Exploring Possible Extension to Commercial Development of Comilla City, Bangladesh: A Perspective from Space Syntax

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ABSTRACT

Comilla city has a long history of urbanization. Due to urbanization, the City is facing intense development including road networks. Comilla is a hub of road communication of eastern part of Bangladesh. *'The Grand Trunk Road'* which passes through the city is known to be as one of the oldest highways of Bangladesh. At present, the most important Dhaka–Chittagong Highway road follows a by-pass route within the city from the district cantonment to *Poduar Bazar*. These road networks have a great influence in the commercial development of the city. Integration of road network is very important factor for commercial development. More integrated road networks make more incorporated commercial development. The question is which one is the most integrated road in Comilla City and in which area the further commercial development will take place? In attempting to answer these questions, the paper aims to study and analyze the road networks and integration values with integration core of Comilla City through space syntax method using the software "UCL Depth map" (version 10). This research will also investigate the relation between road network and Commercial development and will provide a guideline to identify the possible future expansion of the commercial zone.

Keywords: Commercial development, road network, Comilla City, Global integration, local integration, axial map

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INTRODUCTION

Considering Dhaka (Capital City of Bangladesh) as an example, the development processes is threatened by rapid urbanization and increasing population , over 30 times within the period of 1951 to 2001 (GOB, 2003). The city is experiencing the rapid increase of scattered and unplanned land development without appropriate guidance resulting in immense land use and transport deficiencies in the city. In all stages of historical growth process it is found that the retail centers in Dhaka are growing mainly along the major accessible routes in the city and the retail developments have grown along the integrated streets in the global context of the city (N. Hossain, 2014). In planned Dhanmondi Residential Area the integration core follows mainly an unplanned commercial growth, the second highest values is basically includes the educational, official and other purposes (B. Ahmed et al. 2009). The physical expansion and functional growth of the city is affected by the crisis in the transportation system and the entire social and physical environment it is progressively deteriorating which causes suffering and inconveniences to the people (Mahmud et al 2010).The extension part of Dhaka city is also facing the same problem. Comilla City being one of the business cities in Bangladesh is also facing spontaneous rapid growth without any prior or systematic planning and the physical characteristics are gradually changing. Lack of proper planning and future growth assumption can lead the Comilla City in a chaotic situation like Dhaka. Unplanned zoning of commercial land use will hamper business development of the city and will create a negative impact on the surrounding land use. As commercial development is closely connected with the integrated road network, proper placing of commercial zone is possible if we can identify the integrated road networks of Comilla City. It would be a better way to work with the future intensity of a road network and integrated system to harmonize the unplanned growth of Comilla City. This research is conducted for understanding the future action plans. This paper will investigate how these road networks will impact on the surrounding land use in terms of commercial expansion. Space syntax method is adopted for analyzing the road network characteristics of Comilla City in present context along with simulated situation.

OBJECTIVES AND METHODOLOGY

The objective of this paper is to

- Analyze the spatial characteristics of the town and compare the integration core along with the commercial activities of Comilla City.
- To identify the inner logic of the future expansion of commercial development in relation to the road network.

For integrated analysis of the road network, commercial building location by land use, spatial data was built and processed by map of the study area (Comilla City), using Arc GIS 10.Spatial data were analyzed by reflecting area and length of each data set using depth map. Main analysis focused on the city area commercial land use without the presence of agricultural land use area.

To analyze the integration of the street network, commercial building location by land use, spatial data was built and processed by map, using Arc GIS 10. By reflecting area and length of each data set spatial data were analyzed using depth map .The analysis focused on the commercial land use of the City area without the presence of agricultural land use area.

OVERVIEW OF RESEARCH DOMAIN

Road Network of Comilla City

Figure 1: Map of Comilla City. (Comilla city corporation website)

The district of Comilla (Figure 1) has an area of 153 square kilometers. It is bounded by *Burchiganj* and *Tripura* on the north, *Laksham* and *Chauddagram* on the south and *Barura* on the west. There are some important roads in the city. The main city center is termed as "*kandirpar mor*" (figure 04). The busiest *AK Fazlul Haque Road* (figure 02) starts from here and has been developed as the main business district of the town towards east. The road continues to *chawk bazaar* and after being intersected by *"Thana road"* and *"Bazrapur road"* at a nodal point, it is termed as "*Comilla Bypass road*". "*Kandirpar mor*" (figure 04) connects towards west with the second essential node named "*police line mor*". This node has a major influence on morphological characteristics of Comilla City as it is being intersected by the new *Dhaka-Comilla-Chittagong* bypass road. Before an establishment of this road, Comilla City was connected with *Dhaka-Chittagong Highway* through "*Abdul Malek road*" *(Barura Road)*. Another road named "*Dr. Akhter Hamid Khan*" act as a boundary line for the city as it has subtracted the EPZ and industrial zone from the city.

Figure 2: A K Fazlul Haque Road

Figure 3: Atypical commercial scenario

Figure 4: Kandir par mor (node)

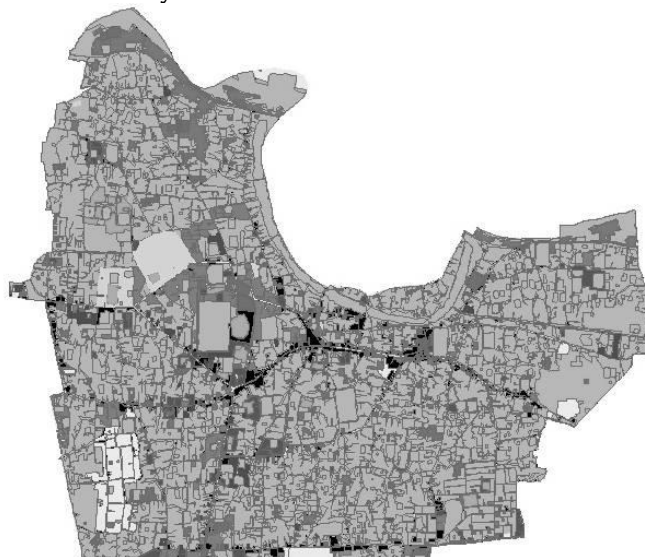**Important Commercial zones of Comilla City**

Figure 5: Land use map Comilla City. Source: LGED (Local Government Engineering Department)
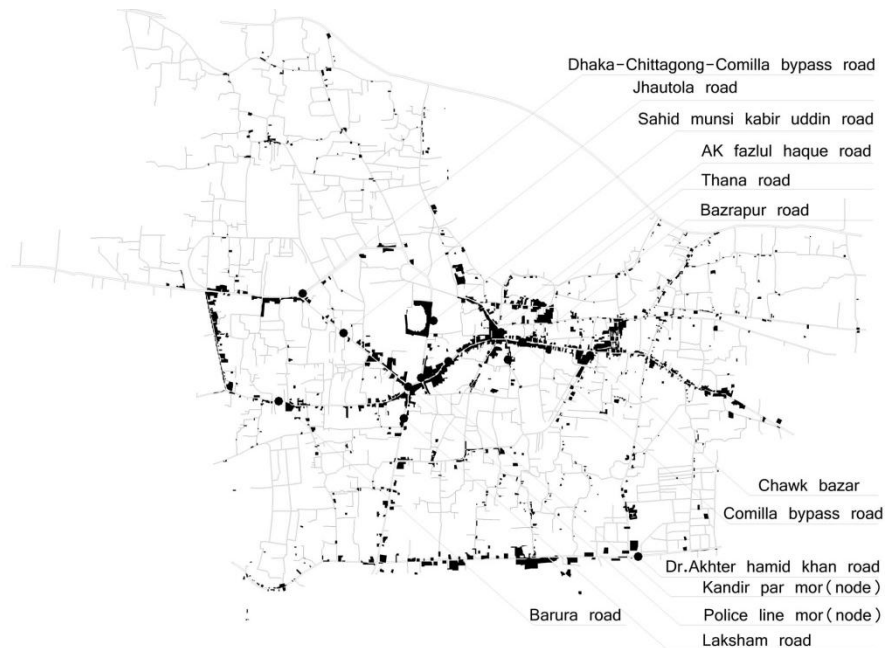
Figure 6: Commercial development along with road. Black colour is showing the commercial areas

The land use map of Comilla City (figure 5) shows that business areas in the Comilla City has been developed through one direction. Lots of shops, banks, insurance, restaurant and markets have developed near *A K fazlul Haque* road. The progression started from the "*Kandir par mor*" (node). This commercial development (figure 3) continues to chowk bazaar bus stand. In the northern side of Comilla City there is another bus stand named "*Sasongacha*". There is also some development between the "*Kandir par Mor*" and the sasongacha bus stand.

LITERATURE REVIEW

Space syntax and analyzing cities spatial characteristics:
Space syntax is a methodology for measuring the relative accessibility of different locations by partitioning the spatial system into relatively independent but connected subspaces (Hiller and Hanson, 1984). It adopts a configuration approach to study to what extent and in which conditions the social and spatial attributes are correlated. Space Syntax is a set of theories and techniques for analyzing spatial configurations. (B. Jiang,1998). Marcus said that the main variable of urban form is accessibility that analyzed within space syntax is and how the accessibility between spaces varies according to the changes in the configuration of urban form (Marcus 2007). This is why it is necessary for us to use a quantitative and scientific method to understand the spatial character of city.

Integration
Integration of a space is the most important measure of syntactic analysis. The integration value of a line is a Mathematical way of expressing the depth of that line from all other line in the system

(Hiller & Hanson, 1984). It describes the average depth of a space to all other spaces in the system. The spaces of a system are ranked from the most integrated to the most segregated.

Integration core

The Integration core shows the important deep structure of a spatial system. Integration core forms the pattern of most integrated line of an urban system. The size, shape, nature and space depend on the shape, connectedness and geometry of the urban system and on its mode of growth.

Axial map of Comilla

With the help of the depth map, Space syntax simulation of Comilla City has been conducted. The axial map creates axial lines which are straight lines. The global and local integration values were generated from the axial map. The integration value of a line is a mathematical way of expressing the depth of that line from all other lines in the system (Hiller & Hanson, 1984). In integration, the relative depth and shallowness of any spatial system are seen from any particular point within it.

Scatter diagram

Scatter plot is a type of mathematical diagram for a set of data which is based on Cartesian coordinates to demonstrate values for two variables. The data is displayed as a collection of points, each having value of variables determining the position on the horizontal axis and the value of the other variable on the vertical axis.

ANALYSIS AND FINDINGS

'Axial map analysis' by Space Syntax is used in this research. These have the values of integration which is an indicator which enables the reading of the relations of the urban transport connectivity. A chromatic scale is used to present the integration values, in a way that the most integrated axis (accessible ones) are assigned a color in the scale of yellow, orange and red; while the more segregated axis are represented in a scale of green, light blue and dark blue..
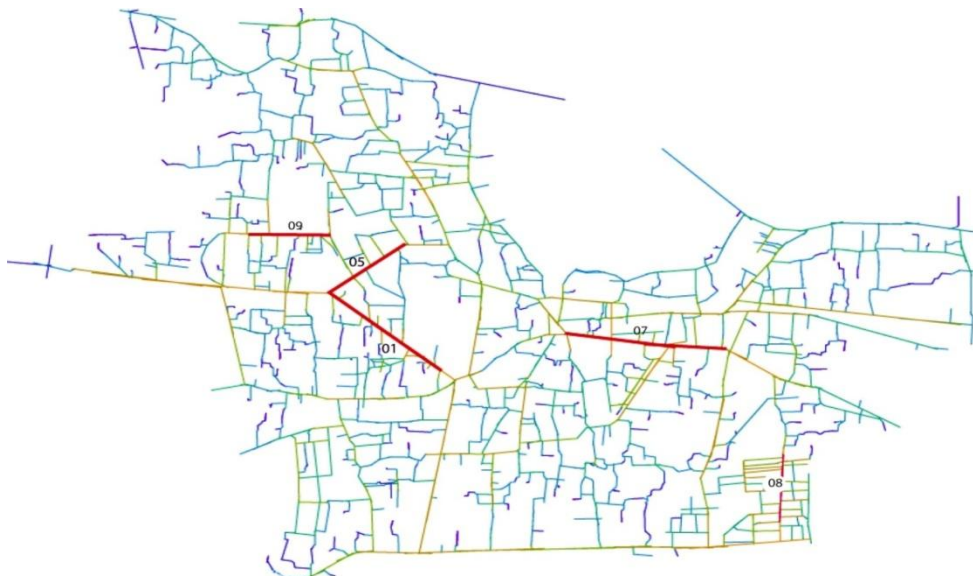

Figure 7: Axial map of Comilla (Local Integration) The bold line is the most integrated one.

Table 1: Local integration, Connectivity of an access road of the commercial zone

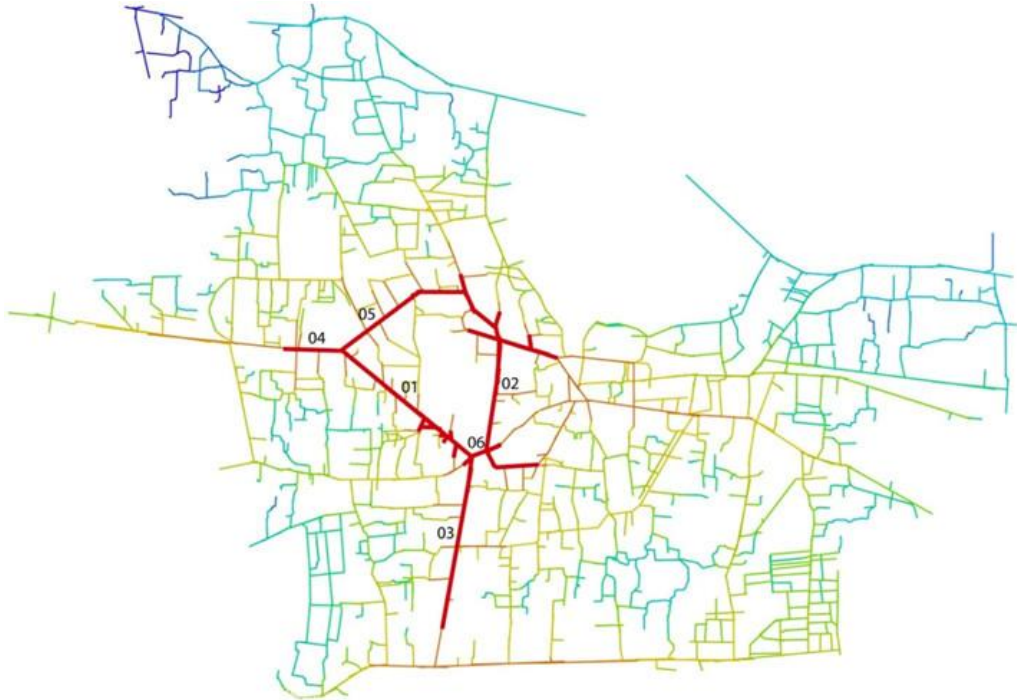| S.L	Adjacent main road	Ref	Integration (HH) R=3	Connectivity	Mean depth
01	Jhautola Road	1085	.736389	16	12.3349
07	AK fazlul haque road	438	.682898	14	13.2227
08	Jam dighi road	122	.53833	18	16.505
09	SSH lane	1538	.62089	13	14.4434
05	Bypass road	1133	.746073	10	12.1878

Figure 8: Axial map of Comilla (Global Integration). The bold line is the most integrated one.

Table 2: Global integration, Connectivity of access road of commercial zone

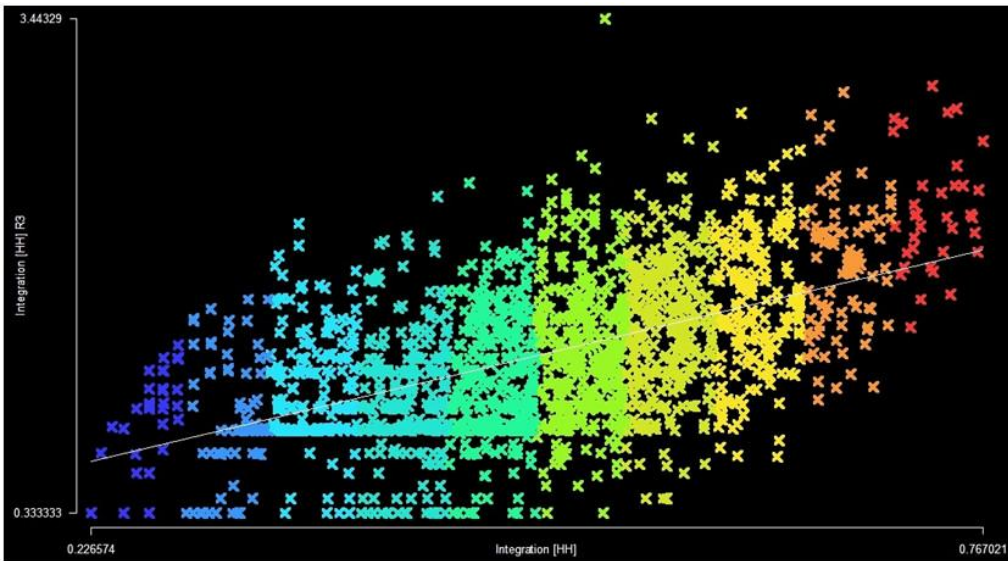| S.L	Adjacent main road	Ref	Integration (HH) R=n	Connectivity	Mean depth
01	Jhautola Road	1085	0.736389	16	12.3349
02	Sahid munsi kobir uddin road	919	0.759375	7	11.9918
03	Laksam Road	1031	0.730554	8	12.4254
04	DCC Bypass road 01	1434	0.718329	7	11.9412
05	Bypass road	1133	0.746073	10	12.1878
06	Kandirpar road	932	0.76312	6	11.9208

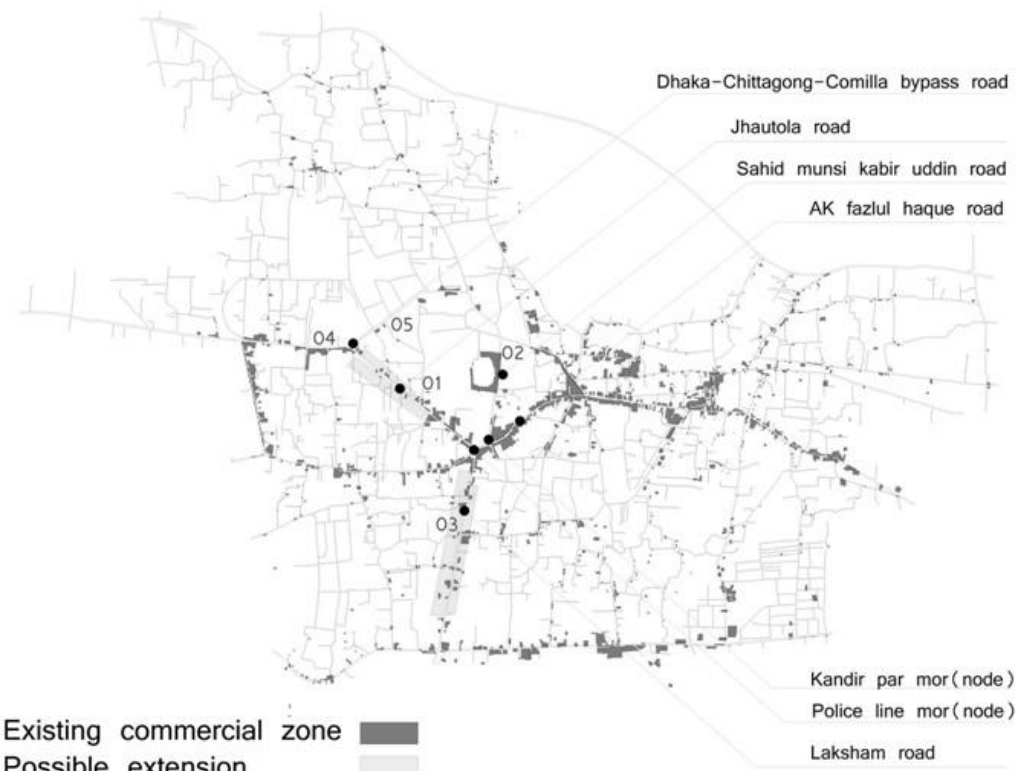Figure 9: Scatter diagram of Comilla

Figure 10: Possible extension of commercial zone in Comilla City

Here, from the Depth map analysis table the Maximum integration value has been found is 0.767021; on the other hand minimum integration value is 0.226578. Mean integration value is generated by dividing the total calculated road numbers (total 1946 roads) with summation of each integration value (977.115521). The mean integration value is 0.502113; so it is seen that respected roads (Described in table 02) have high integration than the mean value. All these roads (Jhautola Road , Sahid munsi kobir uddin road, Laksam Road, DCC Bypass road 01 , Bypass road and Kandirpar road) are within 5% most integrated Roads

With the space syntax analysis (local integration) it is seen that the present land use pattern of Comilla city have been developed from the west to the east side along with the AK fazlul haque road. It starts from the Kandir par mor (node). The Kandirpar mor is connected to the Dhaka Chittagong-Comilla bypass road with a second node (Police line mor), with a highly integrated line (6). From the global integration, the most significant lines are found on the Dhaka Chittagong-Comilla bypass road at DCC Bypass road 01 (04), Jhautola Road (01) and Laksam Road (3).The second node created here with the contiguous line is connected to the first node (Kandir par mor). The extension of the local highest integrated lines is found in global integration (Jhautola Road, Laksam Road). Integration core becomes prominent at Dhaka-Chittagong-Comilla bypass road. It is possible to develop future expansion of commercial areas can be assumed towards the Dhaka-Chittagong-Comilla bypass highway .The possible commercial development have shown in the map given at (Figure 10). For the Scatter diagram of Comilla the X-axis integration [HH] have been shown with relation to Y-axis integration [HH] R3. The global and local correlation (figure 9) is high, steady, and the tangent of the slope is also very steep.

CONCLUSION

The study conducted an integrated analysis of the urban area for its street structure correlation to the commercial development. Urban road network has a considerable influence on the spatial configuration of a city which can change the commercial dimension of the urban area. Space syntax simulation helps finding the present scenario and possible future expansion of the commercial area in Comilla City in a scientific and useful way. From analysis it is found that the global and local integration values are highly correlated. The study shows that Global value of roads is more integrated or accessible than the local value of roads which is much more segregated or inaccessible. Thus Global integration value of roads has high connectivity (*Dhaka Chittagong-Comilla bypass road*) and control values than the local ones. The analysis shows that further commercial development will take place towards the Dhaka-Chittagong-Comilla bypass highway. The result of the study will help to understand the future land use pattern and to make them compatible with the present as well as ever growing future demand of Comilla City.

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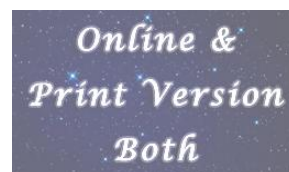
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