Generative Process, Patterns, & the Urban Challenge
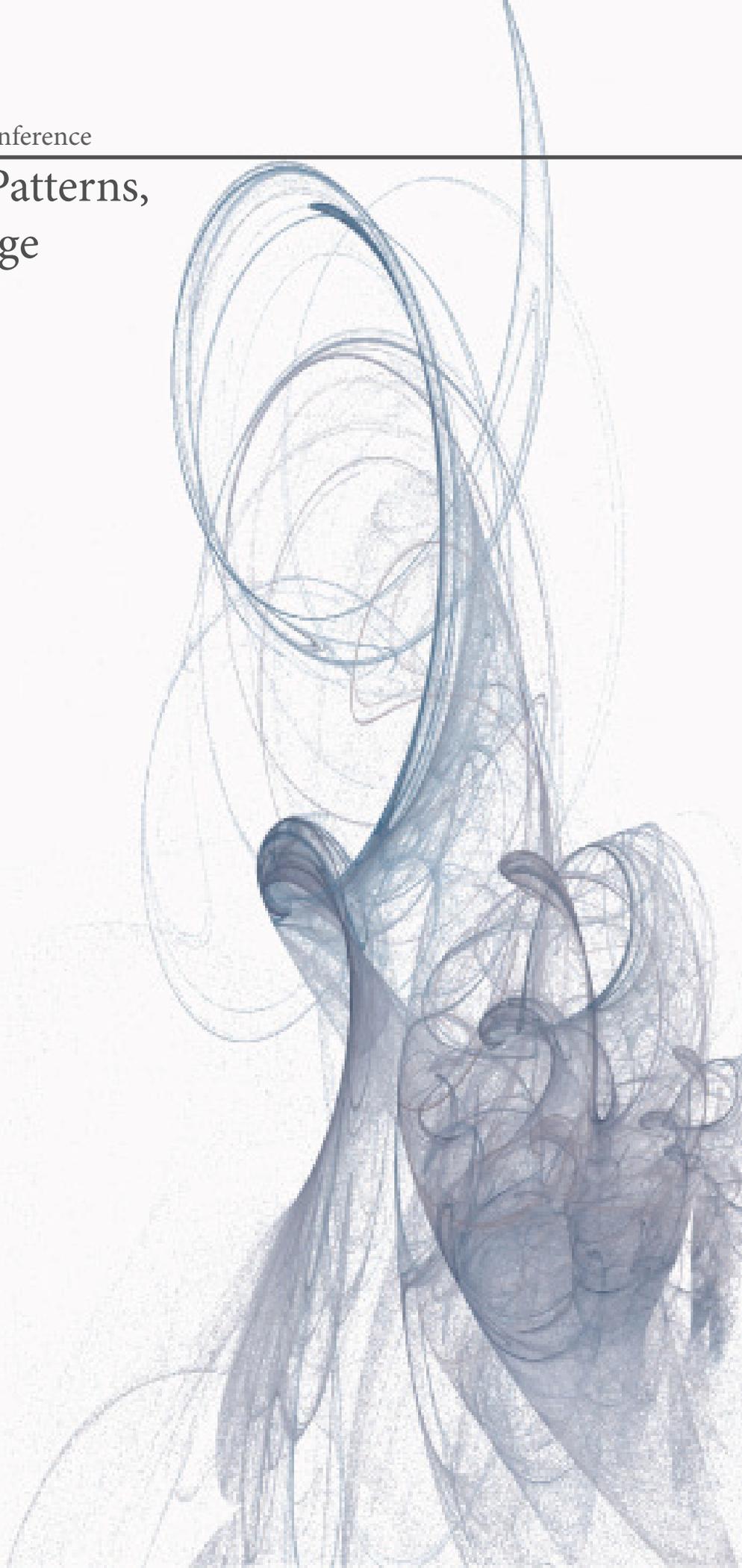
Presentation Abstracts

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Hajo Neis

Generative Process, Patterns, and the Urban Challenge

In this introduction to the conference themes Hajo Neis describes different meanings and understandings of generative process. He also explicates and compares three different kinds of generative processes that have been developed within the overall pattern language approach by C. Alexander et al over the last 50 years for the disciplines of architecture and urban design:

1. Pattern Languages may be considered the first kind of generative system or process. Their application started in the mid-60ies and is still widely in use and has expanded to a large number of different fields and professional applications.

2. System of Rules approach and Morphogenetic Sequences are considered the second kind of generative process. For architecture and urban design this kind of process is exemplified and has been published in the book "A New Theory of Urban Design." The method is in use since about the mid-1980ies.

3. The generative (urban) code can be considered the third and more recent kind of generative process, which is experimented and worked with since the early 2000s.

Neis continues to look into other kinds of generative process such as computer generated applications known also as Parametrics. He explores applications of pattern languages in other academic fields outside of architecture that have burgeoned over the last 30 years, specifically in computer science, but also social sciences, product design, music and art.

He ends with some suggestions on the urban challenge and how generative processes may be useful in helping to tackle and solve some of the growing urban problems in the world, especially when we understand generative process as a (re)generative process for the growing number of disaster areas of many kinds.

Don Corner

The Roots of Deep Energy Retrofit

Transformation to a low carbon society will necessarily involve the retrofit of existing building stocks toward the goal of zero net energy. This paper reports on a pilot study of research protocols needed to develop and propagate the broad base of knowledge and experience required to meet this challenge.

Techniques for effective rehabilitation are as diverse as the buildings themselves. Identifying multiple performance improvements, matching them to each other, and to the unique characteristics of the building, are fundamentally "grass roots" activities. Inputs come from architects, engineers, system representatives, tradesmen and material suppliers. To succeed we must engage the full diversity of actors in our building culture. To paraphrase John F.C. Turner's seminal writing, originally argued in reference to housing, "The economy of [building retrofit] is a matter of personal and local resourcefulness rather than centrally controlled, industrial productivity." (Housing By People, 1977)

To facilitate resourcefulness, integrating a range of known and new techniques with the particular circumstances of the climate, site and structure, we must: (1) engage as many people as possible in the search for appropriate solutions, and (2) adopt an effective means to share the results.

Protocols developed in the pilot study draw inspiration from Ward Cunningham's "Portland Pattern Repository" used to stimulate collective innovation in computer software, and eventually growing into the concept of the wiki. Pattern, in this usage, refers to the work of Christopher Alexander and his colleagues. Alexander's patterns have the form: context/conflict/resolution. This is particularly applicable to building retrofit because it is fundamentally context driven and filled with conflicts among energy strategies and existing conditions. The "resolution" expressed in each pattern is a proposition that frames pragmatic research questions. To validate each proposition requires contributions from many sources. It is here that Ward Cunningham's open approach is brought to bear.

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Alexander Schmidt

Urban Challenges of Beauty & Climate Change

Two souls, alas!, reside within my breast! (Johann Wolfgang von Goethe Faust 1)

The rapid urbanization of the world is one of today´s pressing challenges. Continuous migration from rural areas and the economic attraction of the growing regions cause high speed urbanization and hyper growth of mega-cities into giga-cities. The urbanization process in China is a vivid example. Here the cities will grow larger and denser, but eventually they will have to be smarter and technologically more updated in order to tackle the challenges. (The phenomenon of shrinking cities in other regions of the world can be neglected.)

Many politicians will be involved in the decision-making processes, although they have almost no idea about the development and their effects on urban environment and population. Experts from various fields will develop and discuss solutions. Experts will also be consulted by authorities and inform politicians. Numbers and quantities will be unbeatable arguments in the debate, as they are regarded as objective and measurable: The cost of infrastructure, the width of roads, the number of trees, the height and the bulk of buildings, the size of lots for housing or shopping centers, the density of population....

Who is dealing with the design qualities of buildings? Who is responsible for the beauty of urban environment? Who will be looking for urban livability of neighborhoods and downtowns? Until now technical experts are focussed on technical solutions, but there is no trans-discipline to take responsibility for design quality and beauty. We need a discipline which takes the lead for beauty and design quality coordinating different technical experts for public space, neighborhoods, parks, river fronts or the city as a whole.

But do we have a right to beauty in the face of forward-pressing global problems?

Mastering the challenge of climate change is the most important issue for mankind in the 21th century. Climate researchers claim this in order to avoid the tipping-point and save the planet from the potential of runaway global warming and keep the planet liveable. The reduction of CO_2 emissions by measures in the fields of climate mitigation and climate adaptation are the basic approaches. Low carbon cities, zero energy cities, sustainable urban development - these are key words for the next generation of mega-cities, which call for more innovative technologies, smart grids, high tech as well as scenario modeling and algorithms which enable us to vision and shape the urban future.

If at all: In the face of threatening climate changes - shouldn´t we prioritize and first of all or even exclusively work on climate mitigation and adaptation? Is there an appropriate concern of us to deal with beauty at this moment in time?? I say: Beauty is necessary...Life without beauty is senseless ... You may or may not agree...

Is it perhaps justified to deal with both: reduce the CO_2 emissions and increase the design quality of public space and the beauty of cities? We shape our cities but these ethical questions have to be discussed first.

David Week

Cities, Population & Democracy

According to the statisticians to the UN's Population Division, the planet's population now stands at 7 billion, and will top out at 10 billion around 2050. The reason that population growth is expected to cease is because as people become more secure in their lives, fertility drops. This is already happening, but there is a lag between the drop in fertility, and the topping out of the population. Key to this topping out is the assumption that these people will have a good enough life to drive down fertility.

Where will these people live? They will live in cities. First, there is no room for them in the countryside, and improvements in the productivity of the countryside allows for fewer people to live there. Second, it is cities that are the great generators of wealth, and this is why people move there. They are both pushed away from the countryside, and pulled towards the cities.

There are three types of city in the world. There are first world cities, with relatively stable populations, of which London is an example. Then there are third world mega-cities, which have already grown to 10-20 million, of which Bangkok is an example. The third type is the fast-growing newer cities, of which Dhaka is an example, as well as many of the cities in Africa. These are will absorb most of this population.

These cities are not prepared, nor preparing, for growth which will see many of them expand in area ten-fold over the next 40 years. Most of this growth will occur in terms of the unplanned growth we have come to think of as "slums". These slums are examples of fast "organic" growth. They are not unstructured, but nor do they have all the structures need to create the good life.

This rapid growth in these new cities is the key challenge for urbanists over the next 40 years. The first world cities are wealthy, and will do well enough. The third world megacities, have already grown, and for them it's a much more difficult problem. The question is how can we accommodate the additional three billion in the fast-growing cities, so they have the good life essential for the world population to peak?

This is a unique opportunity for those who study the organic growth of towns. For purely pragmatic reasons, these cities cannot be controlled and planned in the way of traditional modern metropolis. They will grow organically. However, there will be ways in which this growth needs to be channeled, or supported, to better provide for future residents. The paradigm here is not development control, but strengthed-based development, where we enhance what works, and only add structure where absolutely necessary.

Such an approach highlights that ordering city growth is not about plans or regulations. These are just instruments of a more important ordering process: governance. Because organic growth is inherently democratic—perhaps chaotically so—tacking the fast-growing cities may open the door to more democratic of forms of city governmance, decision-making and formation.

Gabriel Brown

Chinatown Portland : Pressure Patterns and the Challenge of Regeneration in Historic Districts

There are some places where the development equation is relatively simple: land plus demand leads to development. There are also a few places where a complex web of pressures and perceptions obfuscate this simple arithmetic. Portland's Old Town/Chinatown district is just such a place. In fact, despite popular consensus of the manifold advantages inherent in this historic jewel at the heart of Portland, it has remained largely stagnant for over half a century. This study will seek to elucidate the shroud of fog that has fallen over the public discourse surrounding this neighborhood. Through analysis of demographic data and interviews with those vested with an interest in the district, I will attempt to extrapolate the various incentives, both positive and negative, that steer development. Many of these incentives are relatively common patterns in land development. Others are singularly unique to Old Town/Chinatown. These incentives, regarded here as pressure patterns, will be analyzed for their validity as well as their phenotypical expression in the public discourse.

Chong Liu, Chibiao Hao

Preservation of Sacred Sites in Qingdao

Nowadays, the preservation of sacred sites during rapid urban development is a focal point in China. This article firstly shows the challenges about the preservation of sacred sites in Qingdao since implementation of Chinese reform in 1978. With the hints of the pattern language theory and recent practical experience in China, the author argues that it is insufficient to resolve the issue of heritage preservation only by the power of local government. Qingdao's local government should actively promote citizen participation in the improvement of city's strength of sacred sites' preservation.
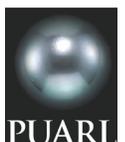
Robert Walsh

Pattern Languages and the Birth of Vancouverism

This paper concerns the adoption of Pattern Language methods and their substantial, if as of yet underappreciated significance in the transformation of the design and planning culture of Vancouver BC, and the impact that this has had on the city.

The City of Vancouver British Columbia has twice been transformed by residential high rise booms, each of which added over two hundred new residential high rise buildings to the city. The first wave of high rise construction spanned from 1956-1974 and proceed along the lines of conventional planning mechanisms that imposed restraints on building mass and lot coverage, resulting in a high density neighborhood with a mixture of positive and negative consequences for the city. By 1978, for instance, Vancouver was being routinely described as "a setting in search of a city," a reflection of the fairly generic character of the new buildings that had recently been constructed in great numbers.

Vancouver's second high rise boom began in earnest in 1991, although its actual origins can be traced to several earlier unrealized efforts by local architects and developers who proposed large scale master plans incorporating high rise and low rise housing clusters that were never constructed. The second high rise boom is generally considered a substantial improvement over the first high rise boom and is often cited as one of the reasons that the City of Vancouver is today regarded as one of the most livable and desirable cities in the world. The existence of two residential high rise booms with distinctly different outcomes provides an interesting vantage point from which to consider the importance and utility of Pattern Languages, given that Pattern Languages informed one wave of high rise construction, but not the other.
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Howard Davis

Resilient Urban Morphologies

The research described in this paper is concerned with the idea that it may be possible to identify relationships between urban morphology, building typology and the ability of the city to effectively harbor economic development at the grassroots level. A series of related research projects, in Guangzhou, London and Portland, all springing from the author's work with the "shop/house", or the building that combines commercial and residential uses (about to be published in the book Living Over the Store: Architecture and Local Urban Life) represent detailed investigations of local urban fabric. These varied investigations, which combine architectural, urban, geographic and economic analysis and ethnographic fieldwork, are intended to lead to prototypical projects as well as policy recommendations. The work also indicates that in actual cities, a subtle and contextual interpretation of ideas of emergence and generated structure may be needed.

Session B : Urban Sustainability and Ecology
Saturday October 29, 2011
1:30 PM - 3:00 PM

Michael Tavel

Climate Responsive Urbanism : Historic Precedents & Progressive Practice

Passive design, such as for passive heating and cooling, was always an integral part of urban environments until the era of cheap energy. Patterns of passive design from the past can now be relearned from historic precedents, and applied to the urban environments of today. This paper and session will overview historic precedents for patterns of passive design in urban environments in a variety of climates and on several continents. These patterns involve not only urban morphology, but also cultural patterns of behavior that relate to climate, and to the harnessing of natural resources.

In contemporary progressive practice, urban environments have been designed to conserve resources with an emphasis on energy. Case studies from several continents will be reviewed for the passive design patterns employed. These patterns involve both the energy performance of buildings in urban contexts, and the culture of peoples' relationship with resources.

Ross Chapin

Patterns of Pocket Neighborhoods

The term 'pocket neighborhood' was coined by Ross Chapin to describe clusters of houses or apartments around shared ground - a garden courtyard, pedestrian street, shared backyards, or a reclaimed alley. Surrounding neighbors share ownership in the commons, offer care in its on-going maintenance, and keep an eye out for friends and strangers. Children experience an expanded safe horizon beyond their front gate. This intermediate scale between an individual house and the wider neighborhood is a key factor in promoting a sense of belonging, community and neighborhood resilience.

Chapin will present *Patterns of Pocket Neighborhoods* from his book, **Pocket Neighborhoods : Creating Small Scale Community in a Large Scale World**, published by Taunton Press in March 2011. His presentation will describe webs of patterns at various scales and their relation to social dimensions, trace historic precedents, and show contemporary built examples with illustrations that span from blocks to building clusters, buildings, elements and details.

Steven Hardy

Poly-variable Parametrics in a Computational (Urban/Suburban) Remix

Most computational methods exploring urban issues focus on higher-density, central cityscapes. Although there is value in exploring these types of computational urbanism it remains that the largest percentage of future growth (especially) in the US will continue to expand at the fringe (figure 1-left) and that the "traditional city center may now be considered subordinate to the urban sprawl that it had originally defined"1. Haunted by the fact that the larger part of the urban expansion is often shunned by the architecture and design professions, but not unaware of disinterested in traditional urban (re)development, Computational (sub)Urbanism.Remix was established to use of a type of 'fuzzy' explicit logic modeling, to surpass the linguistic binaries of 'urban', and 'suburban' and instead explore computationally-generated network-oriented metaUrbanizations formed from modulations of function, density, building type and organizational variation.

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Kyriakos Pontikis

The Humane Green : Developing "A Green Pattern Language"

Pattern language was developed by noted architect Christopher Alexander and his associates over 30 years ago and was published in the book, A Pattern Language. When APL was developed no particular attention was given to green patterns even though few of the patterns are considered green. Our current knowledge and awareness of many environmental issues dealt with by the building and design industry has expanded and changed. This advance in knowledge necessitates the creation of "A Green Pattern Language" which can be used by architects and designers in an effort to create sustainable building environments. Such a language can contain "humane patterns" which will deal with qualitative aspects of space, and "green patterns" which will deal with quantitative aspects of space. This paper will present efforts by the author to create such a language, share lessons learned, discus future implications and conclude that the language has potential and should be researched and developed further.

Session C : Pattern Languages & Generative Design
Saturday October 29, 2011
3:30 PM - 5:00 PM

Saied Zarrinmehr

Axiomatic Design : Pattern Languages as Ideas to Think With

To establish a connection between architecture and mathematics I will refer to Christopher Alexander's earlier works, where he simulated design problem using graph and set theories. Alexander suggested independent diagrams that emerged out of decomposition of the design problem to resolve design complexity. In reaction to his work, many authors like Hillier and Steadman discussed that a designer should have preconceived ideas in mind to design a form. Preconceived ideas or pre-structures are hints of axioms in design. In this paper I will connect the dots between Alexander's works from 1963 to 2002 using his initial mathematical language. The process of diagrams' evolution strongly supports that generation of successful designs is not plausible without relying on preconceived ideas, which Alexander preferred to call them patterns. I will also conduct a case-study to illustrate the evolution of diagrams. This case study will also tell us why Alexander based the validity of patterns on intuition rather than mathematics.

Susan Ingham

Patterns of Living for Houses and Families

The creation and use of patterns and pattern languages can be one of the first steps of a generative design process. Rather than starting a project with a "program" – a laundry list of desired rooms and spaces - patterns redirect the focus to underlying needs and visions, both for the house and its inhabitants. A qualitative feeling of place can be communicated and expressed through the use of patterns and pattern languages that can be used as a reference point throughout the building process. This presentation will illustrate and discuss the process of creating and using patterns for single-family residences and the families that live in them. Patterns from both books A Pattern Language and Patterns of Home will be referenced and used as a point of departure, but many of the patterns that will be illustrated are unique to the particular family and house that they inhabit. Examples of new houses as well as remodels and additions will be shown.

Yodan Rofe

Feeling Maps as a Basis for Diagnosis and their Role in Generative Planning and Urban Design

This paper presents a summary of fifteen years of research into "feeling maps", and their role in generative processes of urban planning and design. It begins with discussing the role of feeling in Alexander's theory as it developed over forty years, and in determining two key concepts of this theory: "patterns" and "centers." It also discusses the role feeling plays in the process of "diagnosis" as the basis for generative planning and design. Mapping feeling was developed as a way to demonstrate empirically that people's feelings in the environment are shared to a large degree, and the results of this research are summarized. However, the interpretation of feeling maps, and the elaboration of a "diagnosis" is not a mechanical transformation, but a creative and communicative process in which both the local "pattern language", or "list of centers," and the diagnostic map are developed together. This will be shown by example from an urban design workshop carried out by the Building Process Alliance at CNU XV in Francisville, a neighborhood of Philadelphia.

Hubert Froyen & Evelien Verdonck

Collaborative Writing of Universal Design Patterns

From a historic point of view, pattern languages have been embedded in the living 'culture of building' (Davis, 1999) for many centuries. In the seventies, Christopher Alexander and his team have documented a series of such (universal) patterns in the static form of a book.

Over thirty years on, some traditional patterns are being questioned by a new social awareness of human diversity. A new perception of human 'dis-abilities', the insight in new environment-related-disabilities (handicap situations), and the prevalence of disability in the aging population all fundamentally challenge current design patterns.

The concept of Universal Design is about a new quality relationship between a diversity of users (old and young) and human-made objects and physical environments. It goes beyond the mere provision of special features for various segments of the population; instead it emphasizes a creative and inclusive approach to make the built environment better for everyone..

The main topic explored in this paper deals with the new Universal Design paradigm, and more particularly with the question how specific Universal Design Patterns might permit us to communicate, through ICT and in real time with Lead Users (Von Hippel, 1986)3 or so called users(-experts) of built environments. How we can use dynamic Universal Design pattern databases as a forum for 'design negotiation', and as part of sets of powerful contemporary design support tools?

Ngoc Hong Nguyen

Building Generative Modules for SmartCode Based on Simulations of NetLogo : An Agent Based Model

Conventional zoning regulation encourages sprawls and segregation, supports unhealthy lifestyle and favors auto-dependent patterns of development. SmartCode is one of the zoning reformed strategies aiming to retrofit cities and their neighborhoods. While SmartCode provides an overall applicable framework for a whole city, generative modules will create flexible outcome and results adapted from existing conditions of local neighborhoods. There is a call to build generative components for SmartCode. But how to build these modules to match with the purpose of building coherent pattern of development and create an emergent outcome for the urban form of neighborhoods? These modules must also work well within SmartCode's framework.

My purpose is to build generative modules for SmartCode. To do that I used an agent-based model program called NetLogo to simulate development process of a neighborhood based on the generative process proposed by Christopher Alexander.

The result is the generative modules based on the rules from Alexander's generative process. These modules can be used to guide the future development for the selected neighborhoods.

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Jascha Rohr & Sonja Horster

The Field-Process Model

The field-process-model is a theoretical framework the Institute for Participatory Design developed to understand generative design processes as dynamic interactions of forces in a field. The development of this model became necessary after we encountered numerous theoretical problems with the appli- cation of our formerly, more systemic oriented, understanding of pattern languages and design proc- esses. The field-process-model explores the idea that a field with its forces (as used in numerous pat- tern languages) is the spacial description of a process which in turn is the chronological description of a dynamic field. The model gives us a good understanding of how generativity and emergence unfolds and how we as designers can foster these qualities in our design processes. Beneath the question of the emergence of new (design) ideas, the model also helps to investigate into qualities as immergence, crisis or bifurcation and of cultivation for generative processes. With the framework the field-process- model describes, we hope to show, that pattern languages can become more then good practice de- scriptions as we often see it, but rather applicable tools and strategies for actual design. The goal is to design in open and flexible processes which are alive and create results which are alive. The theoretical insights will be explained through practical examples from our work with landscape architecture, community organizing and participatory design processes in various institutions.

David Week

Generative Form as Human Process, Investment, Risk & Negotiation

The idea of organic towns, as distinct from planned towns, arose as part of the reaction in the 1960s and 1970s to Modernist totalizing city planning. Organic towns are considered to be those in which urban form grows out of many individual acts, without any grand vision in mind. The final town forms is "emergent", rather than planned. More recently, the mathematics of chaos and complexity has engaged both the public and the professional imagination with a vision of complex forms emerging from simple rules locally applied. Put together, this produces the thesis that we can produce organic towns using generative rule systems, just as mathematical rules can produce complex forms.

This paper seeks to criticize this thesis, and propose an alternative model for understanding the growth of organic towns. The critique revolves around the following key points: Towns are built by people, not rules. If such generative rule systems had indeed been active in the production of historical towns, we might have found some examples by now: we haven't. The key difference between a human being and a rule is that a human being is intelligent and complex, and a rule, by definition, is simple and stupid. If we look at historical examples of the generation of urban form, we can see human beings acting to pursue their own interests in acts of urban construction. Just because in arrears we are able to formulate rules which imperfectly and incompletely describe patterns in those actions, that does not mean that people were following rules moving forward.
(abstract abbreviated by PUARL)
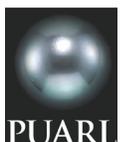
Christian Walloth

Generative Processes in a Post-Modernist's World

In this contribution, the question on how the concept of generative processes fits with post-modernist philosophy, notably with constructionist paradigms, will be raised and discussed. A discussion with the audience should develop based on some briefly introduced key aspects of generative processes, social-constructionism and critical rationalism. The importance of this discussion is raised by the author's own observation of urban development practice tending to be largely led by subjective, socially constructed world views (this observation reflects mainly urban development work in deprived neighborhoods and/or in developing countries). In contrast to this practice, the author sees Alexander's code for generative processes to be based on scientific research and objective knowledge. Given the philosophical and even metaphysical character of this session, we may or may not conclude with one or more (opposed?) statements regarding the role of subjective knowing and objective knowledge in the application of generative processes.

Daniel Schwab

Ecopsychological Inquiry as a Source for Algorithms for Generative Unfolding

Generative design has emerged as a new method for producing adapted urban spaces. As articulated by Christopher Alexander, the wholeness-producing algorithm called the Mirror of the Self Test allows builders to create nature-imitating wholeness in the outer world by testing it against a feeling of wholeness within the subject. The validity of the approach has been shown, but its reasoning is often questioned because of its complex metaphysical claims.

Ecopsychology as a discipline is a field that also explores the way the environment shapes our feeling of wholeness, arguing that wild nature in particular, but also certain kinds of built environments are more supportive of our humanity. Ecopsychology employs a number of experiential and phenomenological methods that allow the subject to experience the influence of the environment on the subject more precisely, while connecting that experience to the form of the outer world. As such, they offer alternative or supporting methods to the Mirror of the Self test that might serve as experiential wholeness-producing algorithms in generative design.

Robert Walsh

The Evolution of Architectural Vernaculars : A Six Part Framework & Two Comparisons

Some ground breaking architectural work leads to widespread imitation, while others remain one-of-a-kind anomalies never to be repeated. Is this merely a matter of luck or coincidence, or is there something else going on which determines which works lead to advancement of the field and which works only advance the career of a particular architect?

In this paper I will present a model of design development that draws from a combination of research in mechanical engineering design optimization theory and recent studies of theories of sustainability to produce a six part framework through which to understand the development of architectural form languages. This framework will then be used as a lens through which to consider two case studies: a historical example and a contemporary example. The historical example will consider the profound changes in building morphology that distinguish office high rise buildings from Chicago and New York City built prior to the great Depression, from those which were built after World War II. The contemporary example will compare and contrast recent projects by Rem Koolhaas, Norman Foster and BIG. The concluding discussion will consider the implications of the six part model for the continued viability and importance of generative systems and pattern languages to the development of new architectural vernaculars in the context of socially sustainable urbanism.

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(continued)

     The six part design development model is based upon an approach to design optimization drawn from mechanical engineering in which a solution space is defined through the interaction of multiple boundary conditions that together define a range of acceptable options known as the solution space. After a brief example showing how this model can lead to optimal results while still allowing for conscious choice amongst multiple options, this model will be expanded in a way that permits its use in exploring a different sort of design space typical of architectural design projects.

     In the architectural model of design optimization proposed in this paper, six different but connected layers will be introduced, each of which is superimposed on the solution space, with the idea being that generally these resulting boundaries defines a range of possibilities, while the aggregate result together defines the current solution set. These six boundary layers are:

1. Economic issues (profit, construction costs, land values, market demand, etc.)
2. Political and Legal issues (zoning codes, building codes, construction law, politics)
3. Community issues (demographics, local culture, history, community needs and values)
4. Physical context (natural environment: geography, climate, geotechnical, etc. Built environment)
5. Technology (Building systems, construction methods, traditions and innovation) 6. Aesthetics (architectural design, landscape aesthetics, urban design, art)

(abstract abbreviated by PUARL)

Masanari Motohashi & Eiichi Hanyuda

Toward ICHIGAN

     March 11 2011, Great East Japan Earthquakes and Tsunami damaged and washed away many cities and local government offices in Japan. Because some local governments there lost important information and stuffs, they cannot operate their duties. Communities have been damaged deeply and widely.

     We have started Project ICHIGAN for building robust communities and local government/city networks against disaster. To be strong cities under these disasters, we expand the concept of sister/twin cities to support each other in various layers. These layers must be self-organized so we describe their structure and dynamics using a pattern language and its process. Our goal is realizing robust local governments, cities, and communities with building their networks and languages without a central government.

     Each local government, city, and community makes connections and friendships to other organizations in other areas. We provide small seeds of a pattern language to build robust systems of human and IT networking. We will support participants to describe their self-organizing master plan with C.Alexander's method and start a process to diagnose their cities through annual drill and coordinate each other.

     Our challenge has been started. We hope to have a chance to introduce our approach and get your feedback to improve it.

Session F : Patterns & Culture
Sunday October 30, 2011
9:00 AM - 10:30 AM

Christopher Andrews & Seth Wachtel

Kreyol Living Wisdom & Haiti Regeneration : Using Indigenous Environmental Patterns

     In the critical deliberations about how best to rebuild after the devastation of January 2011, the incredible vitality with which Haiti has traditionally fashioned a sustainable, durable, healthy, and perhaps most remarkably, a beautiful environment, must be acknowledged and harnessed.

     Thus, in order to really stick, this rebuilding must have, at its foundation, an understanding of Haiti's dynamic and innovative Kreyol culture, and its unique blend of African, European and American environmental traditions. Working with our partners on the ground in Haiti we have proposed a two part process--the first an outline of the patterns of this legacy, and the second a series of case studies that demonstrate how this approach is being applied to real projects.

     We call the Haitian environmental legacy "Kreyol Living Wisdom". It is a touchstone and inspiration for rebuilding, a magnet for investment, and a priceless stake in establishing Haiti's full partnership on the world stage.

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Aysun Oskoze

Courtyards in the Traditional Anatolian Urban Pattern

The aim of any planning and design for the restoration, re-arrangement and healing of traditional urban patterns should not only involve refreshing streets and buildings, but also the arrangement purposes of the elements forming the city and the interpretation of the fields.

One of these elements, the courtyards, is the city fragment functioning as a connection between private dwelling unit and its environment.

The courtyards are not only places for family meetings or central distribution, but also an important architectural element shaped by considering the climatic conditions. Today as in most Arabian cities; this architectural form are built in a way that it protects from sand and wind –despite their tops are open and can gather the cool weather and the keep it until morning, it also has a function of bringing calmness, silence and harmony to the cities as well as joining beauty and practically in urban planning.

The formation of the traditional Anatolian Urban Pattern and the factors that
affect the ''Courtyard use'' within this pattern:
a) The urban heritage blended with different climatic and geographic circumstances and cultures that the Turks took over in Anatolia;
b) The traditions brought by different cultures that migrated to Anatolia.
c) The traditions of living in the process of to become Turkish and
to become Muslim.

Jens Martin Gurr

The 'Cultural Dimension of Sustainability' in Urban Systems : Urban Cultures as Ecological 'Force-Fields' in Processes of Sustainaable Development

Drawing on basic ideas from the field of ecocriticism and cultural ecology, this contribution argues that urban culture is one of the central driving forces in urban systems, as it constitutes a quasi-ecological 'force-field' which serves both a seismographic as well as a catalytic function in urban environments. In other words, I propose that urban cultural practices and forms of expression both react to and contribute to making sense of the dramatic demographic, economic, political, and ecological challenges the metropolis has to face at the turn of the 21st century; in so doing, they bear a particularly regenerative potential, playing a significant role in the process of fostering sustainable development in cities. Incorporating a theoretical conceptualization of the urban culture and a selection of case studies from Anglophone contexts, my paper thus sets out to contribute to an awareness of what Sacha Kagan and Volker Kirchberg have recently referred to as the 'cultural dimension of sustainability'. Moreover, the paper underlines the dire need to also approach the issue of sustainable development from a Cultural Studies perspective, illustrating that Cultural Studies may not only contribute to a deeper understanding of forms and functions of urban culture, but, as a 'social practice', should also function as a basis for actual political decision-making processes geared towards the maxim of sustainable development.

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Karen Kho

An Emerging Building Culture

Why is it so difficult to create places with "life" or beauty? And how can we overcome the challenges? These questions underlie my exploration of Christopher Alexander's Nature of Order series. In this paper I introduce a developmental perspective that provides insight into how and why our built environment has changed so dramatically in the last few centuries. In particular I explain how stages of ego development relate to worldviews, building process and the built environment. An understanding of developmental factors aids us in identifying the specific challenges to creating living structure and suggests fruitful avenues for further work.

Gisela Humbert & Wolfgang Stark

Innovation & Improvisation Patterns for Organizations & Social Systems

Today´s and future organizations (and societies) need to cope with complex and unexpected situations. These novel and unusual settings, compared to regular organizational planning, can teach us that innovation processes are less based on rational planning than it used to be. Today we both need to understand intuition and serendipity as a source of innovation and to develop the art of improvisation. Organizational Cultures therefore need to encourage creative processes and the use of minimal structures as generic codes to built patterns for improvisation.

In „Music_Innovation_Corporate Culture" (http://www.micc-project.org) we have been analyzing innovation and improvisation patterns in organizations and communities by using and expanding the concept of pattern language and linking it to musical patterns and the language of music.
In order to elaborate theoretical concepts and application tools for improvisation in organizations and social systems and to use musical patterns to understand the process and culture of innovation we are collaborating with the award-winning jazz-musician and vibraphonist Christopher Dell and his Institute for Improvisational Technology (http://www.ifit.de/).

Based on project findings we will present tools how to link organizational patterns and patterns in music, and we will show that innovation patterns display similar principles like artistic processes and therefore can be inspired by improvisational art like jazz and improvisational music.

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Lauren Johnson

InterLattice Construction System

InterLattice is a new joinery system composed solely of interlocking plywood pieces. The interLattice system is composed of vertically oriented triangular modules that connect to each other in a manner inspired by conventional brick and mortar construction. Connection gaps between the triangular modules act as flexible mortar, adhering the modules together and allowing for a wide range of connection angles. With the interLattice, double curvature in form is possible without the typical need for tiling or major alteration of module geometry. This enables material sheets to be nested and CNC cut simply and efficiently; tabs and slots are unique to their position, but the overall size of pieces remains consistent. The parametric model of interLattice allows for control of lattice geometry and automatically updates connection conditions, paying attention to patterns and constraints within the design. Through this modeling process, CNC-ready interLattice designs are simultaneously generated and visualized. InterLattice systems are highly flexible and have many potential applications including interior walls, self-supporting awnings, and weatherproofed exterior structures. To further understand and develop the system, the construction of a landscape pavilion is proposed.

Taro Narahara

A Conceptual Framework for Applications of Self-Organizing Logics

This paper proposes a conceptual framework for applications of self-organizing logics in generative design systems. The methods introduced in this paper are in an abstract and conceptual form that explores one possible future direction of computational design strategy. In order to explain the potential of this problem-solving direction, general aspects of what our contemporary practice in architecture and urban design is facing will be discussed in response to the increasing complexity in our culture. However, the main focus of this paper is not on providing immediate solution methods to resolve any specific professional problems in contemporary architecture. Rather, the paper investigates the emergent characteristics of this method that can potentially evolve new design solutions over time, and shows how tools employing the method can be used for design collaboration with humans, rather than simply as passive evaluation and analysis tools. The paper foresees important potential for this new design direction inspired by self-organizing computation (SOC) and speculates regarding its potential areas of application in urban design.

Eileen Tumlin

Towards Living Systems: Reclaiming & Refocusing the Applications of Pattern Languages in Digital & Physical Design

The work of Christopher Alexander has had a major influence on software programming which has in turn had a pervasive impact design and architecture. What is the nature of this impact and is our world improved? Have pattern languages influenced the digital tools architects and designers are using in ways that enhance our built environments? Is this a closed loop or is there an opportunity to reclaim the underlying principals of Christopher Alexander's work and refocus them on creating digital processes and tools which help produce physical environments with life and wholeness?

Digital generative design processes and programs are rapidly developing and becoming part of mainstream architecture and design. These tools allow designers to produce what are often referred to as new forms and complex geometry. Is the application of parametric modeling and design doing anything more than creating new or more complex forms? Is it actually helping us to create forms and environments with more life?

The outcome of these new methods is sometimes beautiful and inspiring. At other times the outcome is confusing and cold with results that lack scale and have little connection to the human experience. The irony of this is that much of what has influenced these developments in generative design can be directly credited to the work of Christopher Alexander. The technology that borrowed from work such as A Pattern Language has evolved into systems which are embraced by the design community and yet are often completely disconnected from the underlying principles that indirectly and directly helped to create them.

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Towards Living Systems: Reclaiming & Refocusing the Applications of Pattern Languages in Digital & Physical Design (continued)

Which aspects of digital generative design might hold the potential to further the aims of Christopher Alexander and which aspects actually perpetuate the role of the ego in the design of the built environment? This paper will explore the connections between current parametric modeling, smart geometry, and generative design approaches and the goals of pattern languages as they relate to the generation of life-enhancing environments. Examples of processes which are actually enhancing the human act of making and design with technology and digital fabrication will be discussed. Potential opportunities for taking current digital technologies and focusing them back towards the aim of creating places and objects with life and wholeness will be the main goal of this paper.

Duygu Yenerim

An Urban Challenge of Transforming Informal Settlements: Using BIM to Monitor the Colonias' Increasing Energy Consumption

Aerial images and Building Information Modeling (BIM) tools and techniques can be used to model low-income informal communities with substandard housing conditions in the colonias of Texas. These settlements share many characteristics with the low-income houses in developing countries, such as inadequate infrastructure and lack of access to basic services (HUD 2003; SOS 2011; Texas Office of Attorney General (OAG) 2011; UN-Habitat 2003; Ward 1999). Since informal settlements throughout the world have been growing rapidly and unexpectedly, finding a way to monitor their growth pattern and its impact on energy consumption has become very important (UN-Habitat 2008). As informal settlements grow and become formalized as townships or municipalities, their energy consumption will increase dramatically. We hypothesize that our method can be useful to monitor informal settlements for (a) their growth patterns and (b) variability in energy consumption due to the transformation of these settlements to formal communities.

To explore this goal, we have created BIM models of the colonia settlement in Larga Vista, Laredo, Texas for both 2003 and 2011. Google Earth TM is used as the digital satellite image source and we have also access to construction information, plans and several aerial images of colonias covering 28 years of development (Reimers-Arias 2009). Both will provide us data on houses such as; (a) footprints, (b) number of storeys, (c) materials, and (d) location of windows and doors. Through using this information we have created a BIM model of Larga Vista informal community in Autodesk® Revit® 2011 and generated an energy analysis in Autodesk® Project Vasari. We can compare the communities at different time intervals to better understand how they grow and change. We can project into the future the growth of the communities to reach an understanding of the impact on energy consumption under various scenarios. We argue that this method can be widely used in other countries.

Session H : Interdisciplinary Applications
Sunday October 30, 2011
3:00 PM - 4:30 PM

Christopher Andrews

Ambassadors from the 15th C. to the 21st : A Revival of the Classical Anatolian Carpet Design

Over the past decade, Christopher Andrews has been reviving the classical rug patterns of Anatolia (modern day Turkey). These carpets, many of which we know today by the names of the Renaissance painters who depicted them with faithful accuracy in their works, like Holbein, Lotto, Ghirlandaio and Crivelli, are held to be some of the most beautiful carpet designs in the world. The original versions of these patterns date from the 13th through the 17th centuries and are prominently displayed in many of the world's finest museums and art collections.

Initially inspired by Christopher Alexander's "A Foreshadowing of 21st Century Art: : The Color and Geometry of Very Early Turkish Carpets", Andrews and his company "Classical Carpets" have analyzed the geometry, color and structure of these patterns in detail, down to the "molecular" level of the individual yarn and knot, in order to craft contemporary creations that employ durable traditional methods of manufacture, from local handspun wool production, natural vegetal dyes, to handweaving, washing and finishing. These designs are thus not just literal copies of specific carpets, or loosely derived modern interpretations, rather in their design and maing, they capture the essence and character of these timeless masterpieces, as "ambassadors" from the 15th century to the 21st.

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Kinda Al Sayed

SpaceSyntax as a Parametric Model

Through reading the language of space, Space Syntax research has produced the first scientific theory to identify a quantifiable knowledge that has implementations in design. The main contribution to design by this theory was the identification of three design filters. The first filter is the structure of space as the generic function of architectural and urban form. In essence, the remaining two filters are intended to bring about a cultural differentiation of a design. While we agree on the spatial structure as the first design filter, in this paper we identify the second design filter as the set of formal attributes that are directly obtained from the spatial structure. The third filter is then the remaining attributes of urban form that have no direct connection to the configurational structure of space. To establish the definition of the second filter, investigations are held into the parametric relationship between urban structure, street width, building height and landuse distribution. The finding of the analysis suggest that while street width is related to line length, higher buildings are more likely to be located in areas that are central between potentially dense through-movement routes. In the landuses case, the answer is more complex and dependent on the radius of measure used. The parametric model identified through these investigations will be applied on an existing urban structure for reasons of verification. The degree to which this model is deterministic of the built form will mean further development and adaption of the model as a tool to aid urban design.

Philip Speranza

22@ Generative Planning, Small-Scale Cultural Interventions as Connectivity

This paper will present urban design research on bottom-up generative processes in the new information–based activities district of 22@ in Barcelona, Catalunya, showing how identity can derived and part of a planning approach that uses the existing fabric to integrate workers and residents within a single cultural identity and place.

In 2000 the city government of Barcelona conceived of a business activity district, similar to Silicon Valley, placing it in the underutilized post-industrial and residential neighborhood of Poblenou. Called 22@, its dual purpose is to diversify the city's business activities and to support a doubling of the local residential density and the cultural presence of Poblenou. Both purposes will update the identity of Poblenou from an earlier industrially-based identity to one based on information. Unlike the tabula rasa top-down urban planning of the Olympic Village in 1992 that demolished large expanses of the city, the planning of 22@ protects the small and medium sized historic industrial fabric with bottom-up, block by block guidelines. Rather than adopting classical axial structure to connect blocks, the connectivity of the 22@ blocks will depend on material and cultural features already characteristic of the district to weave public spaces together at the scale of emergent pedestrian zones and neighborhoods. This generative process encodes parameters on the small scale of cultural events to link existing behavior patterns and explore how these patterns are evolving for Catalan culture in 2011 and the future.

This fine-grained, bottom-up planning of 22@ provides an excellent context for exploring how modest yet systematic design interventions at the pedestrian scale can enhance the newly emerging identity of the neighborhood in ways that are consistent with the existing culture of current Barcelona and Catalan. The research to be presented documents interventions that would support, for example, annual music festivals, a food market network, community gardening and social interaction and refuge from the more vehicular oriented streets. Investigation of a possible public food network questions the current food and work cultures in the 22@ district, and the differences that have evolved from traditional midday lunch culture within Catalunya and Barcelona. How can the local information technology support an evolving food culture and communicate a shared cultural identity for both residents and workers?

The paper will demonstrate how relatively modest, culturally based design interventions can create a frame for self-generating patterns for a changing district at the scale of individual spaces, neighborhoods and the overall district. This is an important strategy of urban planning that relies on network design using small interventions and guidelines rather than traditional top-down planning approaches.

Hajo Neis & Alexander Schmidt

INNOVATIONCITY: A Competition for a Sustainable Urban District in the Ruhr-Metropolis

InnovationCity started as an urban initiative in the Ruhr Metropolitan Area of Germany for identifying and developing a large urban district in one of the 32 cities that form the Metropolis. In 2010 InnovationCity was presented as a competition, in which all cities (or combination of cities) could participate and propose an area in their boundaries that would be developed as a showcase of an urban sustainable district. The competition areas needed to include about 50,000 inhabitants, with additional commercial areas, industry, office zones, and educational and recreational facilities, as a typical cross-section of the Ruhr Metropolis.

The authors were part of a competition team for the City of Essen, located at the center of the Ruhr Metropolis. In the two-phase competition, five cities were selected to enter a second and final phase. In the final jury decision, the city of Bottrop was awarded the first prize and funding support for development of a sustainable urban InnovationCity. The authors will describe the efforts by the first three teams (including the city of Essen) and describe and analyze three different approaches to InnovationCity. Although the City of Essen did not win the competition, it was decided to continue the project anyway under a different program called KLIMA-WERKSTADT ESSEN and a research project called "klimainitiative essen (KIE).

Dieter Hassenpflug

Another Language of Patterns : Semiotics of Chinese Urban Space

Dr. Dieter Hassenpflug's main areas of research include Chinese urban development, the history of the European city, urban semiotics as well as urban retail business. His most recent book publication is The Urban Code of China. This book has been widely reviewed and has been celebrated as eye-opening by major scholars and practitioners of urban planning in China.

The book explains the hallmarks that all Chinese cities have more or less in common, their spatial grammar, their syntax, in short: their code. It is only by deciphering their commonalities that we become able to form a clear picture of the Chinese city's internal structure and to intelligently evaluate and organize our diverse impressions. Moreover, deciphering the code of the Chinese city enables the author to "read" cities newly designed by Western architects. He thus also helps the reader to arrive at valuable new insights into China's booming process of urbanization and urban development.

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David Week
Contemporary Philosophy & the Pattern Language

Chris's attempt to understand how people design things led him to patterns, arranged in a language; Sometimes he talks about them as genes, evolving as the way of life evolves. Looking at these patterns, he started to see similarities between them, and arrived at some features he called properties. In all of this, he was attempting to arrive at something difficult to define, which he called "feeling".

Lakoff and Johnson (among others) in attempting to understand how people understand the world, have arrived at what they call "cognitive metaphor", which is just like poetic metaphor, only taken seriously. A person's metaphors are given to them by their language, which constantly co-evolves together with their form of life. Metaphors can be expressed in different ways, but among those there is a two-concept form (think of names like "Zen View" or "City-Country Fingers" as metaphors which bring together two concepts), there is a central exemplar form (think of the key photo in a pattern), and there is a spatial form (think of the diagram in a pattern.)

The metaphors which structure our understanding thereby structure our perception of the world; our thinking about the world; our action in the world (including making things.)

Johnson then started to see similarities among the metaphors that they had collected through their studies of language. These similarities all had a spatial character to them. These similarities Johnson called "image-schemata". (In his book The Body in the Mind, he actually compares them to CA's categories: and there's a strong (but not perfect) correlation between the sets of spatial structures.) For instance: when I say "the heart of the matter", I am using a metaphor, since a matter doesn't literally have a heart. And this metaphor is structured according to a centre-periphery schema: it calls on our spatial imagination and spatial experience. And this similar to the property "centres". When I say "I give you my word", I don't literally hand it over to you: another metaphor. This one follows a path schema, in which something passes from A to B. This may map onto gradients… what we experience as move through a building. Other metaphors may blend these schemata.

Where do these schemata come from? Here, the exploration leads us to the body, or rather our embodied experience of the world. It's because we have the kind of bodies that we have that we experience the world in terms of up and down, and front and back, and centre and periphery, and contrast. A diatom's world (in so far as it has one) does not have up and down, or front and back, though it might have centre and periphery, and light and dark. So the way in which we experience space is structured by that fact we are embodied beings, not disembodied Cartesian minds.

Our bodies, are, of course, the site of feeling.

This leads us into the philosophy of embodiment, which proposes that our experience of world, of space, and of things, is deeply intertwined with our bodily being. So we have Maturana's idea of the world of an organism, as something constructed from its coupling with its environment, but not a representation of an external environment. We have J J Gibson's idea of space as the potentiality for human movement: again, an organismic construction, not an empty geometrical void. We have Merleau Ponty, who's understanding of the structure of space was so entwined with embodiment that he ended up describe the world as "Flesh". We have the neuroscientists, who tied embodied feeling to all thinking processes, and the philosophers of the extended mind, in which mind is not inside your skull, nor even inside your skin, but in fact extends into your environment (think of how it's easier to think in an ordered work environment, than a cluttered one.)

So: form of life - language - spatial structures - feeling… all explored and interrelated in ways that are very radical (and take some getting used to), but much more developed and fleshed out (no pun intended) than Chris has managed on his own: because this is the work of hundreds of people over a hundred years, where Chris is attempting it using Cartesian concepts drawn from mathematics.

But if you put Chris's architectural explorations, with the sophisticated philosophy, you get something quite well-connected into the mainstream of the humanities and the social sciences, but also extends into workaday issues of columns and beams and clients and trees.

Maria Fierro & Mauricio Caicedo

Formulation or adequacy of tools and mechanisms, technical, economic, legal, educational, ethical and management to make possible a Sustainable Urban Development

Human activities have always caused some kind of environmental degradation. At first the people number on the planet was reduced and limited to a craft activity, so that the impacts were not visible and nature was able to assimilate without major consequences. As the human community grew, it became more complex and their scientific and technological progress, increased social demands and the impacts generated by the ever increasing of the industrialization and modernization, accelerating the urbanization.

Today cities occupy about 4% of the total area of the planet and they are home to 50% of world population, consume 75% of natural resources and generate 75% of the planetary pollution and waste, so it is constitute the largest source of unsustainability of the world. This unsustainable, resulting in increasing pressure on nature, which deteriorates and upsets, is also an unacceptable burden for their own physical support of life and results in the planet's ability to replenish resources and absorb the pollution and waste.

Besim Hakim

What are the essential features of the generative process. What do we have to confront today to make the process viable for implementation?

What are the essential features of a generative process that was inherent in traditional urbanism? Results of extensive research of traditional towns, especially those located around the Mediterranean basin, has demonstrated the existence of these four components:

Ethical/legal norms that are derived from the history and value system of the society and augmented by local customary behavior as related to building activities.

Private and public rights and responsibilities are relatively coherent and understood by all the parties involved in building activities.

Control and management of various sectors of the built environment is distributed among various parties with increase of power for the inhabitants of neighborhoods, whereas the public sector is primarily in control and management of infrastructure and the urban structure of the town or city.

Rules and codes are clearly in place for building activity for the public and private sectors. These rules and codes contain successful customary practices. They are usually proscriptive in nature based on intention, rather than being prescriptive, and must be responsive to the peculiarities of each location and its unique conditions.

Michael Mehaffy

Generative Coding Using Pattern Languages: Issues and Opportunities

The author will give a report on work to develop generative coding processes utilizing the well-established capabilities of pattern languages, in partnership with several institutions in Europe and the US. The session will describe several related challenges and their potential resolution.

For example, Alexander (2010) noted that pattern languages have lacked sufficient information about geometry, and his more recent work (2003) lays out the basis by which this capacity could be integrated into pattern language systems, providing a morphogenetic capacity. The author will describe this opportunity, and progress to date.

Alexander (2010) also noted that pattern languages must be project-specific, and must interface with the actual construction process, with its unique flow of money and other resources. The author will describe the application of process-based pattern languages to this process as well.

Finally, the author will draw lessons from the success of software designers and others who have masterfully exploited pattern language technology, and the larger themes of complexity science and sustainability. This will connect the session to the larger themes and concerns of the conference.

Sergio Porta

Plot-Based Urbanism and Urban Morphometrics

Generative urban design has been always conceived as a creation-centered process, i.e. a process mainly concerned with the creation phase of an urban transformation. We argue that, though the way we create a space is important, how that space evolves in time is ways more relevant when it comes to providing livable places gifted by identity and sense of attachment.

We are presenting in this paper this idea and its major consequences for urban design under the title of "Plot-Based Urbanism". We will argue that in order for a place to be adaptable in time the right structure must be provided that, in turn, is quite more stable in time. The force that shapes (has always shaped) the adaptability in time of livable urban places is the restless activity of ordinary people doing their own ordinary business, a kind of participation to the common good which has hardly been acknowledged as such, that we term "informal participation".
Investigating what spatial components belong to the stable spatial structure and how they relate to each other is the scope of our research. In this paper a methodology to represent and measure form-related properties of streets, blocks, plots and buildings in cities is therefore presented. Several dozens of urban blocks in Milan (IT) and Glasgow (UK) of different historic formation are surveyed, redrawn and analyzed. Effort is posed to identify those spatial properties that are shared by clusters of cases and therefore to define "taxonomic units" of urban blocks on the basis of their form. Spatial properties are defined as relationships between features in space and the recurrence of such relationships across cases that have a different origin in time and are differently placed in space is investigated.


Nicolaus Wright

Instrumentality of Mapping for Systemic Micro Sites

This paper presents a methodology for the use of mapping and modeling techniques for the design of urban micro-sites with the goal of linking them in service to the greater ecological function of the city. Mapping can be used as an instrument for the development of urban improvements that are actively responsive to available environmental data and the change in policy that it causes. Dynamic multi scalar ecological effects cannot take place in the city only through the large scale intentions (zoning overlays, etc.) alone, they must be accompanied by incremental micro site strategies that can be implemented by stakeholders and citizens in their immediate vicinity. By utilizing the plethora of environmental data available explicit modeling techniques can connect metropolitan scale ecological intentions to localized implementations of street and neighborhood improvements. These techniques can be used to form heterogeneous, responsive urban forms that integrate large scale metropolitan goals with local, individual decisions.

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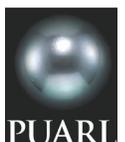
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