Commentary on "Planning and Representation of Joint Human-Agent Space Missions via Constraint-Based Models"

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With their paper entitled 'Planning and Representation of Joint Human-Agent Mission via Constraint-Based Models' the authors from the University of Edinburgh steer our minds to aspects of future space missions, many of us may not even have thought about while watching a well known science fictions series on TV. The authors have anticipated, and elaborated on, an issue that is likely to decide on the success of any planetary exploration mission of medium to large scale. It is the problem of a target oriented coordination of activities between agents of different kind, that control entities largely dissimilar in their individually offered capabilities. This coordination will be the output of a rather dynamic mission planning process executed at several layers of an underlying hierarchical structure. Various types of constraints action upon the entities, Astronauts, robots and spacecraft, deployed respectively to both an orbit about the planet and its surface, determine the short term tactical planning. Modifications at this level may impact on the medium term planning. In case they do, the overlying strategic plan may be affected and may have to be re-evaluated. Since delays in signal propagation can be large (e.g. between 3 and 23 minutes OWLT for a Mars mission) and concurrent use of Earth ground stations by other missions will not guarantee communications access at any time and for any duration, tactical mission planning must be executed independently of the planners on Earth. The authors present an approach that appears to have the potential of coping with related planning scenarios. They base this approach upon a general purpose ontology, referred to as 'I-N-C-A', an acronym that stands for Issues-Nodes-Constraints-Annotations). According to the authors I-N-C-A can be used to represent synthesised artefacts in the form of a set of constraints on the space of all possible artefacts in the application domain. Exploitation of I-X Process Panels (I-P2) is proposed to show the current state of the collaborative planning as seen from the perspective of the panel's user. The suitability of such panels, though for other purposes, has been demonstrated in different coordination scenarios on Earth. The authors provide a justification for the selection of the I-P2 technology with respect to the interfaces with both Astronauts and software agents. A potential application in a Martian environment is presented to illustrates the authors' ideas.

While many of us are familiar with the conventional methods of mission planning, i.e. activity plans compiled with computer assistance by planners on Earth, included telecommand sequences then transmitted to the spacecraft for autonomous, timeline based step by step execution, and results eventually being reported back to Earth, the inadequacy of this method for more complex missions has become obvious. This is not only relevant to interplanetary mission of larger scale, but is likely to apply as well to multi-satellite missions in orbits close to Earth, in particular if time constraints determine the mission success. It would be interesting to see, whether such types of missions could be considered and selected as a pre-cursor applications for the interesting proposal the authors have put forward to us.