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EFFICIENT POWER ALLOCATION FOR PROFITS MAXIMIZATION IN DIGITAL CHANNELIZED SATCOM SYSTEMS

Abstract

For digital channelized SATCOM systems, power allocation is an effective way to improve the transponder's power utility and spectrum efficiency under the influence of nonlinear high power amplifiers. With link supportability guaranteed, a lot of work has been done to minimize the total transponder output power or to maximize the total transponder capacity, but none has considered the different service demands of different links. Nowadays, the integration of satellite service with 5G terrestrial wireless is a typical application in 5G cellular systems. And in the practical commercial situation, different links will apply different pricing strategies in accordance with their capacity demands. Therefore, how to allocate the capacity properly to maximize the total profits is a significant issue.

In this paper, considering an economic model for the digital channelized SATCOM system, we introduce an optimization problem of profits maximization. Then with formulating as a non-linear non-convex optimization problem, a multilayer search (MS) algorithm is proposed. Specifically, the MS algorithm consists of two parts:

1. The part to search the optimal allocation under a fixed parameter (the transponder's operating point). By setting the fixed parameter, the original non-convex optimization problem turns into a convex optimization problem, which is much easier to solve. This part is implemented by the binary search method.
2. The part to search the optimal value of the fixed parameter. By constructing a unimodal function, this part is implemented by the golden section method efficiently.

Further, numerical simulations using the same parameters in earlier literature are provided. Comparing to several typical traditional solutions, the maximal profits obtained by the proposed solution could be increased by 6% at least. Besides, for the special situation where all links use the same pricing strategy, the profits maximization problem becomes the capacity maximization problem. Then analyses indicate that the MS algorithm itself outperforms the traditional algorithms in terms of convergence rate and result: in the simulation case, being 12.6 times faster than MO algorithm while getting the same maximal capacity, and being 4.8 times faster than EMO algorithm while increasing the capacity by 4%.