



URBAN STUDIES & PLANNING

UJSP

Complex Adaptive Systems

Lecture 2

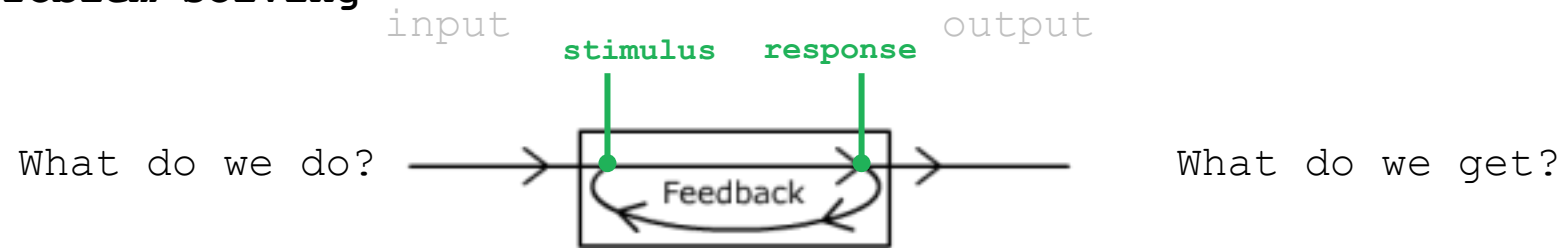
4.5.2022 Anssi Joutsiniemi



PLANNING AS LEARNING

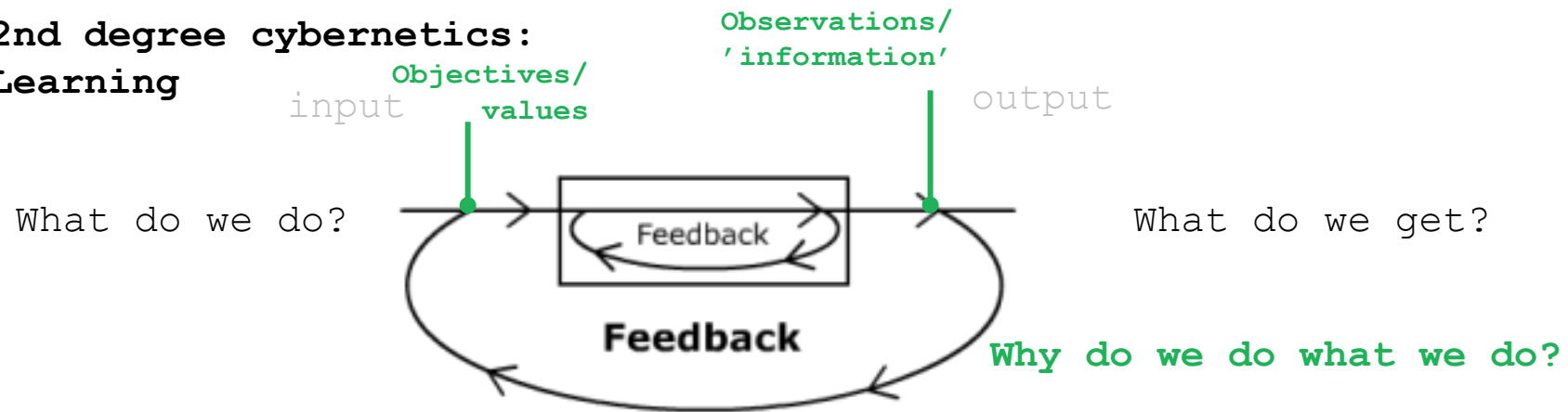
1st degree cybernetics:

Problem solving



2nd degree cybernetics:

Learning

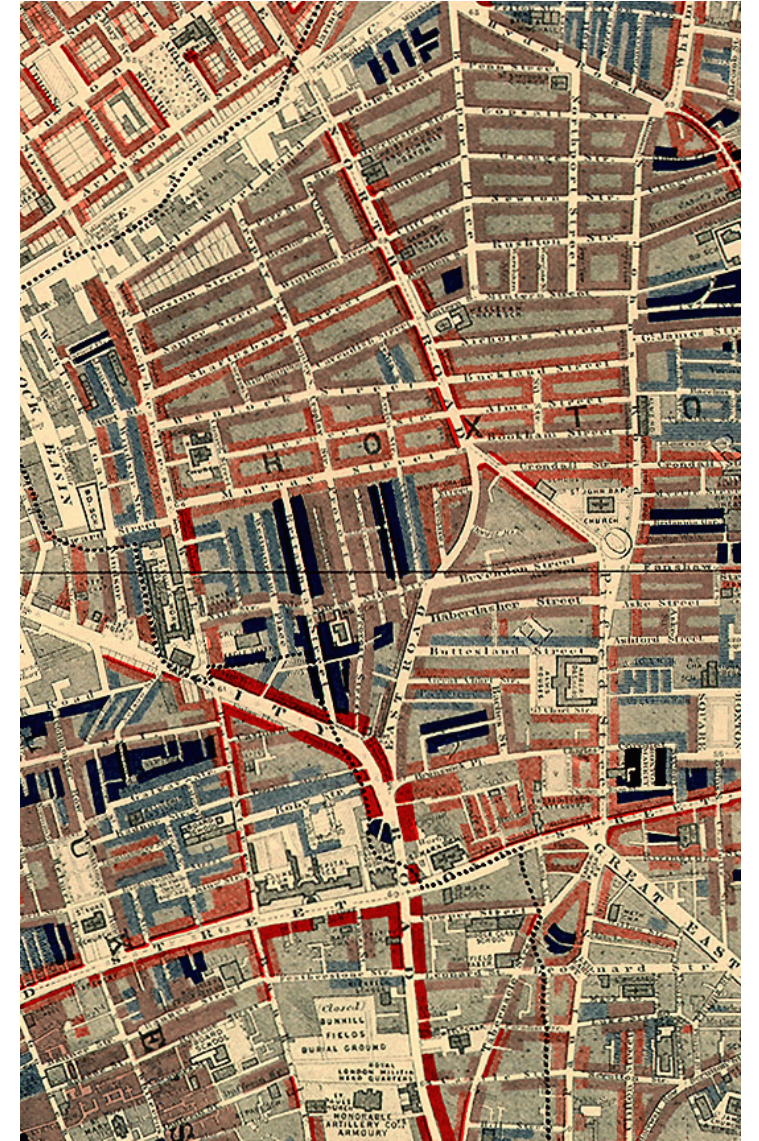


Planning and order

Emergence and Economic Behaviour

Emergence of urban orders (Webster & Lai 2004)

- **Public domain order**
 - (patterns of rights imposed upon common resources)
- **Organizational order**
 - (patterns of planned co-operation)
- **Institutional order**
 - (patterns of rules and sanctions)
- **Proprietary order**
 - (patterns of exclusive property rights)
- **Spatial order**
 - (patterns of activities over space)



(Charles Booth 1889)

Complexity economics @ SFI 1990's

- Rationality is bounded
- Information is incomplete
- Equilibrium is not achieved
- Reasoning is inductive
- Environment is changing

Related:

Mitchell Waldrop (1993). *Complexity - The Emerging Science at the Edge of Order and Chaos*

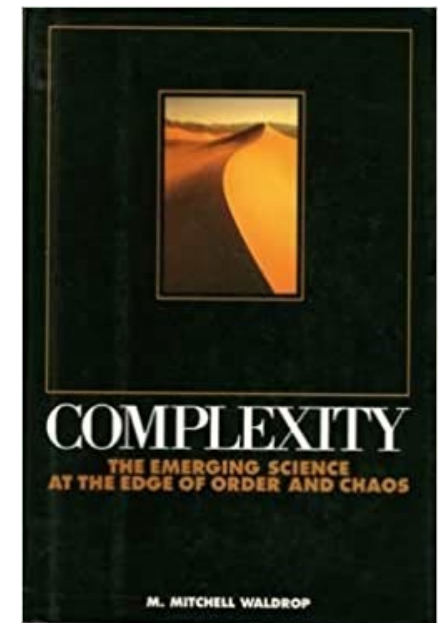
Murray Gell-Mann (1994). *The Quark and the Jaguar: Adventures in the Simple and the Complex*

John Holland (1995). *Hidden Order: How Adaptation Builds Complexity*

John Holland (1998). *Emergence: From Chaos to Order*

Kauffman, Stuart (1993). *The Origins of Order*

Casti, John (1994). *Complexification*



Cost of co-operation

- R. Coase "Nature of Firm" (1937)
 - "size & existence of groups is based on costs of searching information to transact (exchange partners)"
- Costs of co-operation
 - Exclusion cost [to protect]
 - Transaction cost [to exchange]
 - Organization cost [to combine]
 - Governance cost [to set rules]
- Allocation of scarce resources
 - Money, time, space, material

Complexity of Co-operation

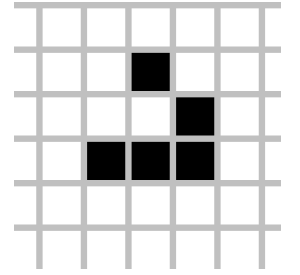
Prisoners' dilemma

- Classical example of bounded rationality in co-operation
- <https://www.youtube.com/watch?v=jUTWcYXVR5w>
- <https://www.youtube.com/watch?v=t9Lo2fgxWHw>

Iterated Prisoner's dilemma

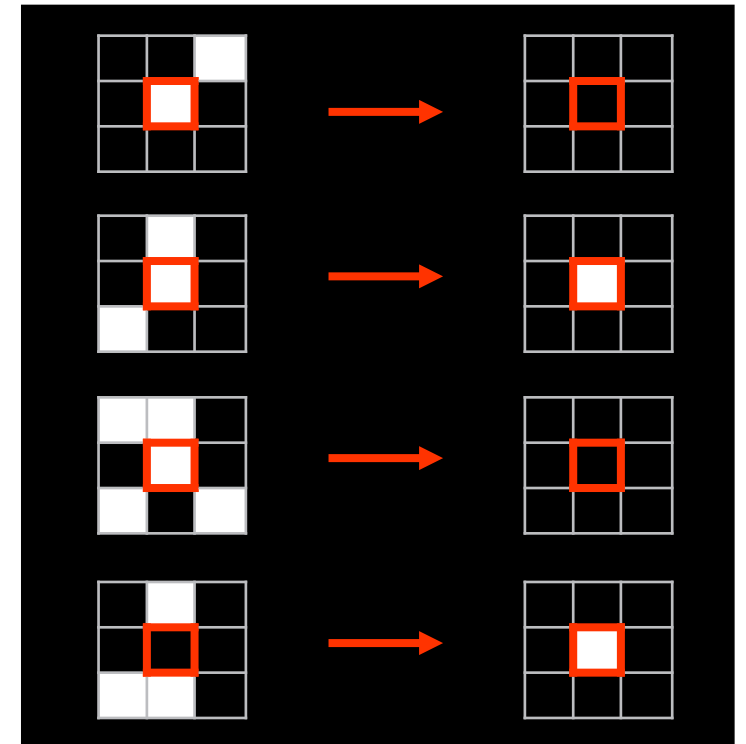
- Robert Axelrod: The Evolution of Cooperation
- <https://www.youtube.com/watch?v=B0vAbjfJ0x0>

Conway: Game of Life (1970)



Transition rules of automaton:

- Any live cell with fewer than two neighbours dies, as if by loneliness.
- Any live cell with two or three neighbours lives, unchanged, to the next generation.
- Any live cell with more than three neighbours dies, as if by overcrowding.
- Any dead cell with exactly three neighbours comes to life.



W. Brian Arthur: "El Farol problem"

- 'Bounded rationality and inductive reasoning' (1994)
- **Problem: Every Thursday night, a fixed population want to go have fun at the El Farol Bar, unless it's too crowded.**
 - If **less than 60%** they'll all have more fun than if they stayed home.
 - If **more than 60%** they'll all have less fun than if they stayed home.
- Evolution based on strategy (RULE) & memory (DATA)
 - **DOWNLOAD ARTICLE:** http://tuvalu.santafe.edu/~wbarthur/Papers/El_Farol.pdf
 - **EXPLAINED Part 1:** https://www.youtube.com/watch?v=2_h0ot56YXE
 - **EXPLAINED Part 2:** <https://www.youtube.com/watch?v=PJNmlfqh1J0>
 - **NETLOGO MODEL:** <https://www.youtube.com/watch?v=QB6GmQ2AK1o>

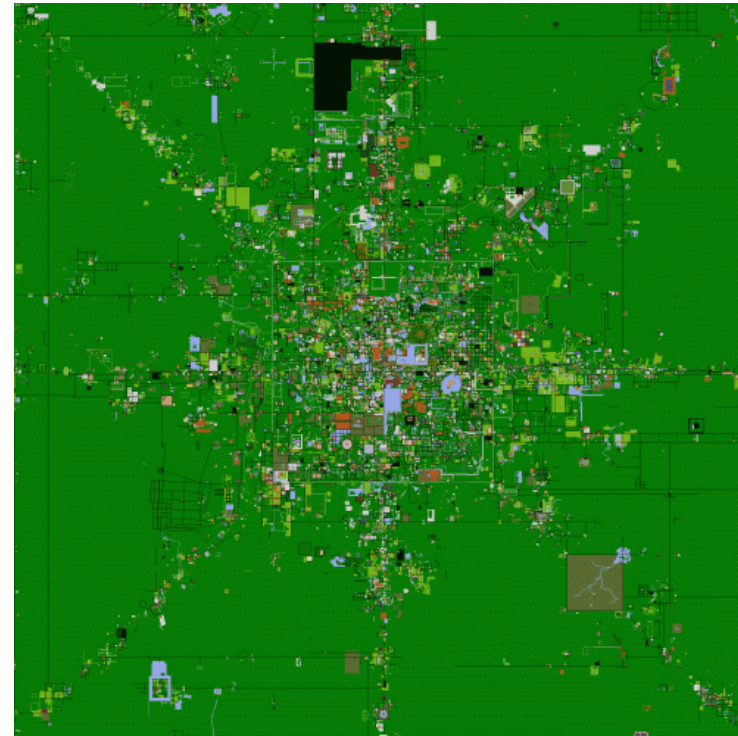
Accessibility landscape

Fundamental problem chicken-egg:

Does urban concentration create activities or activities concentrations.

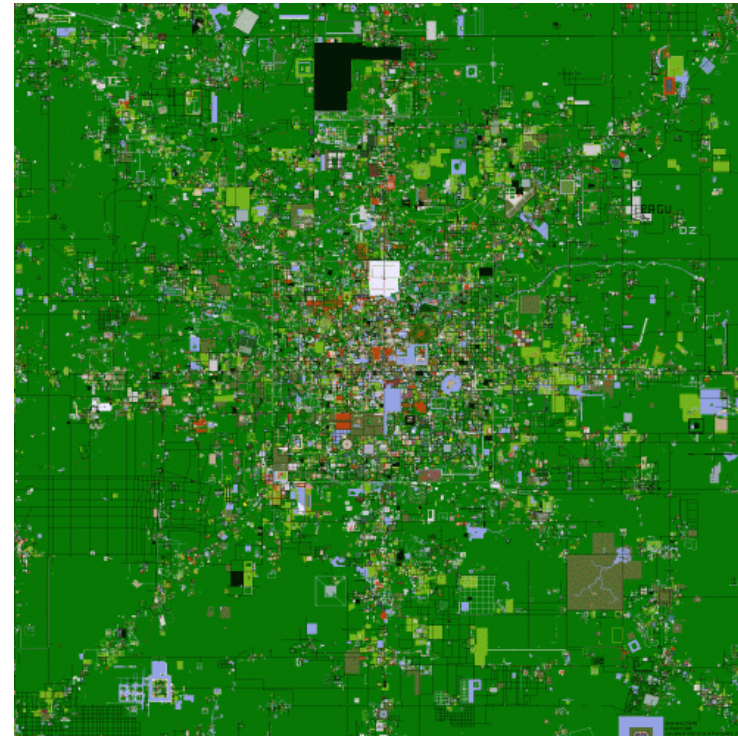
Neighbourhoods and information

- Accessibility as aspatial entity
- AlphaWorld (virtual world w/ teleportation mobility)
- Find:
 - **The origin**



Neighbourhoods and information

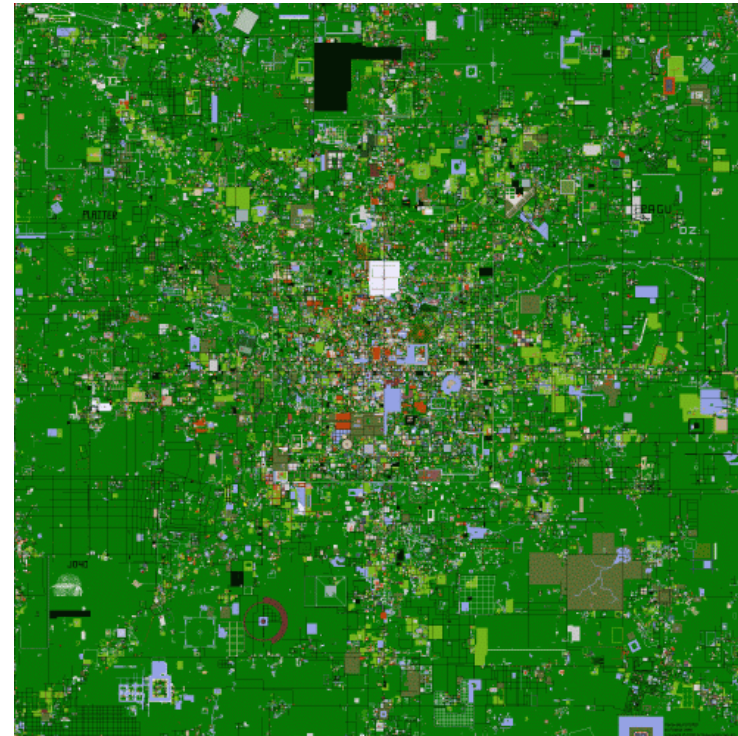
- Accessibility as aspatial entity
- AlphaWorld (virtual world w/ teleportation mobility)
- Find:
 - The origin
 - **Diagonals**



Neighbourhoods and information

- Accessibility as aspatial entity
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- Find:

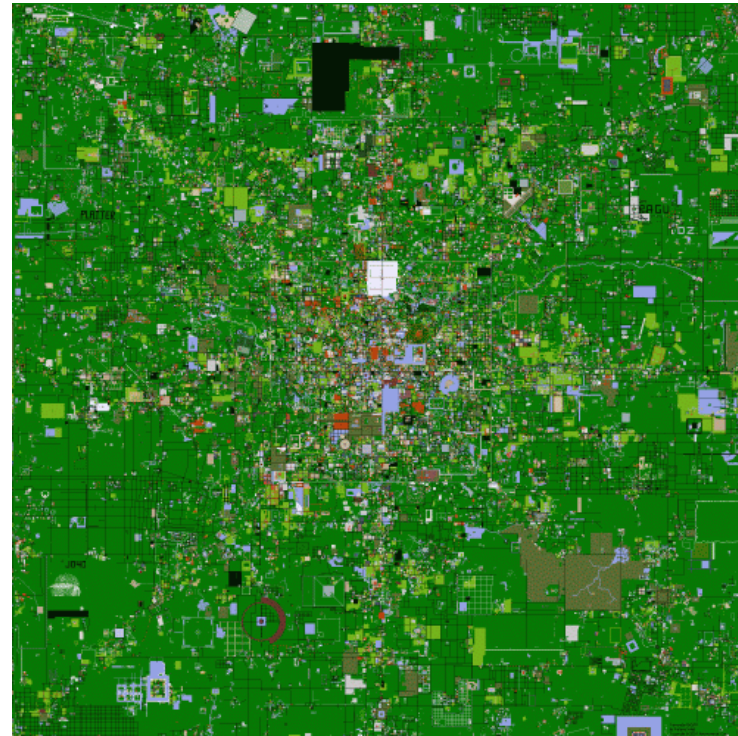
- The origin
- Diagonals
- **Sprawl**



Neighbourhoods and information

- Accessibility as aspatial entity
- AlphaWorld (virtual world w/ teleportation mobility)
- Find:

- The origin
- Diagonals
- Sprawl
- **Polycentricity**



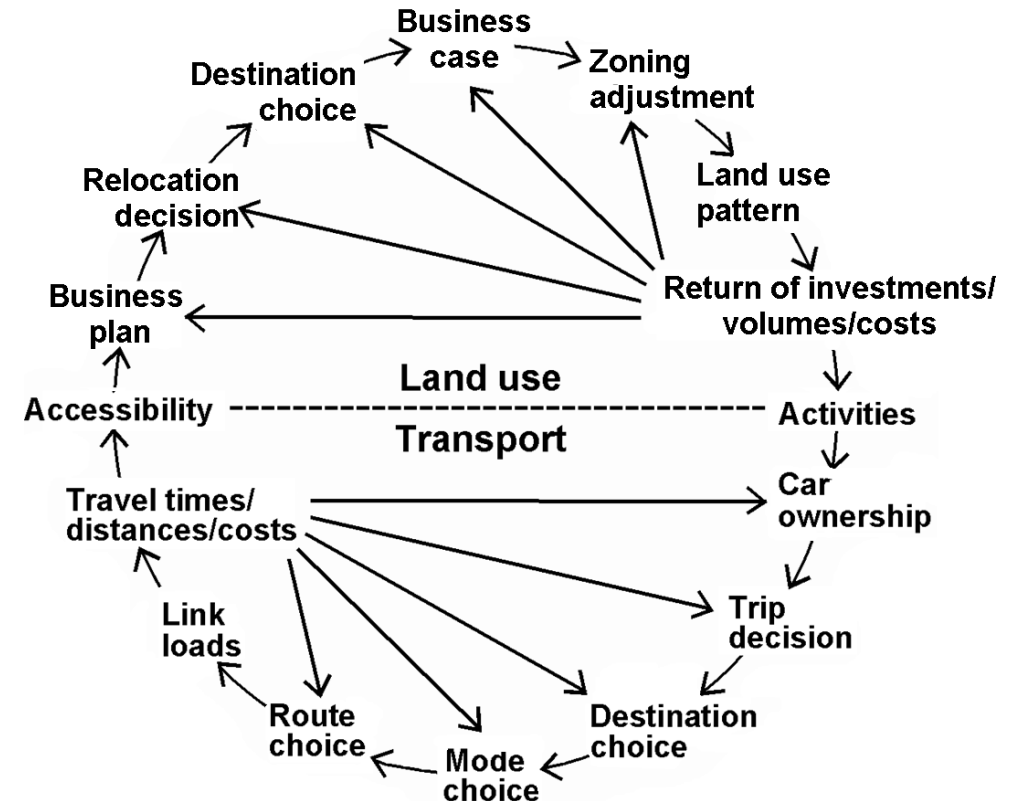
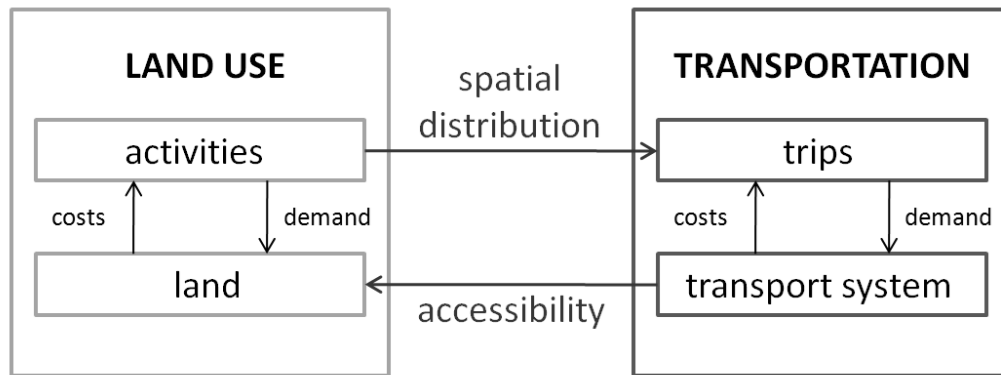
Neighbourhoods and information

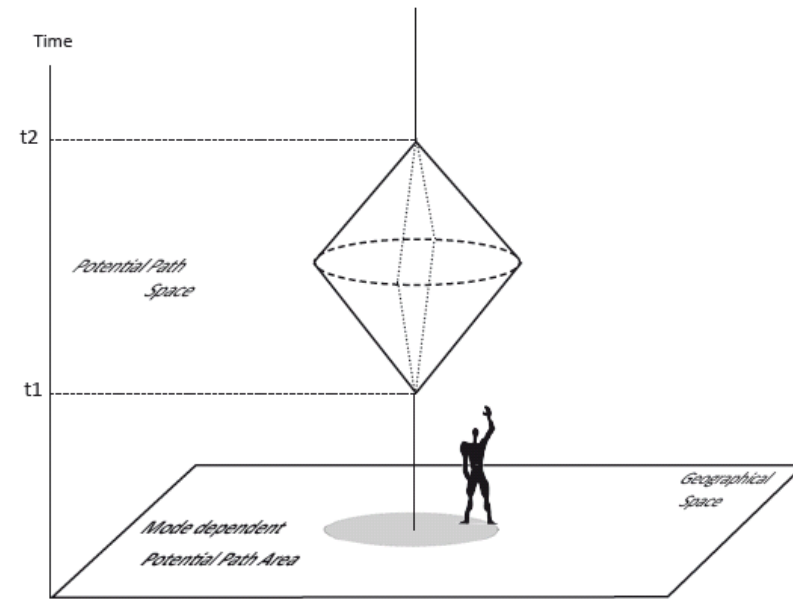
- Accessibility as aspatial entity
- SecondLife
(virtual world w/
teleportation mobility)



Land use - transportation circle

- The fundamental problem





"Accessibility" fingerprints

