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OPTIMIZATION OF SPACECRAFT IMAGE COLLECTION PLANNING AND SCHEDULING PROBLEM

Abstract

The space-based image collection planning problem can be described as choosing a sequentially ordered set of collection targets, from among a larger set of available targets, that maximize a specified benefit while remaining compliant to several time-dependent constraints. Based on various customer needs, a collection of targets that comprise points, strips and large areas constitute a requisition set for an imaging satellite. This paper presents satellite scheduling for a multi-objective programming problem in response to various requests. The objective is to maximize the value of image data acquired by the constellation of satellites over the upcoming planning period.

For solving this problem, the formulated mathematical programming problem has been divided into three phases i.e. discretization phase, target decomposing phase and the scheduling phase. In discretization phase targeted area is discretized equidistantly with spots and the set of interpolated spots represents the whole target area. In target decomposition phase area target is decomposed into strips and corresponding visible time windows are estimated. To address the satellite scheduling problem, we first demonstrate a detailed problem description and then transform the problem into multi objective set covering problem within several criteria and constraints.

In order to illustrate the various concepts has been used to formulate the complete mathematical programming problem; a fundamental problem in response to various requests subject to constraints from both satellites and requirements is introduced in the present paper. This fundamental problem includes determining which targets to collect and in what sequence. Presently, the challenge of collection planning is being met by simplifying the problem to a point that it can be solved by a given set of tools or algorithms.