem. In order to create a public space in this location, we focused on Urban Gardening concept. In true NYC style, the focus was on creating vertical urban gardens that would also serve as a public space and act as a uniying factor in between the communities.
This site is interesting because it is already in a place that is central to Harlem. In the course of the analysis, I wanted to answer the following questions about this site to gain a better understanding of how it would function as a public space as well as an urban gardening space. The following questions quided my analysis:
|| What are the site's strengths and weaknesses?
|| Is the site suitable for a new public space (market), would people utilize the open space as "shortcuts" or more interesting roads in the area?
|| How does the site perform for Urban Gardening?
|| How does different forms on the site create a better public space?

**1** *< axial analysis integration >*

# Harlem, NYC

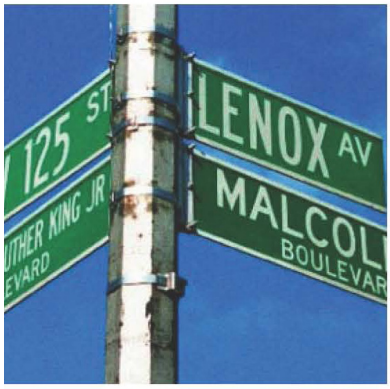
*I had seen the photographs of Harlem in its glory days, stylish men in bespoke suits, women so well dressed that they'd put the models in 'Vogue' to shame. I knew that Harlemites loved to dance, to pray, and to eat.*
**-Marcus Samuelsson**



|| **African-American** residential, cultural and business center.
|| "**Harlem Renaissance**" in 1920-30
|| Experiencing **gentrification**
|| high **unemployment, poverty, crime** as well as **mortality** rates
|| Melting pot of **diverse** communities. I
|| **segregation** between the communities.
|| **Experiment ground** in NYC
|| W125th and Lenox Av is an empty piece of **green land**
|| Create a **public space** in this location
|| Urban **Gardening** concept
|| Act as a **unifying** factor in between the communities

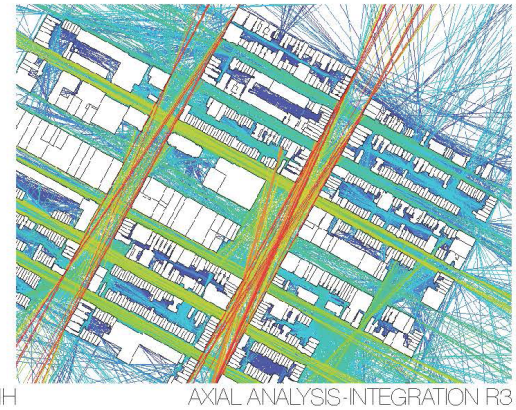
For the analysis, I relied on Axial analysis for measuring connectivity, integration and choice and used Ecotect insolation and shadow analysis for the solar analysis of the site. Furthermore, I analysed three design options that were developed for the site as proposals for the open market and the holders for the vertical gardens (both open and closed).

AXIAL ANALYSIS-INTEGRATION H




## 2 < *axial analysis connectivity* >

AXIAL ANALYSIS-CONNECTIVITY

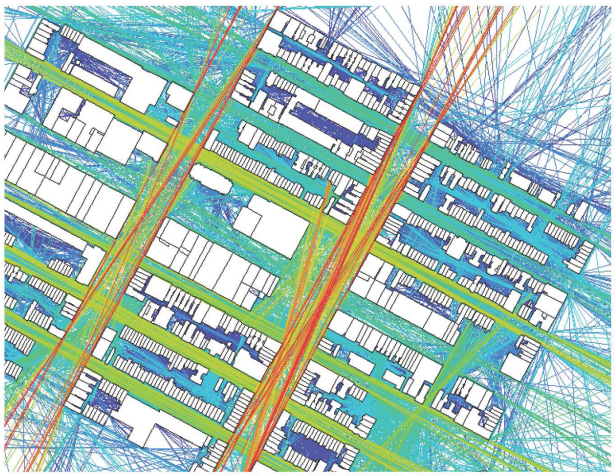


HH AXIAL ANALYSIS-INTEGRATION R3

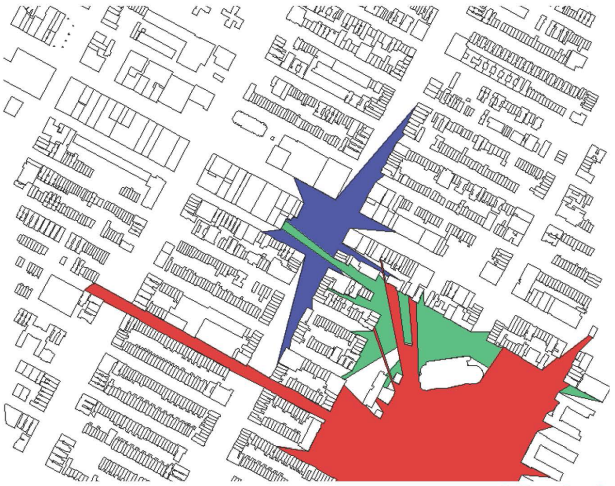
# 3 < axial analysis current >

AXIAL ANALYSIS-INTEGRATION

AXIAL ANALYSIS-CHOICE



AXIAL ANALYSIS-CONNECTIVITY



ISOVISTS

ISOVIST ANALYSIS

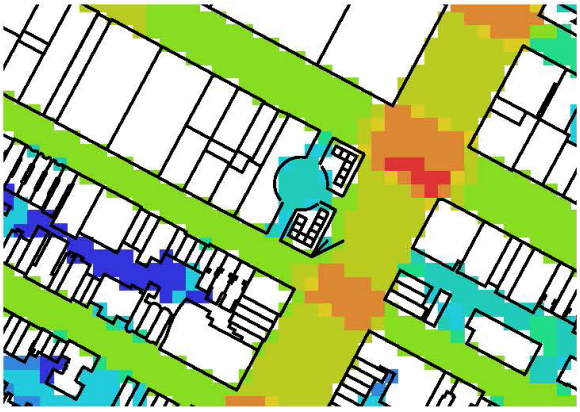
In this analysis I looked at how the current site behaves as an open space. This space is a closed space and is not used by the public. However, If it is an open space to the public its characteristics changes significantly.
The "integration [HH]" – show how each street is connected to all others in terms of the maximum possible directio changes. The current space is highly integrated and already connected well with the surrounding network. It is a prime location by this analysis. The isovist analysis also conforms that this site is located at a prime location for use as public space.
Once its stance as a suitable site to build a new public space is established, how is it possible to determine what kinds of forms exemplify its qualities while also drawing in pedestrian traffic to the proposed market space?
AXIAL ANALYSIS-CURRENT

# 4 < axial design option 1 >

CHOICE R3
BLUE 0, RED 1000

CONNECTIVITY
BLUE-0, RED 5

INTEGRATION
BLUE-0 RED 5

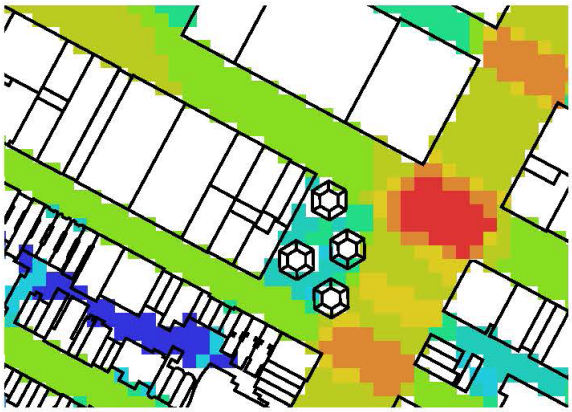


VISUAL INTEGRATION
COLOR RANGE- BLUE 2, RED 10

The option one is a piazza structure with an inclusive circular shape for the public space. The program for it proposes a built structure for the vertical garden and the market stores to be facing both the streets as well as the interior piazza. I analysed the space at a radius on 3 and the results show that the public space in the design seems to be quite integrated in comparison with the location while also having higher connectivity values. However, the circular shape of the design may have a large influence on the integration value.

# 5 < axial design option 2 >

CHOICE R3
BLUE 0, RED 1000



VISUAL INTEGRATION
COLOR RANGE- BLUE 2, RED 10

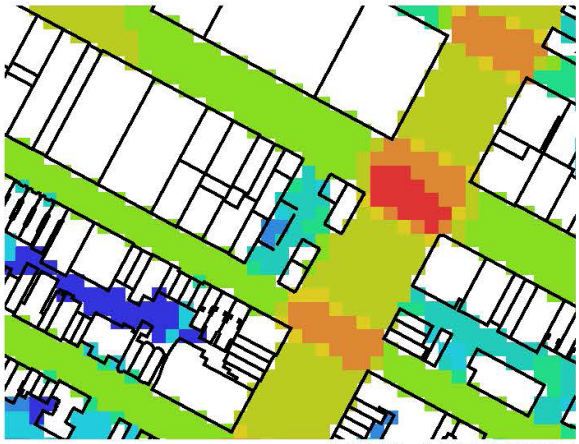
CONNECTIVITY
BLUE-0, RED 5

INTEGRATION
BLUE-0 RED 5

The option two constitutes of a more hut structure where the gardens and the public amenities co-exist and the circulation path that is created would become the "public" space for the pedestrian traffic.
I analysed the space at a radius of 3 and the results show that the public space in the design seems to be less integrated but not so well connected with its surroundings. The reason maybe because of the appearance of angular changes when navigating through the space. It requires more changes in angle, from crossing from one street to the other than would option one, thus giving less connectivity and integration values.

# 6 < axial design option 3 >

CHOICE R3
BLUE 0, RED 1000



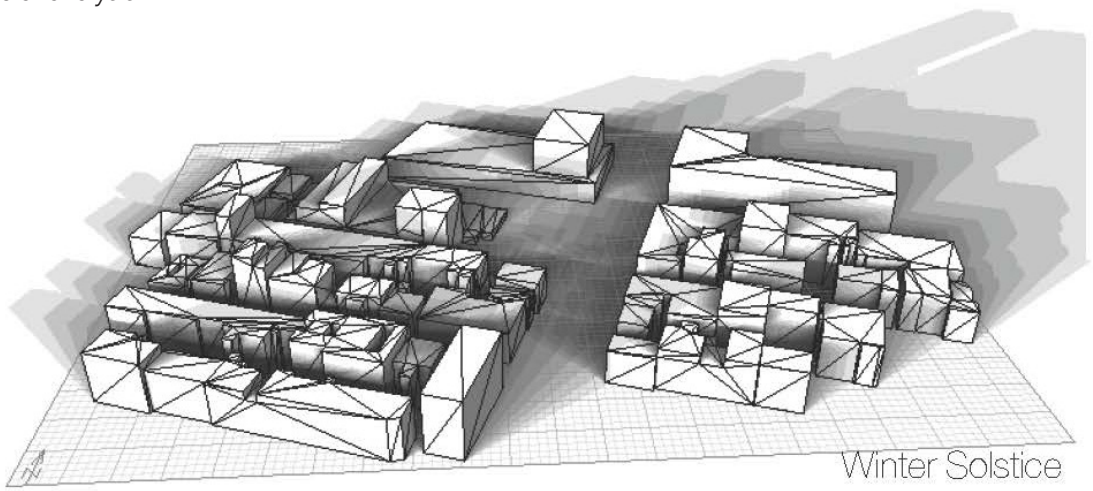
VISUAL INTEGRATION
COLOR RANGE- BLUE 2, RED 10

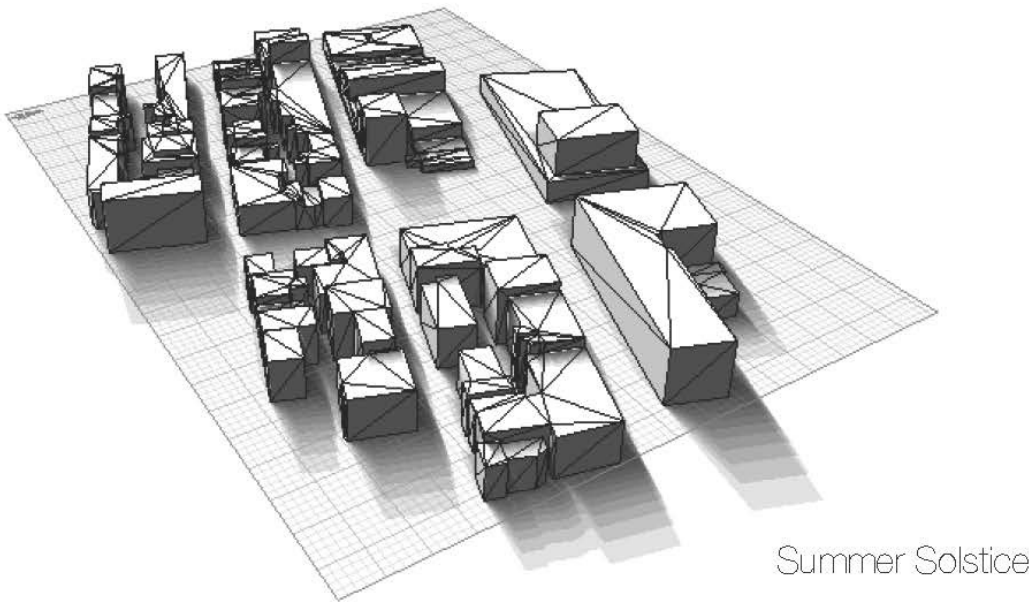
CONNECTIVITY
BLUE-0, RED 5

INTEGRATION
BLUE-0 RED 5

The option three is a more typical building structure and a open public space in between the vertical gardens and the shop spaces in front.
I analysed the space at a radius of 3 and the results show that the public space in the design seems to be well integrated as well as having good connectivity status.

# 7 < solar analysis >

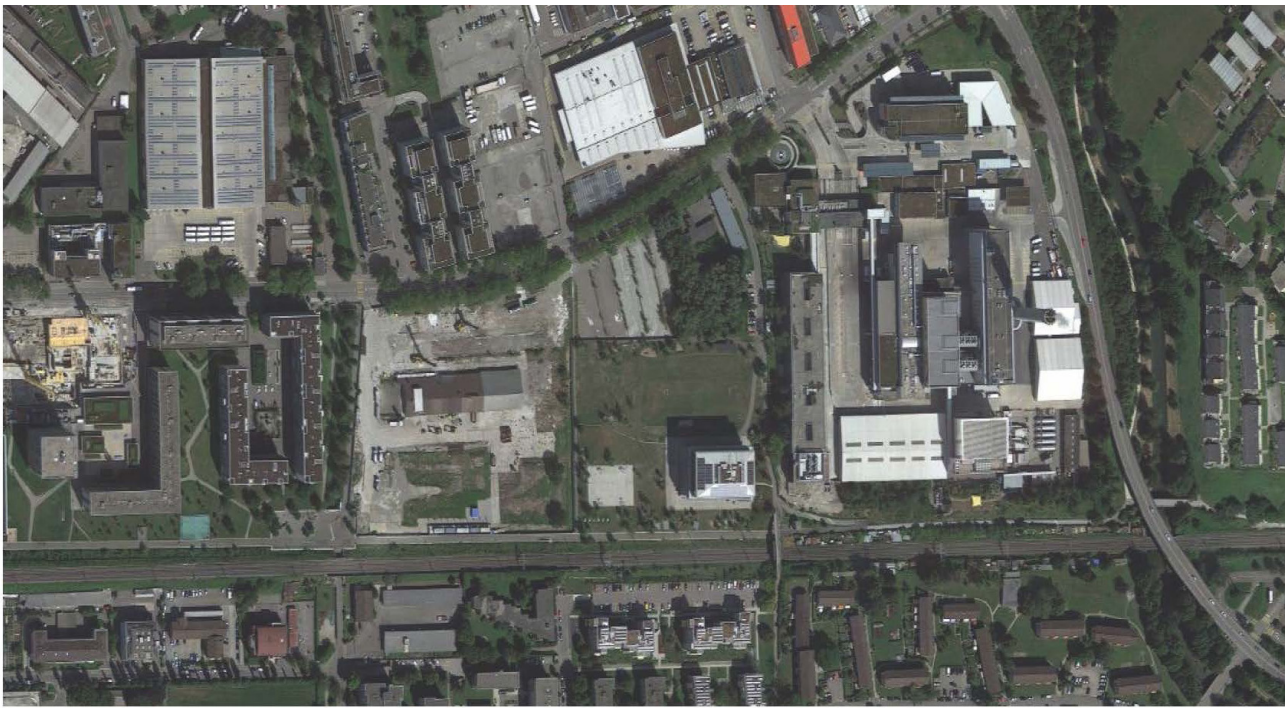



In order to answer the questions whether the site is suitable for a new public space (market) and how does the site perform for Urban Gardening, I looked at the insolation analysis of the site as well as the shadow ranges at the summer and winter solstice.
From the insolation analysis, the site receives high levels of irradiance directly on most parts of the site. In an open market structure which would bring the community together and food, this may not be ideal in summer months, as NYC could reach temperatures of nearly 40 degrees during these months. The design would have to adapt to such requirements.
Furthermore, the site is also hardly shaded during the summer months and this would give some design considerations regarding to the placement of different plants for the vertical garden.

# 8 < conclusion >

The analysis of the different design options that were conducted shed some light into how the arrangement of the different forms lead to different integration, connectivity and choice values. In order for the public spaces of the project to really function well, they would need to compete for pedestrian traffic that might prefer an alternative pathway to get through this location. For a public space such as a market, this is could be a reason why it would thrive. Even though the analysis is largely also influenced by the values of the major road beside it and should be ideally discounted, it is interesting to see if the space would function as an alternative more interesting "road" to the pedestrian traffic.
Furthermore, it is interesting to perform an axial analysis on the grid of NYC, which is largely identical and still find certain areas that happen to be more globaly integrated than other places. The axial analysis method proved to be useful in analysing in even the most uniform of all cities. I would think that it is actually more difficult to discern the most ntegrated point of a uniform city than a much more "randomly" generated one.
It would be interesting to use this analysis to evaluate the circulatory systems of architectural proposals such as these analysed because it really allows one to compare several proposals at once and discern each's strengths and weaknesses from each other.



# Competition Analysis Hunzikerareal

Pascal Ryser

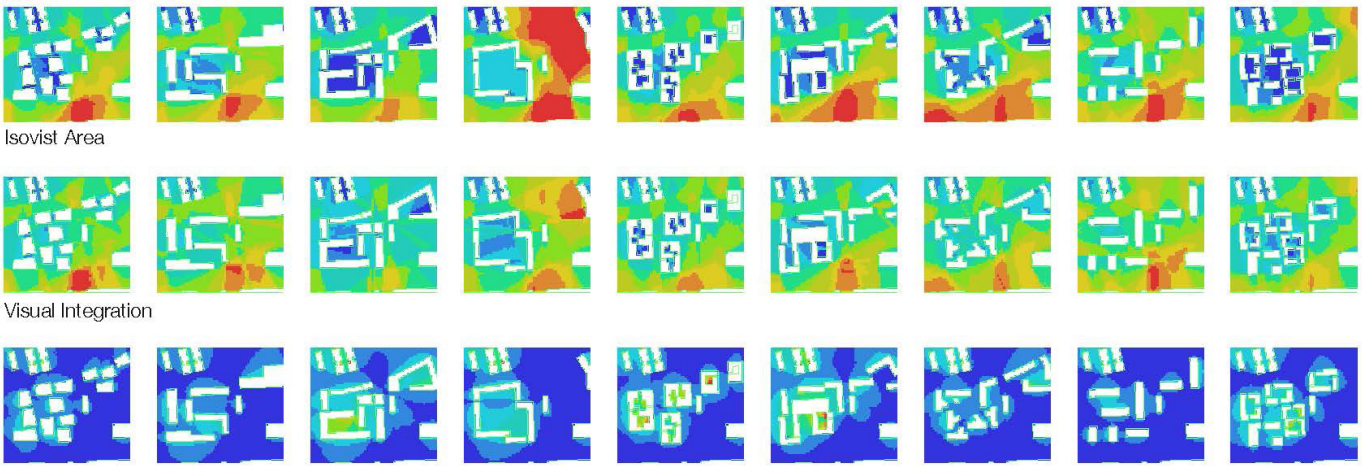
*< summary >*

Intention

Through depthmap analysis and comparison of different competition proposals, this documentation tries to show the potential of the analysis method for large scale architectural competitions.

Competition Hunzikerareal

In 2007 the "Genossenschaften" (cooperative housing enterprises) of Zurich celebrated their 100 year anniversary.
They decided to launch a project where they wanted to find new ways of contemporary living and realize a housing project that is a contemporary prototype for residential architecture and sustainable living.
In 2008/2009 a competition was held where the participants had to present an urban plan of the whole site as well as one building in detail where they presented their idea of contemporary living. The analysed proposals are entries of this competition.




Isovist Area

This Aspect shows, how large the area is that can be observed from a certain point. It gives an idea of how public or intimate a space might feel.
Red = A large area can be observed from this point. In reverse this point might feel very public and open.
Blue = A small area can be observed from this point. In reverse this point might feel intimat and enclosed.

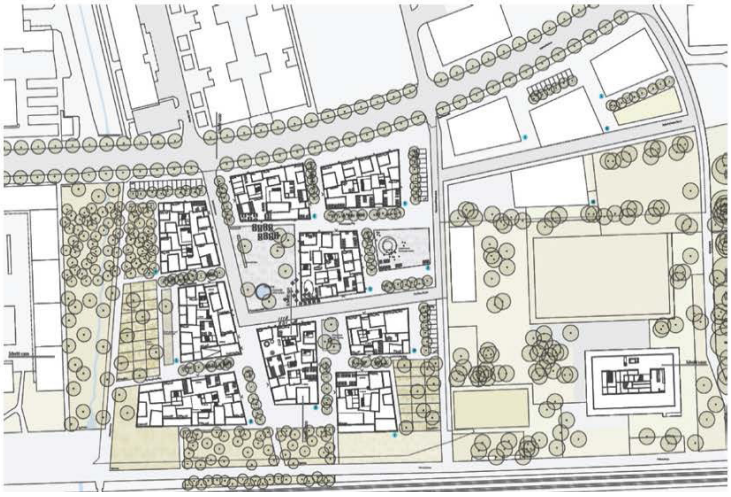
Visual Integration

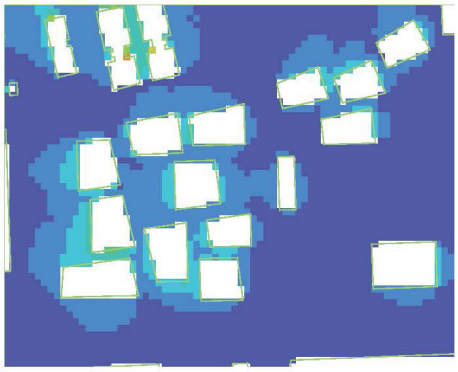
The Integration value shows how much an area is visually central within a context. It is possible that a space has a small isovist area value because it is heavily enclosed but at the same time has a relatively high visual integration value because a few steps away it is situated within the visual center of an area.
Red = Visually central.
Blue = Visually peripeheral.

Angular Mean Depth

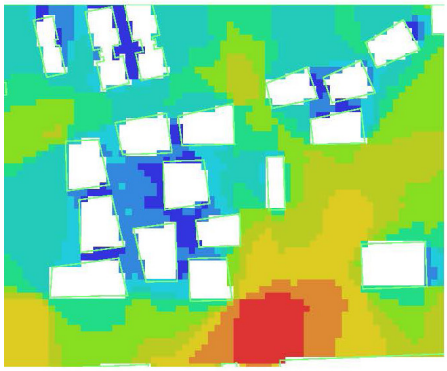
Depth describes how far away a point from all the other points is. With the angular mean depth, the distance
is measured in angular changes that represent a path. The more depth a space has, the more inconvenient are the ways to the other spaces as there are a lot of angular changes within the path.
Red = Peripheral point with ways that include many angular changes until the other points are reached.
Blue = Central point with ways that include few angular changes until the other points are reached.
Color Code
Red represents the highest values, blue represents the lowest values. The analysis data was scaled to the same color range to make a direct visual comparison possible. As a consequence of this procedure, the minimum and maximum values may not be reached by some proposals.

Proposal 1: FELLINI - Futurafrosch & Duplex Architekten



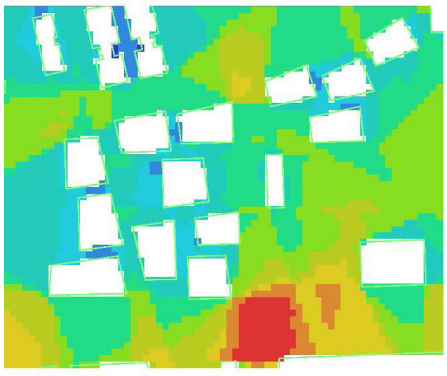


Angular Mean Depth



ovist Area

The Spaces in between the volumes show a relatively low depth and high integration even though the isovist area value is low.
This could mean that for example the central plaza will become an intimate space that is at the same time well connected.



isual Integration

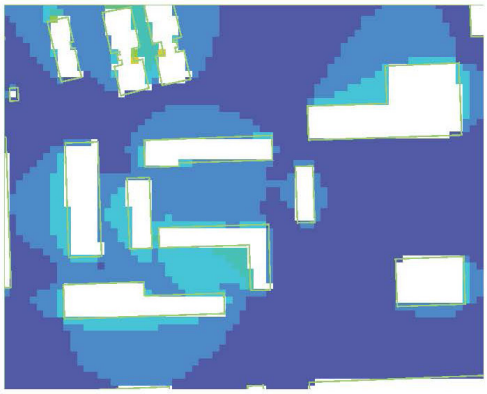
## 2 < *proposal 1* >

The Proposals reached from very open bar volumes that remind of modernist plans to a variety of courtyard houses. The complex relationships of public spaces in the area of conflict between openness and seclusion are shown precisely in the computational analysis.
In the end the winning proposal of Futura-frosch and Duplex Architekten seems to find the right balance
between the two extremes. Coupled with the fact that they proposed very compact volumes that are energy-efficient and easy to be planned by seperate architecture offices, it seems understandable that ths proposal won the competition.

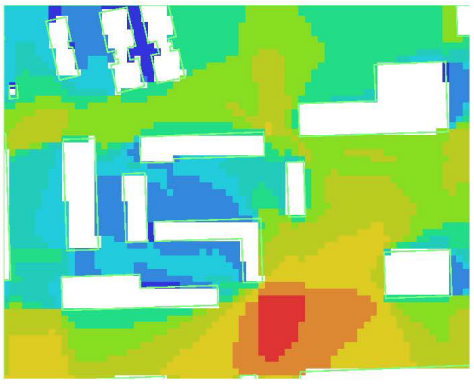
Proposal 2: SATO - Müller Sigrist Architekten

The second proposal defined a green courtyard and relatively open urban plazas with rectangular buildings of varying depth.

Site Plan

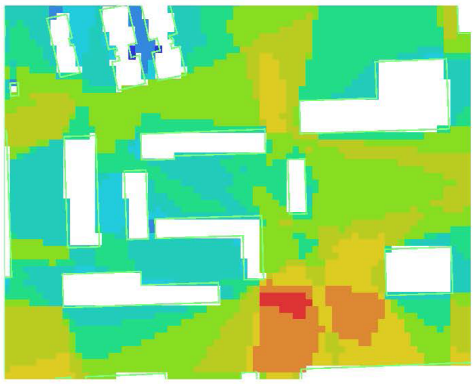


Angular Mean Depth



The courtyard and plazas show a heterogeneous distribution of values. some parts are much better integrated and have high isovist area values while other parts of the same plaza or courtyard show opposite characteristics. The analysis leads to the assumption of open spaces that are unclear in their purpose concerning openness and publicness.

Isovist Area



Visual Integration

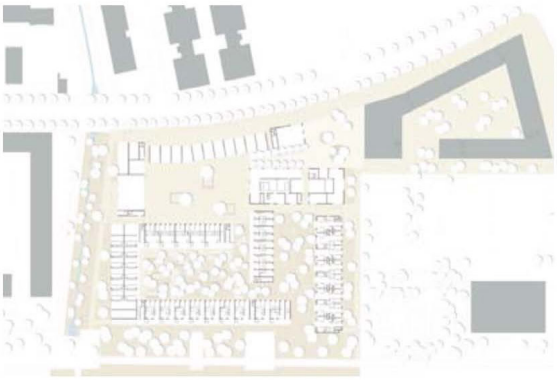
Digital Urban Simulation | Final Project

## 4 < proposal 1 >

Date: 11.05.2015

Proposal 3: NANA - Stücheli Architekten

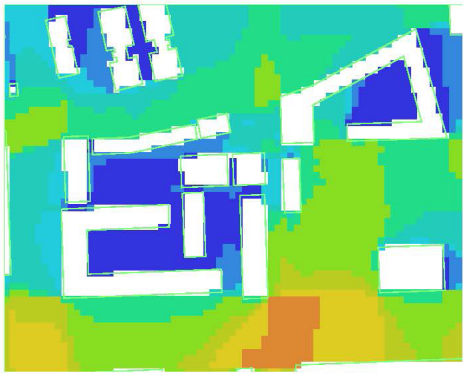
# 5 < proposal 3 >



Project NANA suggested courtyards that are stronger enclosed with building volumes that are conected at some edges.

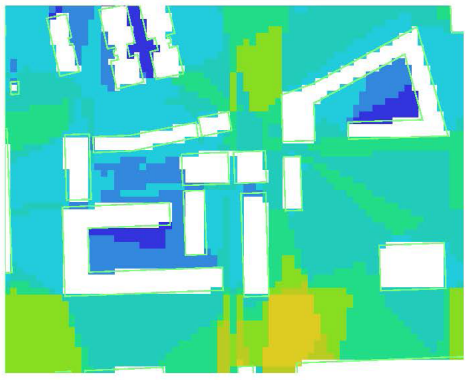
Site Plan

Angular Mean Depth



With this project, the courtyards are much clearer defined. The isovist area and visual integration values show clearly that they are visually strongly enclosed.
Also in terms of depth, the courtyards show a very different character to the rest of the open space. In the southern courtyard the depth values even decrease to worrying low values.
The spaces might feel very intimate but may sometimes be a bit too disconnected to their environment.

Isovist Area

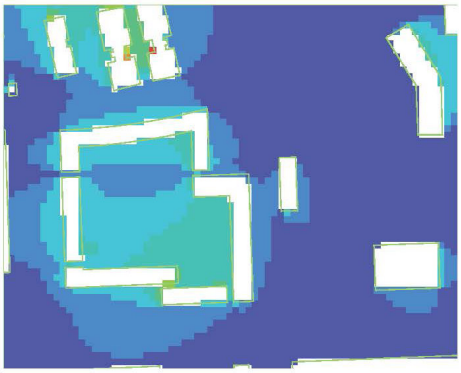


Visual Integration

# 6 < proposal 4 >

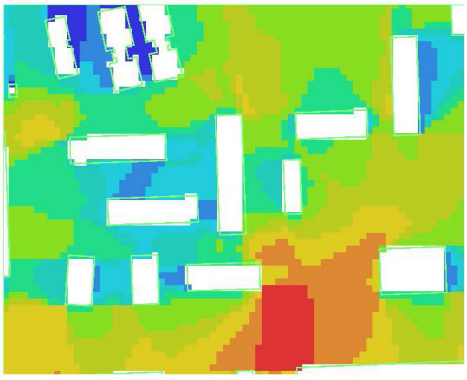
In the project of Scheidegger Karamuk Architekten a large continuous building encloses a large introverted courtyard.

Site Plan



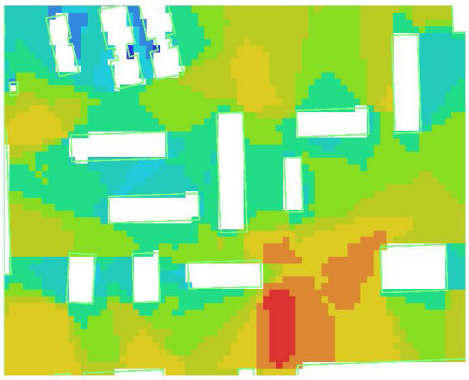
Angular Mean Depth





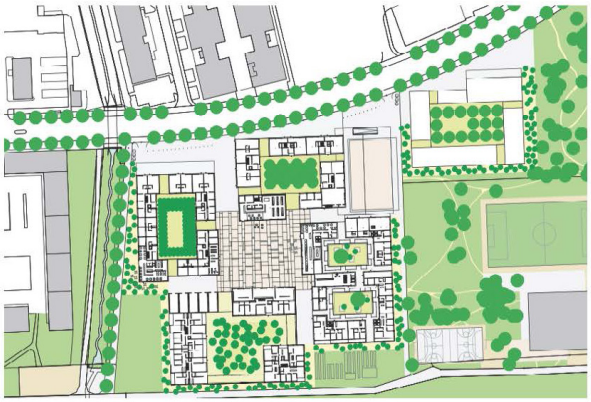
Already the plan layout reminds of a playful way to interpret modern city extensions. The analysis values suggest rather indecisive open spaces as it was often the result of modern city planning.

Isovist Area



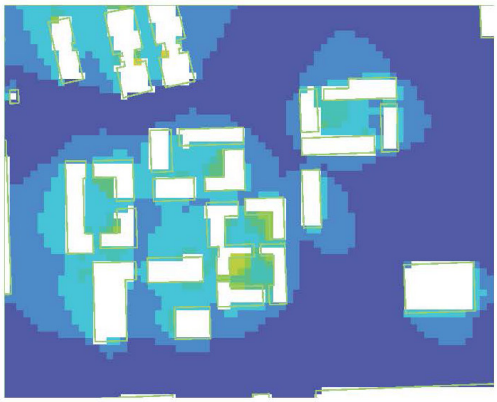
Visual Integration

Proposal 8: VICINO - Ernst Niklaus Fausch Architekten

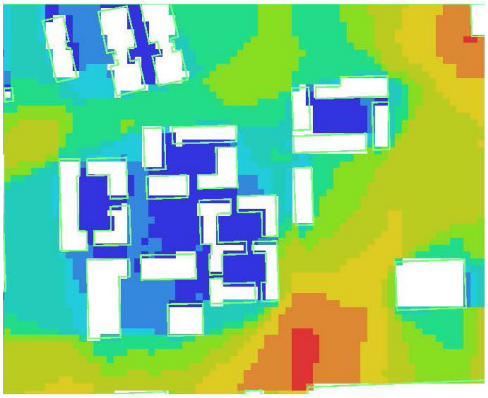


The proposal of Ernst Niklaus Fausch Architekten shows a central plaza that is defined by courtyard buildings with different green spaces in their centres.

Site Plan

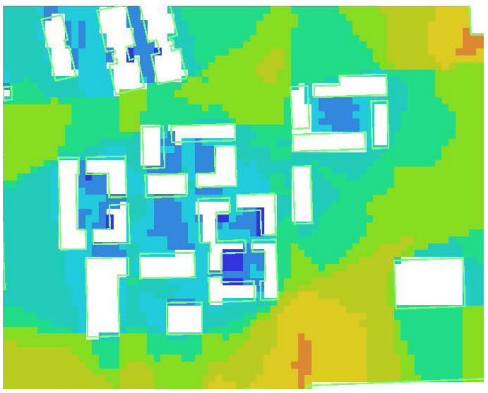


Angular Mean Depth



The central plaza and courtyards may feel pretty intimate but are at the same time relatively well integrated and show relatively high depth values.

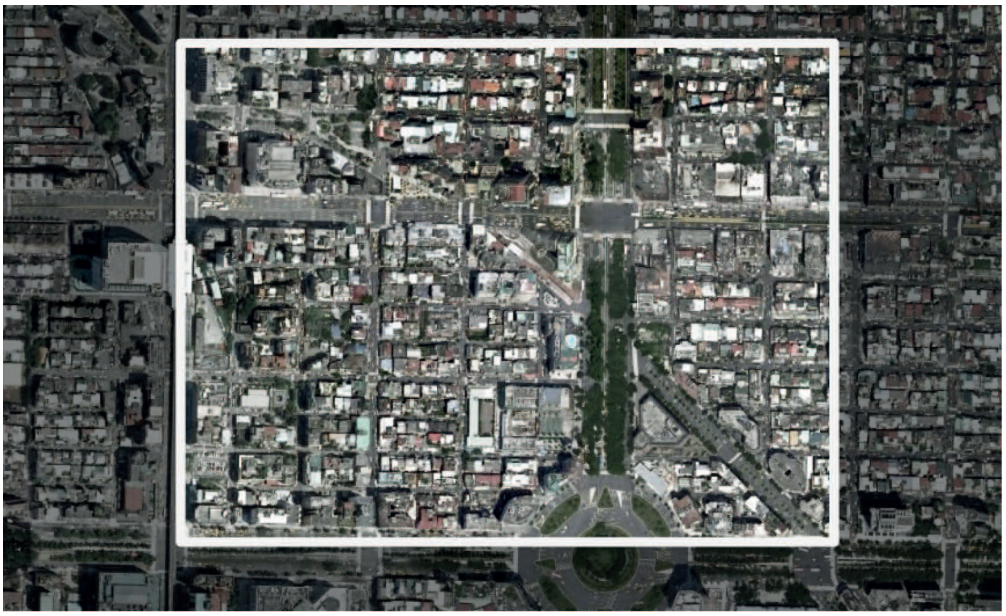
sovist Area



## 7 < proposal 5 >

## 8 < conclusion >

The computational analysis can be a help in interpreting design proposals. Oftentimes they show clear evidence for what is already expected and observed in the plans. Sometimes they even reveal aspects that were not expected from the plan (e.g. the appearing new center in the TOTORO project).
The procedure of visibility graph analysis is time consuming, especially the calculations for depth. A careful survey into what resolution the analysis should have must be carried out. Higher resolution is always desireable in order to have a clearer picture of the analysis but at the same time it causes very fast a large amount of computing time.
The analysis shows that computational analysis can be a helpful tool for designing. It might even be the tool that leads to a winning proposal through evidence-based analysis. Also in the process of evaluating competition entries, computational analysis could be a valuable tool in order to find evidencd based data about the characteristics of open spaces.

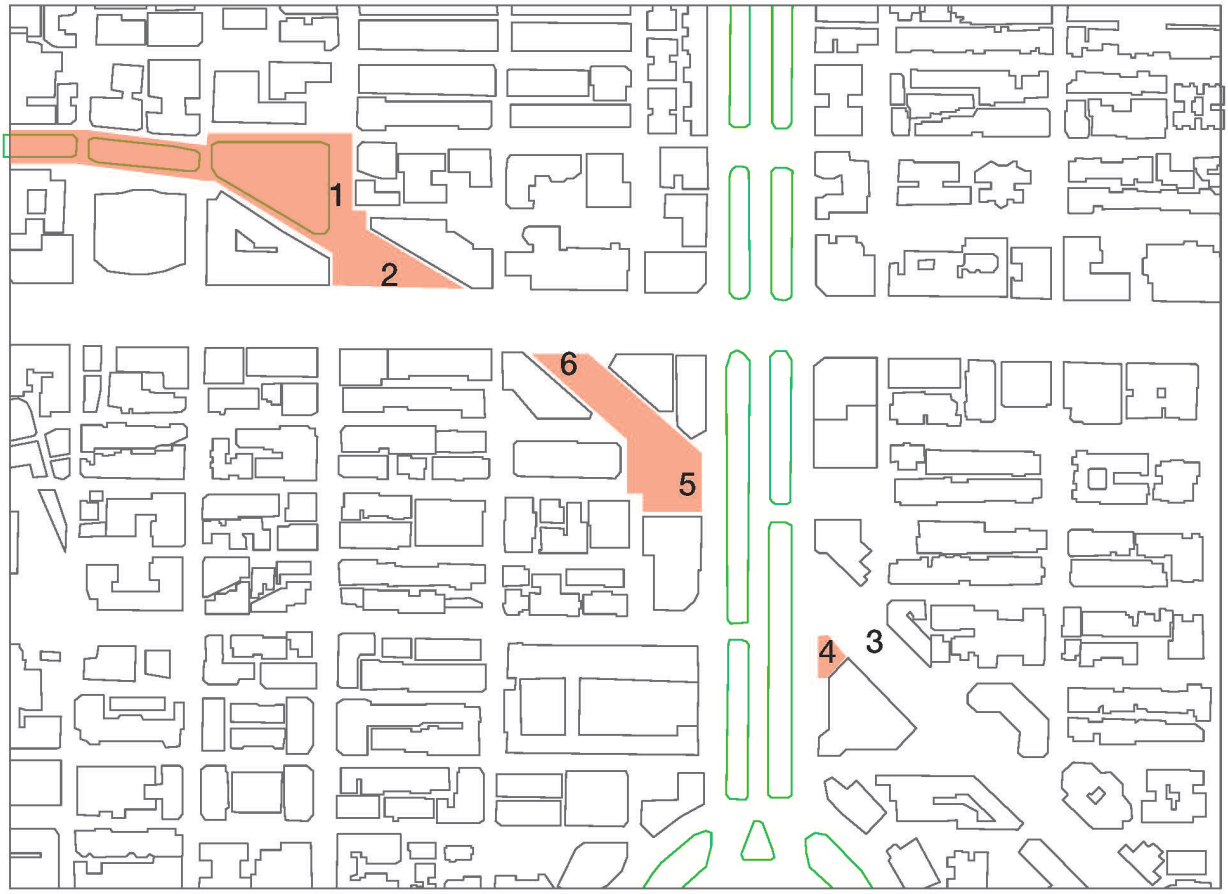


# Urban Green Belt Extension

Tsung Hsung Ku

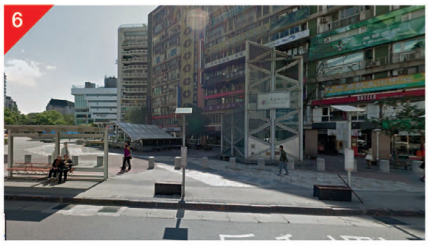
*< summary >*

Taipei is the capital city of Taiwan, the most thriving and alive city. Within this city, the area showen in white frame, is the most popular and vibrating commercial district, called “East area” by locals. Among the streets across this area, the green belt on Dung-Hua South Road is well-known urban landscape in Taipei.
There’re several public space with decent spatial qualities nearby this street, including the plaza nearby a 24-hr opening book store. this plaza is relatvely small, but full of cultural atmosphere and brightly alive vibe. Some artistic events and music outdoor concert will be held at this plaza.
However, due to the high volume of traffic flow, these public space are discrete that people need to take detour from one to another. The environmental advantage of this area is that pleasant view and peaceful atmosphere while you are walking on it. So, the discrete distribution of the open spaces fragmentize the intact experience. It would be possible to release over-crowded problem, if we enhence the spatial continuity of this area.
In term of climate condition, Taiwan is located in subtropical zone , the temperature is extremely high with full of humidity in summer. Though, Dung-Hua South Road is covered by tall and wide-span camphor trees and banyans, it is still a lack of green canopies.
In this project, I try to propose a possible prelimenary solution for this area, which is to find most optimal connection between public spaces and the location of new plants solving the over heated problems in summer.



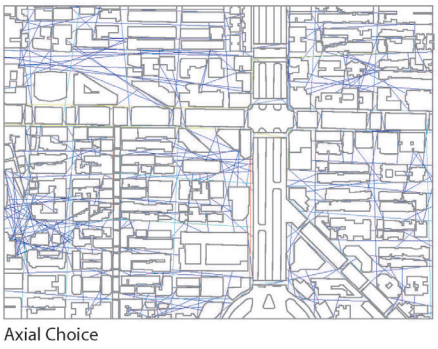

# 1

*< analysis criteria >*

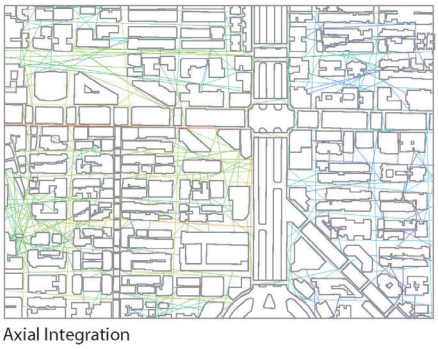


**Existing Pedestrian Area Analysis**

Pedestrian Area



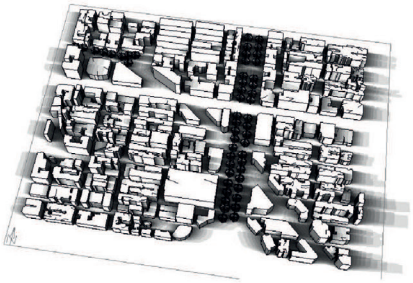
Axial Choice

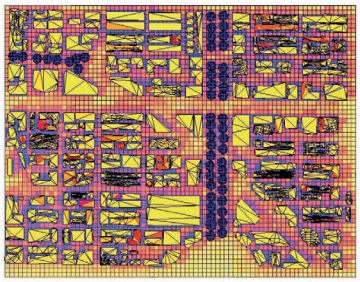


Axial Integration

**Analysis of Existing Environment**

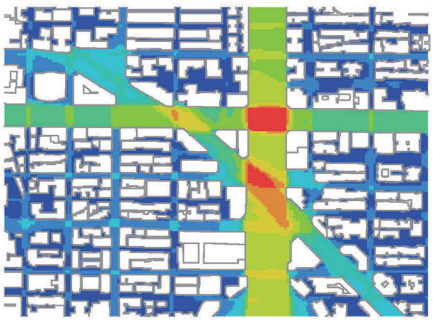
In Taipei, the urban planning was not designed as pedestrain-friendly space.Therefore, I attempt to use axial analysis from pedestrian's aspect.
In order to analyze the pedestrian movement to fit the existing situation, defining the walkable area is the first priority.



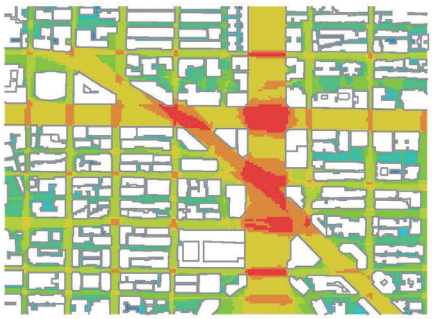


## 2 < analysis >

Visible Area



Isovist Area



Isovist Integration

**Potentiality**

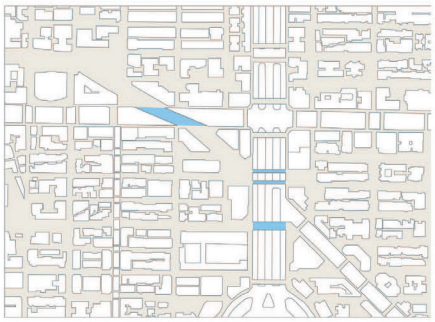
In isovist analysis, we can find that there're best visibilities at the intersection of the roads, which means we can take this advantage as our new connection properties.

In axial analysis of the visible area graph, we can see that there's a explicit tendency from east-southern to west-norhern corner, and the orange-red lines exactly connect the different open spaces .

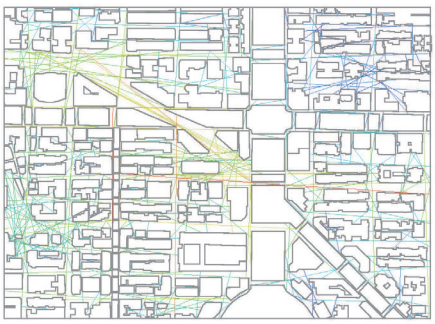
It implys that we will can experience the variable landscapes on this axis with most connective choices.

Axial Integration

Axial Connectivity

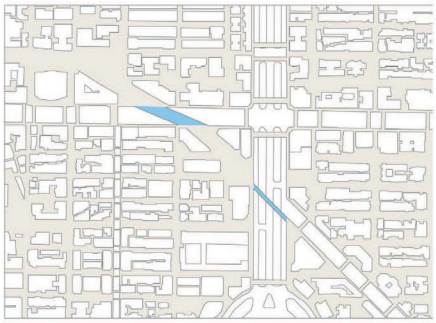


OPTION 1

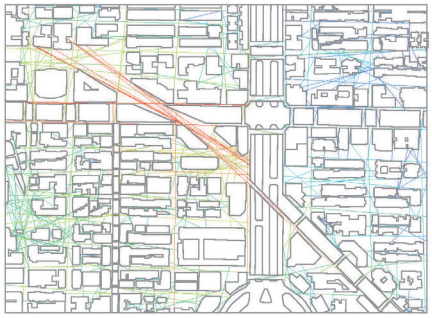


Axial Integration

In this option, it improves the connection and total depth, but the analytical graph shows that it still remains part of discrete paths.



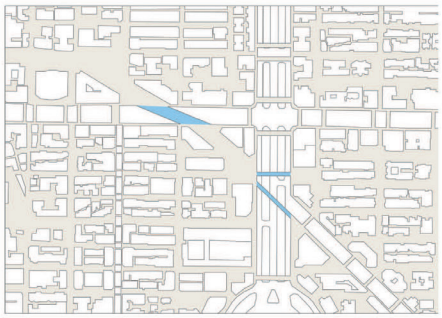
OPTION 2



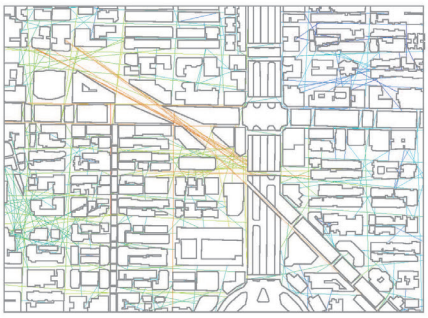
Axial Integration

In this option, the analysis shows that it connects all public areas with good integration property, but the path is too narrow for staying, but only for moving through the main avenue.

## 3 < options >

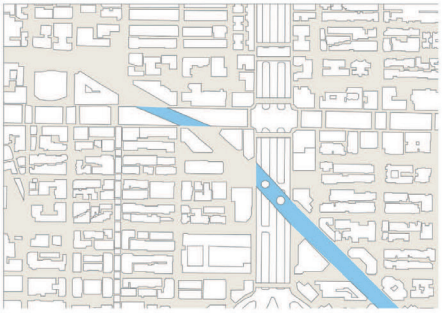


OPTION 3

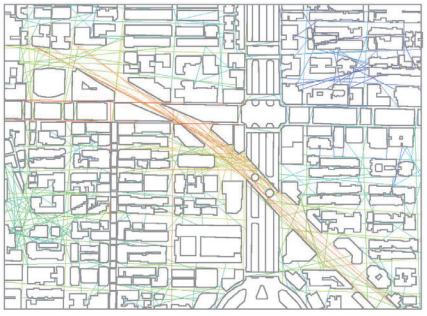


Axial Integration

As previous option, but it adds one more east-west direction connection.
The analysis shows that it not only provides diagonal connection but also horizontal one.
it makes the middle plaza possess more dynamic flows coming from variable directions



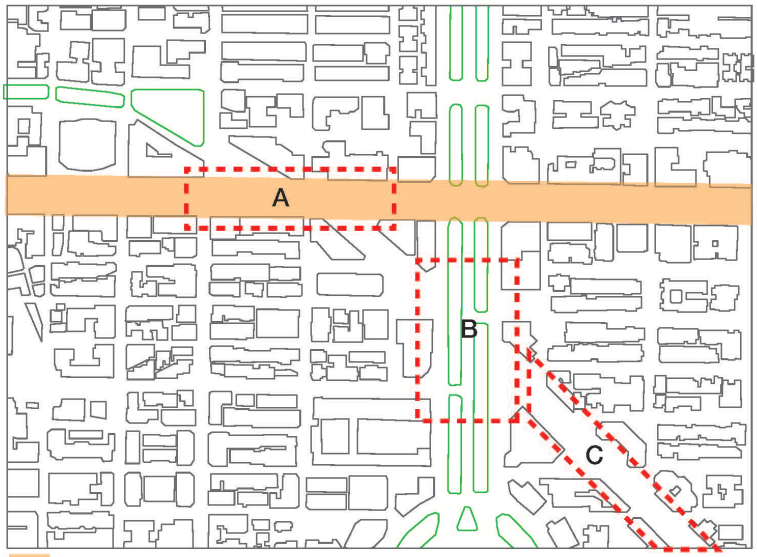
OPTION 4



Axial Integration

In this option, it ichanges radically with wider connection across main avenue , and change whole street from car-driving area to pedestrian area.

However, it provides the best pedestrian area, with the cost of traffic ciculation change.




existing underground shopping street

**Strategies for Connection**

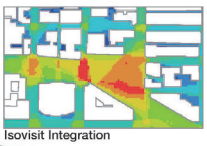
**To sum up from the analyses of 4 improvements, there're 3 main connections in need of solutions. I propose 3 approaches based on option 4.**

A create the path toward to the exisitng underground shopping street, which make people can directly pass through the road, in the mean time, it create a visible space connecting two plaza.

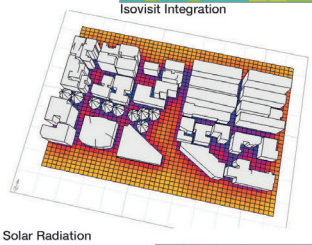
B create a bridge , which let people can directly pass through the main avenue with visiblity of gı belt.

C make it pedestrian area, and prohibit from car driving.

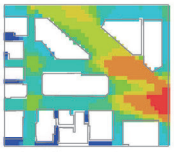
een



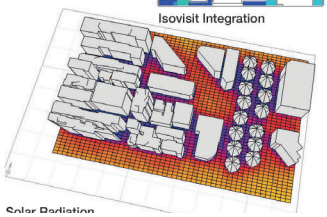
Isovisit Integration



Solar Radiation

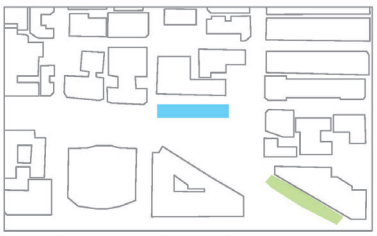


Isovisit Integration

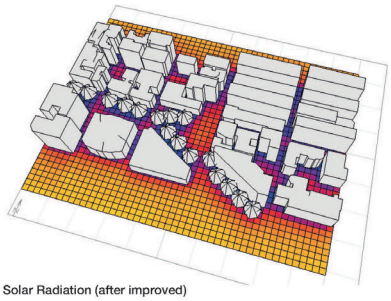


Solar Radiation

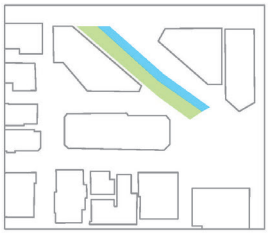
The location fo rest area is based on visibility
The location fo plant area is based on solar radiation



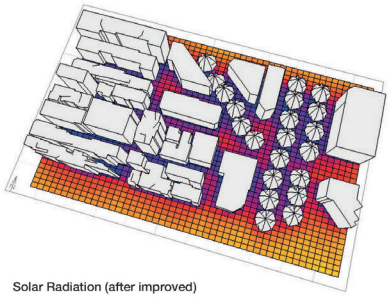
Rest Area Plants Area



Solar Radiation (after improved)

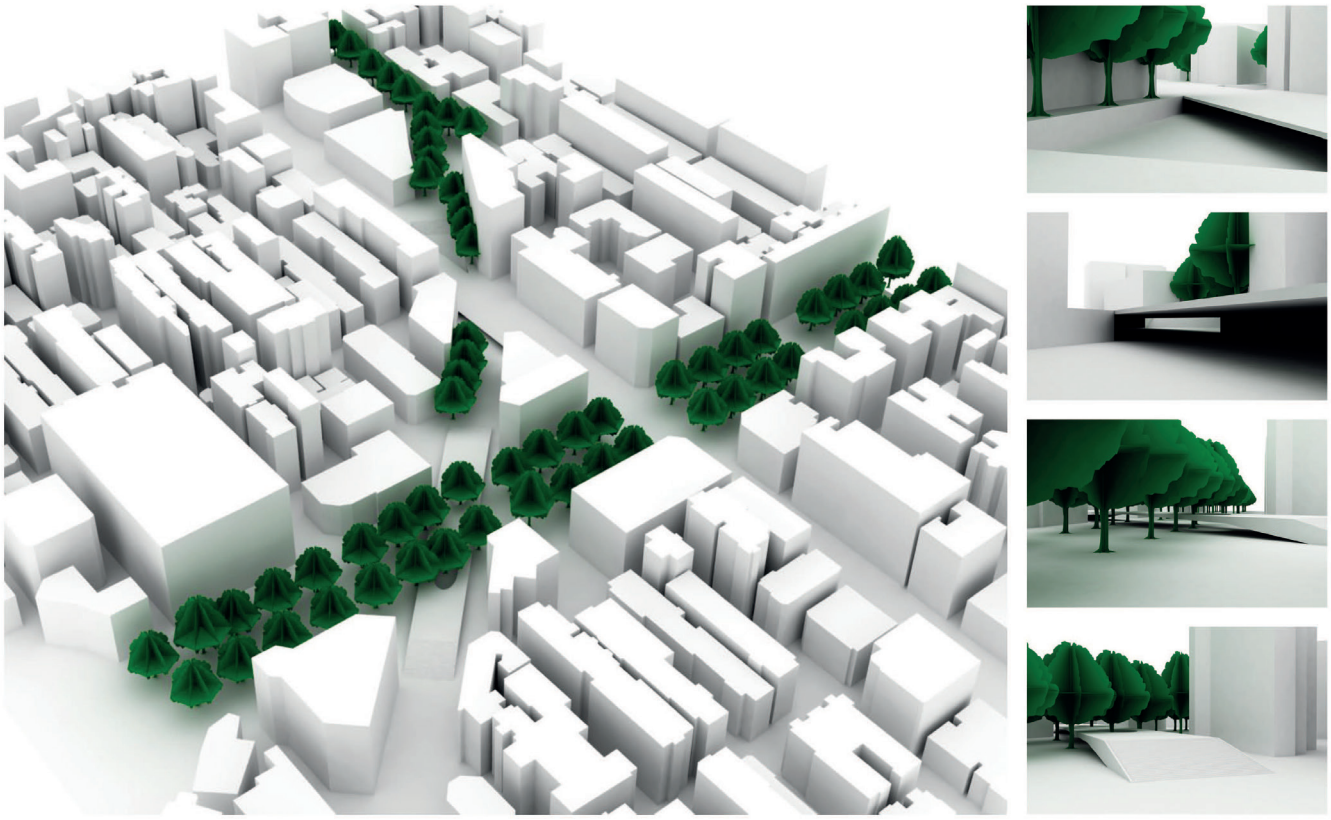


Rest Area Plants Area



Solar Radiation (after improved)

**5** *< strategies for connection >*



# 6 < conclusion >

In this project, I can get the the result which is closest to the existing enviroment by axial-line analysis for public space and approachs of connection. The better solution still can be judged by same analysis among several proposal. The reason is that axial-line analysis provides us most intuitive results on the spatial continuity and possible distribution.
Besides, the type of spaces we analyzed is mainly focused on public space at pedestrian's aspect. We can run our analysis on the map that only existing building blocks. It also can provides the suitable slocation from human scale. Combining two points mentioned above, if we want to find a further result, we still need to clearify the circulation between pedestrian and vehicles, the purpose of visiters and locals, convenience and living quality.

-Introduction-

# Liberty Square/Timisoara/Romania

Petra Pfaff

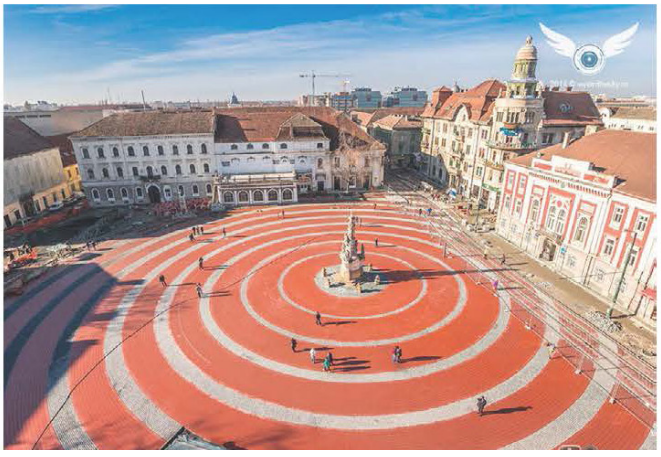
*< conclusions>*

Timisoara's historic center is in the process of becoming an pedestrian-only area, except for the tramlines. The center is a succession of 3 public spaces - the Union square, the Liberty square and
the Opera square - each with their own characteristics. While the Union square is completely treeless and hosting two major cathedrals and the arts museum, the Opera square is hosting the national opera and the orthodox cathedral with rows of trees and flower beds, the Liberty square is the smallest of the three and used to be more a small parc with 40 trees than a square, nevertheless being perceived as a square.

# 1

*< strategies for connection >*

Today, the Liberty square is undergoing a major change. Due to the new pavement project, all trees have been cut down, although the initial project included all existing trees.
In a city where summers are hot and temperatures can reach up to 40 degrees, a green oasis is always welcomed. However, continuing cutting down trees in public areas and busy car traffic are increasing air pollution and lead to different heat islands within the city.



Many citizens are criticizing the townhall's decision for the lack of vegetation and are disappointed in the lack of consistency between what is shown to be built and what is actually being built. There is ongoing pressure on the townhall to replant trees.
Meanwhile, citizens of Timisoara are critizing in a funny way the current state of the square, naming it "the Red Square" or "a landing place for UFOs".

## 2 < *Timisoara* >

E.T. salutes Timisoara
Source: http://www.opiniatimisoarei.ro/ultima-trasnaie-cu-piata-libertatii-cum-fac-timisorenii-misto-de-primarul-nicolae-robu/13/05/2015

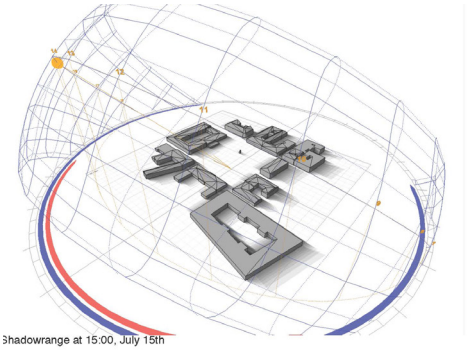
A new ice rink
Source: http://debanat.ro/2015/04/timisorenii-au-gasit-o-utilitate-pietei-libertatii-fara-copaci-la-iarna-ar-putea-fi-patinoar-foto/

-Responses of the broader public-

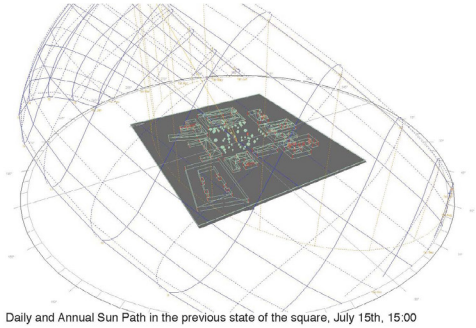
# 3

*< Ecotect analysis >*

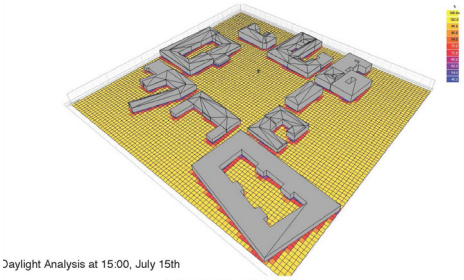
The analysis in Ecotect aims to show the solar impact on the square in its previous state with 40 trees, in its current treeless state and in a proposed state with replanted trees in a concentric pattern, to match the existing pavement, and to compare the three results. Although the results might state the obvious, it is important to quantitatively show the difference in order to raise awareness.



Shadowrange at 15:00, July 15th

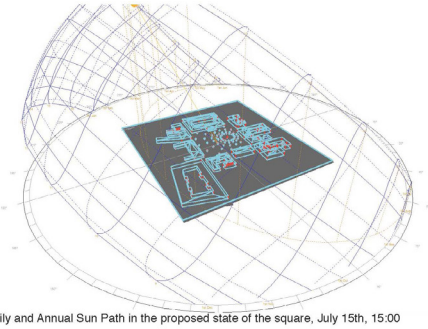


Daily and Annual Sun Path in the previous state of the square, July 15th, 15:00



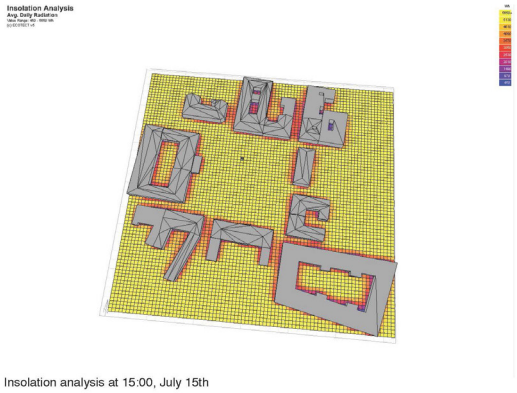
Daylight Analysis at 15:00, July 15th

-Ecotect Analysis - Current State-

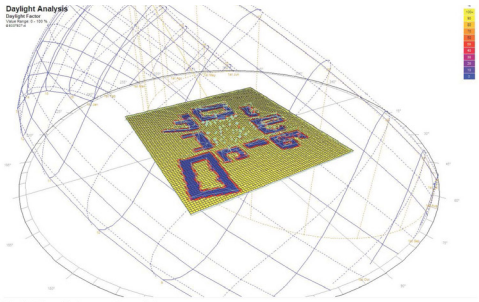


Daily and Annual Sun Path in the proposed state of the square, July 15th, 15:00

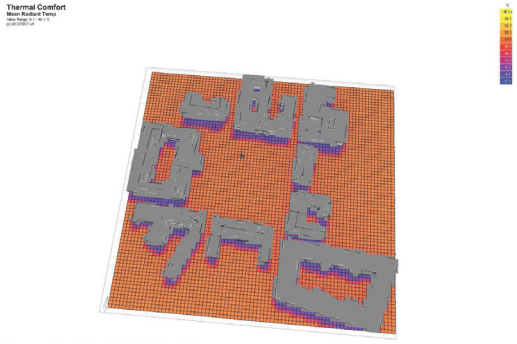
-Ecotect Analysis-




Insolation analysis at 15:00, July 15th

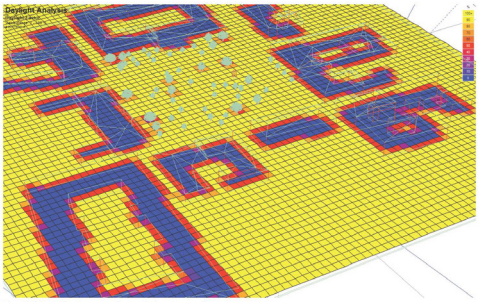



Daylight analysis - previous state



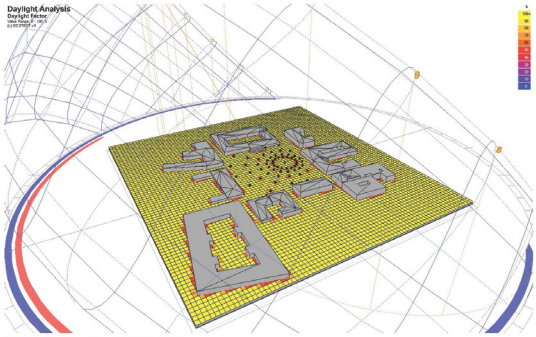

Thermal Comfort at 15:00, July 15th

-Ecotect Analysis - Current State-

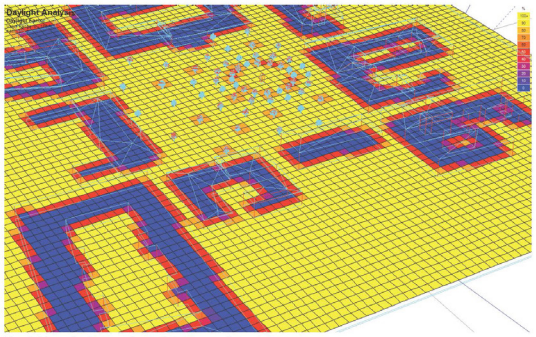



Daylight analysis - previous state - zoom in

-Ecotect Analysis-

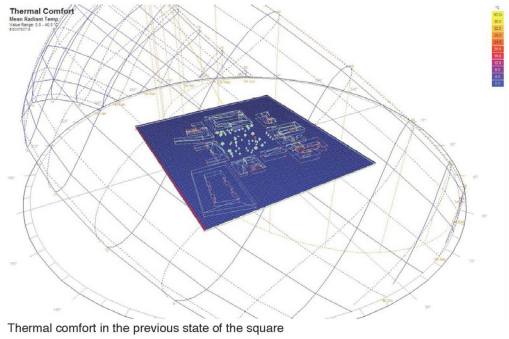



Daylight analysis - previous state

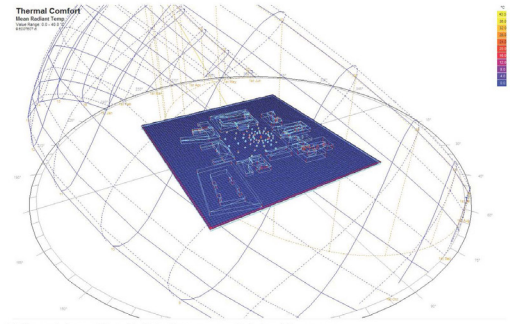



Daylight analysis - previous state - zoom in

-Ecotect Analysis-

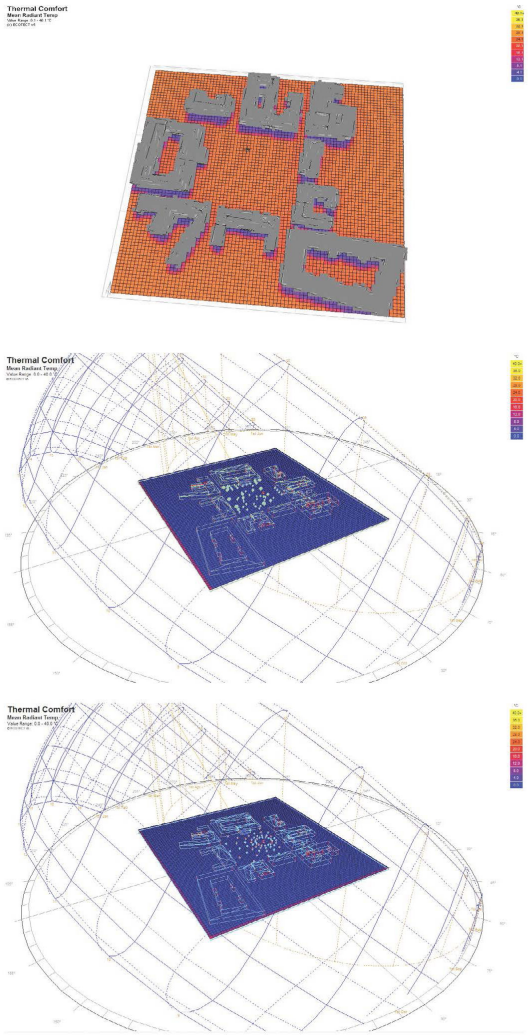



Thermal comfort in the previous state of the square




Daily and Annual Sun Path in the proposed state of the square

-Ecotect Analysis-




-Comparison thermal comfort-

## 4 < thermal comfort >

Unfortunately, the calculation for the thermal comfort has not worked with Ecotect (do not know why). This is my assumption as a conclusion had the thermal comfort simulation work properly:
The comparison in the thermal comfort in the current, the previous and the proposed state of the Liberty Square evidently show the importance of vegetation in public spaces an urban heat islands. Both the previous and the proposed states show lower temperatures in the square. The proposed state both lowers temperature and provides shade to the passer-byers as well as conforms to the current design through the concentric array with a large amount of trees (50).
In conclusion, it is possible to have both design and comfortable urban climate in a place that needs its vegetation and shade and also keeps a familiar image to its passerbyers.

MAJOR NEW LIGHT RAIL HUB

CENTER FOR DANCE FOR CANTON OF GENEVA

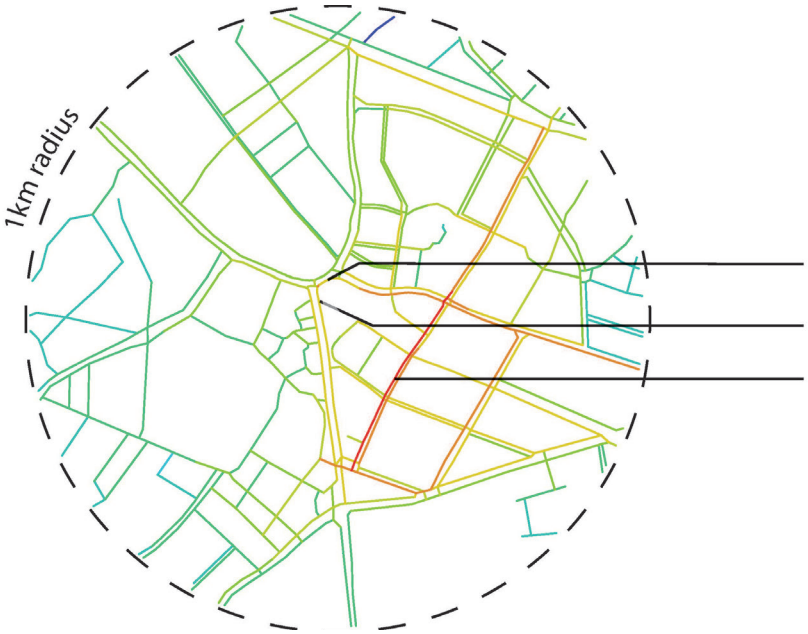
STUDENT HOUSING INTEGRATED IN GREEN PROMENADE

# Optimizing Pedestrian Networks and Solar Massing in the Paris de la Concorde, Geneva

Peter Ortner

*< introduction >*

Timisoara's historic center is in the process of becoming an pedestrian-only area, except for the tramlines. The center is a succession of 3 public spaces - the Union square, the Liberty square and
the Opera square - each with their own characteristics. While the Union square is completely treeless and hosting two major cathedrals and the arts museum, the Opera square is hosting the national opera and the orthodox cathedral with rows of trees and flower beds, the Liberty square is the smallest of the three and used to be more a small parc with 40 trees than a square, nevertheless being perceived as a square.




**EXISTING CONDITIONS**

integration light rail stop: 319 (range 36 - 398)

integration cultural center : 322 (range 36 - 398)

integration Rue Golay : 373 (range 36 - 398)

hh integration of vernier pedestrian network in 1km radius of proposed cultural center and light rail stop

**INTERVENTION 1:**
**IMPROVE CROSS WALKS AROUND SITE**
**ADD PATH ALONG RAIL**

integration light rail stop: 356 (range 36 - 398)

integration cultural center : 345 (range 36 - 398)

integration Rue Golay : 390 (range 36 - 398)

hh integration of vernier pedestrian network
in 1km radius of proposed cultural center and
light rail stop

## 2 < intervention >

**INTERVENTION 2:**
**PEDESTRIAN BRIDGE ACROSS TRACKS**
**CROSSWALK ACROSS AVE. L'AIN**

integration light rail stop: 366 (range 36 - 398)

integration cultural center : 358 (range 36 - 398)

integration Rue Golay : 395 (range 36 - 398)

hh integration of vernier pedestrian network
in 1km radius of proposed cultural center and
light rail stop

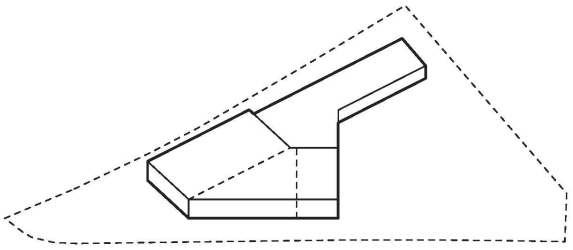
**INTERVENTION 3:**
**CONNECT AXES THROUGH SITE**

integration light rail stop: 367 (range 36 - 398)

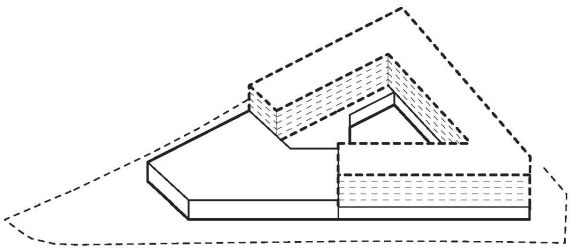
integration cultural center : 363 (range 36 - 398)

integration Rue Golay : 395 (range 36 - 398)

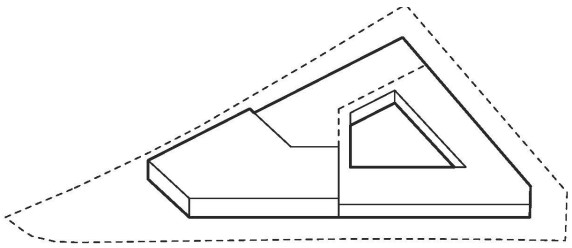
hh integration of vernier pedestrian network
in 1km radius of proposed cultural center and
light rail stop



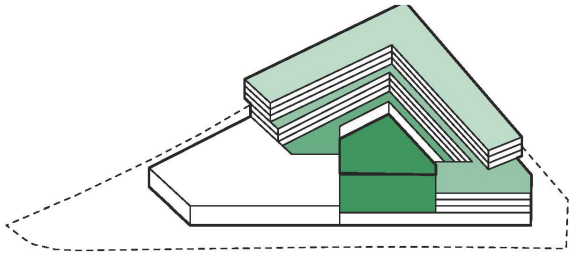
1. Cultural Center



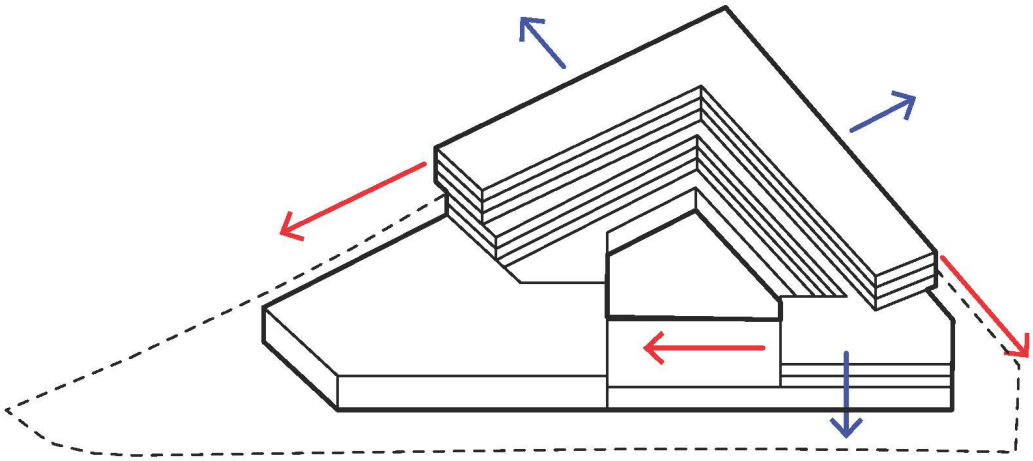
3. Residential Envelope



2. Educational Facilities

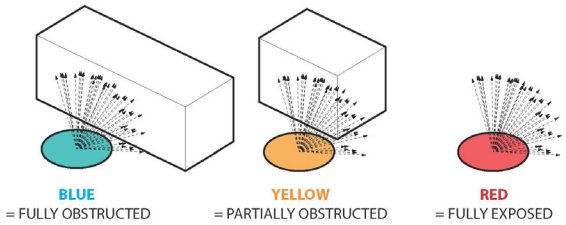


4. Potential Massing

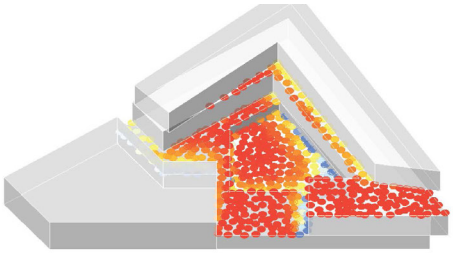


5. Parameters for modifying the residential massing

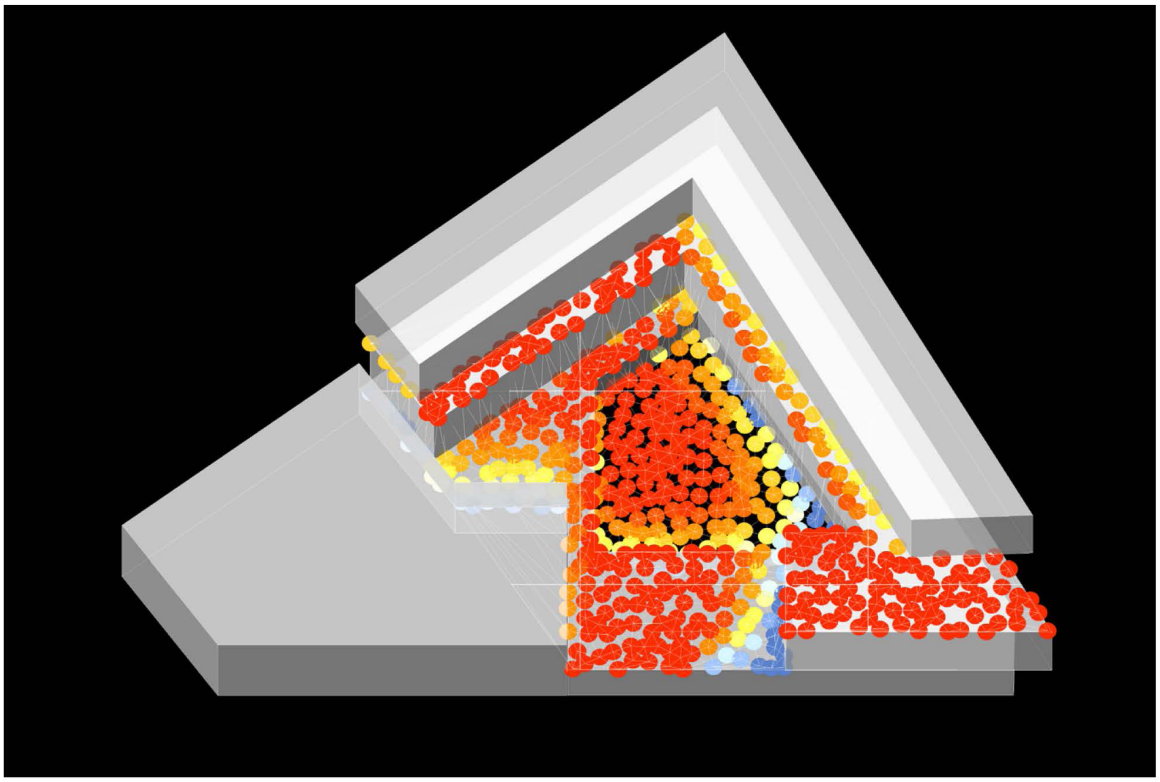
6. Massing with heavily shaded central courtyard




5. Diagram describing analysis of solar ray access



6. Massing showing analysis surface and shaded points



8. One of the set of most optimal solutions found by the evolutionary solver.

## 5 < massing conditions >

Abandoned Railtrack in Basel

# Abandoned Railtrack in Basel: Residential or Commercial?

Chunhui Liu

*< introduction >*

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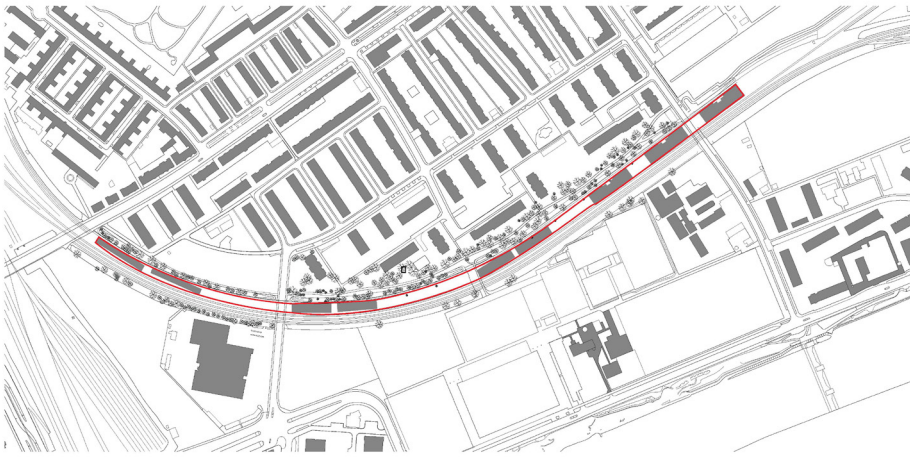
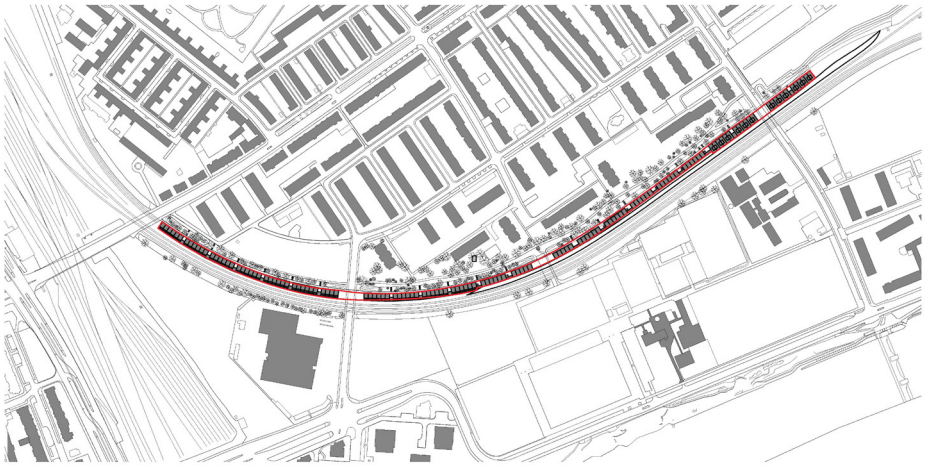
# 1 < city planning >



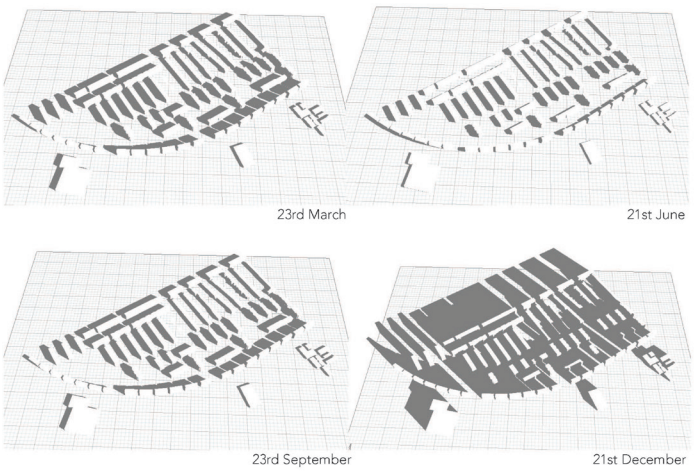
Commercial

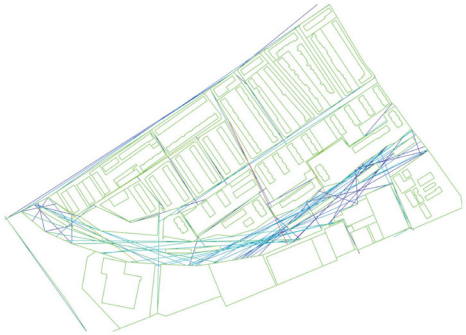


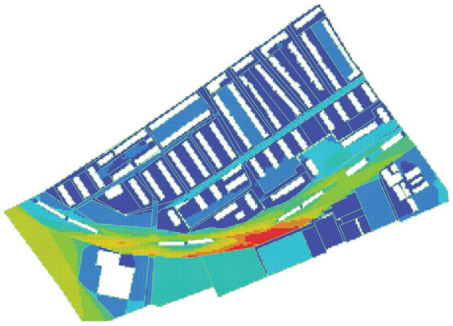
Residential

# 2 < solar analysis >

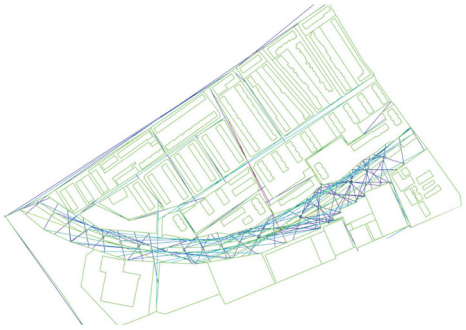
Residential

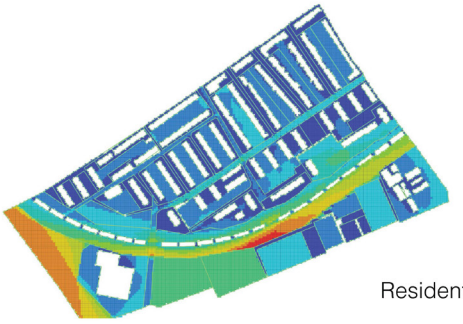






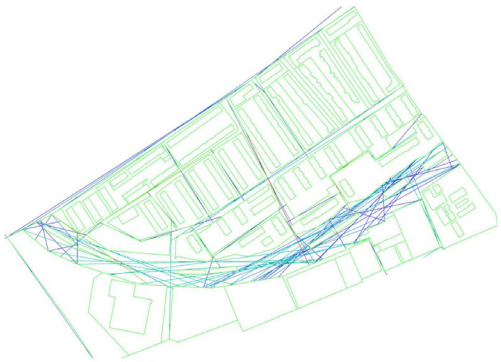
Commercial

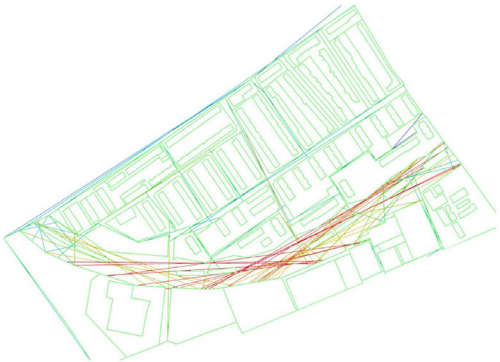




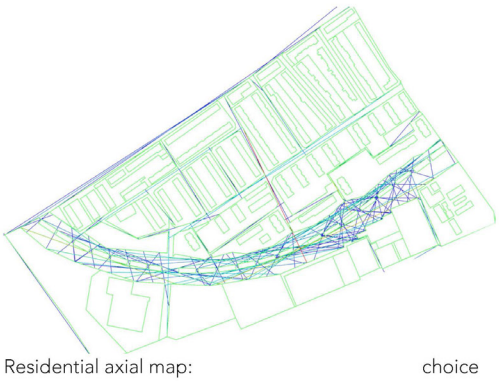
Residential

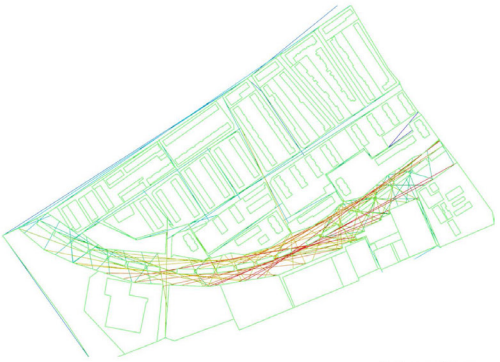
## 3 < *commercial / residential* >





Commercial axial map: choice integration





Residential axial map: choice integration