GeoGRID: integrated platform for applications of remote sensing

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Abstract:
Ever since the successful launch of Sputnik in 1957, the artificial satellite has become the most reliable and widely-used platform for observing the earth from space. It is estimated that about 8000 satellites have been launched into space so far, with applications that range from military, meteorology, navigation, communication, to earth resource and environment monitoring. Both the technology of data acquisition and data analysis in the realm of remote sensing are advanced fast. Various methods/algorithms have been developed to process the remote-sensing data and incorporate the data with other forms of geospatial information for various applications, resulting in a very complicated procedure of data processing that demands a considerable amount of computational resources. Meanwhile, the spatial, temporal, spectral and radiometric resolutions of remote-sensing sensors are upgrading in an even faster fashion. A huge amount of remote-sensing data is continuously transmitting from the orbit back to the earth, which also needs an enormous amount of space for archiving and accessing the data. As a matter of fact, for most satellite missions, the ratio of the data that have been utilized to the data that have been collected is embarrassingly low. Another trend in remote-sensing is the implementation of synergic observation and the rapid distribution of data. For example, the International Charter "Space and Major Disaster" aims at providing a unified system of space data acquisition and delivery to those affected by natural or man-made disasters. To timely response to a disaster event requires an efficient coordination of various sensors and a well-defined strategy of data processing. In light of the development and the trend in the realm of remote sensing, an integrated platform is urgently needed to meet the aforementioned requirements for the applications of remote sensing.

The innovative technology of GRID has been successfully applied to many fields in past few years. This technology has been evolved from the grid of computing to both the grid of data and the grid of sensor. Therefore, it would be ideal to develop an integrated platform for applications of remote sensing based on the GRID technology. This consensus has been reached by many scientists in various space agencies and research institutes all over the world. As a result, an international project of GeoGRID is proposed. There are more than ten countries are involved in this project currently and more countries are expected to participate this project in the near future. Based on the cooperative agreement between the Disaster Prevention Research Centre (DPRC) of National Cheng Kung University and the National Space Organization (NSPO) of Taiwan, DPRC serves as the first image application and distribution centre (IADC) in the world that receives, processes and archives FORMOSAT-2 imagery on a daily basis. After more than one and a half years of operation, DPRC has successfully applied FORMOSAT-2 imagery to disaster preparedness, rescue and environment monitoring, such as in the aftermath the South Asia tsunami. DPRC has also demonstrated the potential of FORMOSAT-2 daily revisit imagery in site surveillance. This paper describes the infrastructure of Taiwan GeoGRID that is able to process a large amount of FORMOSAT-2 daily revisit imagery. The prototype of Taiwan GeoGRID comprises of several modules, including level-2 product generation, band-to-band coregistration, spectral preserved pan-sharpening technique, multi-temporal imagery matching and quasi-automatic orthorectification. Two examples are given to demonstrate the applicability of Taiwan GeoGRID for site surveillance. More sources of satellite data and functions of image processing would be added to Taiwan GeoGRID following the protocols defined by the international GeoGRID project in the future.