Extracting Urban Building Density and Floor Area Ratio Based on QuickBird Image

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Abstract: Urban building density is the ratio between ground area taken up by buildings and the block area; Floor area ratio (FAR) is the ratio between total floor space and the block area. Study on the urban building density and FAR helps to find the irrationality of urban designing. While measuring the building height and area directly costs a lot of time and manpower, using satellite image can save a lot. The paper applies the fruits of extracting building heights from shadow in satellite image to the field of estimating FAR, and realizes estimating building density and FAR fast and efficaciously. The object-oriented software eCognition is used to extract the information of buildings and shadows from the high resolution QuickBird image. The geometric relationship between building-height and shadow-width in the image has been analyzed, and then the building heights are extracted from the shadow width. Furthermore, with the information of building heights and area, building density and FAR of YuZhong District, ChongQing city, are estimated. The result shows that in YuZhong District, the highest FAR is 3.5, which appears in JieFangBei Block, and the highest building density is 43.40% which appears in NanJiMen Block. Finally, to estimate the calculation accuracy, 14 buildings' floor-number are measured, including ChongQing Library, New Dongfu Garden and so on. There are two reasons for using this validation method, one is that estimating building heights from shadow width is where the shoe pinches, and it also is the main resource of estimating error; another reason is the limitation in collecting measured data about building density and FAR of YuZhong District. The result shows that the accuracy of estimating floor-number has achieved above 90%, which has demonstrated prospecting applications of satellite remote sensing for urban purpose.

Keywords: Building Density; Floor Area Ratio; QuickBird Image; Shadow