

An Automated Methodology for the Identification of Impervious Surfaces from High Spatial Resolution Multispectral Imagery and LiDAR

Abstract

The accurate measurement of impervious surfaces is increasingly becoming necessary as communities seek to mitigate flood risks, improve runoff water quality, and develop community stormwater management plans. An attempt to delineate impervious surfaces for a 9,000,000 square foot study area within the City of Scottsbluff was made using four-band multispectral high-resolution imagery and Light Detection and Ranging (LiDAR) data. An ISODATA classification was performed on the multispectral imagery and classified into six land-cover categories that were aggregated into the two parent classes of impervious and pervious. Rules were then generated in a Knowledge Based Expert System (KBES) to apply the LiDAR data to the ISODATA classification with the objective of determining if LiDAR could facilitate a more accurate impervious surface delineation. Both the ISODATA classification and the KBES classification were referenced to a 200 point random sample set. The ISODATA classification yielded an overall accuracy of 91.0% with a Kappa of 82.0%, while the KBES classification yielded an overall accuracy of 94.0% with a Kappa of 87.9%. It was therefore concluded that LiDAR data has some potential for facilitating the accurate delineation of impervious surfaces, and a call for more research is made.