Chapter 27
Significance of Affective Sciences and Machine Intelligence to Decipher Complexity Rooting in Urban Sciences

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ABSTRACT

An urban system is a complex system. There are many factors which significantly influences the different aspects of it. The influencing factors possess different characteristics as they may be environmental, economical, socio-political or cognitive factors. It is not feasible to characterize an urban system with deterministic approach. Therefore there is a need of study on computational frameworks that can investigate cities from a system's perspective. This kind of study may help in devising different ways that can handle uncertainty and randomness of an urban system efficiently and effectively. Therefore the primary objective of this work is to highlight the significance of affective sciences in urban studies. In addition, how machine intelligence techniques can enable a system to control and monitor the randomness of a city is explained. Finally the utility of machine intelligence technique in deciphering the complexity of way finding is conceptually demonstrated.

1. INTRODUCTION

This chapter aims to explain the significance of affective sciences in deciphering the complexity of an urban system. In addition, the pivotal role which machine intelligence techniques are capable of in characterizing an urban system is described. The proposed chapter begins with a note on urban system outlining its various facets. Then "affective science" is explained in detail, and how the idea of affective science is relevant in functioning of an urban system is outlined. Later, the proposed chapter details the applicability of machine intelligence techniques in studying an urban system under the realm of affective sciences. Having provided a detailed description on the significance of machine intelligence techniques, and their utility in understanding a complex system; a research problem on wayfinding using a machine intelligent technique and decision tree is demonstrated. This chapter ends with concluding remarks, and suggestions that can be incorporated to strengthen the present study.

1.1. Urban System: Complexity, Uncertainty, and Randomness

An urban system is characterized by keywords such as complexity, uncertainty, and randomness. (Coffey, 1998) rightly mentioned that the idea of urban system has been existing for centuries. It is perceived as either a pattern or an archetype that can be analyzed from different perspectives. There are different definitions of urban system available in the literature. But the definition by (Bourne, 1998) seems well fitting: an urban system can be considered as a system, or a perception. From a system's perspective, it is an object that connects independent urban clusters. On the other hand, urban system corresponds to a perception that focuses in understanding the process of urbanization. Now people believe in unanimity that investigation on cities is not possible in isolation. The associations of a city with other urban centres need consideration as functioning of a city is dependent on its spatial connections. In addition, attributes pertaining to social and political context should not be ignored. The social and political attributes has significant impact in shaping a city's structural and functional design. However, studying a city from system's approach has never been easy as it requires huge amount of data to perform the investigation. For example, this kind of study requires data related to its link with other surrounding urban centres, and beyond as well. (Randall, 1998) made a significant note regarding the urban systems research. The transitory nature of events due the human component should not be ignored. These events have significant potential to influence the behavior of an urban system.

Urban system is composed of different components such as social components and ecological components. Social components of an urban system comprised of various attributes such as demographic characteristics, transportation system, building types, and its density. While the ecological components of an urban system contain soil, elevation, climate, hydrology, and vegetation as attributes. Since an urban system has attributes from different fields, contribution from different disciplines is required to characterize it. The various disciplines which can make significant contribution are urban geography, urban ecology, urban economics, urban sociology, and urban planning (Gopal et al., 2016). Systems within an urban system such as transportation system are considered as critical infrastructures as its performance is dependent on many interacting factors. That makes it a complex system itself (Zio, 2016). There is a need to understand the fact that an urban system is composed of various attributes and many of which has systems characteristics. Consequently these kinds of attributes escalate the magnitude of complexity in functioning of an urban system. Therefore modern urban theorists advocate planning theories that

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