

Morphology of the land parcel mosaic: The key to understand the urbanization process

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Many structures both natural and artificial such as cities, arise as a result of continuous complex processes. These processes transform the environment and leave behind a characteristic spatial structure a kind of their morphological fingerprint. In some cases it is possible to infer the nature of the process from the observed morphological structure. In my presentation I discuss the fragmentation of land accompanying the urbanization process. Here, the morphological fingerprint is the mosaic formed by the land parcels. The parcel pattern exhibits only three, well-defined morphological types. Each type is unambiguously determined by the shape of the distribution function of the parcel sizes. The following three types of the parcel size distribution are found: (1) power-law distribution with the exponent equal to 2, (2) power-law distribution with the exponent equal to 1, and (3) log-normal distribution. They correspond, respectively, to a highly urbanized core of a city, rural area, and suburban area. These regularities indicate that some universal mechanism underlies the process of land fragmentation by humans. In my presentation I present also a mechanism of the city formation within a two-dimensional bond percolation. Within this model, a city is formed from the collection of settlements when the density of urban street network reaches some critical value corresponding to the percolation threshold. The model reproduces faithfully all properties of the morphology of the parcel pattern observed in the city cores analysed.