PROCESSING OF DATA OBTAINED BY REMOTE SENSING OF THE EARTH

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Abstract. Processing of data obtained by remote sensing of the Earth is a critical component of the use of satellite-based sensors for environmental monitoring and research. Remote sensing data processing involves the conversion of raw sensor data into meaningful and actionable information, which can be used to study and monitor the Earth's environment. This article will provide an in-depth overview of the processing of remote sensing data, including the steps involved, the challenges and limitations, and the advancements in technology and techniques.

Key words: raw sensor, measurements, Earth's surface, atmospheric correction, image enhancement.

Introduction

Remote sensing data processing begins with the acquisition of raw sensor data from satellite-based sensors. These sensors capture electromagnetic radiation reflected or emitted from the Earth's surface and atmosphere, which is then converted into digital data. The raw sensor data may include images, spectral measurements, and other types of data, depending on the specific sensor and its capabilities. The processing of remote sensing data involves several key steps, including pre-processing, image enhancement, feature extraction, and classification. Each of these steps plays a crucial role in converting raw sensor data into useful information for environmental monitoring and research.

Pre-processing of Remote Sensing Data

The pre-processing of remote sensing data involves several important tasks, including geometric correction, radiometric correction, and atmospheric correction. Geometric correction is necessary to remove distortions and inaccuracies in the sensor data caused by factors such as sensor orientation, Earth's topography, and atmospheric effects. Radiometric correction is used to remove variations in brightness and contrast caused by sensor calibration errors and atmospheric

conditions. Atmospheric correction is necessary to remove the effects of the Earth's atmosphere on the sensor data, allowing for accurate measurements of surface properties.

Image Enhancement

Image enhancement techniques are used to improve the visual quality of remote sensing images and make them more suitable for analysis and interpretation. Image enhancement may involve tasks such as contrast stretching, histogram equalization, and spatial filtering to improve the clarity and interpretability of remote sensing images.

Feature Extraction

Feature extraction involves the identification and extraction of specific features or patterns from remote sensing data. This may include tasks such as edge detection, texture analysis, and object delineation to identify and extract features such as land cover types, vegetation density, and urban infrastructure from remote sensing images.

Classification of Remote Sensing Data

Classification is a critical step in remote sensing data processing, as it involves the categorization of pixels or image objects into different classes or categories based on their spectral or spatial properties. Classification techniques may include supervised or unsupervised methods, where training samples or statistical algorithms are used to assign pixels to specific classes such as land cover types, land use categories, or environmental features.

Challenges and Limitations of Remote Sensing Data Processing

While remote sensing data processing offers many advantages for environmental monitoring and research, there are also several challenges and limitations that need to be considered. For example, the processing of large volumes of remote sensing data requires significant computational resources and specialized software tools, which may not be readily available to all researchers and stakeholders. Additionally, the interpretation of remote sensing data requires specialized skills and knowledge of environmental processes, which may limit the accessibility and usability of the processed data.

Furthermore, remote sensing data processing is susceptible to errors and uncertainties caused by factors such as sensor noise, atmospheric effects, and variations in surface properties. These errors can affect the accuracy and reliability of the processed data, requiring careful validation and quality control measures to ensure the integrity of the results.

Advancements in technology and techniques have led to significant improvements in the processing of remote sensing data. For example, the development of advanced image processing algorithms and machine learning techniques has allowed for more efficient and accurate extraction of features from remote sensing data. Additionally, the availability of cloud computing resources and open-source software tools has made it easier for researchers to access and process large volumes of remote sensing data. Ongoing research and development efforts are focused on addressing the challenges and limitations of remote sensing data processing. For example, efforts are underway to improve the accuracy of atmospheric correction techniques, develop standardized validation procedures for remote sensing products, and enhance the interoperability of remote sensing data formats and standards.

Conclusion

The processing of data obtained by remote sensing of the Earth is a complex and multi-faceted task that plays a crucial role in environmental monitoring and research. The steps involved in remote sensing data processing, including pre-processing, image enhancement, feature extraction, and classification, are essential for converting raw sensor data into meaningful information for studying and monitoring the Earth's environment. While there are challenges and limitations associated with remote sensing data processing, ongoing advancements in technology and techniques are continuously improving the capabilities of this important tool for environmental research and management. By addressing these challenges and leveraging new technologies, remote sensing data processing can continue to provide valuable insights into the Earth's dynamic processes and support informed decision-making for environmental conservation and management.

The list of used literature

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