Mapping and Modeling of Urban Environmental Quality in Hong Kong

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Keywords: Urban Environmental Quality; Urban Heat Island; Remote sensing; Visualization; Biomass; Image fusion

Abstract

This paper demonstrates the application and usage of current remote sensing techniques for estimating and depicting Urban Environmental Quality at detailed level from satellite images. Temperature data derived from Landsat ETM+, Vegetation Index derived from high resolution IKONOS multispectral images, digitized data of the city urban infrastructure and 3-D virtual reality models were integrated in this study to assess Urban Environmental Quality in Kowloon Peninsula and Hong Kong Island in Hong Kong. A vegetation index image from IKONOS multispectral imagery was fused with the thermal waveband from Landsat ETM+, to obtain more spatially detailed information on surface temperature. These data are combined with image-derived biomass indices for evaluating UEQ in densely built high rise areas of Hong Kong. The structure and spatial location of buildings as well as the evaluation of the terrain are also modeled to permit visualization of urban morphology. The roof surface temperature and the facet temperatures are determined from analysis of the relationship between horizontal ‘seen’ surfaces and ground truth data. This model not only gives an accurate representation of the urban thermal environment, but it also indicates: 1. the presence of natural fresh air corridors into urban areas along mountain valleys and ridges, 2. the key buildings or city blocks which restrict air flow, 3. the effectiveness of biomass in conjunction with building height and orientation in moderating urban temperature, 4. the importance of small patches of greenery in the city, 5. overall strategies for moderating the Urban Heat Island in Hong Kong.