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REINFORCED LEARNING FOR DYNAMIC RESOURCE MANAGEMENT IN VHTS SYSTEMS

Abstract

Very High Throughput Satellite Systems (VHTS) are expected to have a large increase in traffic demand in the near future. However, this increase will not be uniform throughout the service area because the user distribution is not uniform within the coverage, and the traffic demand changes during the day. A solution to this problem is found in flexible payload architectures, which allow payload resources to be flexibly allocated to meet traffic demands in each beam; this adds significant complexity to the VHTS system performance, so the problem of Dynamic Resource Management (DRM) needs to be solved.

Although it may seem feasible to achieve a solution to this problem through optimization techniques, on a larger scale the number of resources to be managed, the limitations that come from the system and the infinite number of traffic demand situations may result in a problem that cannot be solved by conventional techniques. Current research proposes to solve the DRM problem in satellite communications using Machine Learning (ML) techniques.

In this context, the interest for using ML algorithms in satellite communications has recently increased. There have been some technological developments in the use of communication satellites on-board ML, and some of these developments are mainly focused on control and autonomous operations (e.g. by NASA for cognitive space communications).

Whereby, this contribution presents a preliminary study of how and where Reinforced Learning (RL) algorithm can be used in a flexible payload architecture. We analyze the DRM problem in a flexible payload architecture and propose the cost function to implement the application of RL as a solution for the demand of non-uniform traffic and changing over time in the service area.