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2008

# Street Layout and Connectivity: the Evolutionary Consequences of Normative Models

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**Abstract**

Morphological differences between street patterns have been described and documented using measures which capture the spatial connectivity and density of each type.  Dill (2003) described the most common measures, which include intersection density as well as the distance between those intersections, block density as well as the average block size, and street density.  The usefulness of the measures has been demonstrated by applying them to limited samples of urban areas to show how they capture intuitively evident morphological differences, for example between the grid street patterns and the cul-de-sac (Jacobs 1993).  Other studies have used these measures to demonstrate correlations between form and different aspects of function – pedestrian usage (Hess 1997), car usage (Crane and Crepeau 1998), or patterns of land subdivision (Southworth and Owens 1993) just to name a few.  More recently two new measures have been proposed. "Metric reach" captures the sum of street length reached from the middle of each road segment when moving outward in all possible directions for a given distance; "directional distance" measures the number of direction changes needed to get to all accessible parts of the system. (Peponis, Bafna & Zhang 2008).

Using GIS data from ESRI StreetMap 2003, we created a large database and analyzed 118 sub-areas, within the 12 largest metropolitan regions of the US, to compare the familiar planning measures along with the two new measures.  We have explored correlations between the measures to ascertain that they consistently capture differences in street layout. We then used them to capture coarse distinctions between different periods in planning history, particularly as the sample was divided – initially by a significant point in history, the year 1950, and then, by the overriding morphological principles governing the configuration of the street network.  Thus, we have quantified the familiar transformations associated with the suburbanization of the American metropolis – the creation of sparse, poorly connected, unintelligible space (Peponis, Allen, Haynie, et al. 2007).

In this paper, we focus on particular projects and areas of historical significance, mostly in the pre-World War II period, including Riverside, Radburn, and the Whitten study for New York.  We use the analysis in order to discuss the influence of these projects on subsequent developments. Specifically, we are interested in distinguishing between evolutionary trends which transform street layout but preserve connectivity, and trends which lead to increasingly less connected environments.