



Space-Borne-Synthetic Aperture Radar (SAR) System For Real Time Surveillances Of Earth Surface For Detection And Management Of Flood Disaster In Indian Sub-Continent

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Abstract

Earth Observation System consisting of remote sensing satellite in optical and microwave spectrum provides the information of different environmental and earth surface parameters by mapping and monitoring the earth surface for natural disasters such as earth quake, landslides, floods and forest fire apart from natural resource management. The remote sensing satellite images of multi-spectral sensors in the optical spectrum are affected by weather conditions due to clouds and rains as well as climatic conditions, restricting its application during clear sky conditions apart from limiting its image acquisition during the day time only. The development in the space borne synthetic aperture radar (SAR) technology and imaging techniques to reduce the repeat pass period using multi-SAR systems in orbits makes its suitable for real time monitoring and mapping of earth surface for the flood and water resource management due inherent cloud and rain penetrating capability as well as backscattering properties of radar signals in different frequency band. The recent development of space-borne SAR systems in bi-static and multi-static configuration by different space agencies ensures the availability of multi-sensor SAR in different microwave radar bands for the development of space-based flood disaster management system. The inherent characteristics to generate high contrast in SAR image between surfaces such as soil and water is due to very low backscattering coefficient of radar signals from water bodies acting as a mirror reflecting surface and earth surface gives higher backscattering coefficient due to surface roughness consisting of soil characteristics and vegetation, which increases the radar reflectivity of the surface. Major rivers in India like Indus, Ganga and Brahmaputra are snow-fed as well as monsoon rainfall dependent, while the other river basins are purely rainfall dependent. A large variability in the characteristics of rainfall has been observed over the basin in different seasons and months. The southwest (SW) monsoon, which brings about 80% of the total precipitation over the country, is critical for the availability of freshwater for drinking and irrigation. Flooding in rivers are caused due to excessive rainfall and discharge of water in the river basins leading to the overflow of the water submerging the landmass depending upon its terrain profile, river bed characteristics, raindrop size distribution and rainfall characteristics. In this paper, the concept of the bi-static and multi-static space-borne SAR sensors has been described for development of real time space-borne surveillance system for Indian Sub-continent as Disaster Management System (DMS), which can be used for flood detection and flood disaster management. The concept of geostationary radar illuminator and constellation of multi-SAR-satellites in LEO has been described.

Author Keywords

Remote Sensing Satellite, Bi-static and Multi-static SAR System, Radar Backscattering Coefficient, Flood Detection Techniques, Geostationary Radar Illuminator, Low Earth Orbit (LEO), Micro-SAR Receiver

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