Remote Sensing Satellite Image Acquisition Planning: Framework, Methods and Application

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Abstract

This dissertation explores the theories and methods of satellite remote sensing image acquisition planning within a spatial temporal context. For many time sensitive applications, such as disaster emergency response, timely acquisition of critical information is the key to intelligent and effective decision making. Remote sensing plays an important role in information collection for these time sensitive applications. Imagery collected from hundreds of remote sensing satellite sensors offer accurate, frequent and almost instantaneous data covering the Earth in a relatively short time. However, determining which satellite sensors can provide an appropriated kind of imageries during a restricted collection window for the analysis is problematic. Satellite image acquisition planning is developed to solve the problem.

This research explores the design and implementation of a spatial decision support system (SDSS) for satellite image acquisition planning. A SDSS framework is proposed, and several novel models and algorithms are developed to derive optimized satellite image acquisition solutions. Chapter 2 describes the components of the framework; Chapter 3 and Chapter 4 present several models including composite satellite image collection opportunities modeling, collection opportunities evaluation model, and a spatial optimization model. Based on the framework, models, and algorithm, Chapter 5 presents an application of satellite image acquisition planning for tidally influenced salt marshes for vegetation mapping.
Collectively, this research provides a foundation for research and development towards the satellite image acquisition planning.