

Modeling urban dynamics through GIS-based cellular automata



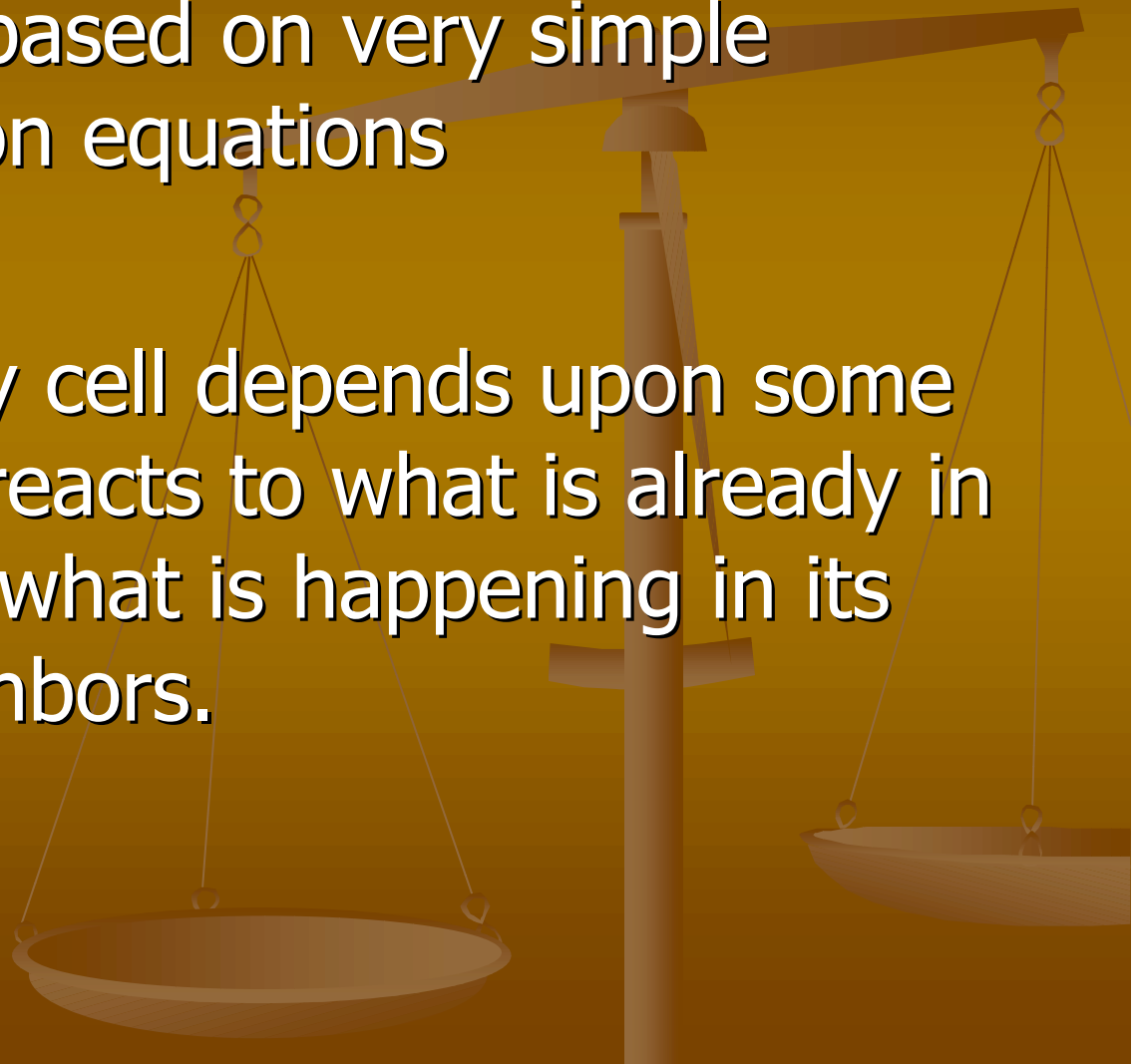
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DUEM approach

- Dynamic Urban Evolutionary Modeling
- A Cellular Automata (CA) approach
- Data is comprised of cells – raster images- where each cell has a distinct value
- Temporal processes of change are represented through local actions which are related to neighborhood relationships.

DUEM approach

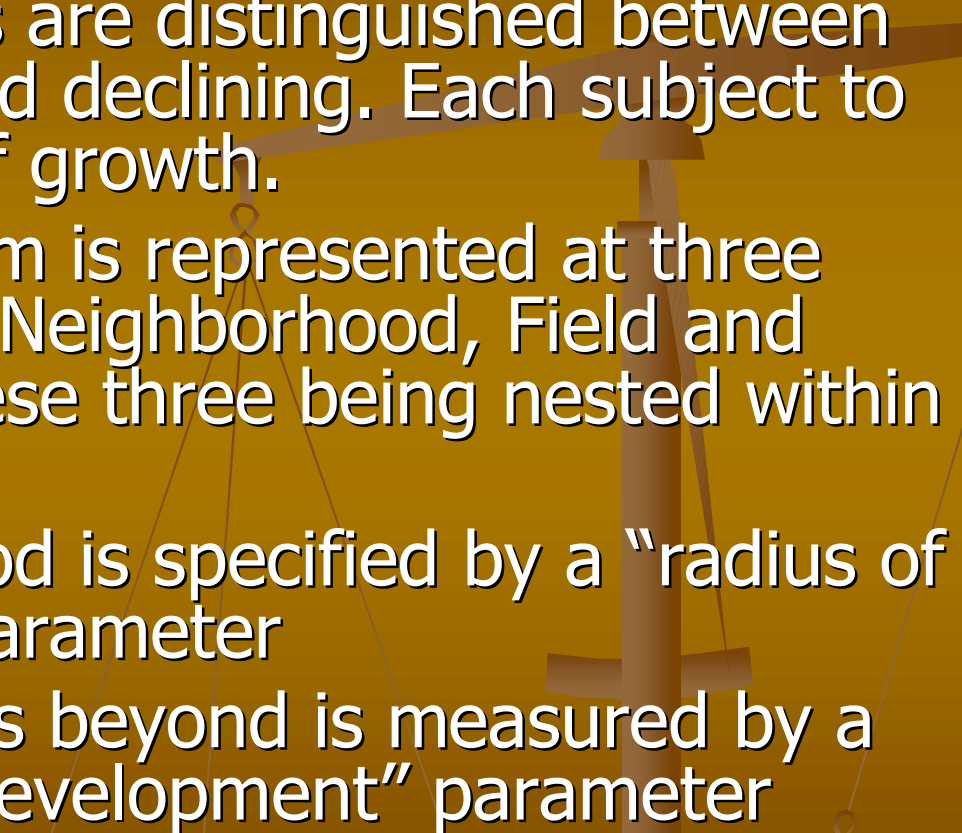
- CA models are based on very simple reaction-diffusion equations
- The state of any cell depends upon some function which reacts to what is already in that cell and to what is happening in its immediate neighbors.



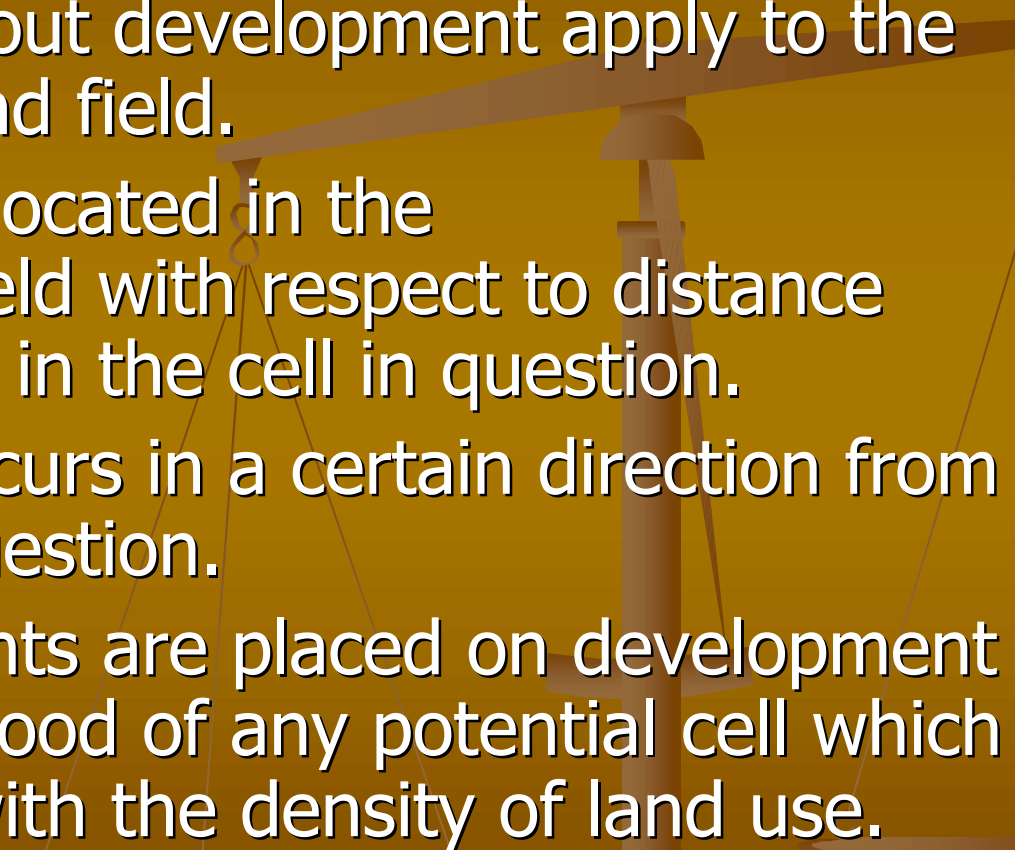
CA Advantages

- Local action in urban models can give rise to global forms which evolve and emerge spontaneously
- Temporal scales can be implemented
- Cellular grids as spatial representation neutralize the effect of configuration and remove any bias which is caused by convoluted or distorted geometries.

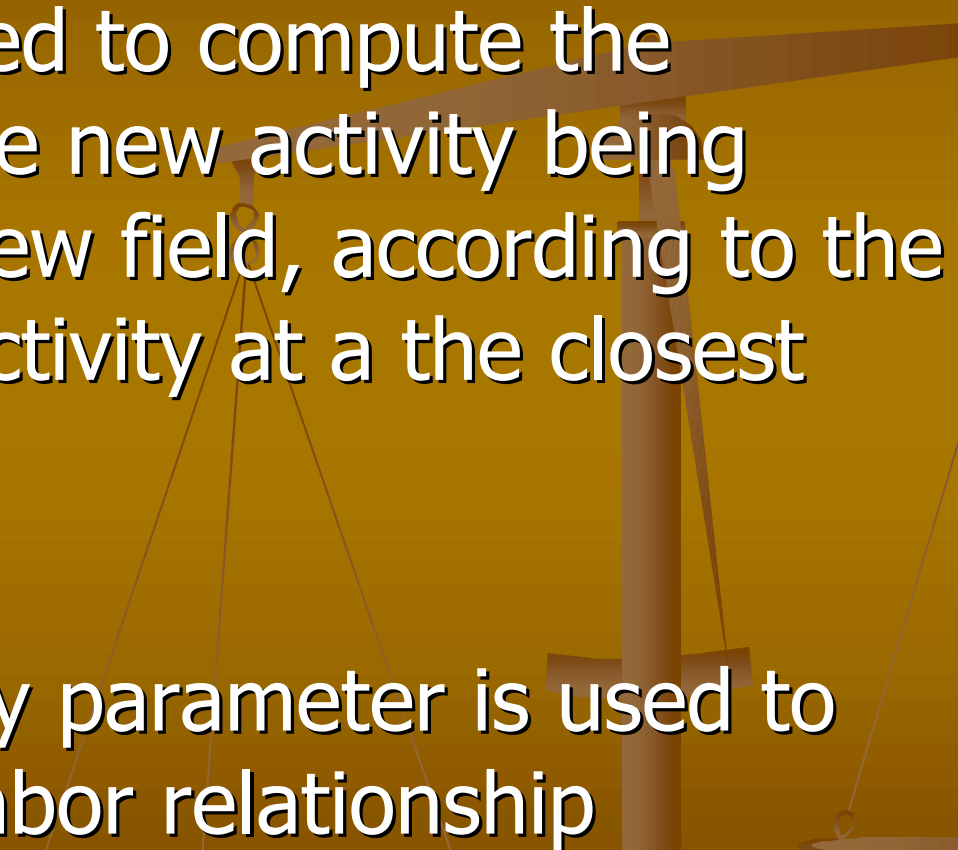
DUEM components

1. Land use classes are distinguished between new, mature, and declining. Each subject to different rates of growth.
 2. The urban system is represented at three different scales. Neighborhood, Field and Region. With these three being nested within one another.
 - The neighborhood is specified by a “radius of affected area” parameter
 - The field that lies beyond is measured by a “free length of development” parameter
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DUEM components

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- 3. Various rules about development apply to the neighborhood and field.
 - A. Development is located in the neighborhood/field with respect to distance from the activity in the cell in question.
 - B. Development occurs in a certain direction from the activity in question.
 - C. Various constraints are placed on development in the neighborhood of any potential cell which are associated with the density of land use.

DUEM components

- A function is used to compute the probability of the new activity being located in the new field, according to the distance from activity at a the closest neighbor.
 - A distance decay parameter is used to model the neighbor relationship
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Lets Check Out the Model!

