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ABSTRACTS

Semi-Automatic Rooftop Extraction to Assess Solar Potential for Smart Cities

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Keywords: K-means Clustering, GHI, Rooftop, Solar Potential, Google Earth, WorldView-3

Abstract

The over-exploitation of non-renewable resources for energy demands is a serious issue. Convergence towards renewable resources such as solar energy is need of the day. Solar energy is the cleanest form of energy available on Earth. The objective of this research is to extract the building rooftop from the satellite images using a k-means clustering algorithm to identify the usable area for solar potential assessment. The scenes of WorldView-3 and Google Earth are segmented into nine parts and the algorithm implemented in Matlab is applied to the individual parts for better utilization of computing resources. This approach has been applied to the parts of northern states of India for solar potential assessment in a fast and accurate manner. The Global Horizontal Irradiance (GHI) data obtained from the database of National Renewable Energy Laboratory (NREL), United States have been used in the solar potential assessment. For the validation purpose, the above-mentioned algorithm has been compared with the digitization in QGIS software. The results obtained from the above-mentioned algorithm developed have extracted 85% to 90% of the features in the satellite image. The developed algorithm has given best results with the WorldView-3 (high-resolution image) than the other coarser resolution scenes. The developed approach is helpful in evaluating the feasibility of the large areas for solar potential assessment. This methodology is useful for the implementation of different government's solar energy generation schemes for rural and hilly areas. It helped in estimating the solar potential of the large hilly area for electricity generation. This approach is useful for a larger area as it computes the usable area by dividing the scenes into smaller parts and applies the algorithm individually to each part of the scene.