In this study, the fusion of Light Detection and Ranging (LiDAR) and hyperspectral data was used to propose a method for building detection. The number of hyperspectral bands was first reduced from 144 to 8 layers using the Linear Discriminant Analysis (LDA) algorithm to remove highly redundant bands and reduce computational costs. Then, these layers were integrated with 4 layers of heights and intensities obtained from the LiDAR data. The fused layers (12 layers) were applied to a Random Forest (RF) algorithm to extract the boundaries of buildings. Finally, two morphological operators were applied to remove the holes on the buildings' roofs and repair their boundaries. A comparison was also performed between the results obtained by the proposed method and the reference study in this field [Debes et al. 2014]. The proposed method demonstrated a better accuracy for building detection in a much shorter time compared to the reference method. The values of 97% and 96% were obtained for producer and user accuracies, respectively. Overall, the method presented in this study proved to have a high potential for building extraction.

1. Introduction

Accurate, consistent and up-to-date maps of urban areas are critical for various important applications, such as environmental monitoring, telecommunication, surveillance and urban planning [Jensen and Cowen 1999]. Classification of urban areas using the traditional methods, such as land surveying, is costly and time-consuming and needs labour-intensive work. However, remote sensing methods are time and cost-efficient, and reduce the number of human errors, such as those arising from reading an instrument or digitizing the existing land cover / land use maps, by applying several accurate professional software packages to process and classify aerial and satellite images [Mayer 1999; Gruen et al. 2012]. In recent years, automatic extraction of urban objects, such as buildings, from aerial and satellite images has gained increasing attention, and different methods have been proposed to improve the accuracy of building detection and classification [Mayer 1999; Seo 2003; Gruen et al. 2012; Debes et al. 2014]. However, many problems still exist in automatic building detection and classification because buildings appear in different types and shapes depending on the culture and region [Seo 2003].

Different types of aerial and satellite sensors providing various types of information can be