SPATIAL CONTINUITY DIAGRAM ON TIME AND DISTANCE LINE

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Abstract
The paper presents the specific method that was developed for studying existing architectural and urban structures. It has been called the Spatial Continuity Diagram. The Spatial Continuity Diagram Method can be applied for preparing guidelines which help supplementing or extending existing urban clusters while avoiding spatial or functional incongruities between existing and new buildings. Several years of improving the Spatial Continuity Diagram Method resulted in research on its implementation in the 3D spatial urban models.

Keywords: urban design; urban space; continuity

Since 2001 we have been developing our own model for studying existing architectural and urban structures. It was based on analysing the most important urban building development features. The method was developed to examine thoroughly ways of expanding and transforming existing architectural and urban structures. This method of analysing urban space has been called the Spatial Continuity Diagram. The method provides for more cautious transformation of existing buildings or erecting new ones while preserving their spatial continuity (Fig. 1).

Urban structures are studied by analysing both uniformity and similarities of buildings clusters. A mathematical formula is used to calculate the degree of uniformity of a given feature and related to it uniformity of the entire cluster of buildings. A specific matrix, which is a basis for developing an electronic inventory, is an integral part of the method. The inventory enables illustrating the distribution of particular feature categories of a cluster of buildings in a 2D space. It is very useful while providing general characteristics of the urban development and illustrating any irregularities of particular features. The Spatial Continuity Diagram Method can be applied for preparing guidelines which help supplementing or extending existing urban clusters while avoiding spatial or functional incongruities between existing and new buildings. It is particularly important that the Spatial Continuity Diagram Method examines not only existing buildings but also newly planned ones. It provides a form of a forecast highlighting the shortage or continuity of the most important features of existing buildings in new buildings that are planned. Additionally, diagrams developed through analyses enable defining the degree of continuity in planned buildings in relation to existing ones.

Despite the fact that the diagram method focused on a 3D space, guidelines formulated involved first and foremost the analysis of data and their distribution in 2D space. It was mainly due to the fact that at that time methods of creating virtual city models and their research were underdeveloped. The Spatial Continuity Diagram Method is based on collecting and processing of several thousand of data. Since the analysis involves such a large volumes of data, already from a very early stage the process necessitated computer aided calculation methods. Published in 2002, the first series of books discussed the method and had a CD with software and manual attached. The software had a form of a special Excel based application (Fig. 2a).

At the moment, the research by the Cyber Urban Centre (CUC)[1] should provide for significant widening of the research on the Spatial Continuity Diagram and including issues related to time and distance in the 3D virtual environment of urban models. Our team focuses

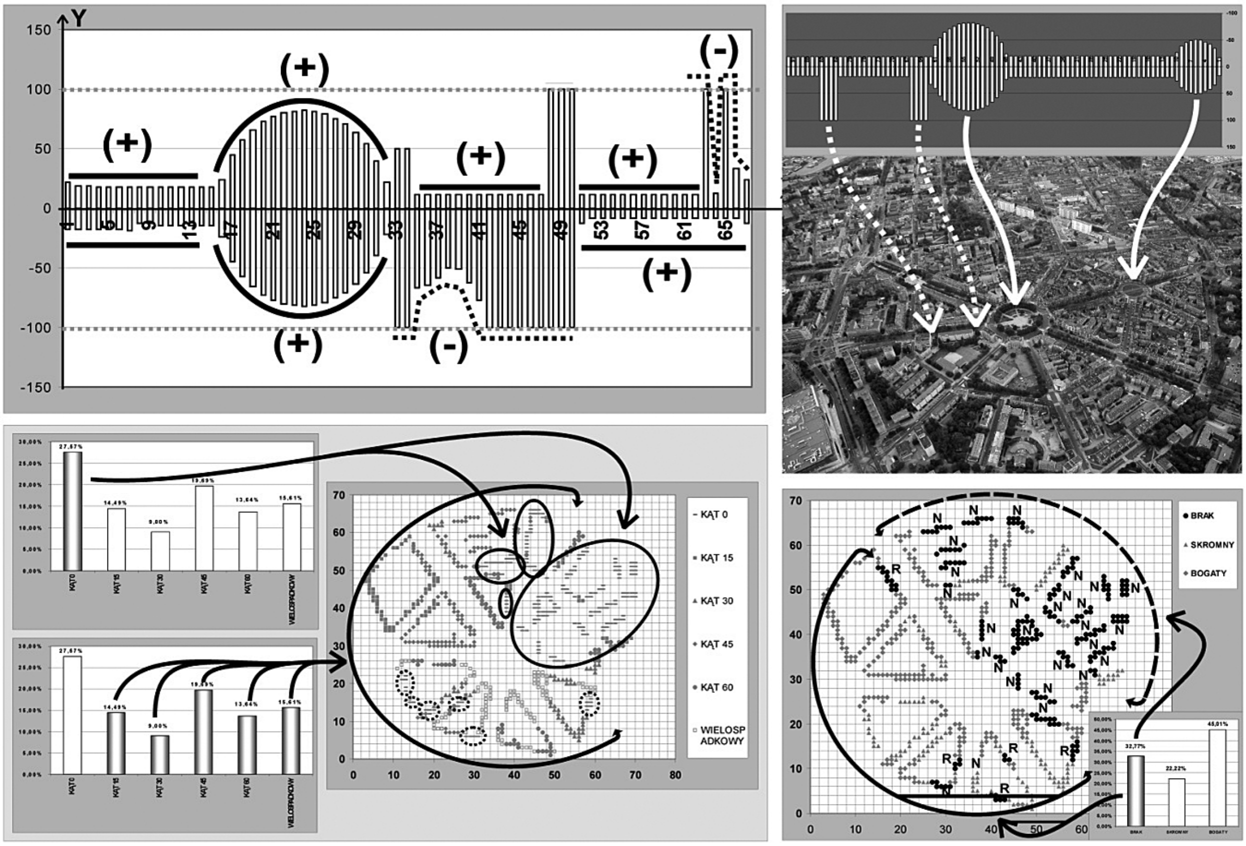

Fig. 1. Examining building facilities in centre of Szczecin while using Spatial Continuity Diagram and histograms and electronic inventories. By W. Marzęcki

on analysing urban structures using unique spatial research methods.

They have been applied in the virtual model of Szczecin and computer analyses of the city of Lublin.[2] Experience gained is a good basis for further research on urban space while using the Spatial Continuity Diagram Method. According to the method, analyses of architectural and urban features and their categories lead to developing information sets in the form of data diagrams. Conclusions of the research, which provide guidelines for rebuilding or extending existing urban space, are developed into a set of data that can be used by a designer who is free to distribute particular categories of analysed features in the design. Expanding the research with 3D aspects of specific features may significantly facilitate defining the essence of development focused on existing buildings and their contemporary transformation in the spirit of spatial continuity. Previous analyses have always considered the 3D aspect of urban space, for instance by analysing building heights.

However, due to shortage of the then virtual city models, it was difficult to analyse mutual relations between particular facilities and their clusters in a broader spatial context. Although such attempts were made during Spatial Continuity Diagram analyses by studying ‘typological paths’ and degree of ‘feature category distribution’, the research were based on questionnaires and 2D analyses of maps. The current use of a more suitable 3D urban space model as a research tool enables the research to cover entirely mutual relations between particular blocks of the urban development.

Major advancement in virtual city model animation may enrich Spatial Continuity Diagram analyses with issues pertaining to the perception of urban space while taking into consideration the time/distance factor. We tend to perceive the surrounding world not in a static manner but as a series of consecutive occur-

[1] The Research Team of the ‘Urban Planning Cyber Centre’ has been established at the Faculty of Civil Engineering and Architecture, Westpomerania University of Technology of Szczecin. The team comprises: Prof. dr hab. inż. arch. Waldemar Marzęcki, dr inż. arch. Klara Czyńska, dr inż. arch. Paweł Rubinowicz, dr inż. arch. Adam Zwoliński.

rences, including their 3D aspect. The analysis of the urban structure, seen as a series of consecutive spatial experiences, brings us closer to the real perception of the surrounding urban space.

In the previous research on urban space which used the Spatial Continuity Diagram, data from analyses were collated in the form of 2D diagrams. The diagrams showed percentages of particular feature categories rather than their locations in urban space. At the moment, the diagrams have a different form. They have been transformed into 3D schemes. Instead of applying more attractive imaging of a flat chart by using blocks to present particular elements, the main idea is to use the spatial structure to express fully the complex nature of urban space in question. Contrary to previous diagrams used in the method, data sequenced according to their values are not distributed in the space of a 3D diagram. Specific values are not decisive regarding the positioning in the diagram but instead the most important issue is their spatial location in the urban structure. In practice, data are placed on a time or distance line (depending on research assumptions). Such a distribution of data is expected to reflect the sequence of specific consecutive phenomena (Fig. 2b). If we consider the physical distance between particular spaces while examining the urban structure, the diagram will include the distance line in metres or kilometres. A phenomenon itself can be analysed while taking into consideration time elapsing before a given distance between urban spaces is covered. The distance line defines distances between specific phenomena. The use of a time line allows for differences in analysing the same spatial phenomena[2].

In the case of identical distance between spatial phenomena, time needed to cover the distance between them starts playing an important role. By shortening the time to move from point A to point B within a given urban structure, we may completely change the perception of the space.

In general, we may assume that the shorter the time, and consequently higher speed of motion, the

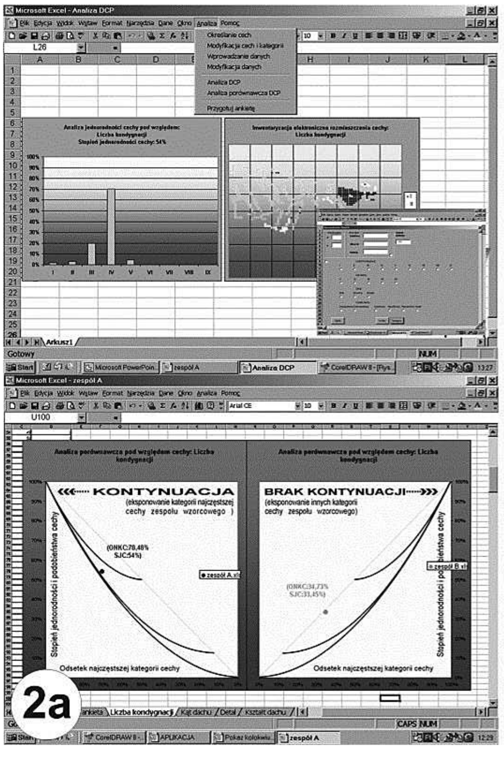

Fig.2a. Spatial Continuity Diagram analyses using computer application for Microsoft Excel. By W. Marzęcki and R. Sokołowski.

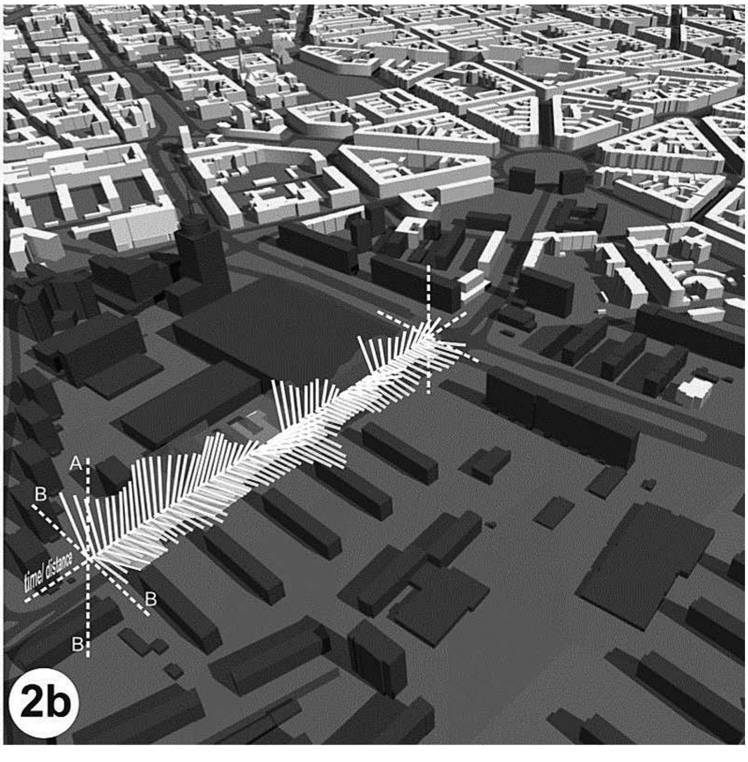

Fig. 2b. Using virtual model of Szczecin city centre for Spatial Continuity Diagram research including new form of uniformity diagram containing features on time and distance line. By W. Marzęcki

[2] K. Czyńska, *Panorama ze wzgórza Czwartek w Lublinie – analiza widoczności zabudowy metodą kątów widokowych*, „Przestrzeń i Forma", 15/2011, Szczecińska Fundacja Edukacji i Rozwoju Addytywnego SFERA. 303 s.

more eager we are to generalise the perception of the urban space in question. We then tend to focus on its major features only. When we take more time to cover a given distance and thus reduce our speed, we can pay more attention to smaller details as the expense of a more general perception of the urban space. In the 3D Spatial Continuity Diagram, the time/distance line is an axis Z. The traditional Cartesian coordinate system is perpendicular to the time/distance line in the new 3D diagram. Data are distributed in space of particular octants within the 3D diagram. Combining potential of studying virtual city models with analytical methods of the Spatial Continuity Diagram should contribute to a better definition of spatial issues in urban structures.

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