Directed urban canyons in megacities and its applications in meteorological modeling

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Directed urban canyons study applies object-oriented analysis to extraction of urban canyons and introduces the concept of directed urban canyon which is then experimentally applied in urban meteorological modeling. Observation of current approach to description of urban canyon geometry is provided. Then a new theoretical approach to canyon delineation is presented that allows chaining the spaces between
buildings into directed canyons that comprise three-level hierarchy. An original methodology based on triangular irregular network (TIN) is presented that allows extraction of regular and directed urban canyons from cartographic data, estimation of their geometric characteristics, including local and
averaged height-width ratio, primary and secondary canyon directions. Obtained geometric properties of canyons are then applied in micro-scale temperature and wind modeling using URB-MOS model and estimation of possible wind accelerations along canyons.
Extraction and analysis of directed canyons highly depends on the presence of linear street network. Thus, in the absence of this GIS layer, it should be reconstructed from another data sources.
The future studies should give us an answer to the question, where the limits of directed canyons are and how they can be classified further in terms of the street longitudinal shape. For now all computations are performed in separate scripts and programs. We plan to develop comprehensive automation of described methods of urban canyon description in specialized software.
The most perspective extension of proposed methodology seems to be canyon -based analysis which is truely object-oriented. Various geometric properties of micro-, meso- and macro-scale canyons should be investigated and their applicability in urban climate modeling should be assesed. Object-oriented
canyon analysis can also be applied in architectural studies, urban morphology, planning and various physical and social aspects that are concerned with human in urban space.