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Analyzing urban growth through autocorrelation techniques and urban simulation models

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Urbanization growth represents one of the main environmental threats of last decades. Several approaches have been adopted in analyzing this phenomenon, mainly related to different study domains. Urban sprawl, soil consumption, settlement risk, and even the attempt to reach a distinction between urban, peri-urban, exurban, rur-urban and rural areas are different sides of the same coin which examine the huge amount of negative aspects generated by urban expansion summarized in soil sealing, loss of productive agricultural lands and forest cover, habitat destruction and fragmentation, waste of energy, pollution, landscape degradation. Consequently, urban growth generates environmental impacts at local, regional and global scales.
The main aim of the present study is to identify urban agglomeration and its variation over time, analyzing historical growth evolution and future urban expansion scenarios.
Multi-spectral images are increasingly being used in the study of urban dynamics. In this research satellites equipped with passive sensors have been chosen among the various possibilities of available satellites and sensors because they are more suitable for planning applications and cheaper. Landsat data, freely available, are multi-spectral data that are already widely used in analysing urban growth. An important feature of landsat data is related to historical information, which allows to study the evolution during the past 20-30 years. A new approach based on satellite and geo-statistical analysis has been proposed for the analysis of urban sprawl. Autocorrelation techniques were used to measure and analyze the degree of dependency among spectral features of urban expansion.
In order to produce a more useful analysis of this phenomenon, it is fundamental to combine several methods and techniques. Data obtained by satellite images have been properly treated to be used as input data for a simulation model adopted to predict urban expansion. In this study SLEUTH model has been adopted for predicting cumulative trends of the area towards urban development over the coming decades. This model adopts a modified Cellular Automata to model the spread of urbanization across the landscape.