Chapter 12
New Computational Models for Image Remote Sensing and Big Data

Dhanasekaran K. Pillai
Jain College of Engineering, India

ABSTRACT

This chapter focuses on the development of new computational models for remote sensing applications with big data handling method using image data. Furthermore, this chapter presents an overview of the process of developing systems for remote sensing and monitoring. The issues and challenges are presented to discuss various problems related to the handling of image big data in wireless sensor networks that have various real-world applications. Moreover, the possible solutions and future recommendations to address the challenges have been presented and also this chapter includes discussion of emerging trends and a conclusion.

INTRODUCTION

The goal of developing new computational models is to enable creation of new big data based remote sensing infrastructure for analysing and mining image data. The system must include a data collection component to aggregate, integrate data and perform validation of image data. Then, the central component of the system performs tasks like filtering, analysis and extraction of relevant patterns from image data. The result of extraction and prediction can be used for agricultural monitoring, crop monitoring or for forecasting of weather and market values.

Most of the big data framework that uses image remote sensing involves the following steps:

1. Organizing and integrating data from scenario based models, satellite images, and other remote stations.
2. Developing data mining and correlation analysis techniques to perform time-series data mining, spatial data analysis or spatiotemporal analysis.

DOI: 10.4018/978-1-5225-7033-2.ch012

3. Developing classification methods to perform image data classification.
4. Evaluating fitness of the data models by comparing data with standard values or indices.
5. Developing methods for monitoring activity using images with low or high resolution.

The system architectural model in Figure 1 involves scenario based models for analysing and mining images, weather data, and pollution data.

For data storage and management, DSpace can be used to store and maintain a large amount of heterogeneous data. The DSpace is an open source dynamic digital repository that can be used for image analysis while using big data. It enables free access to the data.

This chapter enables users to understand major issues and problems related to remote sensing in combination with big data handling for image data. After analysing solutions recommended for addressing the problems, users will be able to understand the process of developing a new framework, tools, or software systems to meet the current needs.

BACKGROUND

Mostly, remote sensing data is collected to analyse disease conditions, growth of plant, pollution, land use, road traffic congestions, and effects of disaster etc. One solution to address these problems is to develop possible computational models which represent several modules for the data analysis. The creation of thematic map for certain problems requires meaningful analysis which aims to show satisfactory results.

The analytical solutions to various engineering problems require robust analysis in a particular context. In this perspective, various issues related to scenarios should have to be addressed, because, complexity of different scenarios varies over time. For most of the existing developments, analysing and developing computational models have been the main motivation for remote sensing applications that use images.

The image data collected through multispectral image sensing can provide information at the element level. It can also provide information at the composite level via inter-pixel relationships. In some of the applications, the output information is used to assess the user belief or expert suggestions by the analyst. The software program validates the hypothesis developed by users. In most of the cases, the analysis fails

Figure 1. Computational system model using different types of data