ABSTRACT

This abstract presents a system, called DEMEditor, that builds desktop virtual reality (VR) models based on interferometric synthetic aperture radar (InSAR) digital elevation models (DEMs), and allows the visualization, quality control and correction of these models. DEMs contain inherently different types of errors originated by different causes, which need to be corrected. The system improves the processing chain to generate high precision DEMs; after the processing of raw data into a DEM, this model can be analyzed in order to verify the data accuracy and errors can be identified and corrected to enhance its precision. The DEMEditor was developed based on a methodology for use by InSAR data experts. The methodology is based on desktop VR interfaces, which allow precise representation of complex data, realistic visualization of objects with sophisticated shape that have features such as height and depth, and are highly interactive to explore information. Desktop VR is increasingly becoming an attractive option because of its ability to build low cost extremely realistic and interactive environments that can be deployed across every office. The users background about the data allows the identification of any types of error, relieving the need for specific detection algorithms that specialize in detecting errors with particular characteristics. The DEMEditor is an important contribution, since related systems are based on non-interactive two-dimensional interfaces. In fact, most methods proposed for performing identification, quantification and correction of errors has not been implemented as a useable tool.

INTRODUCTION

Virtual reality (VR) interfaces are based on the three-dimensional (3D) paradigm. This kind of interfaces is basically classified into two categories: desktop VR and immersive VR. Independently of the category chosen to visualize data, the use of 3D interfaces brings several advantages over classical two-dimensional (2D) ones, especially if the data to be visualized are objects with features such as height and depth and pursue complex shapes (digital elevation models (DEMs) are an excellent example). The main advantages are: (1) the user feels present in the virtual environment (immersion); (2) high interaction between the user and the environment; (3) the virtual environment is able to motivate the user to participate (involvement). These features facilitate the exploration of information and enhance its comprehension.

Actually, much of the research effort in VR has been applied to immersive VR, in order to build more realistic environments through the use of sophisticated devices such as CAVEs (Cave Automatic Virtual Environments), SSVR (Surround Screen Virtual Reality) etc. But, before starting to develop an application, a cost-benefit analysis should be considered. Desktop VR is increasingly becoming an attractive option because of its ability to build low cost extremely realistic and interactive environments that can be deployed across every office.

In this paper we show how desktop VR can be successful applied to tackle a relevant problem of the remote sensing area: correct elevation errors in DEMs. We present a tool that combines a realistic visualization and interactive manipulation of data, as well as a qualitative analysis, together with a toolkit composed of editing functionalities for correction of different types of errors found in DEMs.

PROBLEM STATEMENT

A DEM, according to Burrough (Burrough, 1986), can be defined as “any digital representation of the