SYMPOSIUM ON SAFETY, QUALITY AND KNOWLEDGE MANAGEMENT IN SPACE ACTIVITIES (D5)
Knowledge Management and Collaboration in Space Activities (2)

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KNOWLEDGE PRESERVATION:A SEMANTIC APPROACH TO VISUALIZING AND REUSING MICROGRAVITY MATERIAL SCIENCE DATA

Abstract

At DLR MUSC, a significant amount of data is being produced by various spaceflight projects. The amount of data will increase due to ongoing and future experiments on the International Space Station ISS. To bypass possible bottlenecks and shortages, DLR MUSC started setting up long term data archives based on the commercial Werum HYPERTEST® platform a few years ago. They support the tasks of data storage, archival, distribution and retrieval.

The more extensive and diverse data storage becomes, the more one strives to classify the contents in a larger context and find coherences and synergies among them. This in particular concerns the TEMPUS project. TEMPUS is an electromagnetic levitation facility for container-less processing of metals and semiconductors under microgravity. Apart from the scientific interest, the TEMPUS experiments on short duration flight carriers like parabolic flights or sounding rockets serve as a preparation for future experiments on the ISS. This makes it interesting to efficiently have recourse to the stored knowledge, also for a future user who is eventually new to the data pool and does not know which kind of information is available.

Hereby, semantic techniques provide possibilities for linking distributed information in a more sophisticated manner. One ISO standardized and semantically driven technology of expressing implicit knowledge structures constitutes Topic Maps which offer a powerful way of navigating large and interconnected knowledge structures.

This paper aims at adapting the Topic Maps technology to experiments performed during parabolic flights on the DLR TEMPUS facility between 2003 and 2009. In this context, available metadata like sample material, environmental parameters etc. can serve as atomic constituents for a domain ontology.

By pursuing that approach, the domain knowledge for several experiments is extracted from various information sources and modelled in distinct Topic Maps ontologies. Possibilities of performing that task automatically, i.e., populating the Topic Maps by mapping the contents of the TEMPUS Hypertest database onto the ontology, are discussed. The information contained in the Topic Map is visualized in a web application based on the freely available Ontopia Knowledge Suite. The application has been worked out at DLR-MUSC and exploits implicit data coherence in an intuitive way. The quality of the ontology and added value like enhanced navigation, system extensibility and access to tacit knowledge are assessed by internal users.