Istanbul: A Configurational Model for a Metropolis

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Abstract
The characteristics which make Istanbul distinctive among the world cities are; it's rich heritage of two Empires, a city bridging two continents, nodal point of international transportation, center of international connections, center of historical, cultural and commercial activities, primary center of industry and economic core with an urban population of 10 million.
This paper examines the spatial development of the metropolitan area of Istanbul by adapting "Space Syntax", land use and Central Business District (CBD) characteristics are explored in the light of the "Sub-region Master Plan of Istanbul" prepared by the Greater Municipality of Istanbul.

Keywords:
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Methodology for Analysing the Spatial Structure of Isntanbul

Istanbul is a linear city developed for more than sixty kilometers along the Marmara shores on each side of the harbour. Its population and industry are divided almost equally between the two sides of the city, Europe and Asia.

In order to investigate the spatial characteristics of Istanbul and to facilitate the development of these characteristics with the land use and the CBD pattern, computer models of the public space structure of the city have been generated. The research uses a method of computer modelling known as the "axial map" developed at the "Space Syntax Laboratory at University College London". This is a map of all the public spaces of the city represented as a matrix of axial lines (the longest possible lines of sight and movement). The map is the basis of a graph-theoretic analysis of the configuration of public space.

A series of images of the axial maps are presented below, showing the spatial development of the very large part of Istanbul which covers the area approximately within the first and second bridge connections of the Bosphorus. The maps of 'global integration' show the accessibility of each street to every other street in the system considered as a whole. The 'local integration' and 'radius-radius' maps show the accessibility of each street within a restricted local area. The different numerical data available from these measures can be used quantitatively to explore the changing spatial structure of the city both in parts and as a whole.

The Historical Development of Istanbul's CBD

There is a striking dispersal of the CBD in the metropolitan area of Istanbul. In the 1970's, there were nine centers spread within the city, each with their own characteristic internal structure. In size order, starting from the largest, these are (1) Eminonu, (2) Karakoy, (3)

Fig. 1 Global integration radius-n of Greater Istanbul in the year 2000

Beyoglu, the area between Tunel and Taksim square, orientated along the main thoroughfare, Istiklal Caddesi, (4) Kadikoy (5) Osmanbey (6) Besiktas (7) Aksaray, (8) Mecidiyekoy (9) Uskudar as marked on Figure 2.

Fig. 2 Local Integration radius-3 of Greater Istanbul in year the 2000 1970's CBD is marked as: 1) Aksaray, 2)Eminonu, 3) Karakoy, 4) Istiklal Street, 5) Osmanbey, 6)Mecidiyekoy, 7)Besiktas, 8)Uskudar, and 9) Kadikoy

The CBD expanded linearly by following the lines of topography and the level of topography has had its effect on the expansion of the CBD activities in the new areas. Eminonu district of the historical peninsula, Karakoy, the area between Tunel and Taksim Square, orientated along the main thoroughfare Istiklal Caddesi, Osmanbey, Sisli and Mecidiyekoy are connected to each other linearly. Of the districts listed, Eminonu and Karakoy can be noted as the most important CBD of 1970 and although they are separated physically by the Golden Horn, they are also connected by the Galata bridge. Istiklal Street in Beyoglu, links the historical center to the newly developed ones and still has the most lively and dense CBD functions. Eminonu and Karakoy and the three others, separately located - Besiktas, Uskudar and Kadikoy - are developed along the coastal lowlands near shores.

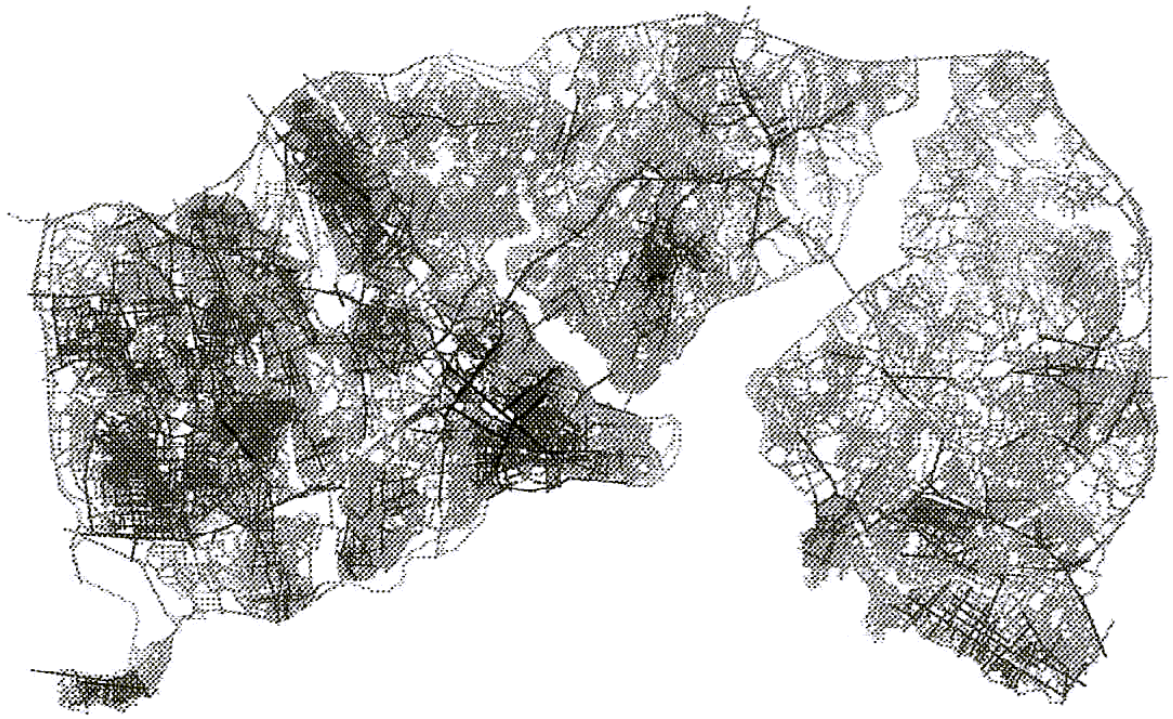
The expansion of the historical core reaches to the Mecidiyek□ y and Maslak axis where 2000's CBD is developing. The main reason for the expansion of the CBD is the construction of the two bridges, Bosphorus and Fatih Sultan bridges. These two passages between Europe and Asia not only serve European-Anatolian through traffic but also Istanbul's inner city traffic. The bridges encouraged motor vehicle traffic and also caused the development of the new CBD northwards to the Black sea coast.

Syntactic Analyses in Macro Sacle in the Metropolitan Area of Istanbul

In order to analyse the area of inner Istanbul, axial representations of the very large part of Istanbul shown in Figures 1 to 5, covering the area approximately within the first and second Bosphorus bridge connections, are prepared.

Figures 1-5 are a series of analyses of integration at different radii. Figure 1, the radius-n analysis shows the most global structure of Istanbul with a strong edge to center pattern centred on Vatan Street of the historical core. This points out a linear development starting from the historical core and continuing on the main road connections of the first Bosphorus bridge. The axial map defines a quite segregated urban form which has a mean depth of 19. Figures 2, 3 and 4 are radius-3, radius-6 and radius -10 analyses, which highlight a much more

Fig. 3 Local integration radius-6 of Greater Istanbul in the year 2000



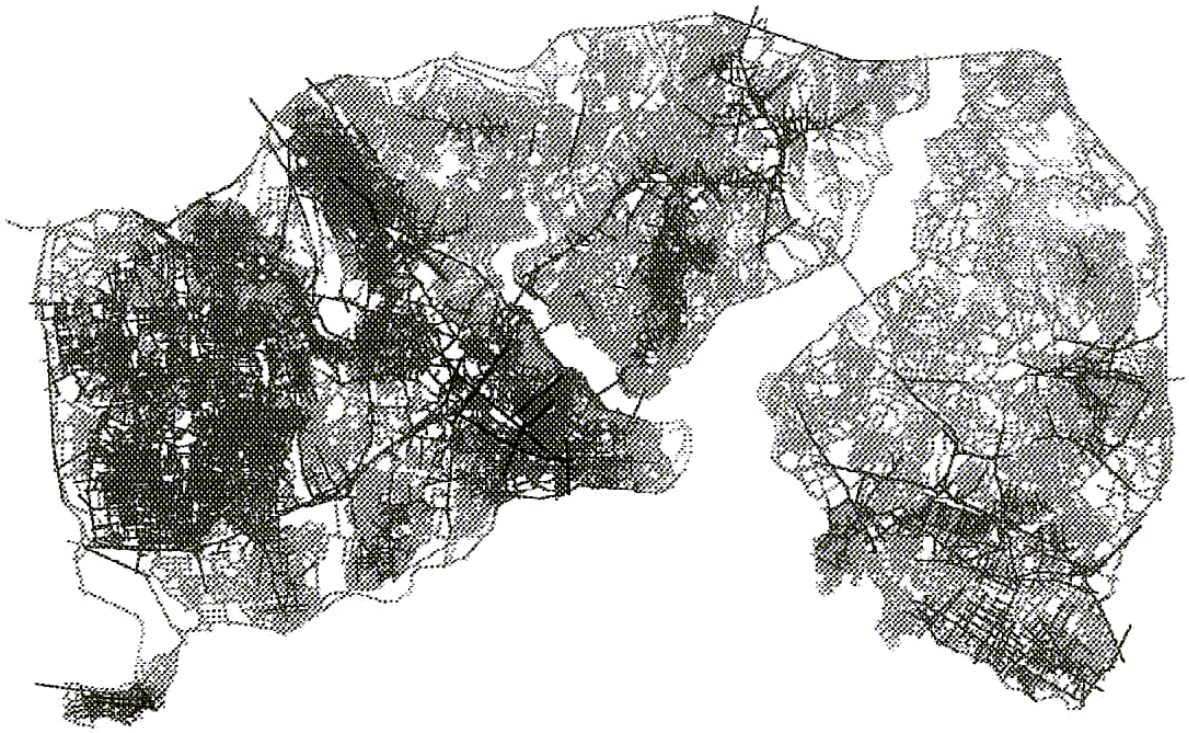


Fig. 4 Local integration radius-10 of Greater Istanbul in the year 2000

localised structure including most local shopping streets, but also picks out Vatan Street as the dominant integrator. This implies that Vatan Street of historical Istanbul is still keeping its CBD functions (which is the reason for movement) and is not only the strongest global integrator of Istanbul as a whole, but also the strongest local integrator of its surrounding area. In the radius 6,10 and 19 analyses, it is intentional that the integration analyses are set at the mean depth of the whole system from the main integrator. The effect of a radius-radius analyses is to maximise the globality of the analysis without inducing edge effect, that is the

Fig. 5 Local integration radius-19 of Greater Istanbul in the year 2000

tendency for the edges of spatial systems to be different from the interior area because they are close to the edge. The figures show a remarkably true-to-life functional picture of the metropolitan city as a whole, highlighting all the main in and out routes and the linear development of CBD functions.

The reason that a spatial analysis can give a true-to-life functional picture is due to the powerful influence that natural movement has on the evolution of the urban pattern and the distribution of land use. To test this properly, a small area within the system is selected, the area which causes more movement activities around the "Covered Bazaar" of the historical core. Observed movement rates of pedestrians and the number of shops on each line segment throughout the working day are then indexed. Figure 6 is the axial representation of the case area where Figure 7 defines scattergrams plotting pedestrian movement of the sample area against radius 3 integration. This has a predictibility value and is 0.7526 for the movement rates during the week days, 0.7694 on Sundays and 0.6929 for the number of shops. The R-squared value shows that about three-quarters of the differences between line segments in their movement rates are due to their configurational position in the larger scale grid. The integration maps of the selected sample area also have some parallels with the larger area maps since Ordu Street, the backbone of the historical core, is defined as one of the integrated lines.

Fig. 6 a) Distribution of the global integration radius-n of the Kapalicarsi case area. b) Distribution of the local integration radius-3 of the Kapalicarsi case area

The old core of the city which caused much of the movement rates, developed linearly - starting from the historical core to the recently developed CBD- by following the topographical lines of the city and still exists. The configurational model with global integration does not define this linear development of the 1970's CBD of the city as an integration core although the Vatan and Ordu Streets of the historical peninsula have the most integrated lines. It is better defined in the radius 10 analysis.

The radius-n map of Istanbul with its intelligibility value (0.0254) defines a less intelligible system. The integration map with, a mean integration value 0.4381, gives a segregated structure, although the most integrated lines pass through the main old CBD of Istanbul

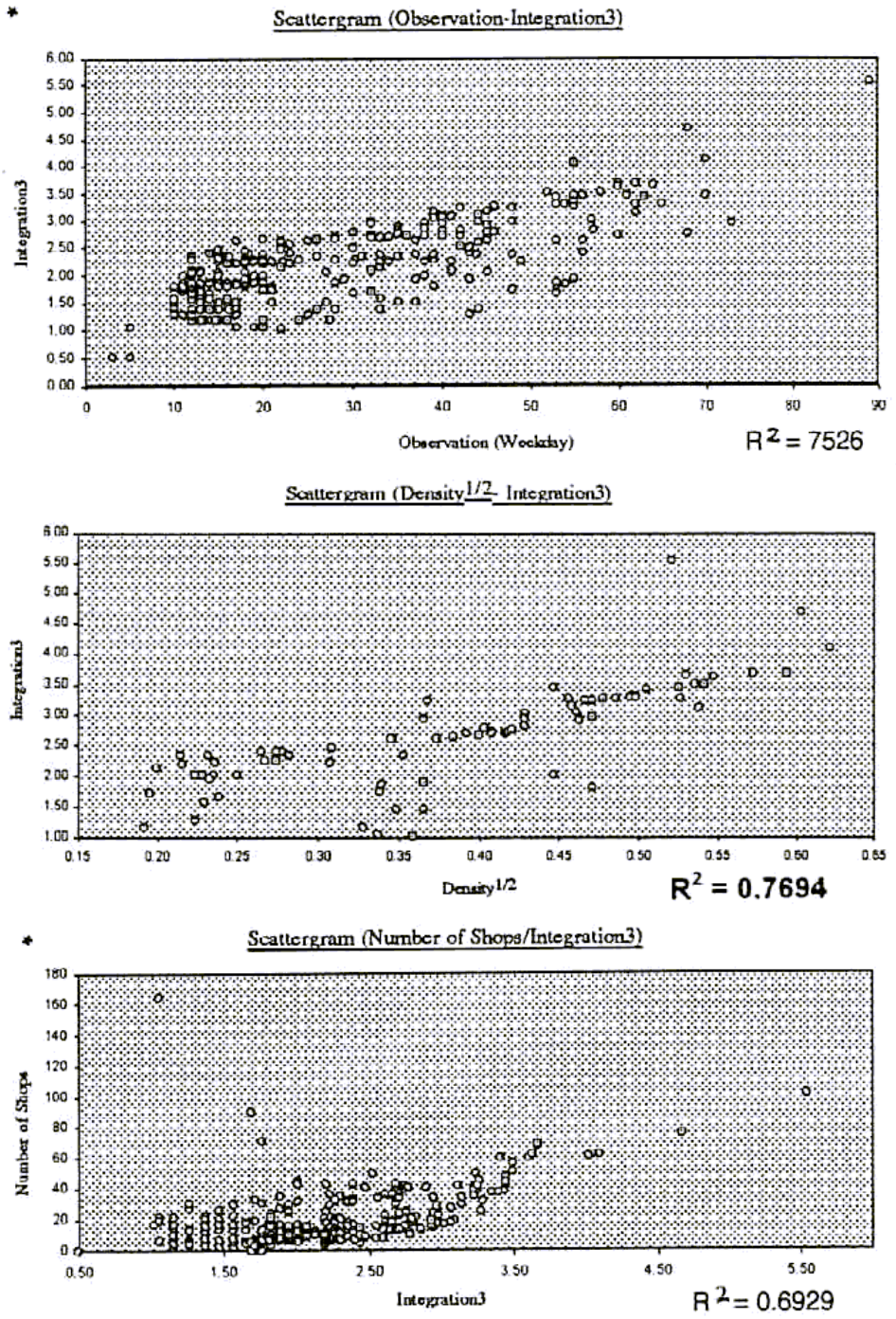


Fig. 7 a) A scattergram plotting int.3 against movement rates in weekdays in the Kapalicarsi case area. b) A scattergram plotting int.3 against movement rates on Sundays in the Kapalicarsi case area. c) A scattergram plotting int.3 against number of shops in the Kapalicarsi case area.

and through the densest traffic routes of the city. The rad 6, rad 10 and radius-radius maps define sub-centers in the metropolitan area. This multi-centred structure which reflects the actual characteristics of Istanbul, also has some parallels with the targets and policies of the master plan of Istanbul proposed by the "City Planning Directorate of the Greater Istanbul Municipality" (1995), such as:

* in order to achieve population decentralisation in the highly populated urban areas, the development of the sub-centers must be encouraged;

* a linear and multi centered development should be emphasised;

* the transportation and the infrastructure system should also support this linear development within the whole metropolitan area;

* the historical and national structure of the peninsula must be preserved. In this respect, the development of CBD activities should be restrained and the historical trade and tourism center should be preserved in the historical zone. In the outer zones of the historical city walls a new CBD with an international management center should be emphasised in order to decrease the pressure of the existing CBD;

* in order to improve the standards of technical infrastructure and decentralise the population, new attraction centers should be proposed;

* the physical development of the sites along the Bosphorus, Golden Horn, and the area within the historical walls which define the identity of Istanbul, must be controlled and protected from land uses causing high population. They should be preserved from the pressures of the dynamic physical development and should be cleared from land uses such as storage, production and industrial activities. The urban development pressures on the historical peninsula and on the Bosphorus, which reflect the signs of the traditional urban structure, should be drawn towards the east and west poles of the city by creating new attraction zones;

* encouraging the service sector in the metropolitan area of Istanbul whilst ensuring decentralisation of industry on both regional and country wide levels;

* ensuring a balanced distribution of centers in the entire metropolitan area;

* abandoning the concept of concentric development, as it is found to be the biggest danger that can destroy the historical identity of Istanbul. The policies for realising this aim are; improving the existing CBD, developing ranked sub-centers, creating new attraction zones, and removing the administration buildings and related public institutions from the city center whilst distributing them to the sub-centers;

* considering east and west sides as individual regions; ensure the balanced distribution of sectors for a preferable population-employment relationship.

Conclusion

The results of this paper, have outlined the spatial configuration which implicate the CBD locations, thus the development policies related to the metropolitan area of Istanbul which can be regarded as a megapolis. The pattern of pedestrian movement on a sample area correlates strongly with the configurational parameters calculated by the model, implicating the configuration in the potential for interaction that occurs on the settlement. If this methodology and model is adapted to the planning practice, then the potential of a more systematic approach to the study of the city may be realised in terms of better planning.

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