Commentary on: Adaptive Resource Modelling for Autonomous Planning and Scheduling

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On-board resource models are important elements in a variety of software systems, including spacecraft simulator, mission planning system, monitoring and diagnostic system. These models synthesize the profile of an activity, in terms of amount of resources that the specific activity consume or produce.

Most of the currently used models are static, although exist the possibility of being manually updated, for instance modifying the application's configuration file. The satellite, as "live system" is subject to aging and degradation. As a consequence the used resource models may become obsolete and unreliable.

In operations the validity of these models needs to be checked at regular intervals. In case of discrepancies the models running in the ground infrastructure are being updated. Different is the case of an autonomous on-board application such as the case of the referenced paper.

It addresses a refinement of a previously presented planning algorithm called NEAT.
The approach of using artificial neural network to dynamically model the resource consumption or resource generation models seems appropriate. And the demonstrated results show concrete and evident benefit when the neural network is being used in the loop.

The question of an operations engineer would be how reliable and robust the neural network estimator is, so that to become part of an autonomous closed loop system.

It is not explicitly mentioned in the paper the process followed to select the proposed network topology. In fact the choice may well influence the performance and robustness of the network. For instance smaller hidden layer usually brings to increase the generalization of a network.
Another question that can be raised is why having a single network for all modeled resources. In the perspective of a simplified network topology it should also be considered the case to have a neural network for each subset of resources that have a degree of correlation or a neural network for each individual resource.

It is also suggested to run more extensive test cases to gain more statistics on the performance and robustness of the network. A worst case to be considered should be the reaction to glitches in telemetry.

The network training process is also critical and particularly the selected amount of training data. The latter should become a configuration parameter of the system. Test cases should be run to quantify the qualitative impact of the selected amount of training data, described in the paper.

Overall the approach is very promising to make an autonomous planning system more robust and adaptable to aging on-board devices and degraded system performance.