Mission and constellation design for low-cost weather observation satellites

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Abstract: The mission and constellation design for acquiring weather images of Taiwan, Republic of China, is presented. The mission requires acquiring at least one image covering Taiwan per hour. The constellation is constituted of the low-cost microsatellites, which employ a passive magnetic attitude control system and an imagery system of miniature cameras. The coverage requirements, accessible coverage zone, access coverage, and access coverage gap, are defined according to the constellation design. The Walker constellation method is employed to calculate the minimum satellites in constellation for the mission requirements. The calculation result shows that the 14/14/0 constellation satisfactory meets the mission requirement. The 14/14/0 constellation is also extended to acquire the images of targets located in the certain specified geomagnetic latitude band (-5 to 22 deg) hourly, with a slight modification of imagery system of each satellite by using multicameras. An application to observe a typhoon as the moving target having 127 images acquired in 102 h in the warning area of Taiwan is also presented.

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