Assessment of the quality of urban life using remote sensing and GIS

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Extended abstract

Introduction

Life in the modern cities takes shape through interaction with various environmental, socio-economic, infrastructural, health, security, political and cultural conditions. The result of this interaction shapes the quality of urban life (QOUL). Quality of lifeis a complex concept involving social, economic, environmental, physical, psychological and political aspects (El Din et al, 2013). In general, Quality of life (QOL) has been evaluatedbytwo objective and subjective points of view. Researches in this field, have mainly been conducted in the form of social studies and in the macro geographical scales of countries or cities,and less attention has been paid to the spatial differences of the life quality in the complex urban environments. In these studies, the principal components analysis (PCA) method has been the most common method used for combining and overlaying of the life quality indicators (Lo, 1998; Jun, 2006; Li and Weng, 2007; Motakan et al, 2010; HatamiNejad et al, 2014; Messer et al, 2014). But,Oneof the disadvantages of PCA is the possibility of deleting some of the useful information.Using Multi-Criteria Decision-Making (MCDM) and Fuzzy Logic methods can also be useful in spatial modeling of life quality. Moreover, QOL as one of the features of geographical environment is a dynamic concept. This means that this feature changesover time and location. The spatiotemporal modeling of this concept can help monitoringthe quality of urban life and planning for its improvement.

Data and Methods

This study offers a framework and process for spatiotemporal modeling of QOUL. For spatial modeling of QOUL, effective indiceswere taken into consideration at first. In this study,the indicators related to the urban quality of life were extracted in 3 three environmental, infrastructural/physical, and socio-economic dimensions.The Analytical Hierarchy Process (AHP) method was used for weighing the parameters(Uyan, 2013). Then, the indicators were combined with each other using the GammaFuzzy Model(Vafai, 2013) and Vikor-Fuzzy overlay technique(Huang et al, 2009). Furthermore, QOUL was modeled temporally due to the variability of environmental indicators and some of

infrastructural / physical indicators during the seasons of the year. For this purpose,the cyclic model (developed based on the snapshot approach (Worboys and Duckham, 2004)) was used. In order to assess the developed framework, the quality of lifewas modeled at urban blocks level in regions 3,6,11 of the city of Tehran.

Conclusion

The obtained results showed that applying multi-criteria decision-making and Fuzzy logicmodels in modeling of life quality is capable of showing the spatial difference oflife quality in urban environments. Based on the results of spatial modeling, the quality of life is more desirable in northern parts of the area (region 3) while the desirability decreases towards the southern areas (region 11). The study of Moran's spatial autocorrelation index (greater than 0.35 for the results of both models and all seasons) emphasize on the non-randomness of the distribution method of the QOL feature in urban blocks and shows the existence of cluster pattern in the study area.The results of temporal modeling indicated that most of the blocks are more favorable in the spring and autumn seasons than in the winter and summer in terms of environmental conditions.

Keywords: Quality of life (QOL), Quality of urban life (QOUL),Fuzzy Gamma model, Vikor-Fuzzy overlay technique, Snapshot approach