DIPLOMARBEIT

Mastering the Donkey Path ?

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Seine Welt ist im Kopf,
aber sein Kopf ist ohne Sinn für die Welt.

Auszug aus dem Vorwort zu
Die Blendung von Elias Canetti[9]

Abstract

The thesis discusses parametric urbanism and related concepts. This new style claims to withhold a revolutionary potential for urbanism. It is at question whether the solutions presented solve the problems the design task poses. Parametric design frameworks show potential in calculating consensus solutions. The protagonists of the new style, claiming to master the hidden irregularities of informal settlement structures, do not present these. Everything is arguable, based on constraints a designer implements in creating a vision for the world.

Contents

A Copernican Revolution for Urbanism ?

Patrick Schumacher presents *parametricism* as a *new paradigm* for architecture. In the past years Zaha Hadid architects have won several urban design competitions. These master plan designs serve as examples for *parametricism* being *"particularly suited to large-scale urbanism"*.[47, pg.14]

The implementation of parameters in the design process is not necessarily dependent on computational tools. It is rather inherent to any process of finding a solution to a given design problem. Nevertheless *parametricism* as presented by Schumacher and Hadid claims to implement methods inspired by concepts and theories from information and biological sciences in adaptable computational design frameworks. A variety of urban and architectural designs reference similar methods, not insisting on a new paradigm.

Introducing new paradigms can be vital impulses in the evolution of design methods, design research programs and even genuine sciences. On the other hand it can be pretentious diction in selling architectural styles. As many similar projects reference similar terms borrowed from other sciences it is hard to draw a distinct line between methods that serve aesthetic form finding and methods that aid the design process in solving finite prob-

lems.

Already the problem of drawing a distinct line between genuine sciences and pseudo-sciences, concerns scientists as well as philosophers. Lakatos claims that, in the case of science as genuine knowledge,

> *"... the typical descriptive unit of great scientific achievements is not an isolated hypothesis but rather a research program."*[31]

It is at question whether parametric urbanism, introduced by Schumacher, corresponds to Lakatos understanding of such research programs dependent on heuristics. Nonetheless the theory of parametric urbanism vastly references terms that can be found in other sciences. Most of these are programs with a hard core of theories protected from refutation by what Lakatos describes as

> *"... a vast protective belt of auxiliary hypotheses. And, even more importantly, the research programme also has a heuristic, that is a powerful problem solving machinery, which, with the help of sophisticated mathematical techniques, digests anomalies and even turns them into positive evidence."*[31]

Lakatos brings the example of Copernicus, who has been excommunicated from Catholic Church for presenting a theory that questioned the dominant geocentric world view of the time. He describes

> *"... the problem of the demarcation between science and pseudoscience of vital social and political relevance."*[31]

Architecture and urban design might not be a practice in the sense of genuine sciences in general but the solutions presented are of social and political relevance.

The Provenance of the Kartal Pendik Master Plan

The Kartal Pendik Masterplan by Zaha Hadid Architects is the winning project of a design competition held in 2006. The competition was launched by the *Istanbul Metropolitan Municipality Council (IMM)* to develop a 5.5 km^2 area split between Kartal and Pendik, two districts located in the south east of the City of Istanbul's Anatolian side.

The project is part of the development of two new city centres in Istanbul to achieve decentralized and polycentric growth, a goal that has been formulated within a series of master plans by the *Istanbul Metropolitan Planning and Urban design Center* (IMP)[1] in 2006 and 2008. [55]

The latest plan was formulated in 2008, the goals are: to establish a balance between conservation and development, to integrate the city into the world economy, to reassert its position as a major metropolis in its region and to promote Istanbul as a site of global historical and cultural significance by the year 2023. Stressing on the idea of polycentricism and Metropolitan sub-centres, the 2008 master plan recommends the formation of *central business districts* (CBD).[55]

Furthermore the master plan focuses on five planning strategies: first, Istanbul competing in the global system. Second, the encouragement of sustainable development (ecological balance and disaster management) is encouraged and third, Istanbul as a world city of culture and natural values (most significantly preserving the Bosporus and Historical Peninsula) is to

[1]The Istanbul Metropolitan Planning and Urban design Center (IMP) is an organization operating alongside political and bureaucratic bodies of the Istanbul Metropolitan Municipality (IMM). The IMP has no administrative or technocratic influence. Even though it's staff consists of experts, decision-making is left to politics of higher order.[14]

be preserved. Fourth, a focus on the service sector, information and communication technology development to increase the economic relations with countries in the region and competence among world metropolises is stressed. Finally, attention is drawn to improve the quality of life in Istanbul through urban transformation projects to strengthen, improve and transform social and economic aspects.[55].

These strategies were reinforced within a document titled *"Strategic Plan 2010-2014". The Istanbul Metropolitan Municipality Council (IMM)* approved a four-year target strategic plan. The aim of this plan is improving the life quality of the city by public transportation, the protection and further development of green spaces and the creation of a financial and tourist city. In this strategic plan Kartal was determined to become one of two major city centres on the Asian side of the city and Pendik to become one of many secondary centres.[2][55]

Critical voices see discrepancies and significant losses in the postulated goals that have been formulated in the master plan of 2006/2008 as well as in the *Strategic Plan 2010-2014* document and the postulated visions in the Design Brief for the competition and furthermore in the achievements of the winning project by Zaha Hadid Architects.[45]

The Design Brief contains no specific spatial constraints, apart from very basic special limitations such as *"40% of the area shall be utilized for roads, green areas, sport areas, cultural facilities and similar amenities".*[27, pg.15] The choice between two floor area ratio coefficients: either 2 or 3 to generate either 4 or 6

[2]One center on the European side with a high concentration of service area and on the other, the Anatolian side, an insufficiently developed center of activities confronts Istanbul with a traffic problem. Most of the people working on the European Side live on the Anatolian Side due to the low value of housing on this side. This results traffic blockage on the roads connecting the two sides.[55]

million sq metres of surface were left to the designers. [3]

Requirements for *Housing* are specified as follows:

> *"Existing residential buildings are low rise and medium quality. New plan is expected to raise the living quality with richer amenities (for example swimming pool, private sports centres, club buildings, etc.). Locations and functions of these housing areas can be changed. Up to 40 per cent of the total construction area can be utilized for the new housing areas can be interpreted within the context of multi purpose buildings".*[27, pg.17]

Apart from *Housing*, the major points mentioned within the section *Recommendations and Guides* of the Design Brief are *Commerce and Service Areas*, *Touristic Accommodations and Hotels*, *Cultural Facilities*, *Administrative Buildings*, *Transportation* and *Marina.*[27, pg.15-19]

The winning proposal starts from a Tabula Rasa[4] Zaha Hadid Architects summarize their solution in a condensed account:

> *"As the Kartal Pendik masterplan takes shape, a new urban centre is rising in the city of Istanbul following the redevelopment of an abandoned industrial area. This new city-within-a-city will comprise a central business district, high-end residential development, cultural facilities including concert halls, museums and theatres, alongside a new marina and resort hotels. Kartal Pendik is strategically placed at the confluence of several important infrastructural links the*

[3] Zaha Hadid Architects chose the floor area ratio coefficient 3, thus created the maximal of 6 million sq meters of surface.[45]

[4] In the Design Brief, the designated area is characterized by "... abandonment by the users, and the possibility of becoming urban slump areas unless a transformation is realized."[27, pg.ii]

> *point at which highways connecting Europe and Asia converge, meeting the coastal highway, sea terminals and rail links to the greater metropolitan area. Indeed, these very elements form the starting point for our masterplan design, which utilizes lateral lines to stitch together major road connections from Kartal to the west and Pendik to the east.*
>
> *Integration of these lateral connections with a central longitudinal axis creates a soft grid the underlying framework for our concept, its fabric further articulated by an urban script which generates different typologies buildings that respond to the different demands of each district within the whole. This calligraphic script creates open conditions open conditions which can transform from detached buildings to perimeter blocks and ultimately, hybrid systems together forming a porous, interconnected network of open spaces which meanders throughout this new urban centre".*[7]

The information given within the Design Brief as well as in this statement by the winning design team seems scarce compared to the goals formulated within the*"Strategic Plan 2010-2014"*. Terms, such as *public transportation*, *supporting the social needs*, *improving social aspects*, *equity* or *limiting congestion*, neither appear in the Design Brief nor in the description by Zaha Hadid Architects.[45]

What is the concrete idea behind a *"soft grid"*, an *"urban script"* or a a *"porous, interconnected network of open spaces which meanders throughout this new urban centre"*[7]? Isn't *interconnectedness* a property inherent to every node in a network? How is this seemingly special interconnected network different from any network (traffic network)?

The Report of the Evaluation Committee for the project dates March 2006, in October 2006, Suha Ozkan (Competition Advisor *IMP*) presents the results and describes the qualities of the winning project by Zaha Hadid Architects with the statement: *"She connected and meshed the east and the west of the site with three patterns, to be reformed and regained. In other words, she respected whatever existed there as property lines. She created different land-uses."*[37, pg.12] Respecting property lines and creating different land-uses are qualities to be assumed by every project amongst the submissions.

Three images illustrate the ideas presented within the winning proposal, the first two accompanied by the description:

> *"At the Grand Buildings scheme for Trafalgar Square in London, I used the concept of carving as a way of introducing multiple events at the ground plane", Zaha Hadid has said. Her scheme for a new city center in Kartal suggests the same earth-carving approach. The plan, prepared by Hadid with Patrick Schuhmacher, for the Greater Istanbul Municipality is being closely followed by Major Kadik Topbas, an architect."*[37, pg.16]

"Urban Geometry can actually dictate activity on the street", Zaha Hadid is cited next to the image showing an overall site map, *"and this perception is reflected in the proposal for Kartal in Istanbul"*[37, pg.17], Ozkan follows.[5]

Urban Geometry can dictate street activity[6], but it is not clear

[5]Supposedly to get an impression of the work of Zaha Hadid Ozkan completes with: "Americans can visit Hadid's Contemporary Arts Center, Cincinnati and in 2012 visit her Aquatic Center for 2012 Olympics in London."[37, pg.17]

[6]Brief observations on the behaviour of people within the City of New York (So Ho) from a pedestrian perspective in respect to urban geometry (and other factors) can be found in *Urban Code 100 Lessons for Under-*

what kind of street activity the proposed geometry wants to encourage.

Apart from qualities that can be assumed to be essential conditions[7] in any master plan proposal, the evaluation Committee commends:

> *The flexibility of the organizing net and the successful application of the loose grid in joining the Project to surrounding areas and conditions.The idea of an adaptable regulatory framework as an armature for collaboration in the future development of the Project.The careful level of abstraction, which the evaluation committee feels, places the Project in an opportune situation for future evaluation.*[19, pg.9]

The evaluation committee advises the structuring of the proposal in a way *"that collaboration will abet it's development through a not entirely predictable variety". "Individual architects, planners and stakeholders"* are mentioned to be included in the development of the project and the committee *"remains somewhat sceptical about certain specific building forms"*[19, pg.9] [8]

Obviously the presented design proposal is understood as an abstraction to be further evaluated. The commendatory statement notes the *idea of an adaptable regulatory framework*[19] that might be helpful in the process of this evaluation.

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standing the City[5]. More detailed strategic studies, such as the influence of spatial layouts on human behaviour can be found in the work of *Space Syntax*[56].

[7] "The strong and originally expressed relationship between the project's organizing ideas and it's formal presentation", "the logical and urbane distribution of uses and density across the area of the Project", "the underlying practicality of the Project in its corporation of traditional elements, including block form, variegated parcel sizes and shapes, density regulations, and logically but not coercively distributed uses." and "the potential ease of phasing and parcellization of the Project"[19, pg.9]

[8] The large number of over-road towers in particular.[19, pg.9]

The project has not been realized yet[9], but more detailed images of it have been published in the course of Patrick Schumacher's presentation of *parametricism* as the *New Global Style for Architecture and Urban Design* and *Modernism's successor* capable to "meet the socio-economic demands of the Post–Fordism" [47] era.

Socio-economic demands are difficult to grasp. Economic demands vary depending on social conditions. Without further elaborating on his understanding of socio-economic demands, Schumacher explains how these are met in parametric urbanism:

> *"Contemporary avant-garde architecture and urbanism seek to address this societal demand via rich panoply of parametric design techniques..."*[47, pg. 15],

such as

> *"animation, simulation and form finding tools"- "as well as parametric modeling and scripting". "Computational techniques, formal repertoires and tectonic logics characterize this work"*[47, pg. 15],

which Schumacher describes as

> *"crystallizing into a solid new hegemonic paradigm for architecture."*[47, pg. 15] *"Phenomena such as*

[9] In 2007 more than 100 companies are said to having signed up to "relocate their headquarters to Kartal Pendik "in the next 10 years." The German electrical company Siemens was then expected to build a factory there. Average monthly residential rates in the region had increased by one third from below 1,000 Turkish lira in 2006 to 2007. Then, construction was said to begin as early as summer 2008 and Suha Ozkan stated "it would be nice though if the new opera house was open by 2010". [15] So far an Opera House by Zaha Hadid Architects officially opened in 2011. It has been constructed within five years in Guangzhou, China.[18] The venture of the €4 bn. Kartal Pendik development involves several investors, coordinated by the construction industry federation Kartal Gzellestirme dernegi (Kartal Improvement Association), the Government does not contribute to the investments.[15]

> *the 'pack-donkey's path' and urban unplanned settlement processes can now be analysed and appreciated in terms of their underlying logic and rationality, that is in terms of their hidden regularity and associated per-formative power."*[47, pg. 18]

50% of the city of Istanbul is built illegally and therefore 50% of Istanbul's settlement is unplanned.[10] The prognosis is that in about twenty years, half of the world's urban population will live in self-built structures erected beyond official planning and state control.[41]

The design brief of the Kartal Pendik design competition describes Istanbul as one of the fastest growing metropolitan areas in the world.

> *"Despite rapid urbanization the city silhouette of the Historic Peninsula could be kept away from the damage, which is caused by intensive new structuring. On the other hand, illegal structuring at the outskirts of the city could not be avoided. Solutions for the physical infrastructure and intra city transportation stayed behind the city's growth rate, and Istanbul is faced with housing, traffic congestion, land speculation and other problems like other developing world metropolitan regions."*[19, pg.1]

It is therefore interesting how the *underlying logic* and *rationality* parametric urbanism sees in such phenomena are to be understood. Do they present new insights that may be helpful in solving the problems urbanism faces in the course of *urban transformation* and growth?

Parametric urbanism indicates that it has understood the process of unplanned settlement phenomena, it remains silent on

[10] The socio-economic demands of the people living in these illegally built structures are demands of the era.

the socio-economic objectives behind the design solution of Kartal Pendik. Neither it addresses the political aspects that allow the realisation of a project of such a dimension within a very short time frame. The application of computational methods suggests that problems are solved rationally. Rational argumentation should therefore be possible. For example, the very rigid heuristics that the design research program sees as its fundament:

> *"Avoid rigid geometric primitives such as squares, triangles and circles; avoid simple repetition of elements, avoid juxtaposition of unrelated elements or systems, consider all forms to be parametrically malleable; differentiate gradually (at varying rates), inflect and correlate systematically."*[47, pg. 16]

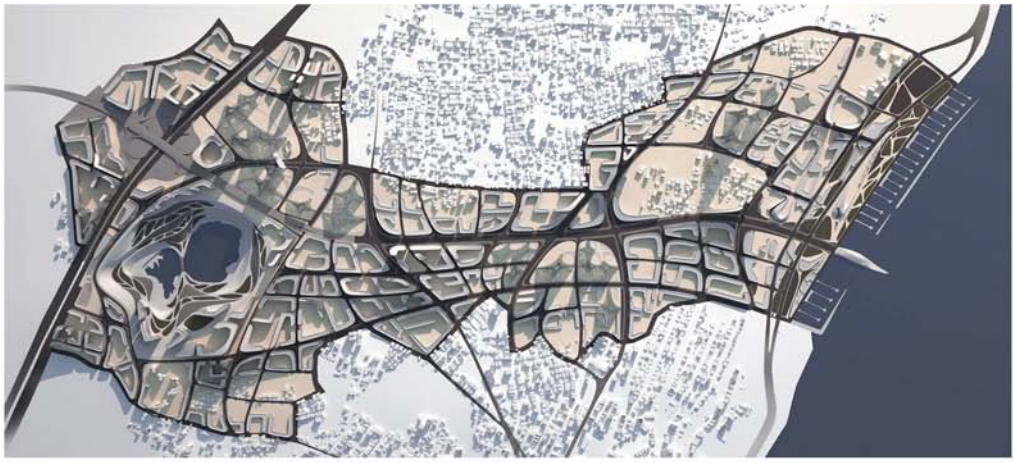
Schumacher describes the goal parametric urbanism wants to meet through these dogmas and taboos as follows:

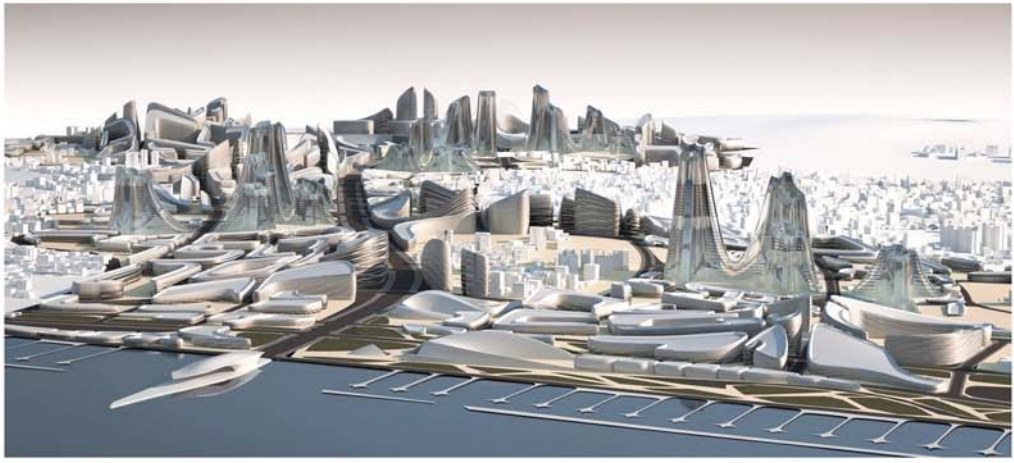
> *"The goal is deep relationality, the total integration of the evolving built environment, from urban distribution to architectural morphology, detailed tectonic articulation and interior organisation."*[47, pg. 17]

Compared to this statement the goals the city of Istanbul wants to achieve by the realization of the Kartal Pendik project seem relatively clear.

It cannot be evaluated whether parametric urbanism's goals and the city's goals conflict. But it is to be assumed that within a city numerous conflicting interests and goals anticipate the design problem. These interests can be of economic, environmental, social, cultural or technological nature.

Figure 1.1: Vision for Kartal Pendik, Areal View[7], Sea View[7], New cityscape [47, pg.21]





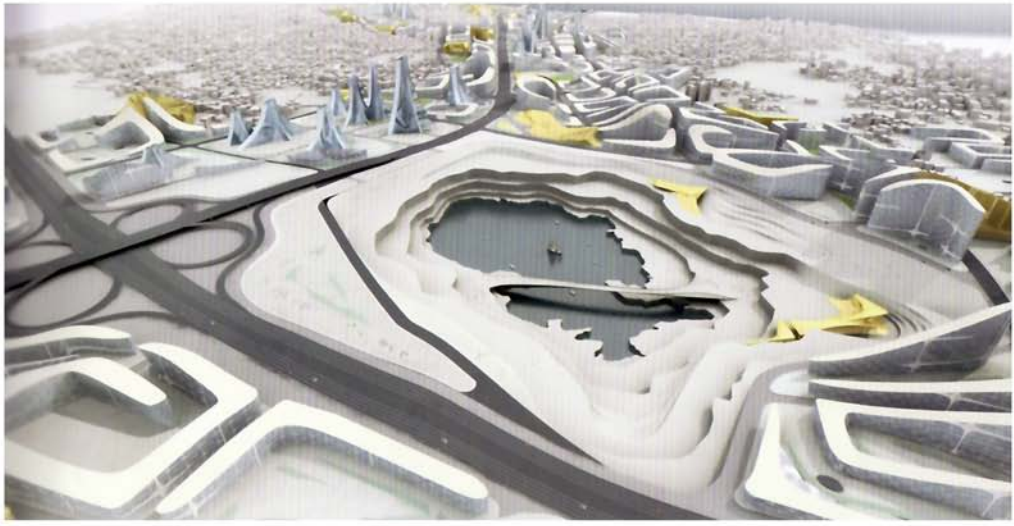
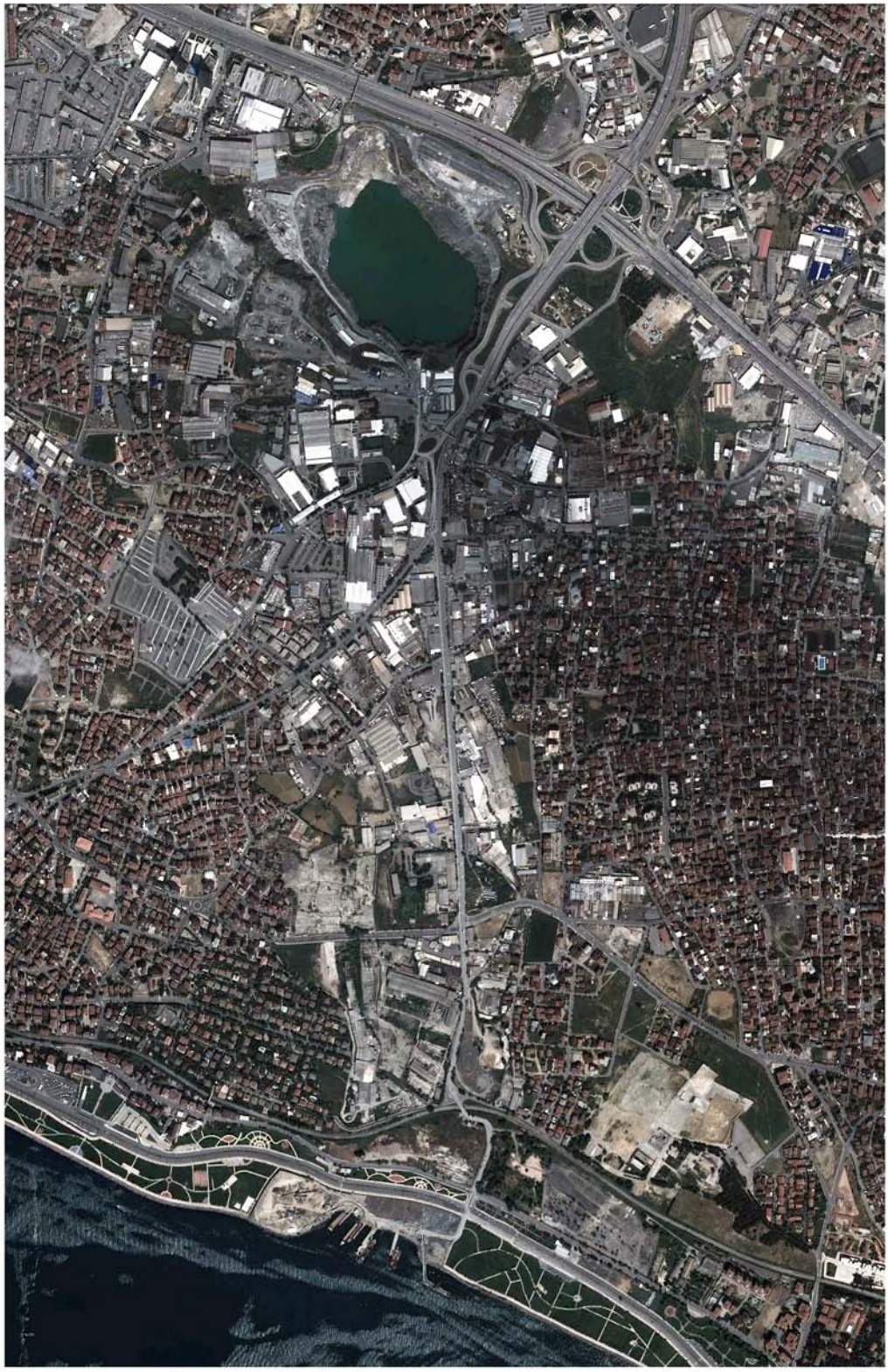


Figure 1.0: Vision for Kartal Pendik, Calligraphy Blocks – tectonic details [47, pg.23], Close-up of cross–towers[47, pg.22]

Figure 1.1: Satellite image Kartal Pendik Google Earth,8/24/2011, accessed September 2012



Desires, Problems and Solutions

In the Afterword of *Local Code* Michael Sorkin, who has been a jury member in the Kartal–Pendik design competition, describes the relationship by which, in his view, every city is formed:

> *"The design of a good city demands a theory of the desirable. Such theories lodge in a space between nature, culture, technology, politics and economics and a set of physical visions on the other. The problem for architecture is, at any given moment, to be aware of the ecology of such fantasies and to reconcile and express them in physical terms."*[53, pg.127]

The reconciliation of this *theory of the desirable* and the expression of it in physical terms seems to be a *wicked problem.*

In contrast to *tame problems* (*"the problems of the scientist, the engineer or the chess player"*), Horst Rittel describes *"all essential planning problems"* as *wicked problems* with the following properties [43, pg.392 ff.]:

– Wicked Problems have no definite formulation.[1]

[1] You cannot understand the problem without solving it, and solving the problem is the same as understanding it.

- Every formulation of the Wicked Problem corresponds to a statement of the solution and vice versa.[2]
- Wicked Problems have no stopping rule.[3]
- The categories correct/false are not applicable to Wicked Problems.[4]
- There is no exhaustive, enumerable list of permissible operations.[5]
- There are many explanations for the same discrepancy.[6]
- Every wicked problem can be considered a symptom of another problem.
- Every wicked problem is essentially unique.
- There is neither an immediate nor an ultimate test to the problem.
- There is no trial and error. The wicked problem solver has no right to be wrong.

Reaching ecological balance, *integrating the city into the world economy* and *improving the city's life quality* are goals the City of Istanbul wants to reach through *urban transformation projects*, one of them being the Kartal Pendik project.1[pg.3] Economic,

[2]Describing the problem of writing a diploma thesis by "it shall have 50 pages of written text", is in the same way a description of the solution as of the problem.

[3]You can always try to do better. If you have solved an equation such as x=y this would not be the case.

[4]"We cannot say that this plant layout or plan for a city is correct or false. We can only say that it is good or bad and this to varying degress and maybe in different ways for different people; for normally what is good for A is not all good for B."[43, pg. 392]

[5]In contrast to tame problems, such as a chess game or a chemical analysis, where a numerable list of permissible operations are essential features.

[6]If traffic congestion is a problem for a certain part of the city, a lot of different reasons for that can be assumed: the road network is not efficient enough or it is because of it is designed for the wrong kind of transportation (cars rather than public transportation). Different solutions to the newly introduced problems can be found depending "on the very first step of explanation (why is there a problem?)"[43, pg.393].

environmental and political problems are classic examples for wicked problems.

The evaluation committee of the design competition gave as advise for the further development of the Kartal Pendik master plan:

> *"... collaboration will abet it's development through a not entirely predictable variety".* 1[pg.8]

This means that the design problem will change while it is treated.

The committee commended *the idea of an adaptable regulatory framework*1[pg.8] that might be helpful in the process of the development of the project. Parametric urbanism on the other hand claims to provide computational methods within such a framework. A central characteristic of wicked problems is that they can never be solved definitely. Therefore an urban master plan design cannot deliver a finite solution.[7] Nonetheless, a design solution in the form of a master plan has been formulated. Is it possible to evaluate the potential of the implemented computational tools?

Rittel argues that design relies on reasoning during the process of finding a solution:

> *"At the micro-level we can identify patterns of reasoning corresponding to recurring difficulties of the process".*[44, pg.3]

On the micro–level, where reasoning takes place, well–defined problems can be found.

[7]For Kartal Pendik a design solution has been presented that serves as a showcase model for a *New Global Style*[8]. This style is based on new computational techniques and claims to be able to *meet the socio-economic demands* of the era. Given that the overall design problem is a wicked one, any statement of having found a definite solution for a whole system of the design task, including socio–economic issues, causes distrust.

In an argumentation on *Ten Better Places for a Football Stadium*, Michael Sorkin shows that decision–making processes, for example, in urban design not necessarily depend on computational aid. A *Score Card* can identify the qualities of different sites for, e.g., a football stadium based on decided criteria. [54, pg.195-205]

Computational methods, as rational tools, can be useful instruments in evaluating and solving well–defined (tame) problems. They can simplify such decision–making processes within a set of constraints, certain *well–specified* restrictions.[9]

A project titled *YOUCity* analysed neighbourhoods of Zürich to identify, evaluate and catalogue existing densification potentials. Building regulations have been implemented within *CityEngine* software *"... to describe digitalized spatial regulations and to view the modeled city"*. Real estate properties can be assessed in the urban context based on personal preferences.[21]

Oqyana is a comparable urban design project in size and complexity to the Kartal Pendik project. As part of the *mega project the World* 2000 houses, villas, and apartments are being constructed on an artificial island to accommodate approximately 12,000 people at the cost of 3.5 billion U.S. dollars. It implements particle systems (*non-linear grid*) and evolutionary algorithms (*"emergence"*[10]) combined with digital catalogues derived from existing evaluated architectural patterns and rule sets that represent individual wishes of stakeholders.[26, pg.36–41]

[9] Understanding the problem is identical with solving it.[43] Such as: the problem being the design proposal should implement a floor area ratio of 3: a design proposal with an implemented floor area ratio 3 is the solution.

[10] e.g. particle systems were implemented with the intention to initially work with a non-linear grid. A set of particles argues out neighbouring parameters (distances to neighbours and special buildings such as churches etc..). Over time a number of solutions is produced. The quality of the solution depends on its fitness' that gets optimized over time.

Oqyana is one of the projects presented in the publication *Beyond the Grid* by Ludger Hovestadt. He claims that his chair takes an altogether different approach to existing computational techniques: modeling structures by computation, virtual walk-on-able models or algorithmically generated building models[26, pg.18].[11]

The integration of a very large amount of information (derived by different demands) into a master plan is hereby met pragmatically within a consistent system of constraints, that is still flexible to adjustments as an emphasis was on cost–control.

> *"... Initially it was not so much about fixed architectural ideas, but rather about a tool that is capable of integrating future data of the expected client wishes coherently within an urban planning framework and then making its interplay comprehensible by displaying it visually."*[26, pg.37]

Hovestadt describes the design problem referring to the *BIG ZOOM*:

> *"as the granularity of elements increases, so does the number of connections: the system becomes more complex and less clear."*[26, pg.19]

He positions architecture, as a design problem, amongst a classification of problems by Warren Weaver[63], as belonging to the group of the *middling* problems that

> *"cannot be tackled using symbolic logic they contain too many elements - or statistical methods - they contain too few."*[26, pg.19–20]

[11] Inspired by what Hovestadt calls the *BIG ZOOM* (the deconstruction of the objects in our environment into smaller parts alongside the decryption of the genetic code) he sees that the emphasis of architecture has moved towards codes that are comparable to the DNA. "Today, codes prepare the grounds as well as the framework upon which communication, planning, financing and construction take place.")[26, pg.19]

Hovestadt sees the key to new solution strategies for contemporary architectural problems in information technology, enabling designers to map, describe and link the elements of a system freely and also makes possible getting rid of rigid definitions and simplified logic.[26, pg.20]

The computational framework in the case of the *Oqyana* project can handle large amounts of information in a way that would exceed most human cognitive skills. With computational aid a larger amount of variables and constraints can be controlled during the process of urban design. Similar computational methods have been implemented on design problems of a smaller scale and presented as *Consensus Machine*. Every legal building or dwelling construction is foremost an organizational task. Environmental restrictions, building law (building codes), detailed space allocation plans, interests of investors and clients anticipate the design problem. The *Consensus Machine* calculates a spatial solution that can be seen as a consensus amongst the different interests.[26, pg.42–49]

One of the metrics of a complex problem is the involvement of many variables that might change during the design process. Computational methods can be used as adaptable design frameworks within arguable solutions can be found and traced depending on the constraints set by the designer. Rittel ascribes the designer, as a wicked problem solver, an

> *"... awesome epistemic freedom in designing: there are no logical or epistemological constraints or rules which would prescribe which of the various meaningful steps to take next. There are no algorithms to guide the process. It is left up to designer's judgement how to proceed."*[44, pg.5]

Figure 2.1: Web of alternative courses of reasoning [44, pg.3]

Shall Measure 'A' Become a Part of the Plan?

LEGEND

x = go to X
? = Uncertainty
* = return to ✻

Source of Idea:
Conceived by the Designer.
'Cookbook'
.....
.....

Issue:

✻ **SHALL 'A' BECOME PART OF THE PLAN?**

Yes
No
X

?

Go Ahead

Go back and Bypass this Issue

Give Up on Project

Issue:
Find Alternative Measure A'

1

ARE YOU CONFIDENT THAT 'A' WILL WORK?

Yes No ?
Investigate

X

2

WILL THE PREREQUISITES FOR 'A' BE AVAILABLE?

Yes No ?
Investigate

Issue:
Is There A Way To Provide Them?

No Yes
X

3

WILL THERE BE SIDE AND AFTER EFFECTS?

No Yes ?
Investigate

Issue:
Can You Compensate?

No Yes
X

4

DO YOU EXPECT THE ADVANTAGES OF 'A' TO OUTWEIGH THE DISADVANTAGES?

Yes No ?
Investigate

Issue:
Are The Aspirations Too High? Should The Demands Be Lowered?

No Yes
X

5

IS THERE SOME BETTER WAY TO ACCOMPLISH WHAT OUGHT TO BE ACCOMPLISHED?

No Yes ?
Investigate

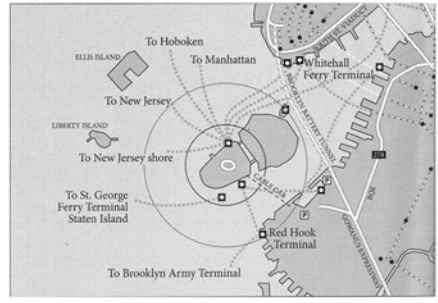
Issue:
What Alternative Possibilities Are There?

✻

Figure 2.1: Analysed Sites and Stadium Scorecard[54, pg.197, 204 and 205]

1. Hunts Point/Port Morris/Mott Haven

10. Governors Island



TEN BETTER PLACES FOR A FOOTBALL STADIUM

Stadium Scorecard

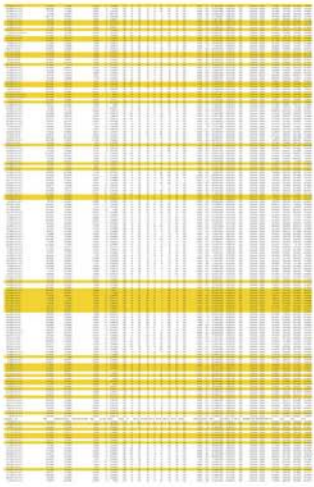
Stadium Scorecard

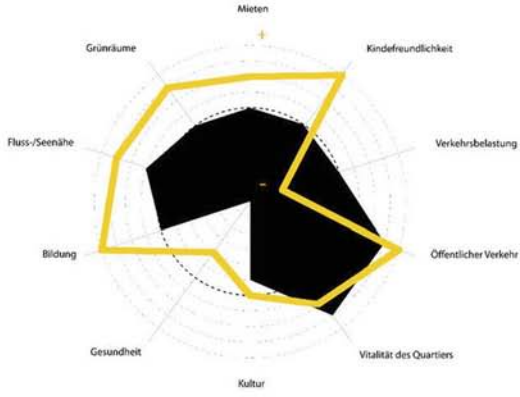
	Total positives	Neighborhood value added	Direct highway to parking potential	Pedestrian accessible	Site preparation **	Sports Synergy	Water*	LIRR*	Amtrak*	Subway*	
1. Hunts Point/Port Morris/Mott Haven	+	+	+	+	+	+	+	+	+	+	9
2. Yankee Stadium/Bronx Terminal Market	+	+	+	+	+	+	+	+	+	+	9
3. Sunnyside Yards	+	+	+	–	–	–	+	+	+	+	6
4. Brooklyn Navy Yard	–	–	–	+	–	+	+	+	+	+	5
5. Sunset Park/Bush Terminal	+	–	–	+	–	+	+	+	+	+	6
6. Hunters Port	+	–	+	+	–	+	+	+	+	+	7
7. Flushing/Willets Point	+	–	+	+	+	+	+	+	–	+	7
8. Coney Island	+	–	–	+	+	+	+	+	+	+	7
9. Fresh Kills	–	–	–	+	–	+	–	+	+	+	4
10. Governors Island	–	–	–	+	–	+	–	–	–	+	2
West Side	–	–	+	+	–	–	+	–	–	+	3

** 10 minute walk ** Indicates special site work is required (e.g. rail platform)*

2005

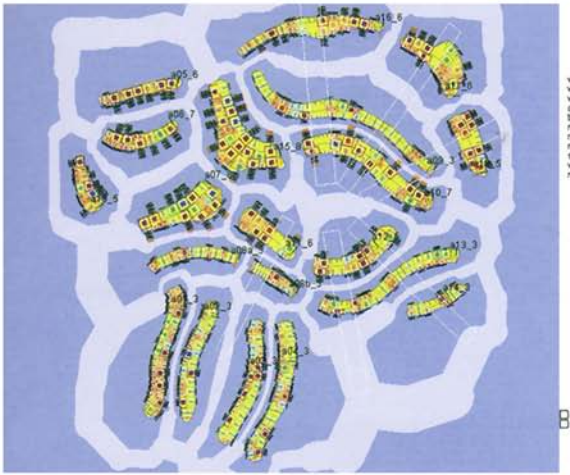
Figure 2.1: Catalogued cites, map of sites derived by prioritized criteria [21]

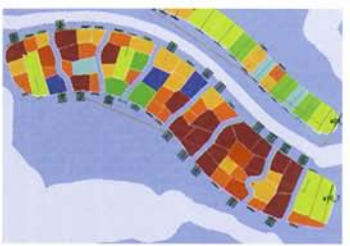




PRIORITÄT
BEWERTUNG

Figure 2.1: Varying building types "Fitness58: 1289"[26, pg.39], visual comparison of layouts derived by parameters that were "played off against one another"[26, pg.40]


Fitness58: 1269
Buildings on Island: 467
Units on Island: 1044
Buildings not on Island: 27
Units not on Island: 621
villa_type_a 53 27
villa_type_b 14 13
villa_type_c 23 15
canal_homes 114 52
town_houses 135 31
marina_aps 411 265
reef_sea_aps 75 45
north_is_aps 117 46
south_is_aps 46 63
west_is_aps 42 49
retail 14 11
diameter: 60
floors: 0



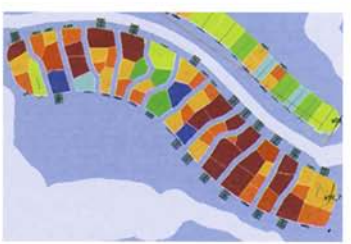
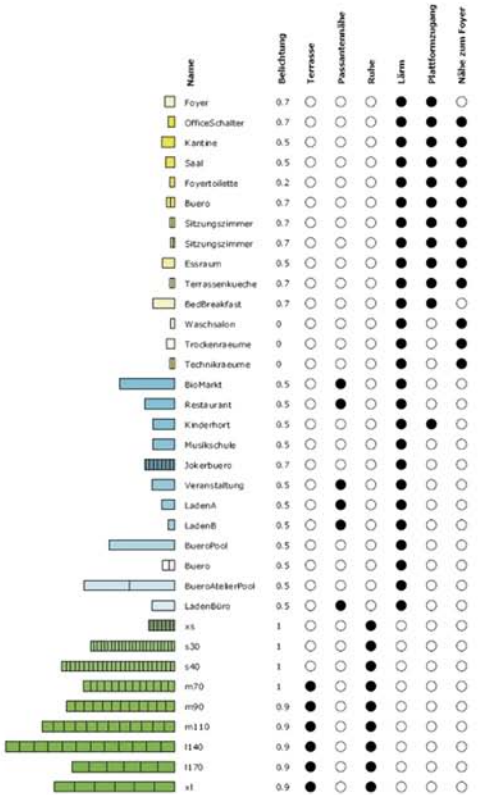
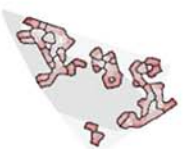


Figure 2.1: Evaluated parameter list, evaluation criteria, development steps: generation 100, 300 and 100 [12]

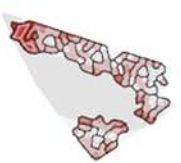


BEWERTUNGSKRITERIEN

Grundstruktur



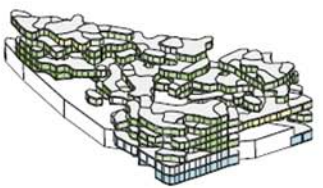
Fassadenlänge



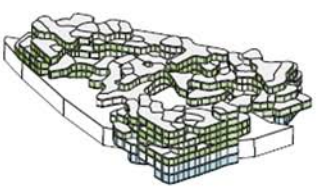
Auskragung

ENTWICKLUNGSSCHRITTE

Generation 100



Generation 500



Generation 1000

Models serve designers as means of perception in reasoning and imagining a desirable state of the world. The media to support the imagination have been manifold at the time Rittel described the reasoning of designers in 1987: sketches, cardboard models, diagrams, and mathematical models.[44] Numerous computational tools can be added to this list today: parametric modeling, finite element simulation and animation tools as well as statistical tools.

Designers are guided by the ambition to imagine a desirable state of the world, playing through alternative ways in which it might be accomplished, carefully tracing the consequences of contemplated action.[44, pg.3]

Apart from the indication that the design is an optimization[12] of some kind, in the case of the Kartal Pendik masterplan, the designers give no explanation of their objectives behind the implemented tools. Nor how the solutions, derived by these tool, correspond to the problems posed. Was the optimization of the relationship of total network length and the average detour factor desirable and why? How does the proposed network meet the demands of Istanbul's traffic situation?[13] Patrick Schumacher describes the traffic network proposed in the Kartal Pendik master plan as follows:

> *"The applied tool, Mayas hair dynamic tool, achieved a parametrically tuned bundling of the incoming paths into larger roads enclosing larger sites such that the resultant lateral path system exhibits the basic properties of Frei*

[12] One of the characteristics of "... the Systems Analyst and Designer", according to Rittel is "... that he is trying to optimize, i.e. incorporate all relevant and important aspects of the planning problem at hand into one measure of effectiveness which he tries to maximize."[43, pg.390]

[13] Traffic issues have been mentioned in many respects in the process of formulating the requirements of the new urban quarter (public transportation to improve the life quality, Polycentricism to deal with traffic problems). For example, dictation of street activity through urban geometry has been mentioned by the designers.[55]1[pp.2]

> *Otto's minimizing detour network. The longitudinal direction was imposed via a primary artery with a series of subsidiary roads running parallel. The result is a hybrid of minimizing detour network and deformed grid."*[47, pg.].

The minimization of detour indicates that possibly another part of the overall urban quarter design problem has been optimized. From the description given by Schumacher it is not clear what the objective behind the optimization was.

Withholding a detailed definition of the understanding of parametric values[14] in its design framework, parametric urbanism concentrates on arguing its formal predominance over Modernist Urbanism. Whereas Le Corbusier argued for the right angle and the straight line as dogma to achieve his principles of order in city planning, Schumacher argues for *curvilinear types*[15] as dogma in parametric urbanism. One of the Negative Heuristics (taboos) of the New Style / Design Research Program is to avoid rigid geometric primitives such as squares, triangles and circles.

Patrick Schumacher cites Le Corbusier's eulogy to the straight line and the right angle:

> *"Man walks in a straight line because he has a goal and knows where he is going; he has made up his mind to reach some particular place and he goes straight*

[14]Parametric representation in mathematics is understood as a representation in which points of a curve or surface undergo a function of one ore more variables (parameters). An example for parametric representation in physics would be the description of way coordinates of moving objects dependent on time. In computer science parameters denote, for example, input variables.

[15]The creation of complex curved geometries in architecture (such as double bent curvatures) has been made possible through advances in computational modelling techniques and digital manufacturing. In the Kartal Pendik master plan a tool originally developed for graphic animation of hair (Maya hair dynamics) has been implemented to simulate the *minimized detour net* which serves as the base for the road network proposal within the master plan.

> *to it. The pack-donkey meanders along, meditates a little in his scatter-brained and distracted fashion, he zigzags in order to avoid larger stones, or to ease the climb, or to gain a little shade; he takes the line of least resistance."*[47, pg.17]

Evidently when arguing to be one's successor you need to refuse the ancestors dogmas and do the opposite just because you now can. Nonetheless the Euclidean straight line still seems to be the shortest distance between two points, there might be other reasons for suggesting a curved traffic network. One could argue on the dominance of the curved line over the straight line[16] but without knowing whether the geometrical shape of traffic network edges serves the optimization of the relationship of total network length and the average detour factor in desirable way it seems speculative. As the desired results that want to be achieved through the minimized detour network aren't clearly explained it is impossible to reason on the value of the traffic network solution the Kartal Pendik master plan represents. It can neither be argued on the value of the solution to the (wicked) problems formulated in the initial master plan, let alone the key challenges the city of Istanbul wants or has to face in the course of it's further development.

Amongst one of these challenges is a very high increase in new

[16]To reach a destination point B from a starting point A different transportation networks can be conducted within a city. The airline distance between point A and B being x, one would have to include a detour factor of the length dx in road traffic. Assuming the objective is to get from A to B as fast as possible d needs to be as small as possible. Yet transportation networks can be modelled via planar graphs of curved edges. The quality of such a graph can be determined with the help of *Dilation Methods*. *Dilation* describes the relation between the shortest path in the graph and the Euclidean distance between two points. Transportation networks like waterways, rail-road systems, or urban street systems can be modelled by geometric dilation, incorporating access to the network in-between knots (crossroads). Geometric dilation accounts the shape of a network edge, still the Euclidean distance, the straight line between point A and B, serves as the relational minimal factor.[29]

cars. Istanbul grows by 84.000 new cars each year. Each car needs 10 linear meters when parked which equals a length of approx 800 km. Congestion costs are estimated to USD 7.2 billion a year. 60% of the total investment budget of the municipality is spent on transport infrastructures every year.[45] Without further clarification on the objective behind the *minimized detour network*[17] in an urban master plan, the purpose of the implication of the method (including computational tools) hereby could have been exercising the method.

Within a parametric computational framework constraints must be very clearly defined. Then design process can be traced and this allows to argue on an intermediate solution, such as a master plan. Argumentation is manageable to a broader audience. This can be the people whose lives are affected by a design solution. It can be in the people of Istanbul's interest to know how an urban transformation project would affect them.[18] As computational methods are already involved in the generation of the proposed design solution, similar tools can be used to present and evaluate it.[19] It is overambitious to hope for a perfect or finished solution but it can nevertheless aid design decision processes.
An approach to simplify wicked problems is reducing the complexity of a possible solution. The danger lies within that

> *"... whatever he (the designer) learns about the problem becomes a part of the solution".*[44, pg.2]

[17] Apart from a reference to complexity theory in general Schuhmacher gives a more detailed description of Frei Ottos research on natural structures and settlement patterns. In analogous experiments with wool-thread models Otto was able to compute solutions between given points that optimize the relationship of total network length and the average detour factor. The computationally derived road network proposal of the Kartal Pendik masterplan optically resembles Frei Otto's analogously derived results.[47, pg.18]

[18] Will there be more traffic congestion or less, from the designers point of view?

[19] In the case of Kartal Pendik this could be a traffic simulation.

It could be that the designer learns that he is confronted with a complex problem and suggests a very complex solution. This could make the situation even more complex. Such as being confronted with a complex traffic problem and thus proposing a formal solution that is again complex, for example, in construction. As every wicked problem can be considered a symptom of another problem Rittel warns:

> *"Curing symptoms can make the real disease worse."*[43, pg.393]

A critical comment on the use of methods unsure of their implication in the field of urban design has come from Jane Jacobs just before computation has entered the field. She describes the state of city planning in the 1960's as having been

> *..."all in the same stage of elaborately learned superstition as medical science was early in the last century, when physicians put their faith in bloodletting*[20]*, to draw out the evil humors which were believed to cause disease."*[28, pg.12]

The parallels Jane Jacobs describes between urban planning at the time and an abandoned medical treatment can be read as a warning.

> *"As in the pseudoscience of bloodletting, just so in the pseudoscience of city rebuilding and planning, years of learning and a plethora of subtle and complicated dogma have arisen on a foundation of nonsense. The tools of*

[20]Bloodletting has been performed in ancient Egypt, from where it found its way to the Greeks and Romans. From antiquity up to the late 19th century it has been the most common method to cure illnesses. As the operation has a history of 3,000 years various tools and techniques have been developed accompanied by diverse visions of the human body. Bloodletting as a general treatment for diseases or as a preventive procedure has fallen into disfavor in the 19th century. The practice has now been abandoned from medical science (apart from very few specific conditions).[50]

> *the technique have steadily been perfected. Naturally, in time, forceful and able men, admired administrators, having swallowed the initial fallacies and having been provisioned with tools and with public confidence, go on logically to the greatest destructive excesses, which prudence or mercy might previously have forbade."*[28, pg.13]

It is at question whether any legally constructed building can have a life-threatening effect on the people residing in it such as bloodletting. As the constraints that serve legal argumentation are very rigid within most legal systems. As long as a design solution is based on legal constraints, finding a solution by chance that wouldn't be life-threatening is possible. It may stress the limits of responsibility in legal construction and can nonetheless worsen an overall complex problem. There is no trial and error for solutions in the built environment.*Every designer wants to sell what he knows best.*[44, pg.6] A designer's interest can therefore be contradictory to the interests of many people. In selling and defending a design model or method he relies on *Sachzwang* [21] reasoning in the same way as a politician. A design affects the lives of many by committing resources. A master plan resembles an intermediate possible solution as a base for argumentation on possible consequences of the plan that is meant to be carried out. Reasoning on design solutions is based on constraints.[44]

> *"Constraints within a design solution are decided, selected and self-imposed"*,

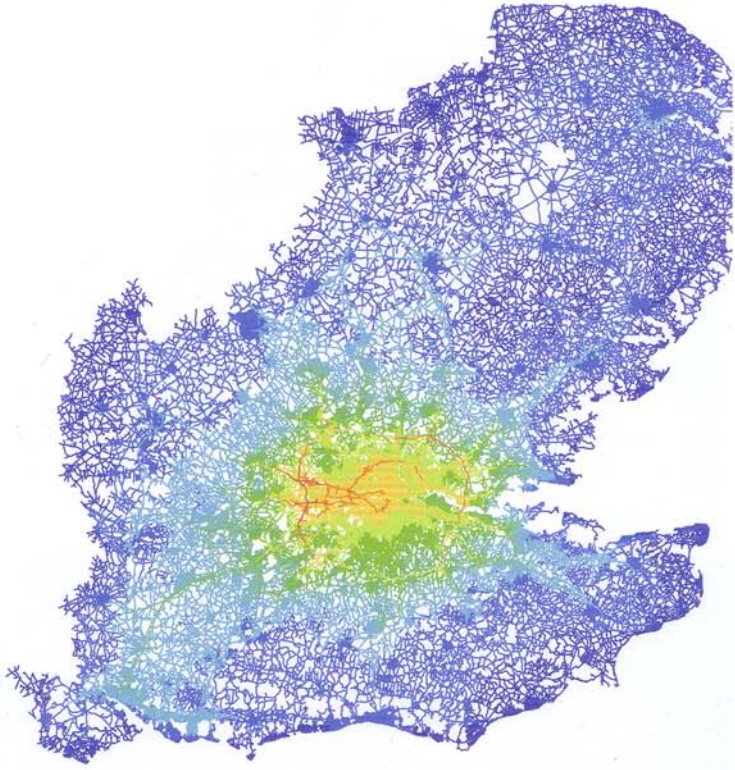
as Rittel argues and therefore a design

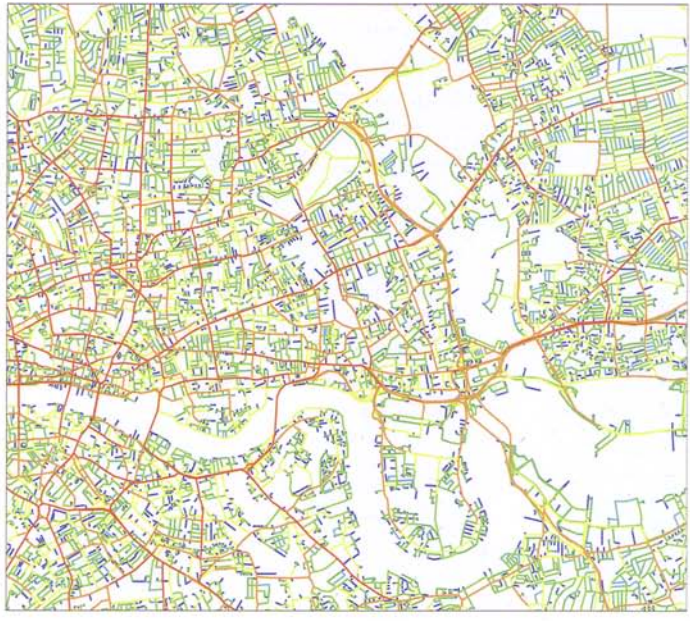
> *"... depends decisively and at every step of reasoning on the world view of the designer"*[44, pg.6]

[21] "derive ought from fact":"Because 58% of the population say they want a freeway, I shall seek to provide it"[44, pg.5]

Figure 2.0: "Minimized Detour Net" [47, pg.20], Kartal Pendik master plan – Urban Geometry[37, pg.17]

Figure 2.1: "Greater Southeast of England spatial agglomeration: radius 50 kilometers; East London and the Olympic site", "spatial congestion: radius 5 kilometers" [10, pg.83]





References, Methods and Buildings

I've never been an intellectual but I have this look. [Woody Allen]

As opposed to Modernist Urbanism, according to Schuhmacher:

> *"Phenomena such as the pack-donkey's path and urban unplanned settlement processes can now be analysed and appreciated in terms of their underlying logic and rationality, that is in terms of their hidden regularity and associated performative power"*[47, pg.18]

Within parametric urbanism and related methods terms from other disciplines, that usually have a scientific determination in their field, are vastly referenced.

Dynamic Equlibrium, *Homeostasis*, *dynamically stable* or *wholeness* are terms designers use to describe the desirable states their design solutions will, should or have reached through parametric tools.

In addition, methods that have been implemented within digital culture and computational sciences (such as evolutionary algorithms, particle systems, artificial agents etc..) that are again inspired by concepts from other scientific fields (such as mathematics, physics or molecular biology) are applied in the design

process.

Some of these terms can be interpreted as a general view of the world, some as metaphors or design strategies. Other imported methods solve problems in the architectural discourse similar to the disciplines where the methods have been established. An explanation on how such terms are to be understood in an architectural context in the built environment is seldom given. They could therefore be *Buzzwords*.

In current technological culture *Buzzwords* are attributed to be intentionally vague. The term *Buzzword* mocks the use of catchwords or catchphrases that are used outside their original context in an inaccurate manner. *Buzzwords* describe fashionable terms that occur especially in political and technological jargon. Behind the notion to sum up political issues in concise catch phrases lies the intention to persuade an audience for ones agenda. Critical is the predominant objective to impress an audience as opposed to give relevant information.

An examination of five exemplary prose passages in his text on *Politics and the English Language* led George Orwell to the following conclusion:

> *"...two qualities are common to all of them. The first is staleness of imagery; the other is lack of precision. The writer either has a meaning and cannot express it, or he inadvertently says something else, or he is almost indifferent as to whether his words mean anything or not."*[35, pg.361]

To focus on lack of precision: Later in his text Orwell describes *"words that are used to dress up a simple statement and give an air of scientific impartiality to biased judgements"* [35, pg.363] as elements of *Pretentious Diction*. What Orwell describes as *pretentious diction* might be seen a survival strategy in the highly competitive architectural field. A jargon in the

sense of a political one can be helpful in selling concepts and theories.[35]

Orwell warns:

> *"... An effect can become a cause*[1]*, reinforcing the original cause and producing the same effect in an intensified form, and so on indefinitely."[35, pg. 358]*

Rittel explains designers disorderly reasoning by the nature of the design problem [44, pg.2]. In order not to worsen the problem one wants to solve, any protagonist of imported methods is obliged to explain their understanding of the implementation in their field.

Without being as rigorous and fluent as Orwell has been with the English prose, analysing five texts[2] on *parametric urbanism* and related methods showed that there is one apparent similarity: vagueness. The most popular terms in the investigated 5 texts that lack precision are *Emergence*, *Generative*, *Agents* (*Autonomous Agents*, *Belief-Desire-Intention-Agents*, *Intelligent Multi-Agent System*, *Intelligent-Decision-Making-Agent*), *Self-Organization* and *Complexity.*

All of these terms can have a very general meaning. But they can also be found as scientific terms defined by the means of their field in foreign sciences.*Self-Organization* can be understood as self-organization of housing construction by people in cooperatives such as in the settlement movement of Vienna around 1917[64][3] or as *principle of the self-organizing dynamic system* formulated by the cybernetician Ashby in 1947[8].

[1] Orwell gives the following example: "A man may take to drink because he feels himself to be a failure and then fail all the more completely because he drinks."[35, pg. 358]

[2] DeLanda[33]; Schuhmacher[47]; Swarm Urbanism[34]; Information Urbanism [58]; Urban Ecologies[60]

[3] When the Austrian capital was suffering from economic hardship and severe food shortages in the wake of the First World War, the movement

Frank Schweitzer sees analogies in urban structure formation and physical phase transition, such as clustering, aggregation and percolation and self-organisation processes that produce new system properties through dynamic interplay of subunits[4][49]. He argues that the model of active Browns particles can be used to describe the formation of urban structures, such as systems of paths. 'Active Walkers' is the spatially discrete formulation of Browns particles in such a model. A path system from a physical viewpoint can be understood as a two-dimensional structure, evolving on the surface. Schweitzer describes that this structure should exist relatively stable over a longer period of time and the active walker on the surface should mainly be found on the path structure. The described path–system is an unplanned structure. It is the walkers task to ensure the existence of the path by using it and if necessary change it's trail. The life time and flexibility of such foot trails, that can be found in newly established settlements, shows that the task of creating and preserving the structure is not dependent on prior consultation amongst the involved particles.

In a discussion of *"science, philosophy and culture"*, Alan Sokal states in a footnote:

> *"Let me emphasize there is no one "right" definition of these (or any) terms. Rather each author has the obligation to his readers to clarify, to the greatest extent possible, how he proposes to use the word."*[51, pg. 264]

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came into being as a self-help initiative, when hunger and the lack of housing drove thousands of Viennese citizens to establish subsistence settlements on the edges of the city. Most of these dwellings were initially makeshift wooden structures accompanied by subsistence gardens for growing fruit and vegetables as well as keeping small domestic animals.[64]

[4]The observation of these commonalties on an abstracted level suggests the hypothesis that there exists a common level to describe these structures. He addresses that the theory of self-organization provides a quantitative access in social areas.[49, pg.38]

Alan Sokal gives an explanation of his understanding of

> *"... science as a world view giving primacy to reason and observation and a methodology aimed at acquiring accurate knowledge of the natural and social world."*[51, pg. 264]

Even if the critical spirit, by which scientific methodology is characterized, correlates with *fallibilism*[5], Sokal points out that well–tested theories in mature sciences are in general supported by

> *"a powerful web of interlocking evidence coming from a variety of sources"*[51, pg. 267][6].

He advises to

> *"... envisage a continuum with well-established science (e.g.. the idea that matter is composed of atoms) at one end, passing via cutting–edge science (e.g.. neutrino oscillations) and mainstream but speculative science (e.g.. string theory) – and then, much further along the way, through shroddy science (N rays, cold fusion) – and ending, after a long further journey at pseudo science)*[7][51, pg. 267]

The French philosopher Gilles DeLeuze and Manuel DeLanda (trying to translate Deleuzeian philosophy into modern day technology) are often cited in the context of parametric design. Sokal and Bricmont characterize DeLeuzes and Guattaris' work by a

[5]the understanding that all our empirical knowledge is tentative, incomplete and open to revision in the light of evidence or cogent new arguments

[6]... Sokal argues that scientific progress lies in linking theories into a unified framework such as: biology hast to be compatible with chemistry and chemistry with physics[51]

[7]Sokal gives as example for pseudo sciences according to his demarcation: astrology, homoeopathy, "creation science", Judaism, Christianity, Islam and Hinduism

> *"... great concentration of scientific terms, employed out of context and without any apparent logic, at least if one attributes to these terms their usual scientific meanings".* [52, p.154]

According to Sokal and Bricmont, they often invoke terms and concepts from physics or mathematics with lack of clarity. Not claiming a scientific monopoly on terms like *"chaos"*, *"limit"* or *"energy"*, he criticizes DeLeuze's and Guattariss referencing of

> *"highly technical terms that are not used outside of specialized scientific discourses, and for which they provide no alternative definition".*[52, p.154]

Brief and superficial allusions have the consequence that

> *"... a reader who is not already and expert in these subjects will be unable to learn anything concrete. And a specialist reader will find their statements most often meaningless, or sometimes acceptable but banal and confused."*[52, p.154]

Analysing a few passages of Deleuzes and Guattaris book *What is Philosophy?*, a french best-seller from 1991, Sokal and Beaumont revealed

> *"at least a dozen scientific terms used without rhyme or reason, and the discourse oscillates between nonsense ("a function is a Slow-motion") and truisms ("science constantly advances acceleration")".*[52, p.157]

The truisms described remind of terms such as *"interconnected network"*[7]1[pg.6]. Without further clarification on how this proposed network is interconnected apart from it's inherent determination, someone who is not an expert might just not realize it is a truism[8]. In the context the term is used one could

[8]On the other hand, what kind of expert needs one to be to identify such a truism?

also speculate that there is a special kind of interconnectedness important to traffic networks, from an architectural viewpoint. Again an architect would possibly come to the conclusion that this expression lacks clarity to even try to understand it's implication. Therefore such statements are either banal or confusing.

DeLanda, for example, says in an interview that he approaches the subject of *"... the form that is generated in response to complex, social, cultural, economic, geographic and other factors"* in *A Thousand Years of Non Linear History*[9] *in terms of the collective unintended consequences of intentional action*[33, pg.53] that become much more obvious to him in decentralized decision making processes than in centralized ones. He says:

> *"I used as my extreme examples the medieval core of Venice, whose labyrinthine structure was the unintended product of many decentralized personal decisions, and Versailles, a city planned to the last detail by centralized decision-makers in the French government."*[10][33, pg.53]

It would be very interesting what becomes clear in the observation of *labyrinthine structures*. It could give insight in *the underlying logic and rationality, of urban unplanned settlement processes*[47, pg.18] and the implication for architectural design solutions of such an analysis.

Two more DeLanda quotes mention *swarm* and *agent* models (can also be found in biological and computational sciences) as

[9] A booktitle a mathematical scientist will probably find confusing, as *linearity* can be found scientifically determined in mathematics

[10] As he seems to share an interest in the morphology of urban settlements with parametric urbanism, this quote raises the hope to find a more detailed description of the mentioned decision making processes behind the morphology of Venice. In *A Thousand Years of Non Linear History* one can only find the nearly exact same, vague mentioning [11] In the case of urban morphology, DeLanda's propositions can only be seen as creative stimulations for further investigations.

acceptable tools to simulate or visualize decision-making processes:

> *"Before we can generate buildings themselves we must model the decision making processes that give rise to them and in order to do this we must be able to devise intelligent decision making agents that influence others and reflect upon their own decisions."*[33, pg.55]

> *"Government organizations (bureaucratic agencies) must be added to the simulations as institutional agents, their authority of their edicts modelled both in terms of their legitimacy and the means of their enforcement as legitimacy changes and as enforcement practices evolve, the rules themselves change."*[33, pg.55]

As mentioned before a designer is confronted with a problem that has no finite solution, this will possible not change within computational simulation of the physical world and as the design of such a framework already depends on the world view of the designer, why the effort? It is not clear what DeLanda is implying. Would a computational simulation of a governmental organization be better than a human governmental organization? Why? Would it possibly give us useful insight in decision making processes behind urban form?

These two quotes are still interesting, as Patrick Schumacher seems to have an altogether different understanding of swarm models:

> *"But instead of only describing crowds moving through space we would like to think of swarms of buildings that drift across the landscape. Contemporary (Parametricist) architects start to conceive of urban fields as swarms of buildings, continuously differentiated, yet coordinated with respect to size, distance and orientation, creating fluid swarm formations. Instead of*

> *the Classical figure-ground separation, the contemporary notion assumes parametric figuration."*[48, pg.423]

The term *continuously differentiated* seems to be a technical term: On the one hand there is the notion of a *continuous function* in mathematics on the other hand there is also the term *continuously differentiable*, also found in elementary mathematical literature. How can physical buildings therefore be understood as *continuously differentiated*? Could it be that those buildings constantly change over time either due to natural decay and environmental impacts (which holds for all buildings) or because they have some unexplained property that allows the building to change[12]? Or maybe there is a deeper mathematical explanation to *continuously differentiated* buildings? Is it possible that this is a complicated description of an extend-able building?

Either way it is very hard for the reader to understand in which sense this term is to be understood. Furthermore how should one then picture the technical architectural solution?

What implies *"swarms of buildings that drift across the landscape"*? One could speculate in a similar poetic language: Buildings and entities of a swarm (such as fish or birds) have in common that as part of a group of entities (or an ensemble) an individual has an effect on the other individuals. If one plans to build in the context of already existing buildings, one has to follow certain rules (such as keeping enough distance to the neighbouring building not to make the neighbouring building's windows useless in by providing daylight) in order not to get into legal debates with the neighbour. Apart from this commonality other characteristics of swarms are not easy to match with the characteristics of buildings. Usually buildings do not

[12]Certain building style are different from others, this becomes obvious over time. Building styles are assigned to certain periods (such as the Viennese *Seccesion*, designed by Joseph Maria Olbrich, is considered a key work of Viennese *Art Nouveau*.)

change their locality within short periods of time, even if the alpha male starts to run.[13]. On the contrary the technical design and execution must resist natural decay at least for a few decades. Individuals of a swarm on the other hand change their location within short time periods and affect each other. Why is the term swarm used to describe buildings?

Trying to adapt swarm logic to building logic in the sense of the citation resolves in critical speculations on world views.

Is it imaginable that whole entities of buildings change their location over time? This would possibly be observable from a point in space that allows viewing the globe move. One could then observe that the globe rotates within 24 hours around its own axis. [14] Still all buildings on the moving globe will keep their position within the ensemble of the built environment. Buildings are usually denoted by location, through street address, and for some building types a fixed local position is crucial to provide service. An airport or a train station regulates air or train traffic. Unless one considers a plane, a train or a boat (house boat) a building, *drifting across the landscape* is a description for other design solutions than buildings.

Schumachers analogy, far from any evidence that computational swarm simulation is an adequate tool for building design, shows the crucial understanding of the implementation of computational tools and scientific methods from other fields in paramet-

[13] If a building design project is a private investment project, as the Kartal Pendik master plan, an elementary desire could be to make money by as many built cm^2 as possible. It will therefore be calculated from which point of time, after a construction has been established, revenues will expectedly exceed construction costs. The *break-even calculation* takes into account the expected average premium payments (before costs) in addition to the purchase price.

[14] The calculation of the rotational speed on earth depends on the location: at the equator the earth radius is about 6378 km therefore the circumference is about 40.075 km, the rotation speed accounts 1670 km per hour.

ric urbanism.

If any entity of similar individuals is contrasted to buildings (constructed to last e.g. a minimum of 50 years) it would be humans moving within the built environment.

Even though designers enjoy *epistemic freedom* and can therefore be inspired by any means while creating a vision for the physical environment, there are certain limits to the production of building form. The implications of lack of precision in using scientific terms in philosophy have been discussed by Sokal and Bricmont.

Yet, an architectural design is not merely engineering and not merely art. A building can be conceived and studied as a work of art. An architect will always have to include engineering in the design of a building. Certain requirements of the design problem have to be met. These are often variable within limits. Living rooms without a window providing daylight or fresh air would be an undesirable solution.

Performance criteria, such as air circulation or energy consumption, often in the form of standard values and state oft he art determinations, serve as consensus values in legal construction. [15]

Supposing that parametric urbanism as propagated by Patrick Schumacher and the designs by Zaha Hadid provide solutions within the variable but still rigid constraints of engineering, what qualifies this new style to claim for a new paradigm in architectural or urban design? Schumacher presents parametric urbanism also as a design research program. This has a scientific sound

[15] An architect is legally responsible for the building solution he provides. In legal construction, state of the art solutions are technical solutions a designer and a constructor agree on to ensure quality of constructions. Therefore standards, norms and building codes are conducted

to it but the research program presented is based on heuristic methods. Heuristic methods[16] in genuine sciences, as described by Sokal, can aid the process of finding solutions within an infinite solution space, but the solutions will have to be proven by scientific methods based on empirical and measurable evidence subject to specific principles of reasoning.[51]

The heuristic methods described by Schumacher serve the production of building form. From the information at hand, these methods cannot be evaluated in terms of their potential to solve building design problems. Rather, they present tools to create aesthetic and formal solutions in a baroque manner. The language that is used in the propagation of parametric urbanism confuses the distinction between design problems (such as engineering) and the production of styles that present aesthetic solutions. Engineering problems can be argued in a similar manner as scientific problems. The problem of arguing on aesthetic values is best–known: it is dependent on taste[17].

Christopher Alexander, a mathematical scientist and architect, stated that the introduction of mathematics makes designers nervous.

> *"The form is the solution to the problem"*[1, pg.15],

he argues, and furthermore:

> *"What does make design a problem in real world cases*

[16] Between 30% and 50% of scientific discoveries are estimated to have been stumbled upon rather than sought out. Louis Pasteur expressed luck in science by saying *"In the fields of observation chance favors only those minds which are prepared."*[39]. Genuine scientists rely on luck in finding new, more or less reliable, solutions or problems. Possibly an image of the scientist randomly fishing in an infinite unknown space of problems and solutions can be drawn.

[17] A building can be very beautiful to a majority of people and therefore attract them in a way a flower attracts a bee but we do not know if this is desirable. Still, in this analogy the flower is seen as static and the bee as moving within a time frame.

> *is that we are trying to make a diagram for forces whose field we do not understand."*[1, pg.21]

In some cases parametrically generated static form in the built environment resembles such a diagram.

The basic misleading consequence of borrowing a method from computer science (or digital culture) that comes itself from another science without architectural determinants based on human building logic can result in the building of a parametrically derived complex static form.[18] Such a form can then be seen as a three–dimensional built visualisation of complex phenomena with the additional quality of being a quite ordinary building.

An example: Aristid Lindenmayer, a biologist, invented a formalism that renders a mathematical description of plant growth known as an L–System in 1968. L–Systems can describe biological growth instructions (e.g.. programs for cell growth that are found in the DNA) as well as complex mathematical systems (such as fractal geometry)[19]. Fractals can be seen as an accommodation of conflicting goals within circulatory functions. Naturally occurring circulatory systems (such as in the human brain or lungs) require the capability of transmitting entities from potentially any source to any destination whilst capturing as small a volume as possible. L–Systems are mainly employed in computer graphics to create plant geometry [17].

Yet, building solutions can be found whose envelopes look exactly as if derived from L-Systems logic. The following state-

[18]Which has its right, but should not be mistaken for solving a problem in the same sense as in the disciplines the methods have been established.

[19]In computation, L–Systems describe a parallel String rewriting System that consists of an initial string (seed) and a set of rules that determine how the symbols in a string are rewritten or replaced by Strings. The modules of the String are interpreted as commands; the parameters for the commands are stored within the modules. L-systems are grammar based (introduced by Noam Chomsky)[17]

ment describes the geometrical solution for parts of the façade and roof of the *New Czech National Library*[20]:

> *"The growth of the library's tectonic envelope is driven by computational processes that derive the specific articulation of each tectonic element's dimensions, angle and orientation in response to recurrent analyses of structural, spatial and environmental parameters. The resulting structure synthesises form, load–bearing behaviour, micro-climatic provisions and organisational capacity within the differentiation of the envelope."[24, pg.103]*

In the case of the Czech National Library one could argue that geometrical solution similar to L-Systems is suitable as circulatory network of forces that need to be transferred from the roof via the façade to the ground while capturing a certain volume. Thus the forces are understood as dynamic factors. The built structure, as a circulatory systems, is desired to remain as static and stable as possible when exposed to the assumed dynamic forces.

Analogous to biological circulatory systems the following (before mentioned) problem could be solved by implementing growth algorithms such as L-Systems: Istanbul grows by 84.000 new cars each year. Each car needs 10 linear meters when parked which equals a length of approx 800 km. Design a circulatory systems with the capability of transmitting entities from potentially any source to any destination whilst capturing as small a volume as possible.(Minimize the space needed for cars and traffic and thus maximize other spaces within the city.) If this is solved, one could then add: Shape any edges of the resulting network in the form of a curve to ensure that movement within the network doesn't result in congestion, but before that prove that curves ensure faster movement to reach a desirable speed of ... when

[20]OCEAN and Scheffler + Partner, 2006

going from East Kartal to South Pendik by car.

Designers have access to a large variety of algorithms that other fields have implemented to describe problems, for a variety of reasons (e.g. the simulation of plant growth). The availability of certain computational tools allows designers to implement these algorithms in the form finding process. It is again very hard to draw a line between aesthetic solutions and solutions that implement a logic similar to the logic of e.g. biological circulatory systems. Biological systems grow by very small molecular parts. The algorithms to simulate such growth processes, can run indefinitely[21]. If one is interested in a rational translation of plant growth algorithms to building logic, the question of the smallest part is unavoidable. Is it desirable to exercise the infinity of fractal growth? Infinite fragmentation could be undesirable as constructive building parts and human scales determine minimum values.

The façade of the Czech National Library is used as an example for a concept named *Morpho-Ecologies*. Thus the design approach is presented as combining *morphology*, *morphogenesis* and *ecology*[24, pg.103]. It is possible that the geometrical solution for the façade and roof requires a minimum of building material. It is not said whether the solution correlates with building logic. A lot of varying angles can be found in the nodes of the network therefore many different building parts need to be constructed and assembled. Whether or not the fabrication of many different customized building parts is an ecologically sustainable solution remains open.

Some actors in the parametric design field state that an increasing use of computational techniques resolves in the temptation to produce design solutions of *"formal complexity"*. Arguing for employing digital design techniques in designs *"responsive to*

[21] In computation fractals can be visualised until the size of one pixel, which is the smallest element a regular screen can render

particular conditions of contexts, user functions and program".[2, pg.2]

Programmatic Form-ation employs *social criteria* in a parametric design framework. The social criteria are: occupant no., needs, lifestyle, living preferences, environmental criteria, location within building, orientation, cardinal direction, exposure to view. Different ground floor plans according to different social criteria are organized to a tower in the city within a generative process.[2]

We know that the Kartal Pendik master plan wants to raise living quality by richer amenities, such as swimming pools, private sports centres and club buildings. The central business district is focused on technological businesses, these could provide *post-fordism* workplaces, no longer dependent on industrial manufacturing. In Istanbul 30% of the employment sector are out of regulatory frame. 36% of the people are unemployed.[45]

There are, of course, a lot of different ways to interpret socio–economic demands. One is to provide as many people as possible with the best possible housing solution to affordable prices. One could be to provide workplaces[22].

Information Urbanism wants to fill a gap it sees in parametric urbanism. Refering to Zaha Hadid and Patrick Schumacher as pioneers in parametric urbanism the collaborative research project misses

> *"... the integration of demographics, cultural and human factors into this computer controlled equation..."*[58, pg.2]

[22]What Patrick Schumacher understands by socio–economic demands is unknown. It is known that he believes that architecture transformed the ape into the human and possibly soon will provide the environment for the *Übermensch.*[62]

It is described as

> *"... a hybrid method which seeks logical urban form and analyses it's importance through urban design education."*[58, pg.1]

A *work flow* is presented that,

> *"... describes a procedure for exploring, collecting, analysing, and 3D representing of urban information from Census data by diagrammatic digital models and fabricated physical models."*[58, pg.2]

Within an example given, a thematic map of Cincinnati has been created showing the distribution of White, Black, Hispanic and Asian population. This map has been overlaid with the railroad system to *"... explore their correlations..."*[58, pg.3].It is not mentioned what correlations the exploration has shown.

Even within different governmental forms over the globe railroad systems are not designed for special ethnic groups of the population. Possibly there is a relation in the use of the railroad infrastructure depending on budget, which might in turn have a relation to ethnicities but the consequences for urban design in this case needs to be further outlined to be clearly understood. Traffic networks can be designed to segregate ethnic groups, such as designed by Robert Moses, also known as *"unstoppable bulldozer"*, for New York in the 1930s.[22] The working process of *Information Urbanism* furthermore involves the extraction of the gathered demographic information into *"... a grasshopper script..."* and streaming *"... the information to a Excel sheet for further calculations..."*[58]. It is not explained what the scripts solve. In a final step the generated data is further manipulated in Maya and Rhino (3D Software) and physical models are created through CNC milling and laser cutting. The physical (static) models are seen as a representation of the dynamic relationship among GIS data sets.

> *"The marriage between GIS and fabrication technologies technologies stimulates a different mindset and design thinking process."*[58] [58, pg.5]

Static results are presented where demographic data no matter whether there is a relation to human building behaviour replaces the algorithms parametric urbanism implements. These information models may represent the actual dilemma architects are in at this point. Maybe the profession really needs such physical models to slowly adapt to social phenomena by a haptic experience? *Information Urbanism* furthermore presents *Swarm City*. An experiment,

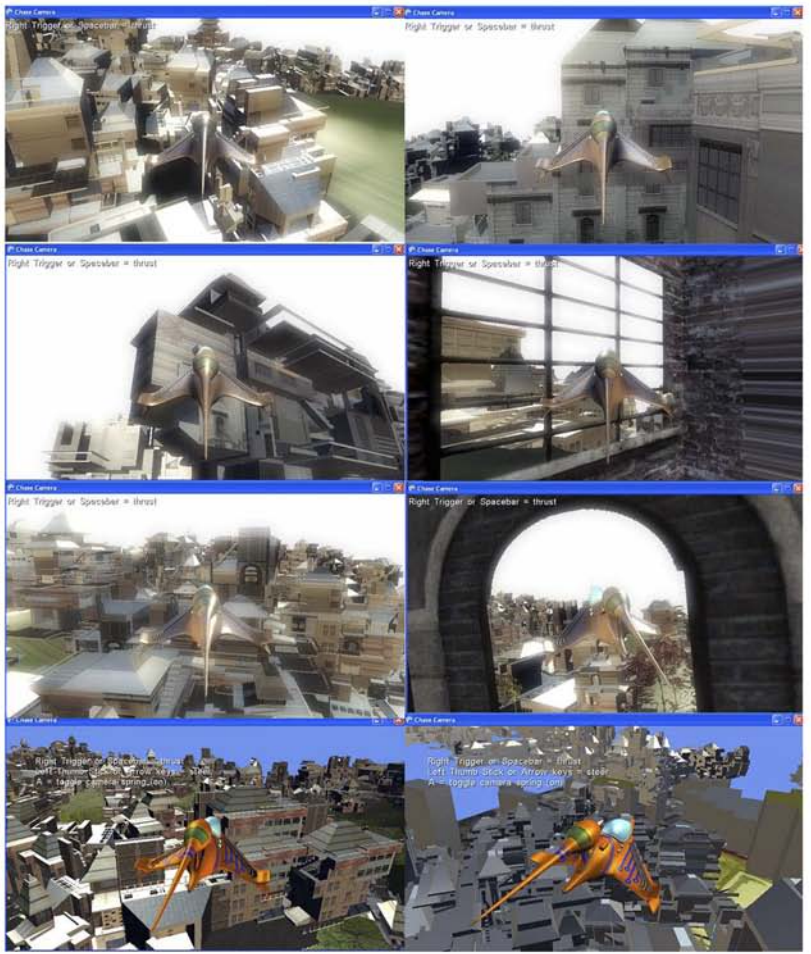
> *"... exploring how to use the diagrammatic geo-spatial data to automatically construct a highly detailed urban model for a video game."*[23][58, pg.6]

Based on Frank Schweitzer's scientific physical elaborations, it is at question what does one obtain from the implementation of unplanned building logic in computational design frameworks. A metric of self-organisation analogous to physical systems, such as aggregates, is that there is no need for prior consultation amongst involved sub-units. What is derived by simulations of unplanned settlement growth and how are the derivations understood to solve the problems within urban growth? A similar translation as of Browns particles to 'active walkers' (as a spatially discrete formulation) would be beneficiary to understand such simulation models in an urban design discourse.

Figure 3.1: Areal view of Rocinha, on the hills behind Copacabana in Rio de Janeiro, Brazil [34, pg.58]

[23] A *family income map* is used to control the placement of particular building style, height and Facade feature. A population density map is used to control the placement of community centers and public space."[58, pg.6]

Figure 3.1: Screen capture of the real time rendering in XNA game studio[57, pg.17]


Right Trigger or Spacebar = thrust
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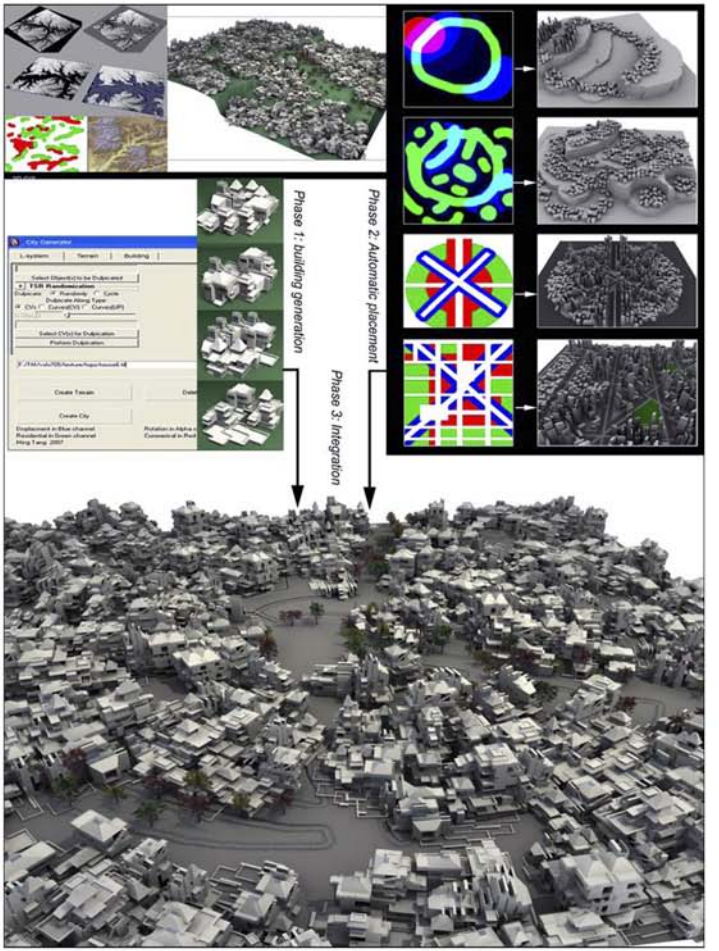
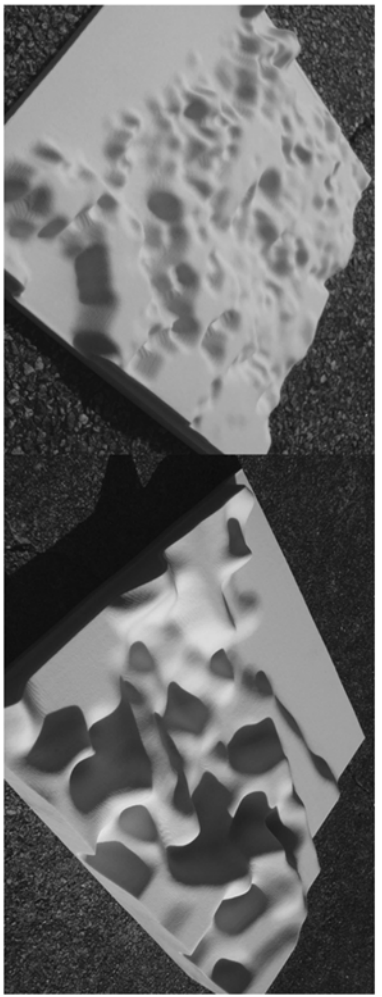
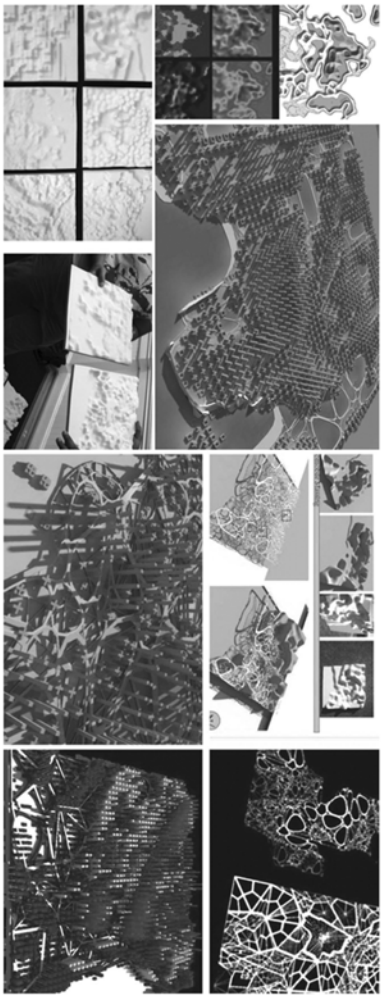
A = toggle camera spring (on)
Right Trigger or Spacebar = thrust
Left Thumb Stick or Arrow keys = steer
A = toggle camera spring (on)


Phase 1: building generation
Phase 2: Automatic placement
Phase 3: Integration





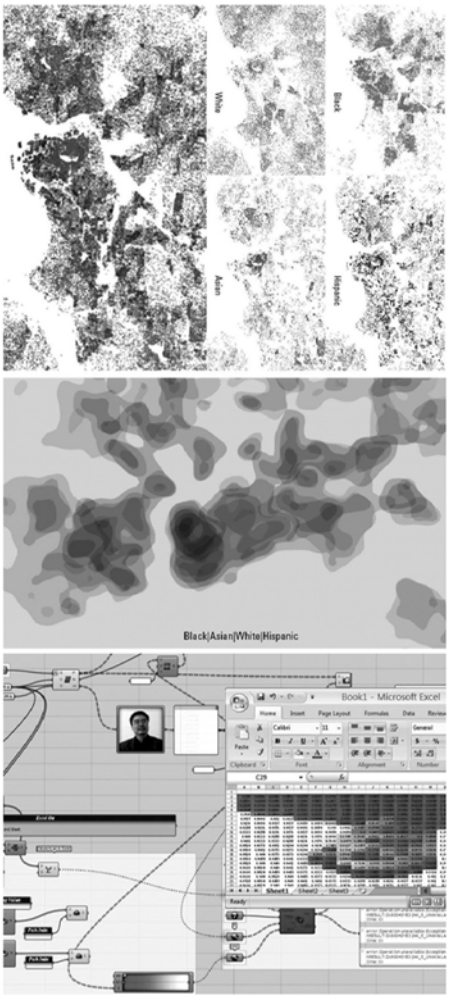
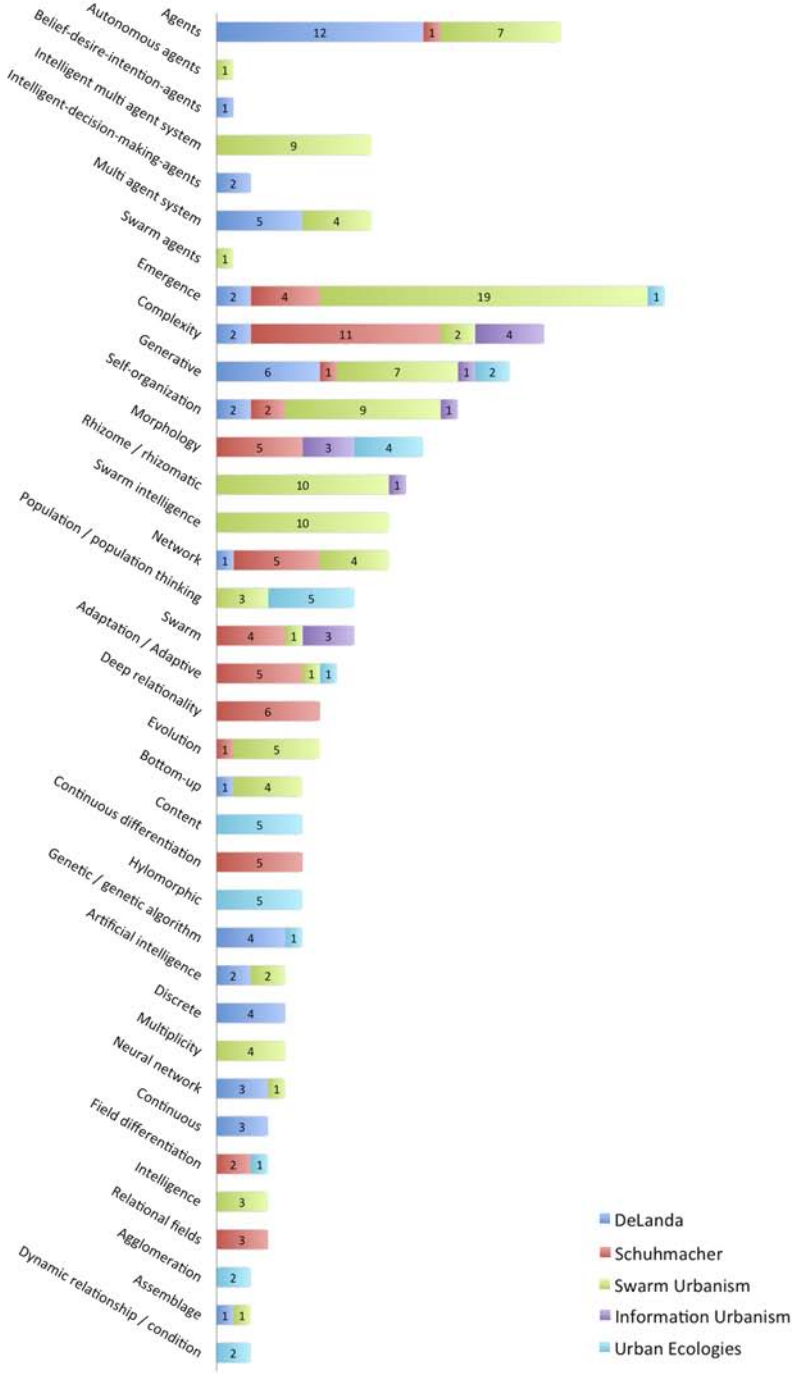

White
Black
Asian
Hispanic
Black|Asian|White|Hispanic
Book1 - Microsoft Excel

Figure 3.0: GIS thematic map, conversion into raster image, import into Excel and Grasshopper[58, fig.1], Screenshot of *Savannah project*[58, fig.2], "After transferring family income data into a 3D surface, the form was sent out to Power Mill and then milled with three axes CNC"[58, fig.6]

Figure 3.1: Popular terms in parametric urbanism and related methods: DeLanda[33], Schumacher[47], Swarm Urbanism[34], Urban Ecologies[60]


Agents
Autonomous agents
Belief-desire-intention-agents
Intelligent multi agent system
Intelligent-decision-making-agents
Multi agent system
Swarm agents
Emergence
Complexity
Generative
Self-organization
Morphology
Rhizome / rhizomatic
Swarm intelligence
Network
Population / population thinking
Swarm
Adaptation / Adaptive
Deep relationality
Evolution
Bottom-up
Content
Continuous differentiation
Hylomorphic
Genetic / genetic algorithm
Artificial intelligence
Discrete
Multiplicity
Neural network
Continuous
Field differentiation
Intelligence
Relational fields
Agglomeration
Assemblage
Dynamic relationship / condition
12 1 7
1
1
9
2
5 4
1
2 4 19 1
2 11 2 4
6 1 7 1 2
2 2 9 1
5 3 4
10 1
10
1 5 4
3 5
4 1 3
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6
1 5
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2
DeLanda
Schuhmacher
Swarm Urbanism
Information Urbanism
Urban Ecologies

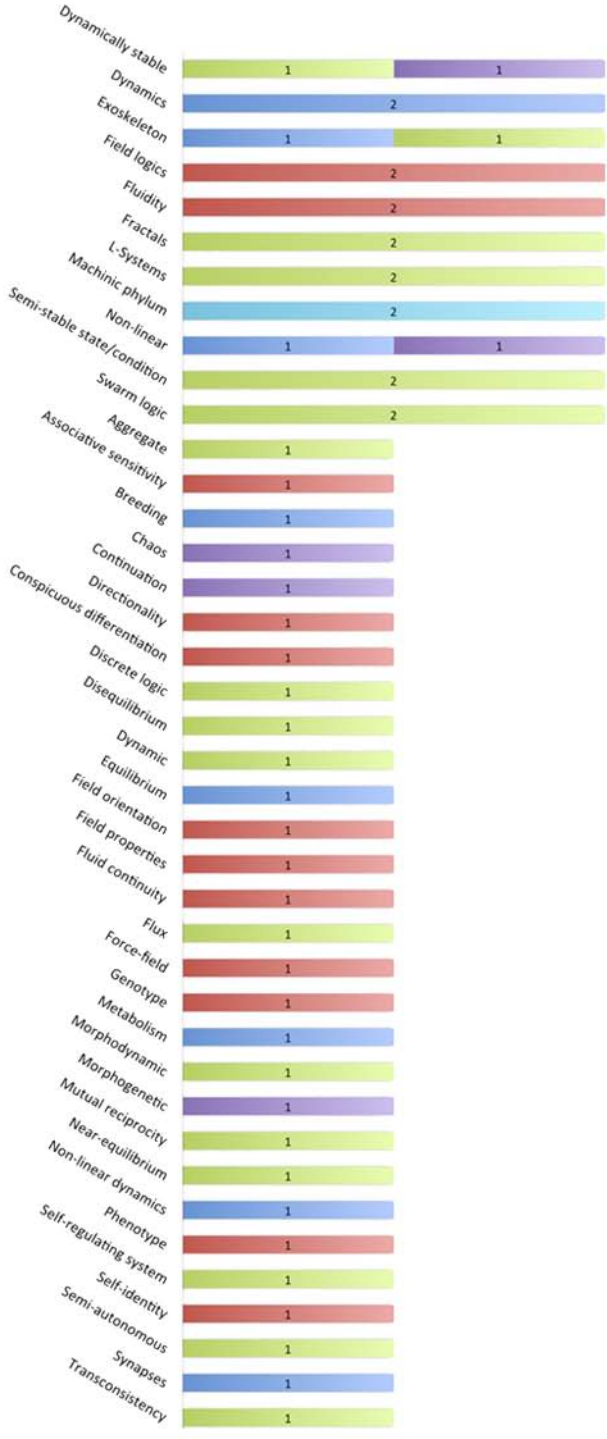
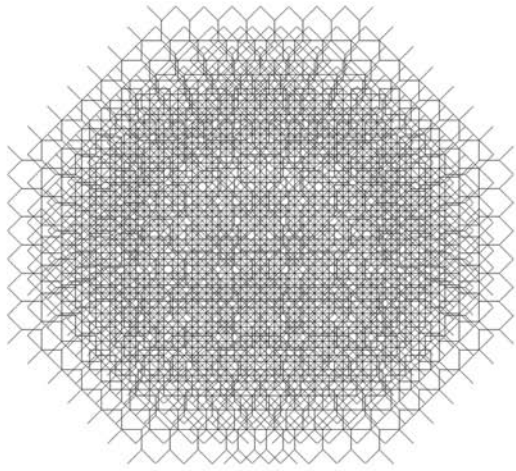
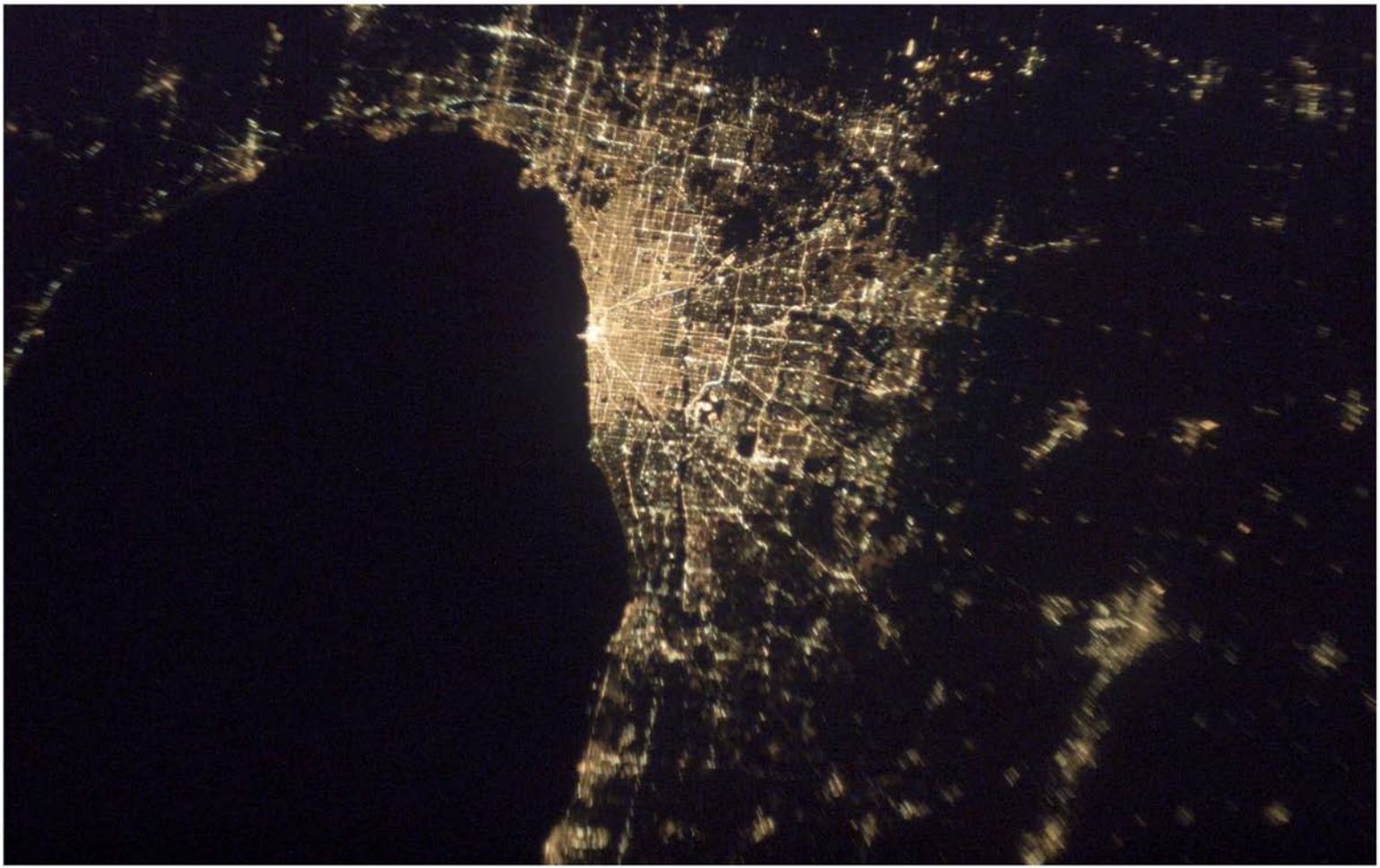

Dynamically stable
1
1
Dynamics
2
Exoskeleton
1
1
Field logics
2
Fluidity
2
Fractals
2
L-Systems
2
Machinic phylum
2
Non-linear
1
1
Semi-stable state/condition
2
Swarm logic
2
Aggregate
1
Associative sensitivity
1
Breeding
1
Chaos
1
Continuation
1
Directionality
1
Conspicuous differentiation
1
Discrete logic
1
Disequilibrium
1
Dynamic
1
Equilibrium
1
Field orientation
1
Field properties
1
Fluid continuity
1
Flux
1
Force-field
1
Genotype
1
Metabolism
1
Morphodynamic
1
Morphogenetic
1
Mutual reciprocity
1
Near-equilibrium
1
Non-linear dynamics
1
Phenotype
1
Self-regulating system
1
Self-identity
1
Semi-autonomous
1
Synapses
1
Transconsistency
1

Figure 3.0: Popular terms in parametric urbanism and related methods: DeLanda[33], Schumacher[47], Swarm Urbanism[34], Urban Ecologies[60]

Figure 3.1: Human thorax Lung reconstruction from CT–scan [23], simple algae algorithm: axiom/seed: X, production rule 1: X=F[-X]+X, production rule 2: F=FF, n=1, n=2, n=3 and n=15; simple algae algorithm wihtout exponential FF increase, n=15

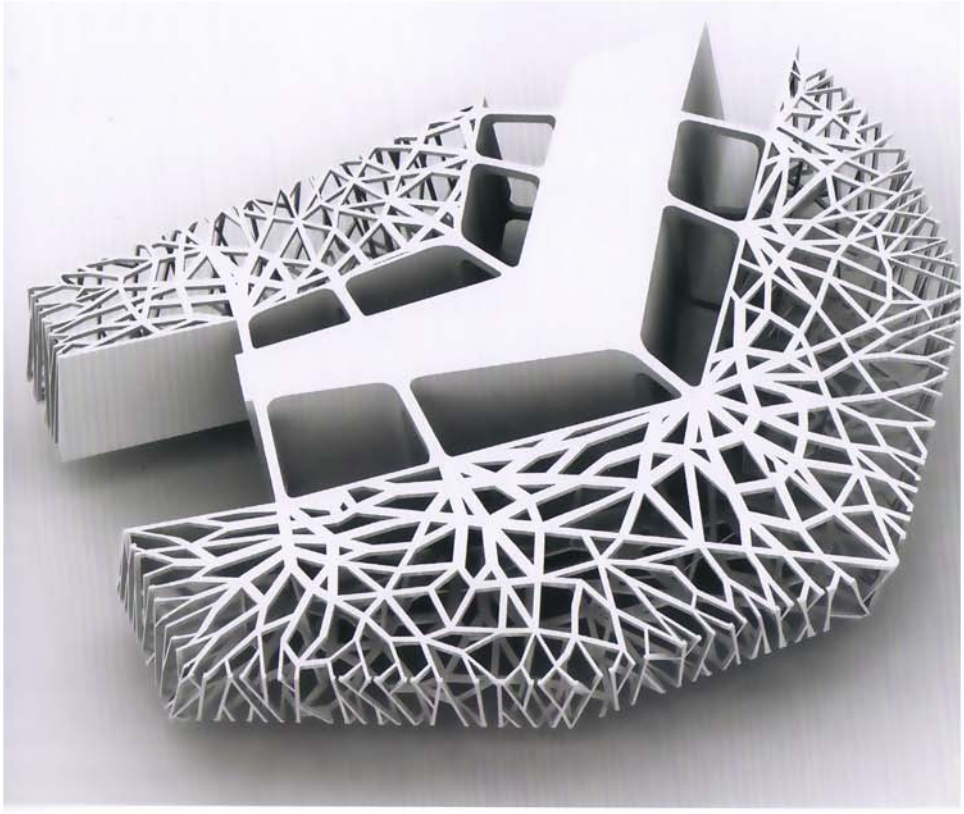


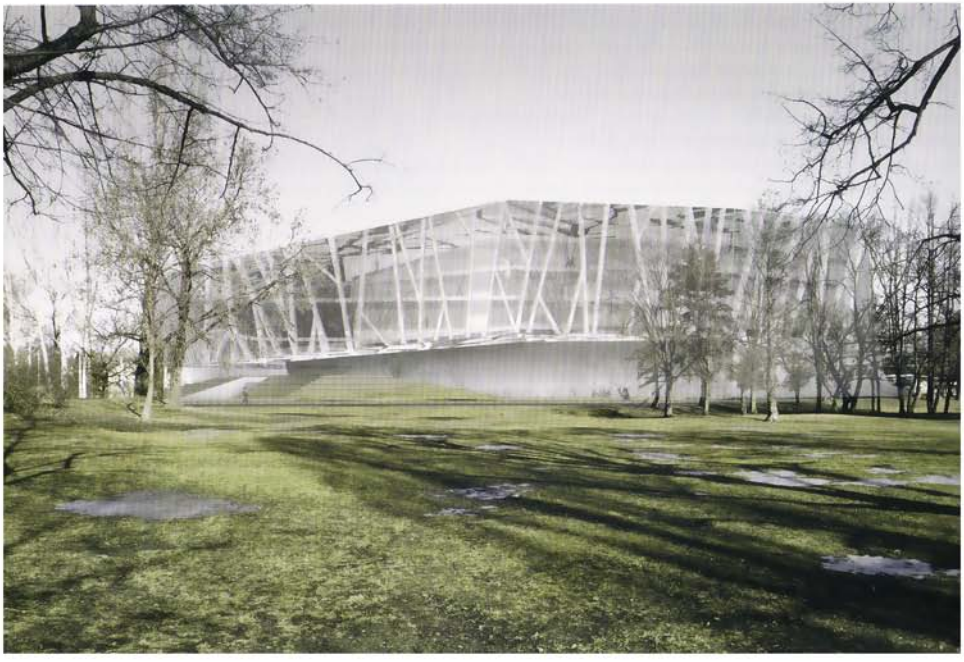


ISS007E16525

Figure 3.0: image of Chicago, Illinois at night, taken by an Expedition 7 crewmember onboard the International Space Station (ISS), shows patterns of the city center and major roads along the coast of Lake Michigan.[11]

Figure 3.1: National Czech Library: tectonic articulation, exterior view[24, pg.106, 107]






gégé 2010

Figure 3.0: Indonesienreise 2010, gégé,[42]

Potentially Middle-Class Solutions

The use of calculators:

Pro: if you understand how to solve and can identify the steps needed to solve the problem and understand the nature of the computation involved, a calculator is a great tool to use. [61]

Contra: Mechanization of fundamental classroom skills may leave kids unable to do simple math on paper. The cost for electricity or batteries may make operating the device daily too expensive.[40]

As mentioned before, the prognosis is that in about twenty years, half of the world's urban population will live in self-built structures, erected beyond official planning and state control.[41]

In Istanbul 50% of the city is built illegally. One of the reasons for that could be that it takes 188 days and 231,4% of the average income per capita in Turkey to deal with a construction permit.[45]

Yet, an architectural style that claims to be able to *"... analyse unplanned settlement processes and appreciates them in terms of their hidden regularity and underlying logic and rationality..."*[47,

pg.18] has designed a solution to the many differing anticipations of the problem. For Istanbul this means a master plan for the development of a new urban quarter that should become a *central business district*. It remains open in what way this solution is understood to solve the socio–economic demands in respect to urban unplanned settlement processes. These demands are part of the complex problem, to which an urban master plan poses a solution.

A design solution can never resemble a desirable result to all objectives in a city. The quality of a solution relies on the cognitive skills of a designer, which are limited and can be aided by computational means. Some point out

> *"... the value of architects' design–thinking skills when applied to the invisible, but no–less–designed world of processes, procedures, policies and flows."*[16, pg.1]

Architectural graduates have, for example, been hired by clinics and hospitals to design their services, not the facilities. One of the hired graduates states that architects

> *"... are well suited to dealing with big, complex problems that require a lot of people to achieve an outcome..."*.[16, pg.1]

According to the U.S. Department of Labor, employment at architectural firms nationwide dropped from 224,500 to 184,600. Many thousands are said to have left the field worldwide.[59][1] The architectural design field is highly connected to the condition of the economic system it acts within. Therefore design commissions depend on the condition of the economic system. But,

> *"People will always need houses, cities and nations will always need schools and libraries and civic build-*

[1] Architectural institutions, representing the profession, usually do not keep track of unemployment.

> *ings, and trendy restaurants will need redesigns. Architecture will never die completely"*[59, pg.5]

There is no one ideal house, but as many different visions for it as there are designers and people who need housing. Joost Grootens describes his vision as follows:

> *"The ideal house is the unfinished house. It can become anything. Building regulators, architects, builders and mortgage suppliers are not accustomed to dealing with the anarchy of the unfinished. This project is a monument to the individual builder. It is made up of an architectonic base consisting of a concrete foundation and a stove with a chimney. It is the beginning of what will become a house. Fragments, a reversed archaeology. Starting simple, the house can then grow with its user and be adapted according to circumstance, preference,want and need. The first step consists of creating basic functions using recycled and inexpensive materials. Different solutions and materials can always be applied as the house develops. The variables in the outcome are unpredictable. This house invites its inhabitants to live and build, to build and live."*[20]

Zaha Hadid Architecs describe their vision for the ideal house, responding to a shift in the way people perceive housing:

> *"The studio has a longstanding interest in the design of spaces for living, in particular in reinventing the contemporary model of the ideal home Ideal House Cologne was a unique opportunity to pursue this line of work by experimenting on a smaller, more temporary scale. Responding to a shift in the way people perceive housing design, with aesthetic qualities now as prized as functionality, the project married form and function to propose a new, more organic kind of machine for living. Its design was a built manifesto for Hadids vision of future housing, which challenged the familiar composition of living spaces to inspire new patterns of use."*[6]

Terms such as *adaptable* or *dynamic*[2] are often mentioned in parametric urbanism. The ideal house presented by Zaha Hadid Architects might have been in a dynamic adaptable state in the process of form finding within the virtual environment. The *Unfinished House* as described by Joost Grootens on the other hand is understood to be dynamic and adaptable within the built environment. Adaptable to what could be understood as social and economic conditions (e.g of the builder).

The designer of a social housing project in Chile describes the potential of his design solution to *adapt* to social and economic conditions, by this expression:

> *"Let's say the genetic information is potentially middleclass."*[3][13]

Quinta Monroy has been the name of a camp that grew in Iquique, Chile, since the 1960's. 97 families have lived there under precarious living conditions. Attempts to improve the situation on site failed because of the cost of the land. The families living there refused to be relocated, as they wanted to stay within their social network. In 2001 the Chile Barrio Program commissioned Elemental to design a living solution in Iquique., Chile, 2003-05.In 2003 the Chilean government commissioned a group of architects, engineers, social workers and contractors to create one hundred low–income households (supported by the Chilean oil company Copec and the Pontificia Universidad Catlica de Chile) on a site of 1.25 acres with a budget of 7,500 dollars per unit for land, infrastructure, and building.[3]

[2]Stanford Kwinter describes the innovative architectural *form fraction* of the last 15 years as having been inspired mainly by concepts and theories from information- and life sciences, supported by the appearance of e.g. computational algorithmic-al tools. Form therefore is understood as a part of an active continuum.[30]

[3]This understanding of genetic information might not correlate with the understanding of it in biological sciences. It is clearly an analogy.

Due to the small amount of ground land, instead of starting from one dwelling at the cost of 300 UF per family and multiply it by a hundred, the architects thought of a building at the cost of 30.000 UF and

> *"... started to put desired conditions into that building. The families had to fit in that building of 30.000 UF. They had to be able to grow."* [13]

To stay within the budgetary limits and allow incremental growth, Alejandro Aravena, architectural director of Elemental, explains:

> *"Our point was, since there is not enough for everything, let's provide the part that they wont be able to do. Secondly, instead of providing a small house, let's provide a middle-class dwelling with that standard, but we will now provide a part."*[13]

The sizes of the resulting spaces (kitchen and bathrooms) are similar to those of middle-class homes, only the basic infrastructural constructions are provided[4]. The building type introduced by Elemental, comprising of expandable units, seems to be a working model for social housing. Also in the context of improving living conditions in unplanned settlements.[5][3].

One might have different views on socio–economic demands. Different social groups might face different economic issues. Socio–economic demands, in a sense that would mean to provide maximum possible living space for as many people as possible at a

[4]The side-walls in between each property. The slabs between bottom and top property are of solid material. In between properties spaces are left open that can be filled by the inhabitants. There are no interior fittings. The building allows extension according to family income and growth. The living space in a completed house is more than double what the original budget could fund.[3]

[5]Since the Quinta Monroy project has been erected, over one thousand expandable units in Latin America have been constructed. Another thousand are said to be in development

cost that is affordable to them, can be met via concepts allowing incremental growth. A formal architectural solution can contain a future value, similar to profit-calculation after a break–even point: This additional value is accumulated by informal construction.

It is at question whether such a solution could have been derived by computational means. A list of the requirements for the ideal house can be endless, a general description of it is impossible. Nonetheless solutions can be described and argued.

In the course of designing, Christopher Alexander advises a field description of the context and reducing the list of required attributes to finite terms. Given, a design solution should improve e.g. the living standard in a given context, it is easier to pin down a finite number of misfits of situation than to grasp all visions of future inhabitants for their ideal home.[1]

In the case of Quinta Monroy Housing, the architectural professionals delivered the parts of the design that the inhabitants couldn't and vice versa. Spatial units *"with a proportion that might be useful for more than one thing"*[13], such as a courtyard, *Aimara's Court Yard*, of a group of families that can agree on this arrangement, could be established. The courtyard has a social impact: it provides safety through an access where the families can overlook who comes in and out. A semi-private courtyard can also be used as an expansion of the living space and serve communicative purposes.*"To prefer specified things involves knowing that choosing some things meant sacrificing others."*[13]. Aravena describes the participation job for him was mostly to communicate restrictions and inform. Whether or not a courtyard has been formulated as a desirable goal of the design process, the established physical ensemble presents a solution to a described misfit of the conditions it should improve: having been an unsafe living environment.

Misfits are the forces that shape according to Christopher Alexander.

> *"But if we think of requirements from a negative point of view, as potential misfits, there is a simple way of picking a finite set. This is because it is through misfit that the problem originally brings itself to our attention."*[1, pg.26]

How to employ the *syncrisis of the formal and informal* in urban design contexts is studied by a concept called *Hybrid District*. Based on local observations in Brazil, the *Hybrid District*[4] is introduced as a methodology suitable for the areas (Rios das Pedras) that will probably undergo impressive growth (e.g. because of proximity to Olympic sites).[4]

> *"The unexpected is both accommodated and encouraged"*.[4, pg.185]

The urban designer is hereby seen as the moderator in a chaired planning process involving all local stakeholders: the public (municipality), private developers, external consultants, and local committees. The design process of the *Hybrid City* comprises 5 steps. Cooperatives are prioritized (as they are seen as socially sustainable) and invited to develop communes in designated areas. Based on the observation that a smaller favela is less likely to transform into a ghetto, social housing projects are initiated and squatting is encouraged within certain limits. Thresholds are introduced to regulate the relationship between different typologies within a block. The moderator is thus equipped with a set of tools that can initiate the integration or segregation of an area. Reversing local development trends, developers are invited to plan, build and invest in commercial areas.[4, pg.190-197]

Incremental urban growth starts with local micro–commerce. Standards, such as different road– and street patterns should

guarantee dense pedestrian–friendly development. Street ratios and commerce share a crucial relationship: A local study has shown that different street ratios encourage a specific types of commercial activity. Therefore determining the proportions of streets, the growth of micro-commerce can be controlled. [4, pg.124-129]

The concept of the *Hybrid District* can be read as a translation of the incremental housing concept. It describes a vision where urban growth is initiated by micro-commerce and formal architectural design solutions serve the regulation of the informal growth.[4]

Whereas in the example of *Quinta Monroy Housing* the results of the informal growth in left-open spaces are imaginable and clear, in the case of large urban quarters a similar concept could possibly benefit from the deployment of computational parametric framework in decision making processes.

Referring to Christopher Alexanders' pattern language[6], *CityEngine* software employs *Procedural Modeling of Cities*. The procedural approach is based on L-Systems. From image maps as given input (land-water boundaries, population density) the system generates a system of highways and streets, divides the land into lots and creates a geometry for the buildings on the respective allotments. Extended L-Systems allow the consideration of global goals and local constraints. The generation of a city within the software therefore reduces the urban model to generating a traffic network and buildings. Global goals[7]

[6]The pattern language described by Christopher Alexander consists of over 250 relevant patterns for the construction of cities, buildings and houses. The patterns are not formalized .[38]

[7]"Global Goals for road creation ... are primarily considered to set the parameters of the modules to their initial values. The system weighs the influences of all active global goals and chooses the appropriate values for the parameters. The influence of a particular goal at any point is controlled by the input image maps."[38, pg.301]

are certain street patterns, local constraints are, for example, land/water/park boundaries, elevation or crossing of streets.[38]

Buildings in a virtual city, generated with CityEngine software are

> *" . . . modeled with a parametric stochastic L-system. For every allotment one building is generated. To follow the different styles, we consider three types of buildings: skyscrapers, commercial buildings and residential houses."*[38, pg.306]

The software allows to control certain variables and constraints in an amount that exceeds most human cognitive skills.

The methodology described by the *Hybrid District*, illustrates that any urban design solution is based on rule sets. While making no computational or philosophical statements on the *dynamic of urban form*, the concept incorporates *dynamic development* and presents architectural solutions as constraints in the built environment. Laying open urban geometrical patterns and their relationship to social and economic conditions allows the moderation of dynamic *informal* growth in housing development

Rule sets need not necessarily be implemented in a computational design framework. to find a design solution to phenomena of the epoch (such as unplanned and informal settlement). It is important to understand the political, economic and social processes anticipating urban form. One can understand these processes by analysing them and digitally process the information gathered. To reveal patterns of correlation between urban form and these complex processes, Studying and describing the problem is at the same solving the problem.1[pg.13 ff.] .

There is no finite solution to the complex problems mentioned1-[pg.13 ff]. Describing them might exceed the potential of state-of-the-art computation.

Even though, a human expert is able to grasp, shape and find a solution to such a design problem, at least for certain aspects of the problem, it is often impossible to formalize the approach in a way computers can process. It is imaginable that an architectural design graduate gets commissioned to design a donkey stable. He or she will probably learn about the relevant spatial solutions to the living conditions of a donkey, as a domesticated animal, in a way that cannot be simulated in a virtual environment. In addition, these problems are often computationally complex, a solution will not be found in a reasonable time frame by state-of-the-art or future computing systems. On the other hand, digital design frameworks can handle large amounts of information in a way that exceeds most human cognitive skills. Computers are not able learn about problems in a way a human designer can. On the other hand a computational framework can handle large amounts of information and deliver a solution based on constraints. These constraints are decided by the designer, who can be guided by different motives:

Zaha Hadid Architects explain their motive behind the design solution of the ideal house by:

> *"Responding to a shift in the way people perceive housing design, with aesthetic qualities now as prized as functionality."*

The aesthetic qualities of the presented solutions are based on curves, as is the presented vision for the ideal house. The construction of complex curves, such as double–bent surfaces, has been made possible through advances in modelling and manufacturing technology. To an extent that allows designers to implement such geometries in an exhaustive manner. The logic that is followed in the design process of such geometries, in construction, is not reasonable in a pragmatic sense, that would allow fast and manageable procedures for many. The construction of the formal building solutions presented by parametric urbanism

means that every part of the construction is different from the other. Assembly is therefore difficult. The straight line and the right angle can be seen as rational in a pragmatic sense that they correlate with the building logic of most construction tasks. Finite elements are dependent on parts delivered by the industries.

The parametric style propagated by Zaha Hadid and Patrick Schumacher is luxurious rather than functional. Complex curved geometries in building solutions are not affordable to most people in this world. It is at question whether the style can be understood as serving the socio–economic demands of many people rather than a minority that has an economical advantage.

The Kartal Pendik master plan might comprise employment for the people of Istanbul. Yet it cannot be seen as a solution that meets Istanbul's housing needs. It can be assumed that unplanned settlements therefore emerge at an out-skirt area of the city. Thus eliminating the forest around the city and therefore creating an ecological imbalance. It is unknown what goals the designers had in mind for Istanbul. It could be propagating and exercising a style.

Shumacher brings up the question: *"Are we overstressing our capacity"*[47, pg.22] in being confronted with an urban field of up to 6 mio. square metres." His answer is:

> *"... no. The more often we are confronted with the task of designing in large–scale developments of this kind, the more confident we become that the tools ams strategies we are deploying under the banner of parametricism can indeed deliver something that produces a decisive surplus value when compared with the usual alternative of uncoordinated, arbitrary juxtapositions."*[47, pg.22]

As a design affects many people[44], an urban master plan is a tool of power. Some argue a master plan design shouldn't be

reduced to solely the physical space but must be taken up with the social components of the era.[36, pg.2]

> *It is impossible to speak of successful urban transformation as long as it does not comprise the multilateral decision making mechanisms and wide scope sustainability*[8] *In such a case, urban projects would become an instrument widely used by entrepreneurialism for the creation of recources.[36, pg.2]*

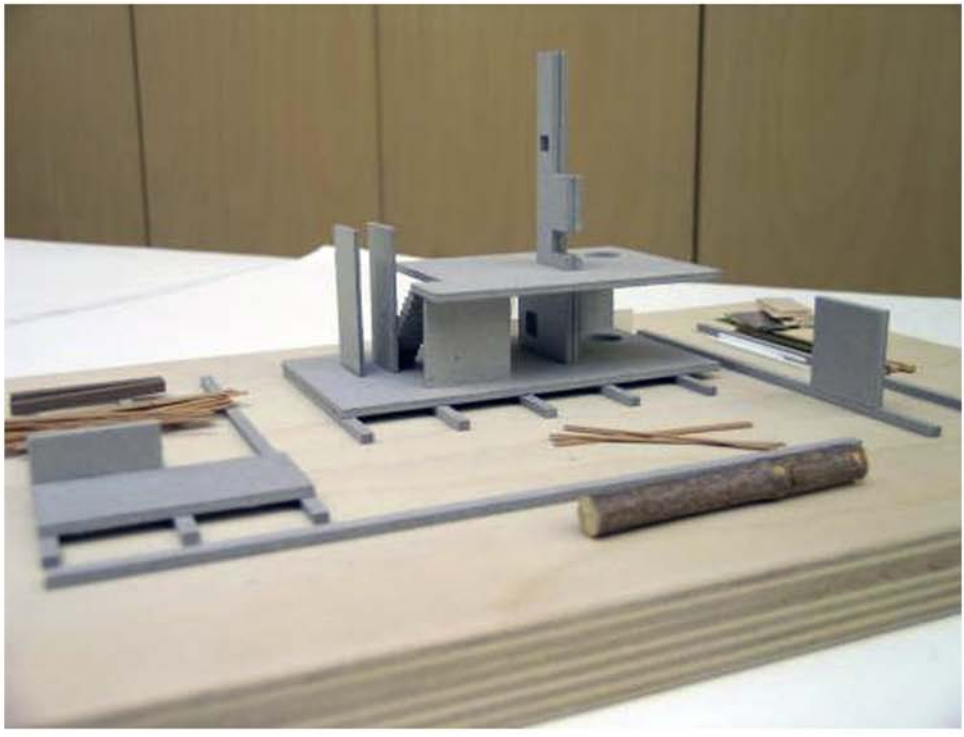
Yet in the physical space, the built environment, there is no trial and error of a design solution.1[pg.13 ff.] A formmaker has to make clearly conceived form, without the possibility of trial and error over time.[1]

*Epistemic freedom*1[pg.13 ff.] in the process of form making is not just a joy for designers. An *adaptable computational design framework* can handle a very large amount of variables that lie within the design task of an urban quarter. Therefore a designer might find it a practical tool to generate a consensus solution. Argumentation on such a solution is based on the constraints a designer sets within a space of possible solutions. These constraints depend on the world view of the designer.1[pg.13 ff.]

The ideal house described by the actors of a new style claiming to withhold revolutionary potential for urbanism, wants to respond to a shift in the way people perceive housing.

Figure 4.1: *Unfinished House* - Joost Grootens[20], *Ideal House* – Zaha Hadid Architects[6]

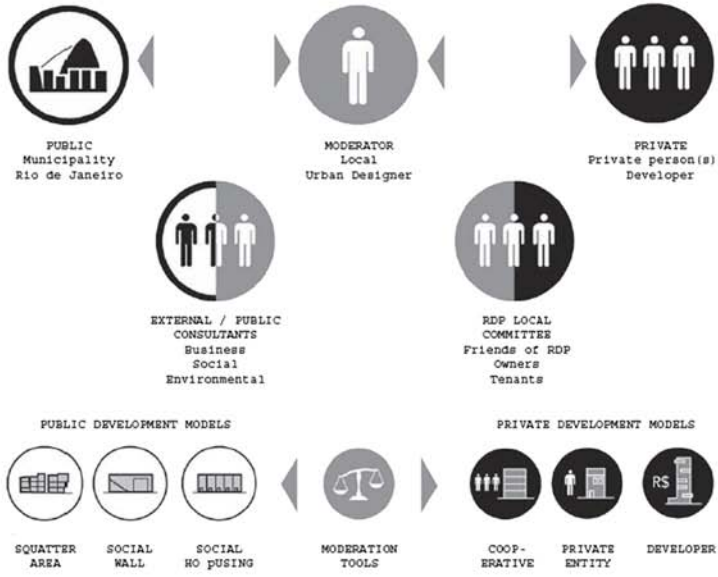
[8] a sustainability understanding comprising welfare provision, socially just, environmentally friendly and democratic decision producing characteristics.[36, pg.1] dimension.

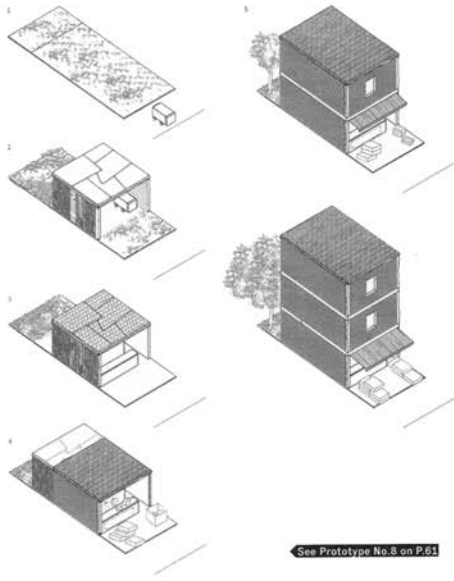



ideal house cologne

Figure 4.1: Equation, constructed housing development, System and Layout, Quinta Monroy Housing[3]

$$X = \frac{150\ \text{famílias} \times 30\,m^2 \times US\$\ 7.500}{1\ \text{há}}$$





See Prototype No.8 on P.61

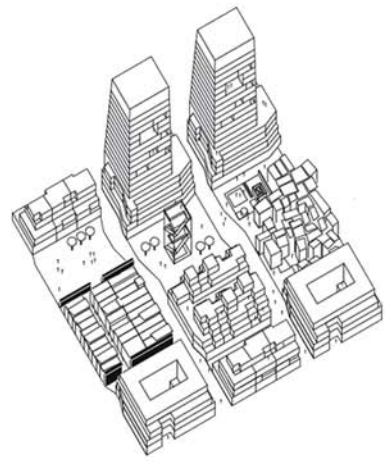


Figure 4.0: Diagram illustrating stakeholders and their interests[4, pg.191], Step 5: Evaluation of the product of four distribution steps, Hybrid District[4, pg.196]

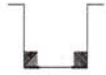
Figure 4.1: Catalog of micro–commerce in Rio das Pedras: shops[4, pg.124]

SHOPS

Groceries shop

95-100%
occupation of public space

Main Road
width: 30m
sidewalks: 5m
1 : 2.5



95-100%
occupation of urban space

Road
width: 12m
sidewalks: 3m
1:1

100%
occupation of urban space

Streets
width:6.5m
sidewalks:1m
2:1

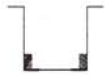
n/a

Alleys
width: 3m
sidewalks: 0m
3:1

Appliances shop

30-45%
occupation of public space

Main Road
width: 30m
sidewalks: 5m
1 : 2.5



50%
occupation of urban space

Road
width: 12m
sidewalks: 3m
1:1

100%
occupation of urban space

Streets
width:6.5m
sidewalks:1m
2:1

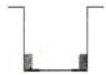
n/a

Alleys
width: 3m
sidewalks: 0m
3:1

Plastic ware shop

50-60%
occupation of public space

Main Road
width: 30m
sidewalks: 5m
1 : 2.5



50%
occupation of urban space

Road
width: 12m
sidewalks: 3m
1:1

100%
occupation of urban space

Streets
width:6.5m
sidewalks:1m
2:1

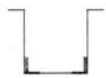
n/a

Alleys
width: 3m
sidewalks: 0m
3:1

Clothing shop

25%
occupation of public space

Main Road
width: 30m
sidewalks: 5m
1 : 2.5



30%
occupation of urban space

Road
width: 12m
sidewalks: 3m
1:1

100%
occupation of urban space

Streets
width:6.5m
sidewalks:1m
2:1

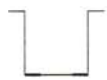
n/a

Alleys
width: 3m
sidewalks: 0m
3:1

Chicken shop

0%
occupation of public space

Main Road
width: 30m
sidewalks: 5m
1 : 2.5



0%
occupation of urban space

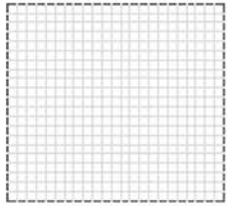
Road
width: 12m
sidewalks: 3m
1:1

0%
occupation of urban space

Streets
width:6.5m
sidewalks:1m
2:1

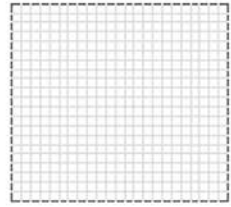
n/a

Alleys
width: 3m
sidewalks: 0m
3:1



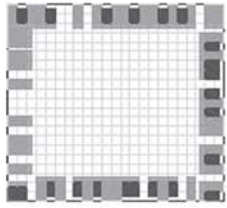
phase 0

scenario 1
area: 1.2 ha
units: 0
capacity: 0 people
public space: 100%
density: 0 p/km²
far: 0



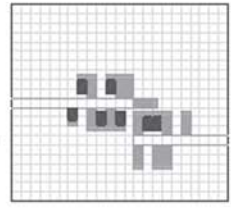
phase 0

scenario 2
area: 1.2 ha
units: 0
capacity: 0 people
public space: 100%
density: 0 p/km²
far: 0



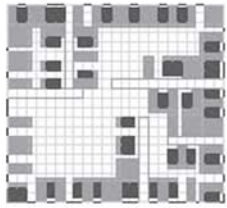
phase 1

scenario 1
area: 1.2 ha
units: 60
capacity: 240 people
public space: 80%
density: 2000 p/km²
far: max. 2.4



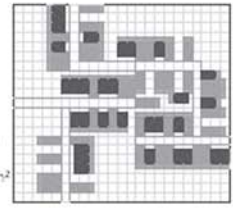
phase 1

scenario 2
area: 1.2 ha
units: 20
capacity: 80 people
public space: 88%
density: 6700 p/km²
far: max. 2.4



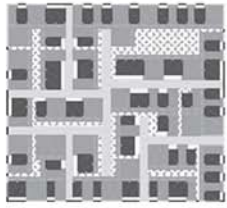
phase 2

scenario 1
area: 1.2 ha
units: 90
capacity: 360 people
public space: 48%
density: 30.000 p/km²
far: max. 2.4



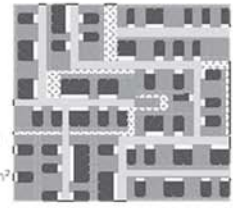
phase 2

scenario 2
area: 1.2 ha
units: 70
capacity: 280 people
public space: 55%
density: 23.500 p/km²
far: max. 2.4



phase 3

scenario 1
area: 1.2 ha
units: 130
capacity: 520 people
public space: 13.5%
density: 43.500 p/km²
far: max. 2.4

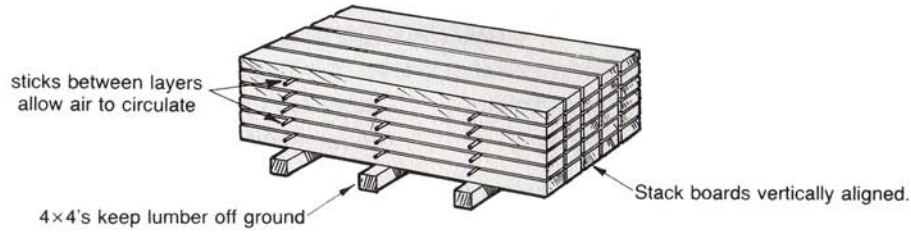


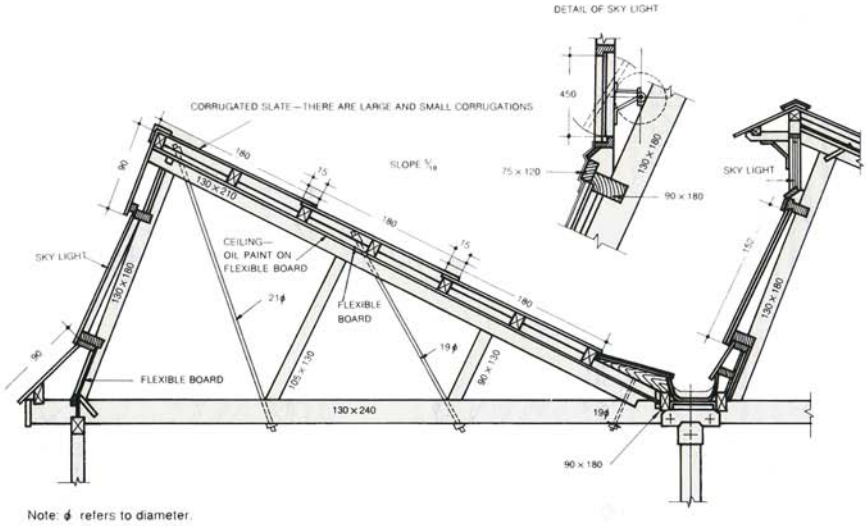
phase 3

scenario 2
area: 1.2 ha
units: 140
capacity: 480 people
public space: 7%
density: 40.000 p/km²
far: max. 2.4

Figure 4.0: A possible scenario of incremental growth initialized by commerce [4, pg.123]

Figure 4.1: A sawn-lumber stack, Board drawing, The four surfaces of a post, Grid marking of horizontal members[46]





Note: ϕ refers to diameter.

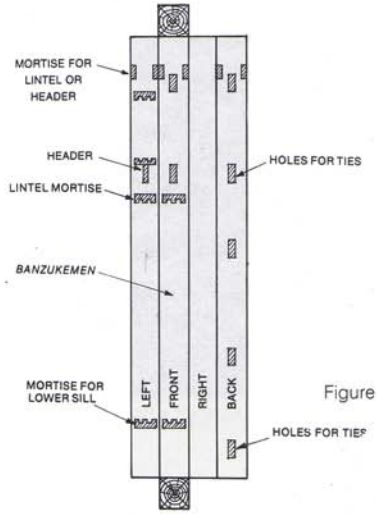


Figure 4.12. The four surfaces of a post.

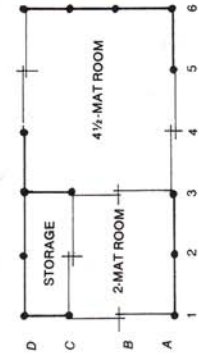


Figure 4.13. Grid markings of horizontal member. Example 1.

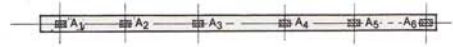


Figure 4.14. Grid markings of horizontal member. Example 2.

Figure 4.1: "IKEA Warehouses on 34 Countries", Image Courtesy Oma, ca.2004[25, pg.137]

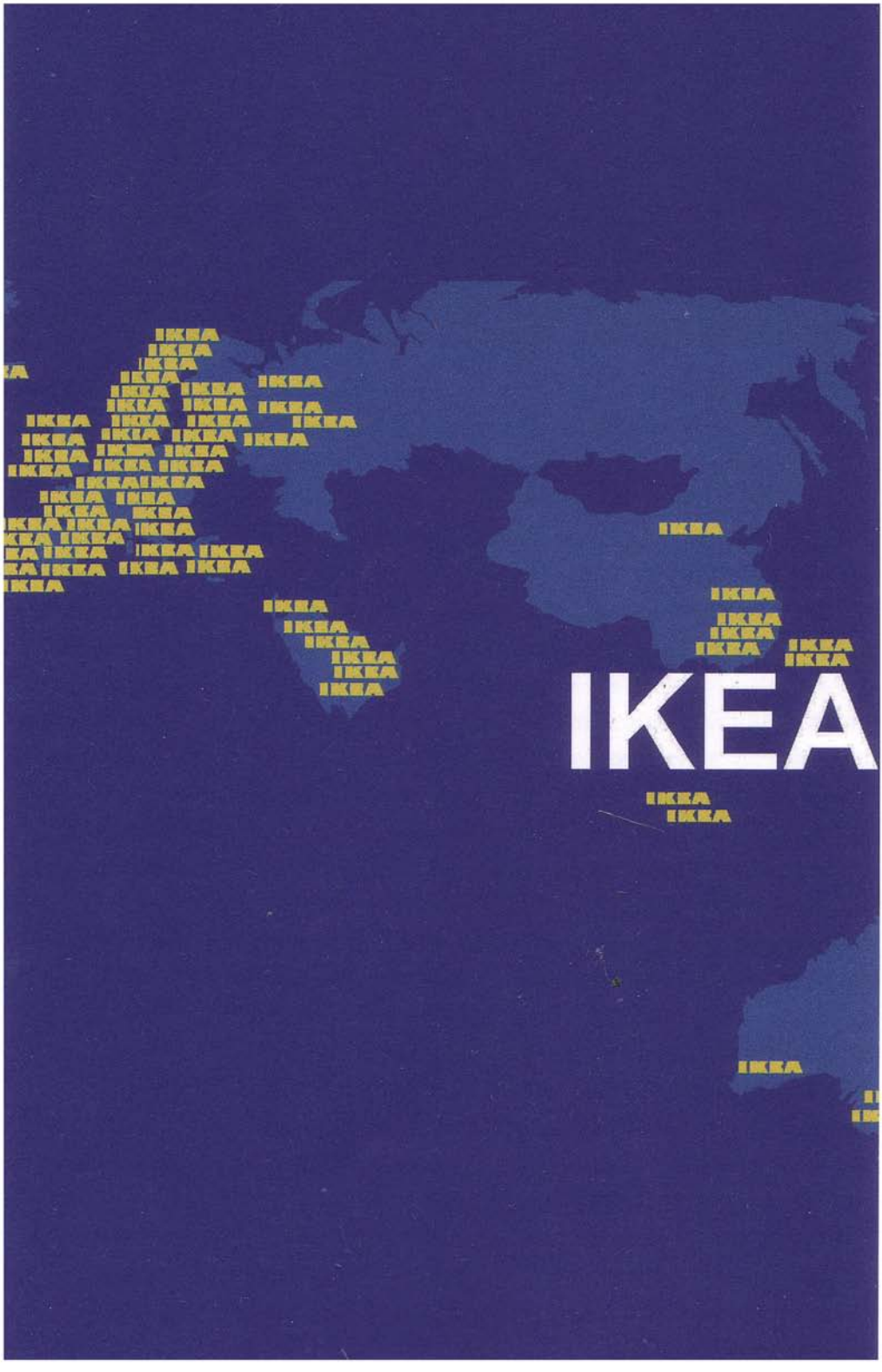

IKEA

Figure 4.1: Kartal Pendik Shore, Google Earth, 5/27/2012,accessed September 2012


Image © 2012 GeoEye
Google ear
e: 5/27/2012
2002
40°52'45.86" N 29°12'10.56" E elev 0 m
Eye alt 1.41 km

List of Figures

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