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CUBESATS AS PLATFORM FOR REMOTE SENSING APPLICATIONS WITH SATELLITE NAVIGATION SIGNALS

Abstract

Studies on the geospatial field using both ground, aerial and satellite based technology have been conducted for several years. Remote sensing technology used for the study of Earth surface and atmosphere has played a key role in a cohort of applications. It has opened the door for new research opportunities and solutions in order to tackle major global concerns such as climate change, global warming, and natural disasters. Such applications usually require global availability, frequent revisit over the same area which forces the use of constellations of small satellites. However, active remote sensing techniques involve the use of very demanding payloads, high on-board power consumption, consequent big platforms, and high costs for launches. The capability of exploiting signal broadcasted from other missions permit to combine the benefit of microwave active sensing with the less demanding needs of passive remote sensing satellites. One of these new technologies is Global Navigation Satellite System-Reflectometry (GNSS-R) because of its potential in remote sensing applications. The global availability of GNSS signals and the existence of different satellite systems with different characteristics contributes to a thorough study of the Earth's surface and atmosphere. The basic concept of this technology is the exploitation of the reflection of navigation signals for remote sensing applications such as soil moisture estimation, sea level measurement, snow depth and age estimation, and sea surface roughness. There are several platforms such as satellites, helicopters and, aircrafts that are used to study these signals. This paper introduces a case study of the GNSS-Reflectometry on CubeSat for remote sensing applications. The development of CubeSat technology contributes significantly to the success of scientific and educational missions. The main advantages of CubeSat are low manufacturing costs and short time to design build a satellite practically from commercial off-the-shelf components. The case study presented here describes the use of software and hardware requirements for the CubeSat based reflectometry model. The challenges for hardware requirements are the use of miniaturized space-borne GNSS receivers accommodated and operated on a CubeSat bus to achieve Earth observations by capturing faint reflected GNSS signals. This research effort analyses technical requirements needed to make GNSS-Reflectometry technology more affordable and convenient to use. The final outcome of this paper is to introduce CubeSat based reflectometry model, which summarizes the theory and signal processing system used for current CubeSat based reflectometry. Keywords: GNSS - Global Navigation Satellite System, GNSS - R-Global Navigation Satellite System-Reflectometry, CubeSats.