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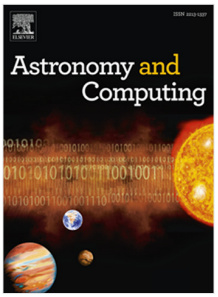

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CASAS: A tool for Composing Automatically and Semantically Astrophysical Services.

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Abstract

Multiple astronomical datasets are available through internet and the astrophysical Distributed Computing Infrastructure (DCI) called Virtual Observatory (VO). Some scientific workflow technologies exist for retrieving and combining data from those sources. However selection of relevant services, automation of the workflows composition and the lack of user-friendly platforms remain a concern. This paper presents CASAS, a tool for semantic web services composition in astrophysics. This tool proposes automatic composition of astrophysical web services and brings a semantics-based, automatic composition of workflows. It widens the services choice and eases the use of heterogeneous services. Semantic web services composition relies on ontologies for elaborating the services composition; this work is based on Astrophysical Services ONtology (ASON). ASON had its structure mostly inherited from the VO services capacities. Nevertheless, our approach is not limited to the VO and brings VO plus non-VO services together without the need for premade recipes. CASAS is available for use through a simple web interface.

I. Introduction

The use of modern astrophysical instruments creates the production of massive datasets. Modern astrophysical instruments are conceived from the ground up integrating science gateways in their design. Those science gateways (SGWs) are composed of data, processing pipelines and applications dedicated to the instrument. They consist of software packages designed for the specificities of the said instrument. Those packages generally include web and desktop environment for online and offline use. They are composed of scientific libraries, grid and cloud computing, as well as workflow managers.

Use of astrophysical instruments produces data that are made public, either after scientific publication or after the proprietary period has passed. The VO has been designed with the goal of allowing the access and enhancing the interoperability of this huge amount of data. The VO is an astronomy-specific Distributed Computing Infrastructure (DCI) offering standards for services query, data access and data models. Around this DCI, different applications (called "VO-compliant" applications) have been developed either for specific needs like the CASSIS (Centre d'Analyse Scientifique de Spectres Instrumentaux et Synthétiques)[1] for spectral analysis, or more generic like Aladin[2] [1] that is probably the most well-known VO-compliant tool.

Despite the VO efforts, bringing together a number of different tasks in order to produce a scientific result may involve different tools and services. Those steps may not be easy to assemble, share and modify outside of a dedicated workflow manager. To overcome this problem, J.E Ruiz et al. [2] propose AstroTaverna, which is a plugin for Taverna workflow manager that brings VO services.

Meanwhile, many web services are available for astrophysics, both inside and outside the Virtual Observatory architecture and specific instruments pipelines. Exploring the capacities of services (the information they may provide and the input parameters they need to be used) regardless of their specific DCI or outside from any DCI remains a concern.

Web services discovery and composition is at the core of many research work in computer science addressing exactly this kind of concerns. A recent survey [3] establishes a framework for the description and comparison of the different approaches, based on the analysis of 12 platforms. Among the 12 platforms analyzed, only one platform (Taverna) was addressing scientific workflows, while 10 out of 12 were dealing with business processes and 1 with mashups (Yahoo! Pipes) but targeting end-users programmers audience rather than domain experts.

[1] http://cassis.irap.omp.eu/?page=cassis
[2] http://cdsads.u-strasbg.fr/abs/2011ascl.soft12019C