Algorithmic Sustainable Design: The Future of Architectural Theory.

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Lecture 12
12.1. Implementation of generative codes in design.
12.2. Urban plazas.
12.3. Designing for children.
12.4. Favelas and social housing.

12.1. Implementation of generative codes in design.

Codes with feedback

- Generative codes depend at each stage upon the entire configuration
- Generative codes are dynamic and recursive — the result of each step feeds into the next step
- … unlike iterative static codes (where the same step is repeated)

Design as computation

- Coherent and sophisticated structure grows, like computing a result
- Follows from many simple steps
- Each step is a computation
- Altogether, we develop a recursive sequence of transformations

Architectural algorithms

- Generative codes evolve structure to satisfy human needs
- Algorithms generate complex structures on the large scale
- Final design can appear "unexpected"
- If the process is adaptive, then the large scale is relevant and correct

12.2. Urban plazas.

Heart of neighborhood

- Project for Querètaro, Mexico
- Generative pattern for designing successful urban plazas

- INTENDED FOR THE NEW PARTS OF THE CITY
- City already has a sprawling 3-storey mixed-use urban fabric, but no community — it is fragmented

At this time, the difference in human quality between the historic center and the suburbs in Querétaro is like night and day, and much of this is due to the presence and quality of the urban plazas. My colleagues in Mexico and I are writing a generative code for successful urban plazas in the new parts of the city. Querétaro already has the appropriate density, and it is the morphology that has to be repaired through a catalytic geometry. Since pre-existing conditions are favorable, this can be achieved in part by inserting new urban plazas. Unfortunately, suburbia in the United States does not have the urban density to benefit immediately from such a reconstruction.

Social capital

- Urban space is not merely the CONTAINER of social capital
- Urban space is ITSELF social capital
- Social discourse occurs by connecting directly to other people
- — and indirectly by connecting to places, to nature, and thus to people

Urban space

- Patterns of human activity nearly always tie into urban space
- 20th-Century urbanism tried to internalize all urban space into the individual house and garden
- Frustrating quest for urban space that one individual or family controls

Urban space (cont.)

- As a result, houses and lots have grown ever larger and larger
- Take over city for private living space
- Unsustainable, but is encouraged by developers and land speculators
- End of social capital in our society!

Strong conjecture

- N.A.S. and Alexis Hugh Ramírez
- "**Can we reconnect fragmented urban fabric by inserting urban plazas?**"
- Will new plazas act as catalysts to re-connect the rest of the city?
- Modernist urban plazas **disconnect** urban fabric — an observed fact

Generative code: plazas-A

- Locate new square at intersection of intermediate-density roads

- Size of square follows historical type
- At least one edge touches on street
- At least one edge is pedestrian
- Build south edge of square with porticoes, if appropriate to culture

In most cases today, the space available for an urban plaza is immense when compared to the size of historical urban plazas. A plaza that is too large can be dysfunctional just as much as a plaza that is too small. This gigantism is due to the general loss of human scale in urban structure in the decades following World-War II. In those cases, we need to create two distinct, autonomous urban plazas that are sensitively connected so that they remain perceptually and functionally distinct.

Generative code: plazas-B

- Surrounded all around by buildings no more than 3 storeys high
- No parking on or around plaza
- Available parking behind, or under
- Guarantee pedestrian feeding from at least 3 blocks all around plaza

Generative code: plazas-C

- Surrounding façades permeable to pedestrian — windows, doors, etc.
- Very narrow street frontages only
- Minimize use of modernist materials
- No glass façades allowed
- No sheer brick or concrete walls

Generative code: plazas-D

- All wall openings (doors, windows) must have a surround of width > 30cm
- Use historical form language only
- Ornamented façades and plaza itself
- Use colors and natural materials
- Signage in traditional lettering only

These considerations are not based upon aesthetics, but are biologically-motivated. It has been found that the information content of the buildings surrounding a plaza strongly influences the use of the plaza and its eventual success. The occupation and use of the plaza depends in an essential manner upon the architecture and visual effect of the surrounding region. It has to do with the informational and fractal qualities that affect us biologically. By sticking as much as possible to the historical form language, including a

high degree of ornamentation, the correct information field is generated around the plaza.

Generative code: plazas-E

- Walk the ground to set footpaths
- Save existing trees and landmarks
- Design to include plants in the left-over spaces; abandon formal symmetry
- Use traditional street furniture, highly ornamented down to < 5mm
- No abstract sculptures or forms!

Importance of detail

- Success of urban plaza is highly dependent on detail of structures
- Necessary but not sufficient condition is the presence of organized, coherent detail on the 3mm scale
- Can only be achieved by ornament
- ORNAMENT RULES PLAZA

Proposal

- Project developed for the city government of Querétaro, Mexico
- Our generative code creates a new successful plaza every time
- We are not proposing a template
- Applied on the Federal level, we can create 5,000 urban plazas, all distinct

Children's playgrounds

- A plaza built according to our generative code is a playground
- Pedestrian access from surroundings
- Hopefully, the plaza will catalyze pedestrian urban life where none exists
- ACCESSIBLE green for children; opposite of today's "see but not touch"

12.3. Designing for children.

Anti-children cities

- Our children are negatively affected by today's built environment
- The geometry of urban landscape is hostile to children's sensibilities
- Most adults do not realize this — they are fooled by visual symbols

The children's world

- Experienced totally with senses

- Emotionally-based experiences
- Extremely sensitive to environment
- Child is not numbed like adults
- Is not yet conditioned to override emotions with abstract ideas

Unasked questions

- Can a child go out of a door and play safely in the environment?
- Can he/she explore without the parent fearing for its safety?
- How far can a child go anywhere on their own?

Downtowns

- Most downtowns in the US have been gutted of human scale
- Hostile glass or concrete fronts of skyscrapers are everywhere
- No permeability of street façades
- Hostile to both children and adults

Suburbs — commercial

- Effects are more subtle here
- Strip malls are pedestrian unfriendly
- The only pedestrian space is a short piece of sidewalk along stores
- No child can ever reach a store on foot from home, because those are designed for car access only

Suburbs — residential

- House surrounded by a yard is an impractical utopian image
- **Front yard** is too exposed for children to feel protected enough to play
- **Back yard** is a totally enclosed prison, and children feel this isolation

Suburbs — residential (cont.)

- Suburban streets are built to the width and smoothness of a highway
- Danger grows exponentially with the street width! (documented accidents)
- Too dangerous for children to play on wide street in front of their house
- US cities do not allow rough paving that slows down cars in European cities

Residential suburbs become unintended parking lots

- After a while, house garages are used as storage, filled with consumer junk

- Multiple family cars start taking over the street and driveways
- Suburb becomes a giant parking lot
- Goodbye to the promised “green garden” image of suburbia!

Intentional parking lots

- Giant open parking lots are terrifying and dangerous for children
- Feel threatened every second you are a pedestrian in the parking lot
- Most parking garages are not better — hostile prison-like environments

Complicity of planners

- Too dangerous for children to ride bicycles through neighborhood
- Planners refuse to change the codes to allow a genuinely child-friendly built environment
- Shockingly, adults have absolutely no idea of how to achieve this goal

Skyscrapers as prisons

- The most inhuman environment for children is the skyscraper
- Children lose all contact with nature and human reality
- This building typology isolates and diminishes the children’s world to within one apartment or one room

Four-storey limit

- Christopher Alexander already gave the criterion of a four-storey limit for apartment houses
- Based upon the distance children can successfully interact with their friends and parents on the ground
- Putting children into high-rises is a crime against humanity!

A new urban realm

- Get rid of dangerous intersections, crossings, giant urban visual objects
- Get rid of prison-yard concrete playgrounds — a sadistic experiment
- Make entire urban space a playground
- Surround useless expanses of lawn by protecting structures to encourage play

Why did we do this?

- Why are Western cities so totally, obsessively, child-unfriendly?
- Because modernist design is based on an inhuman vision of people who did not care for children

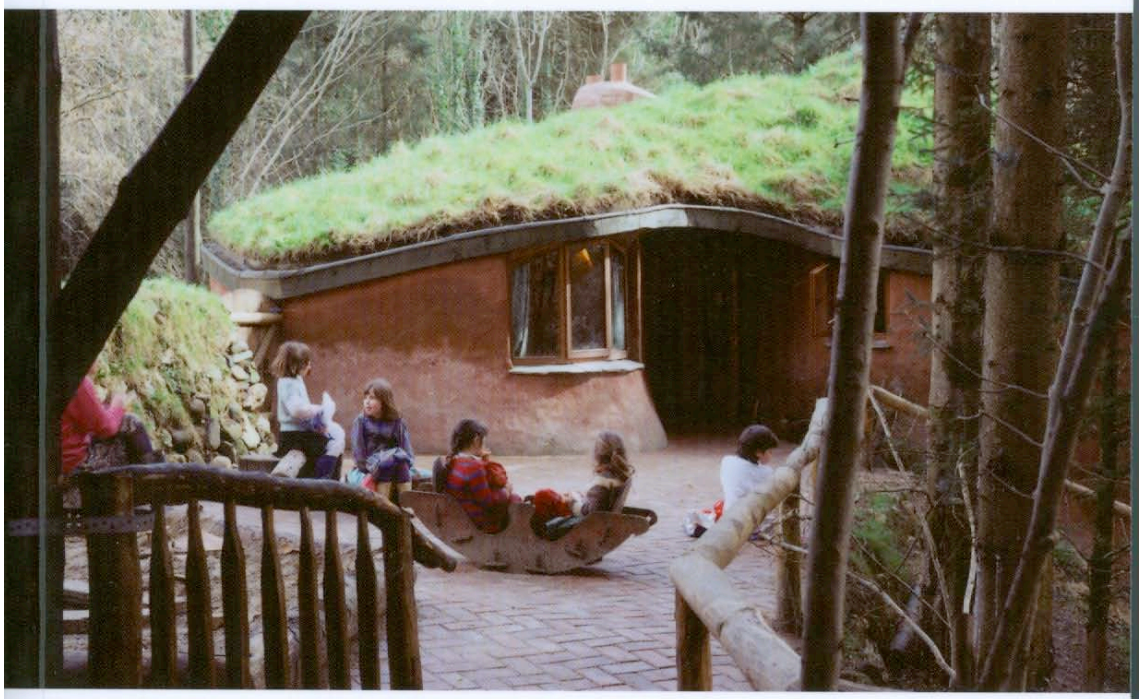
- Ideology overrides human life, even ignores the future of the human race!

The heroes of modernist urbanism gave the example. Around 1922, when he was designing the first glass skyscrapers, Ludwig Mies van der Rohe abandoned his wife and three young daughters, and lived alone for the rest of his life. E. Michael Jones, "Living machines: Bauhaus architecture as sexual ideology", Ignatius Press, San Francisco, 1995: page 113. Le Corbusier remained childless by choice. "I hate children, they are the curse of society. They make noise; they are messy and should be abolished." — Le Corbusier, quoted in Malcolm Millais, "Exploding the Myths of Modern Architecture", Frances Lincoln, London, 2009: page 97.

Christopher Day

- Already wrote a book on design with children in mind
- "Environment and Children: Passive Lessons from the Everyday Environment", Architectural Press/Elsevier, Oxford, 2007

Environment and Children



Passive Lessons from the Everyday Environment

CHRISTOPHER DAY

Architectural Press

"Environment and Children"

Favelas as examples

- We are too arrogant, too caught up with ridiculous and destructive ideas of modernity, too dependent upon mechanization, too proud to admit we have destroyed our cities
- We are too proud to learn from poor people who have a better urban sense that we do!

12.4. Favelas and social housing.

A large part of humanity

- 1 billion people live in favelas
- The majority of those regions have unhealthy living conditions
- The physical structures are made from unhealthy or unstable materials
- BUT THE FORM IS ORGANIC, AND GENERATES URBAN LIFE!

The presumed solution

- Every government wants to replace favelas with industrial housing
- The intention is to visually clean up their urban structure
- The government incorrectly assumes that the people want an **ordered** environment above all else

No solution to drastic problem

- The system responsible for erecting industrial social housing can never solve the problem
- There are too many people
- There is not enough money
- Inhabitants of industrial housing hate their houses — they find them alien

A new proposal

- "Favelas and Social Housing: An Urbanism of Self-Organization"
- Paper by N.A.S., David Brain, Andrés Duany, Michael Mehaffy, & Ernesto Philibert-Petit
- Based in large part on the earlier work of Christopher Alexander

Our criteria for success

- We consider a housing project successful if it is LOVED by its residents
- … unsuccessful if it is despised by its residents
- EMOTIONS ARE CONSEQUENCES OF THE CONNECTIVE GEOMETRY!

The key to success

- Utilize and harness the processes of self-organization
- Cultivate the connection between physical and social complexity
- Reverse machine typologies for social housing practiced during past century
- Abandon the ideology of modernism

Ecosystem competition

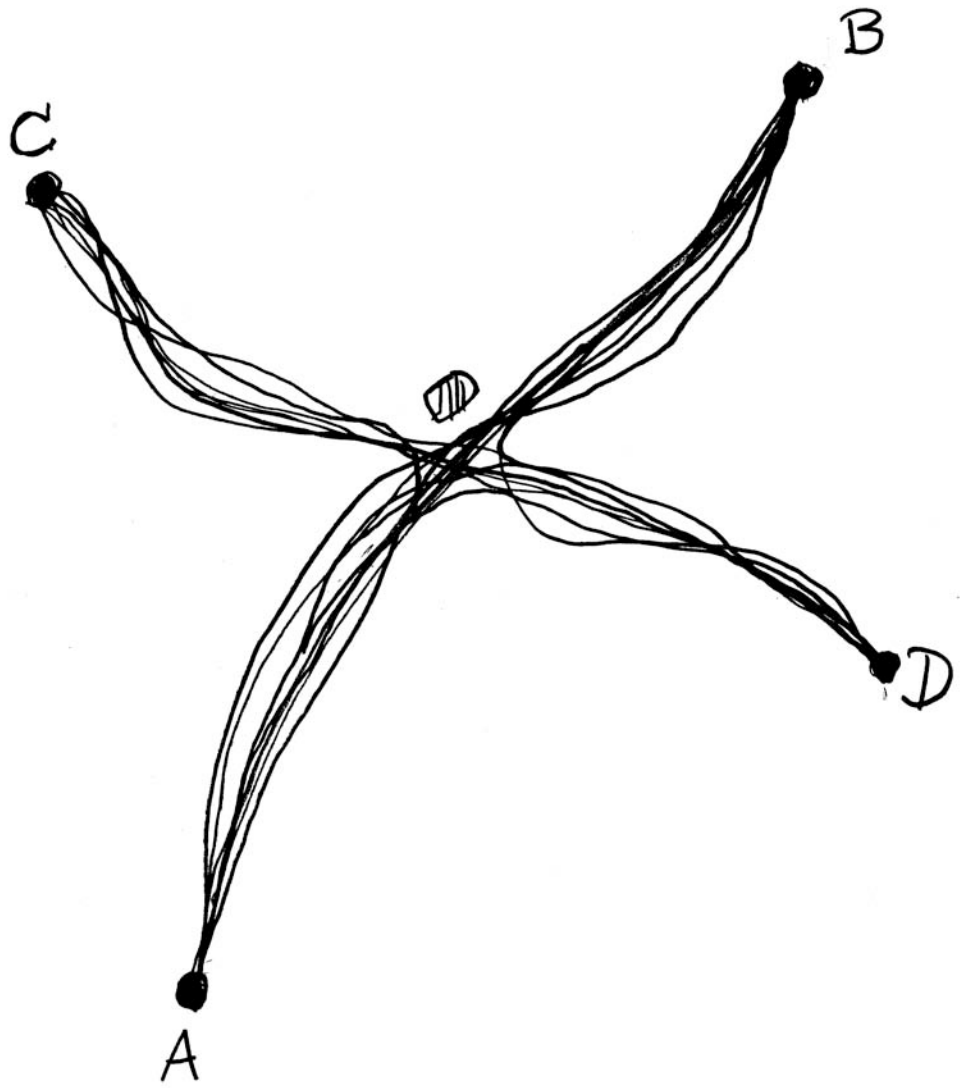
- **Favelas** are self-built, and lie outside government control
- **Social housing blocks** are built by government to impose its control
- Conflict between the two models wastes useful resources and does not solve the housing problem

Artificial versus organic

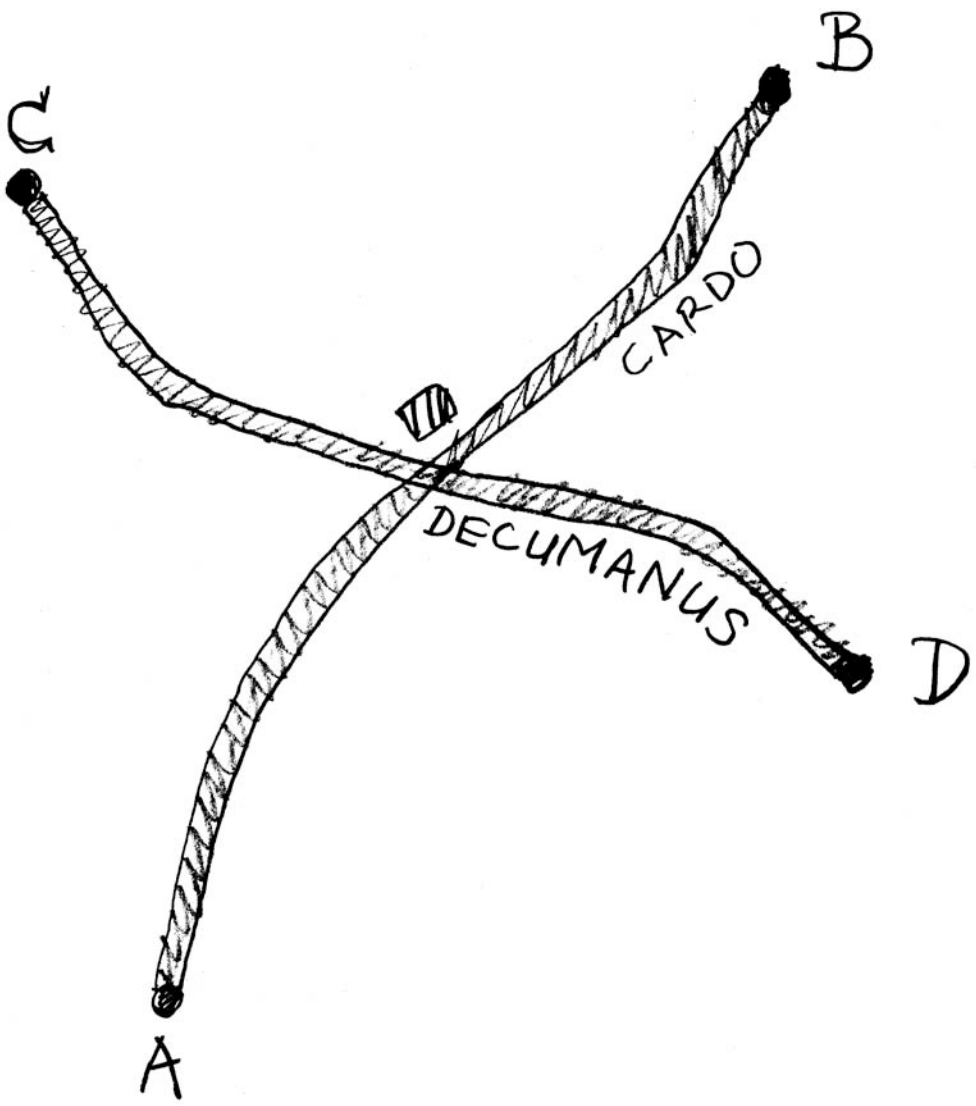
- **Housing blocks versus Favelas**
- Usually artificial versus An organic growth
- Planned housing versus Not formally planned
- Imposition of human will versus Extensions of human biology
- Typical top-down process versus Typical bottom-up processes

Generative code for owner-built social housing

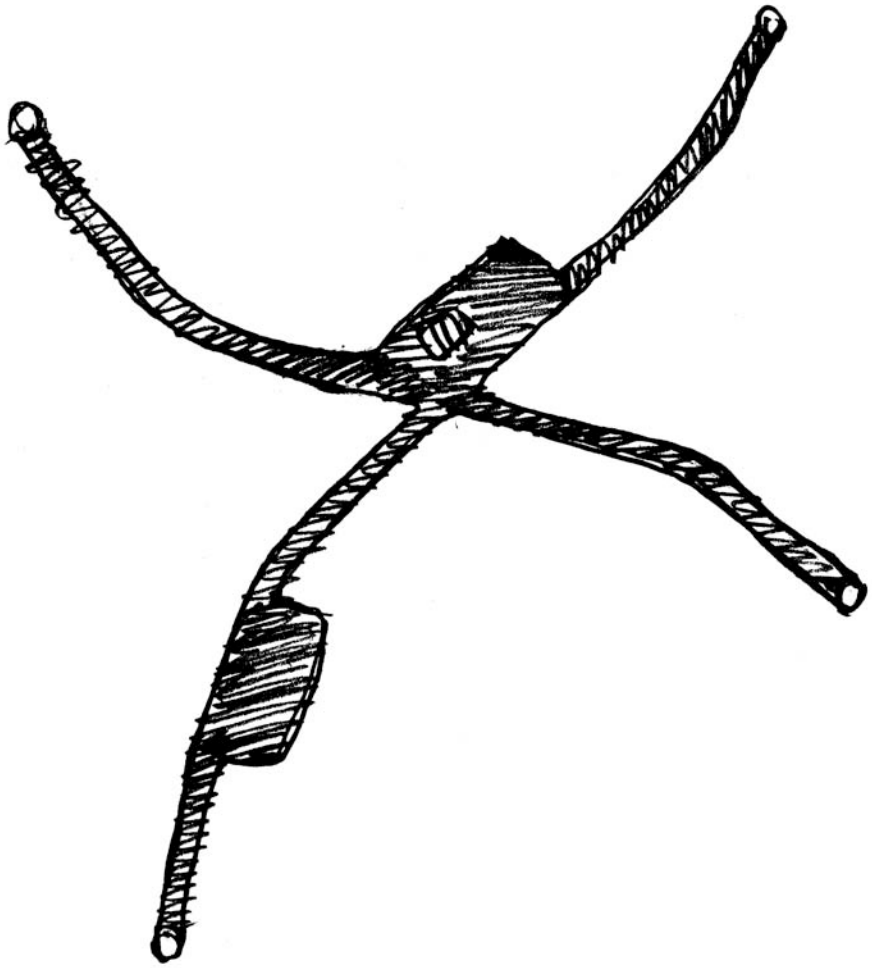
- 10 steps to build a new community
- Government provides materials
- We (NGO advisors) provide advice
- Future residents provide the labor
- Government provides the minimal infrastructure



1. Walk the ground to define paths: main street A-B and cross street C-D, whose layout is determined by the topography and surrounding transportation network.



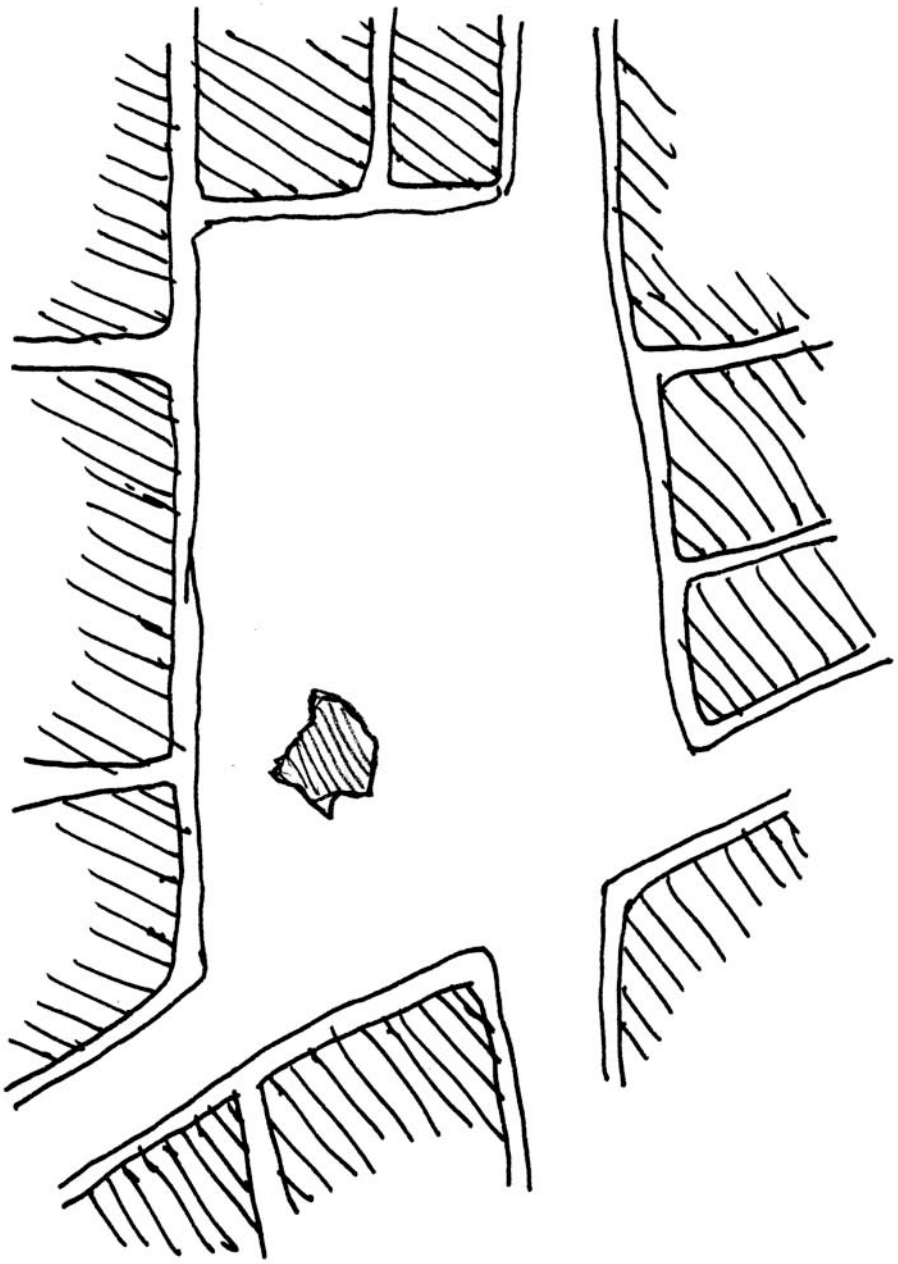
2. Cardo and decumanus define main streets.



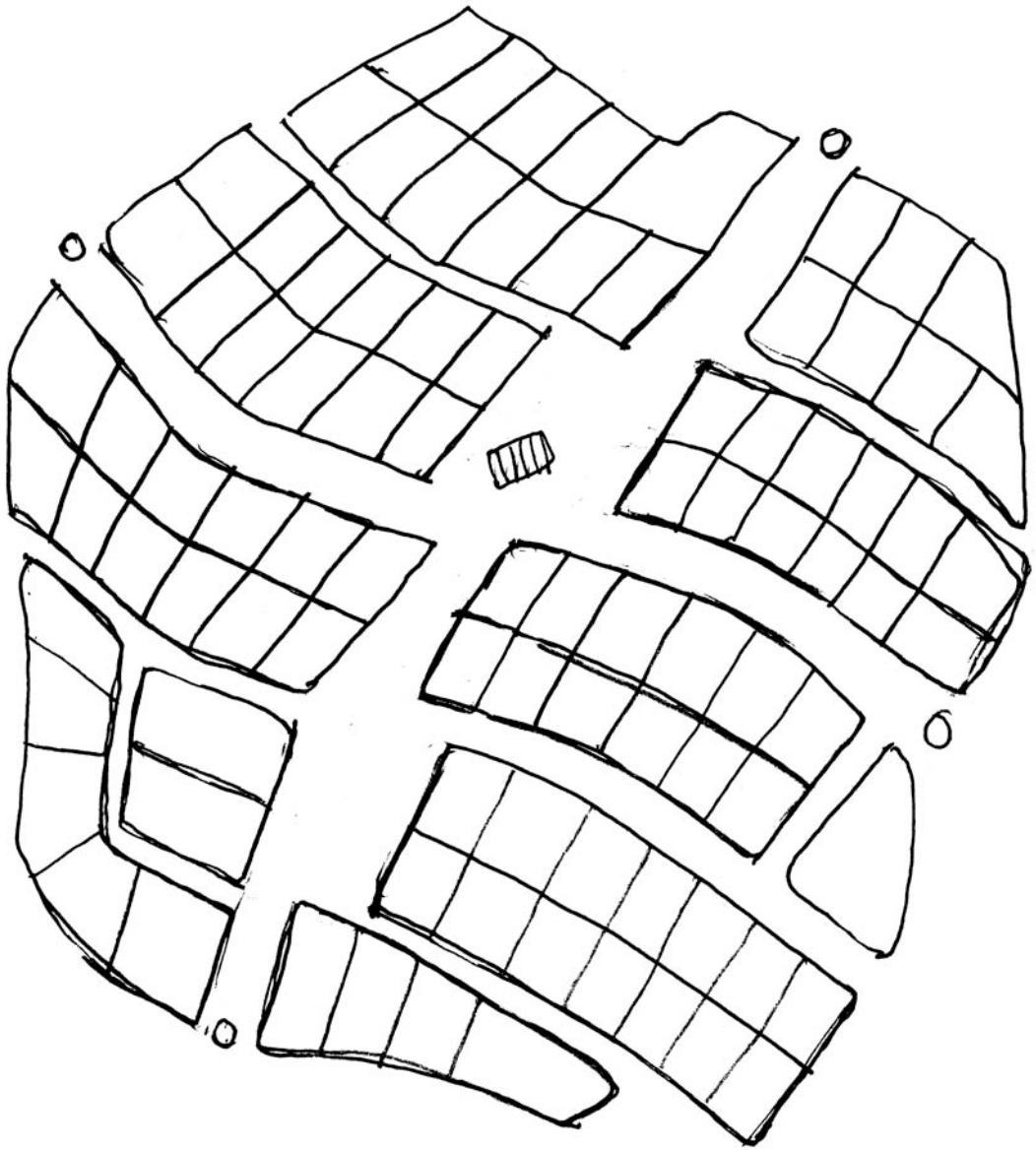
3. Urban spaces chosen by emotional feedback, become bubbles in street structure.

*Note on urban spaces

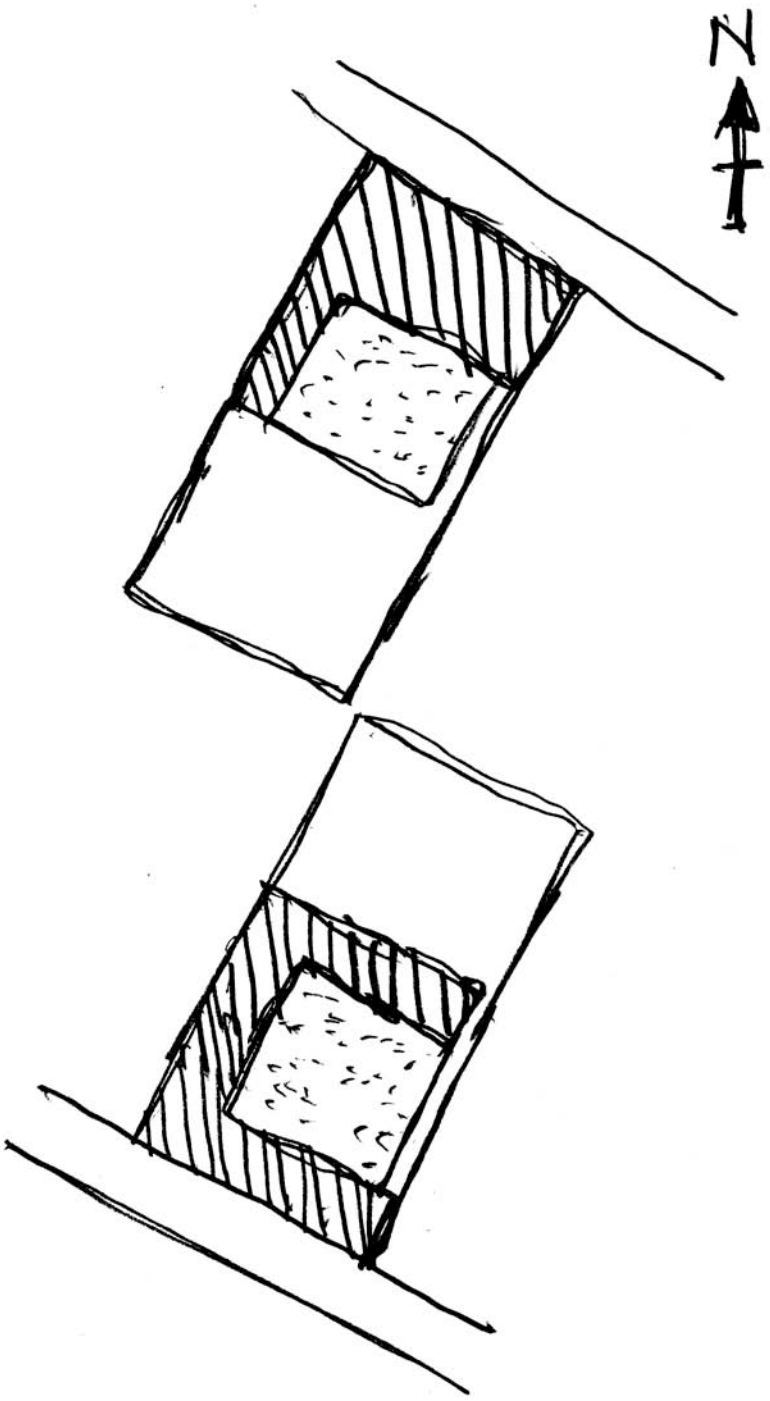
- Save existing pieces of nature: trees, rocks within urban space
- Save any features that can establish common interest
- In older societies, urban space contained sacred elements
- Urban space defined “sacred space”



4. Urban square defined by surrounding buildings — no setbacks.



5. Space between lots defines the streets, not the other way around. Mixed urban fabric fills the plan, leaving left-over space for streets.



6. Patios surrounding house are oriented to catch the sun.

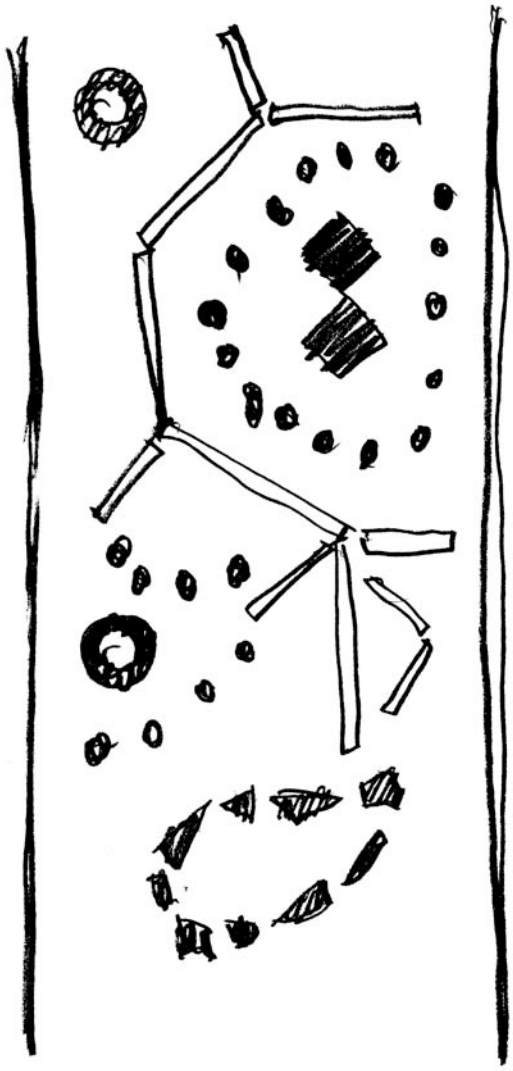
*Note on the buildings

- We don't offer a standardized plan
- Future residents work with a flexible, **recommended** plan that is adjusted, and only

then is the lot measured

- There is a margin for change to adapt to each family's individual needs

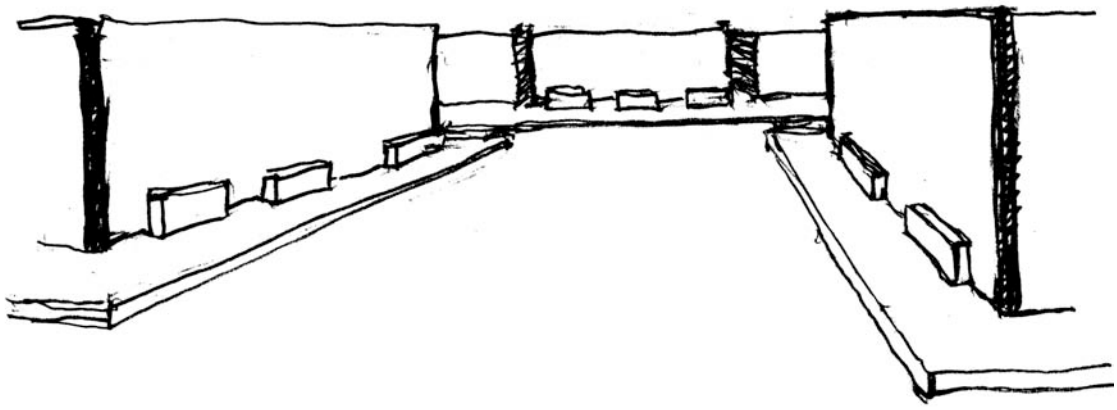
The usual criticism of "loss of freedom" because of individualization is false. An individually adapted house for a particular family serves just as well for a new future resident. Once built by following an adapted process, a structure leaves its imprint of "humanity" that is recognized by all future residents. They can make changes if they wish. Christopher Alexander's students have done an enormous amount of research verifying this point. It is only the non-adapted industrial typology with a standardized plan that is equally unloved by any resident that will occupy it. Look at Stewart Brand's book "How Buildings Learn", Penguin, New York, 1995.



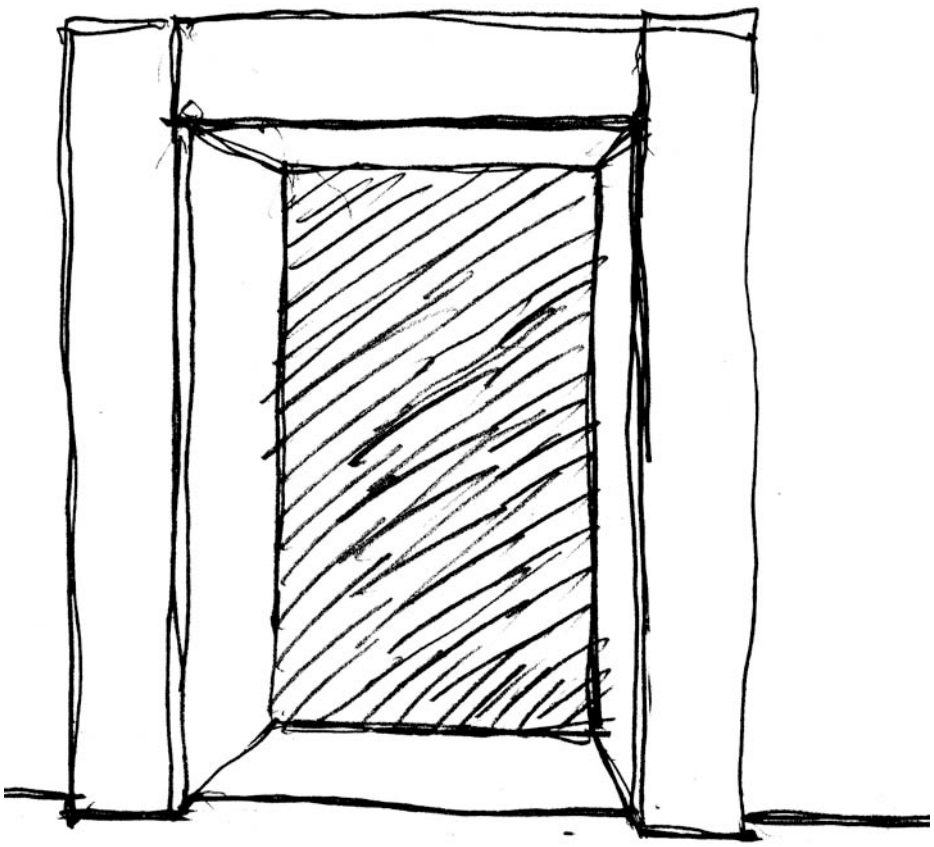
7. Residents design a pattern on their sidewalk, with an example here seen here in plan, while the concrete is still fresh.

*Note on the sidewalks

- First part of entire project to be built
- Each family will truly own their portion of sidewalk, because they ornament it with tiles, pebbles, etc.
- "**We made it, therefore it's ours**"
- Establishes the deepest sense of belonging to the residents

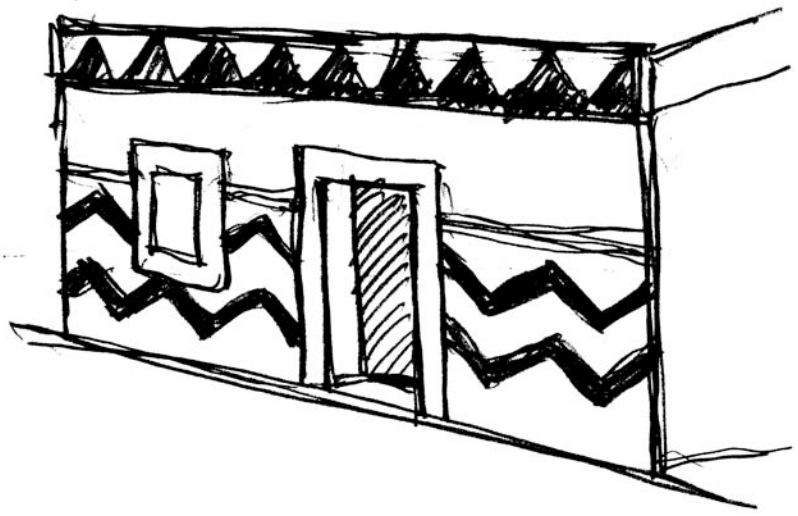


8. Façades, sidewalks, and benches reinforce urban space.



9. Wide, thick boundary defines entry as process of transition.

Entry as a process of transition goes back to Alexander's Patterns 112: ENTRANCE TRANSITION, and 225: FRAMES AS THICKENED EDGES. This is so important for all buildings, not only in self-built housing, but it has been suppressed by modernist ideologues who like to have entrances punched as holes in a wall. This does violence to both the materials and to the wall's geometry, reminding us of tears in a woven fabric, or of bullet holes.



10. Provide materials so that each owner ornaments their own dwelling.

The key to constructing living urban fabric

- Combines the bottom-up favela with top-down social housing
- The cheapest solution!
- Only slightly more expensive than building favelas (which are free)
- It is also the best for the long-term

Obstacles to our solution!

- The myth of large numbers is antiquated thinking
- Control of design and manufacture assumes standardized templates
- Standard social housing model conforms to industrial image of mass-production of the 1920s

False paradigm

- The ONLY reason for standard production of housing is administrative control, NOT quality of product
- Identical, mass-produced units are easier for accounting purposes
- Government bureaucrats care more to maintain their bureaucratic system

Threat to government?

- A government feels threatened by the ORGANIC GEOMETRY of the favela, more than by anything else
- So… government prefers to subsidize the large construction companies

- Desire to impose control prevents a viable solution to housing crisis

Wise government decision

- We must build mixed-use CITY, not cheap dormitories
- We build for living beings, not to cram the maximum number of people into the largest boxes
- Have to get industrial contractors out of controlling social housing

Obstacle from builders

- Industry prefers to build modernist block housing, and not bother with people' wishes — it's simpler
- Lucrative sales of blocks, and government pays for modules
- But builders can still make a profit from our individualized method!

Architects have it wrong

- Architects' idea of "good" design has nothing to do with human feelings
- They rely on abstract concepts of design and form
- Architect-designed social housing is oppressive and inhuman

Political opposition

- From the Left: "everyone is equal, so they must have identical houses"
- From the Right: "poor people have no right to personalized dwellings"
- From the Center: bureaucracy takes care of social housing, which must impose industrial uniformity

Obstacle from residents

- Poor people have seen images on TV
- … of unsustainable American houses
- They want the same thing!
- Don't know that their own tradition provides more sustainable patterns
- Don't know that they will probably be forced into concrete prison boxes

The geometry of control

- Not only social life becomes a victim of geometrical control
- Trees and natural features are all eliminated because they are "dirty"
- The industrial landscape is lifeless

- Life and living urban geometry are complex, not simplistic

New role for nature

- Nowadays, nature is a threat to modernist geometry, and is only partially re-introduced as a purely decorative element
- Wholeness of site is destroyed
- We must retain, protect, and privilege nature to create a living environment

Places of significance

- Sacred spaces — places we love
- Places of community
- They exist in traditional urban fabric, but not in any of today's developments
- We have lost the sense of the sacred
- We have lost the public places we can attach to emotionally

Conclusion

- Favelas and social housing can be amalgamated into a single hybrid housing process
- Self-construction, with government support and expert advice (from us)
- We see this as the ONLY solution to a major problem facing humanity