Commentary on: Autonomous Planning and Execution for a Future Titan Aerobot

Daniel Gaines, Tara Estlin, Steve Schaffer, Caroline Chouniard and Alberto Elfes

by

Alessandro Donati
ESA - European Space Operations Centre
Robert Bosch Str. 7
D-64293 Darmstadt, Germany
Alessandro.Donati@esa.int

Introduction

After the Huygens probe landing on the surface of Titan the proposed Aerobot mission seems to be a logical and coherent enabler to further discover the fascinating world of the Saturn's moon.

While Huygens findings will facilitate the initial modelling of the aerobot's external environment the newly proposed system has to face a set of complexity as pointed out in the article.

Elements of novelty and implications

Two elements of novelty (among others) with respect to the approach currently followed for the rover planning systems are identified. Here below they are briefly discussed together with the implication in terms of resources and performance.

A major element, introducing high degree of complexity is given by the nature of the aerobot mission being a flying platform which implies a high transitions rate between different types of geographic regions.
This means considerable amount of sensorial information continuously generated, collected and processed in near real time to capture essential information. The extracted knowledge will be then provided as input to the autonomous planner. As a consequence the performance of the feature extraction process from sensor data seems to be crucial and particular attention will be required to its proper and effective implementation.

Another element of novelty are the fluctuation of uncontrolled variables such as wind direction and strength, and, possibly, atmospheric pressure and temperature. To cope with these events the automatically generated plans will require to incorporate a high degree of robustness.

In addition, both listed elements above imply other features: time critical generation of the updated model as well as of a new plan. Both need to be fast enough to cope with the rate of novel data acquisition.

Power availability and CPU processing capability and onboard memory could well become bottleneck if not properly sized. Which in ultimate analysis means higher implementation cost or penalty in operations execution.

Summary

The initial proposed approach seems to be well structured; during the iterative design and prototyping phases of AerOASIS the aspects briefly discussed may well be progressively taken into account to better respond to dynamic opportunistic science events.