# Using fractal dimension for characterizing urban spatial structure diversity

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The objective of this paper is to compare fractal-based parameters calculated by fractal methods for urban built-up areas and to link the observed spatial variations to commonly used variables in urban geography, urban landscape or land use planning. Concepts of fractal, scaling and fractal dimension have been widely used in physical and human geography. Fractal dimension are often used as globe index describing urban morphology and growth processes. Inappropriate methods are likely cause bias for measuring fractal dimension. Fractal dimension of urban built-up areas is related with their distributions and regularities. Thus it should be varying with time and location at a micro scale. In this paper, fractal dimension is regarded as a local index; and an improved box-counting method is designed and used to measure it. This approach is applied to Tokyo Metropolitan Area (TMA) for 1974, 1979, 1984, 1989, and 1994. Analyses show that fractal dimension is not only ideal for describing the urban morphology of TMA, but also for exploring the spatial and temporal. Interesting associations are to be found between the fractal dimension and land value, distance, and zoning regulations. Despite its limitations, fractal analysis seems to be a promising tool for exploring the diversity and simulating urban the evolution of urban spatial structure. The model is robust; it can reflect the urban spatial regularities and patterns, hence it could possibly fruitfully be integrated into urban simulation processes.