



ABU DHABI AND DUBAI URBAN ANALYSIS

Posted on April 5, 2024 by Gabriel Sastre



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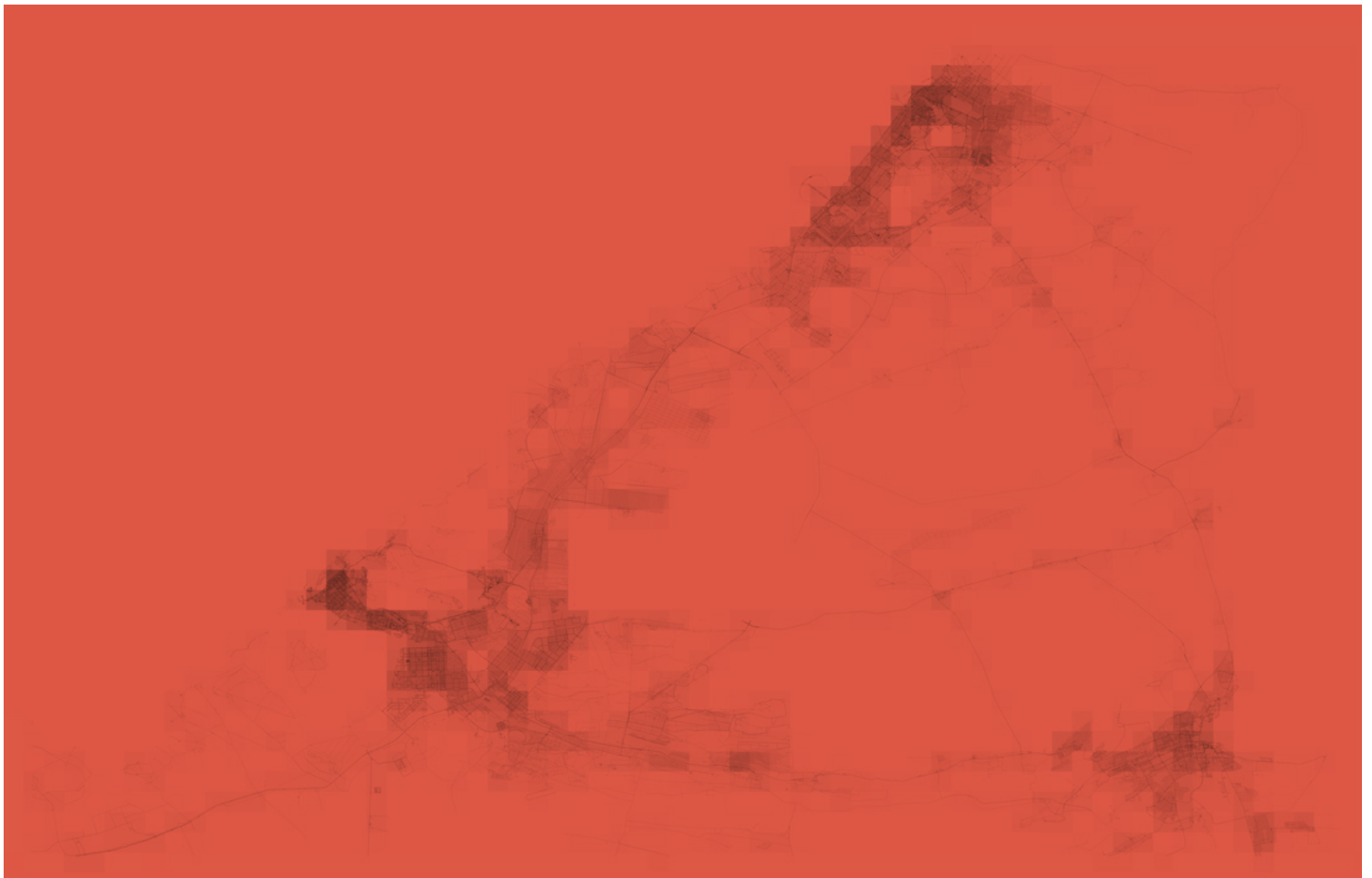
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The analysis presented in this post use the primal approach of Multiple Centrality Assessment (MCA) for several reasons. First, MCA closely follows topology as well as distance, which means that the analysis includes both the lengths and the geometrical properties of the street network. By contrast, space syntax ignores the physical length of the network. Instead of street lengths, *Space Syntax* uses the concept of depth—a measure of steps taken as one turns from one street to the next street.

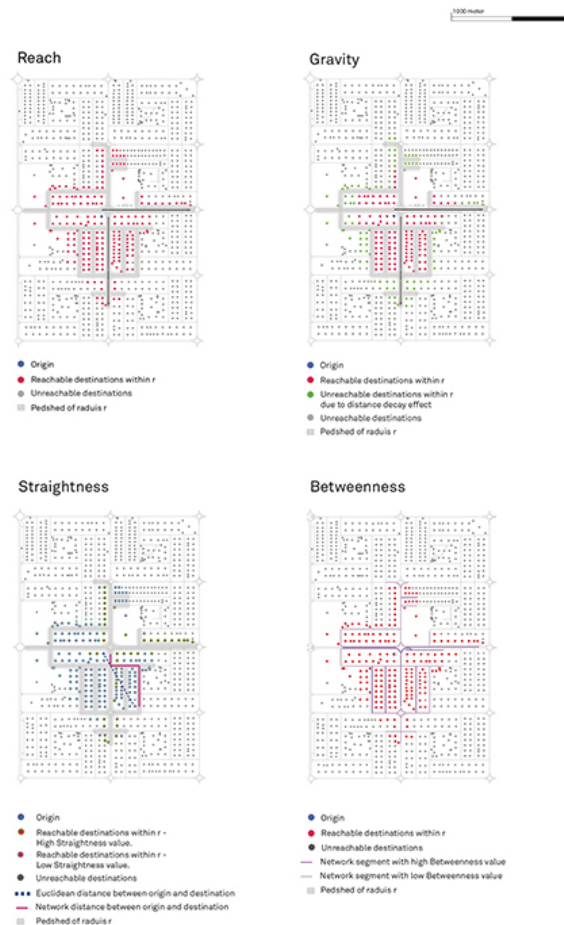


By focusing on topological step distance and ignoring real distance, the space syntax approach makes the perception of cities more abstract (Porta et al. 2006). According to Porta et al. (2006) and Ratti (2004), MCA should be preferred for configurational analysis because it is “more realistic”. They argue that metric distance is considered one of the main properties of the built environment in

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various fields, including urban planning, transportation planning, urban design, and geography, and that MCA respects its importance by integrating metric distance into its calculations (Porta et al. 2006).



Consequently, street and alley densities have units of kilometer per hectare (km/ha), and intersection densities are calculated as the number of intersections per unit area. Building and land-use data include neighborhood area, plot sizes, plot dimensions, plot density, building density, residential and non-residential uses (daily uses), and system of land-use distribution. Obtained GISdata from stakeholders does not include alleys. Therefore, alleyway networks for all studied neighborhoods have been digitized.

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Aerial image analysis completed through site visits allowed our team to trace and digitize the existing alleyway networks in the studied neighborhoods of both Abu Dhabi and Dubai. Alleyways are critical components of a non-motorized transport network. Thus, this book incorporates the alley network into its analysis together with the street networks. The digitized alleyway data can be easily integrated into the stakeholders' existing GIS database. The updated GIS database can then be used for future spatial analysis to obtain accurate results.

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The morphological maps and GIS data were further used as inputs (base maps) to Rhinoceros 3D(Rhino) for Urban Network Analysis (UNA) and as a database for interpreting simulation results. For the network analysis, the researchers used Urban Network Analysis (UNA), a toolbox created by the City Form Lab at the Singapore University of Technology and Design in collaboration with MIT.

Sample Scale — Sample 01

FIG. 15.3
Gravity
Scenario 1: Streets Only

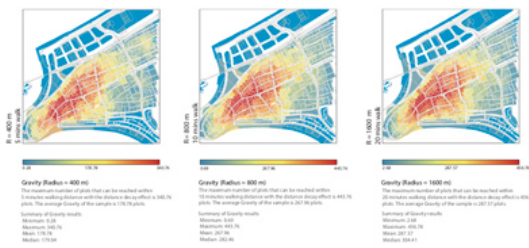
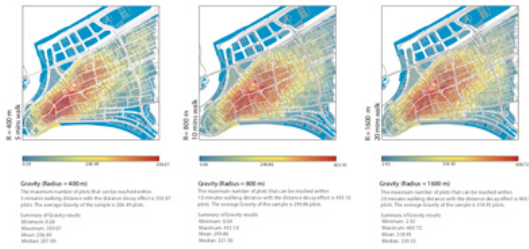


FIG. 15.4
Gravity
Scenario 2: Streets + Alleys



At a 400 m radius, high Gravity values ranging from 178.78 to 340.76 are obtained by plots located near the intersections of internal and collector streets. At 800 m and 1,600 m radii, Gravity values become even higher at the same spots. As the radius of analysis increases, Gravity values increase for all plots, as is evident from the rising Minimum, Mean, and Maximum values shown above. With the introduction of alleys, at a 400 m radius, high Gravity values

concentrate at the same spots near the intersections of internal and collector streets. At 800 m and 1,600 m radii, the distribution of Gravity values does not change. The highest Gravity values of 453.30 and 469.72 at 800 m and 1,600 m respectively are found near intersections of internal and collector streets. The distribution of Gravity values does not notably change when the radius is increased; however, the values improve slightly.

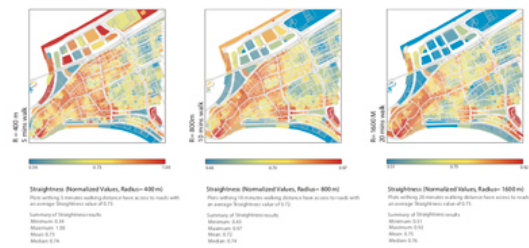


FIG. 15.5
Straightness
Scenario 1: Streets Only

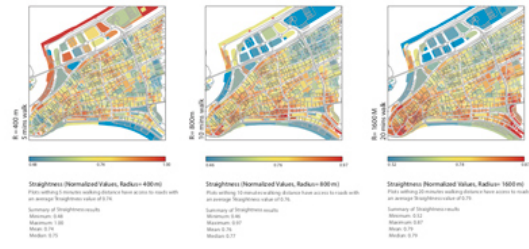


FIG. 15.6
Straightness
Scenario 2: Streets + Alleys

At a 400 m radius, high Straightness values (0.75 to 1.00) are obtained by plots that lie adjacent to collector and arterial streets. At an 800 m radius, Straightness values increase for low-performing plots, while the distribution of values does not change notably. At a 1,600 m radius, high Straightness values prominently appear near the tip of the Creek located at the bottom left corner of the sample. With

the introduction of alleys, at 400 m, high Straightness values (0.75 to 1.00) do not form any cluster and are distributed evenly. At 800 m, high values can be observed near the intersections of internal and collector streets. At 1,600 m, high Straightness values are visible along the arterial street at the bottom and towards the tip of the Creek.



This toolbox is used as a plugin into either GIS or Rhino to conduct graphical and mathematical network analysis in order to describe the spatial patterns of urban areas. UNAs are used to both visually and mathematically understand efficiency and centrality in different neighborhood forms that originated in different morphological periods or growth phases. Morphological periods are time spans characterized by a repetitive use of similar street patterns, land use systems, or building densities reproduced over a certain amount of time until they are replaced (Whitehand et al. 2014).

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