

Technical Forum Group, TFG
Agent Oriented Software Engineering, AOSE
TFG-AOSE Report

Meeting 4, cohosted with EUMAS, 2006, Lisbon, 13th December 2006

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Introduction

This fourth edition continues the tradition of the AOSE Technical Forum Group (TFG) started back in 2004. The scope of this Technical Forum (TF) is to work on the main challenges of agent-oriented software engineering (AOSE). Its specific aim is renewing and strengthening the cohesion of the AOSE community that participated in the previous meetings. As a tangible result of these events, several members of this TFG now share common research activities and projects originating from the discussions they held during the meetings (or after them).

The initial work plan for this meeting mainly included topics proposed by TFG supporters and a few panels on relevant research issues. It consisted of two sessions: a paper/talk session and a panel session. In the first, a small number of short presentations was given followed by open and moderated discussions. In the second, a broad panel-like discussion on the most relevant topics in AOSE was held.

Organising Committee:

- Massimo Cossentino, Université de Technologie Belfort-Montbéliard, France
- Carole Bernon, Institut de Recherche en Informatique de Toulouse, Université Paul Sabatier, France
- Brian Henderson-Sellers, University of Technology, Sydney
- Abderrafaa Koukam, Université de Technologie Belfort-Montbéliard, France
- Juan Pavón, Universidad Complutense de Madrid, Spain

Summary of presentations

The first talk entitled “Simulation-driven development of MAS”, given by Giancarlo Fortino (University of Calabria), presented simulation as an added-value for the whole development cycle of a MAS. One step was added to the different phases of the development process of PASSI to get feedback from some of the models. Simulation is a way to test if something is wrong, as a precursor to the analysis of the nature of the problem, in order to let the designer know he/she has to change requirements or to undertake an additional iteration of the development process. This enables him/her to evaluate and validate functional and non-functional requirements and therefore the individual behaviours of agents. Simulation is based on statecharts and Java code is automatically generated from them.

Joaquin Peña (University of Seville) talked then about MAS product lines (MAS-PL). The aim is to ease the development of MAS by considering the field of Software Product Lines (SPL) in which families of products are considered. Making a product development lifecycle of better quality in this way can be paid off by the fact that

several products can be developed using it. The approach presented is based on MaCMAS, an AOM which deals with complex MAS. The first stages for building a MAS-PL were presented.

The third talk “The Gaia2JADE process for MAS development” by Nikolaos Spanoudakis (University of Paris 9) was aimed at a process enabling designers to easily model a MAS with Gaia and implement these Gaia models using the JADE framework. This Gaia2JADE process, described using the Software Process Engineering Metamodel (SPEM), is composed of the Gaia modelling process to which the JADE development phase has been added. This phase comprises four steps: (1) definition of the communication protocol, using ACL message; (2) definition of the data, their structure and the algorithms that are used by agents; (3) definition of the JADE behaviours and (4) building of the agent classes by aggregating behaviours. The process is an iterative one and could be repeated if errors are detected in the implemented MAS. This can be done using the Gaia services model. Simulation and optimization are viewed as future works to allow an incremental development.

The last talk of the morning, “Towards agent model-driven engineering”, by Jorge Gomez-Sanz (Unviersidad Complutense Madrid), discussed the tendency of current agent oriented software engineering towards model driven engineering (MDE). The talk pointed at a major flaw in current approaches to agent oriented software engineering, namely focusing too much on the modeling part. Software engineering has a much wider scope, like caring about the process followed by the developers to construct the system, the costs involved, the quality requirements, and so on. Besides, many agent oriented software engineering solutions have no support tools or a clean transition from the specification to implementation (sometimes implementation is not even considered). Since the impact of modeling techniques has been so important, it makes sense to use MDE techniques to complement current AOSE methodologies. To illustrate how to enrich a methodology, the talk introduced the INGENIAS methodology as an example of a MDE solution for MAS. It provides support tools for creating a MAS specification, automatic translation from the specification into actual code, and for debugging the system.

The afternoon began with a talk entitled “From Analysis to Design of Holonic MAS” by Vincent Hilaire (University of Belfort-Montbéliard). From a philosophical point of view, a holon is something that is simultaneously a whole (in itself) and a part (of a larger system). Therefore recursive decompositions exist because a holon can be seen as an organisation and also decomposed. Holons are categorized into super or sub-holons forming hierarchies called holarchies. Different approaches exist for the architecture of a super-holon (such as moderated groups). MAS are complex systems and therefore are also difficult to design. Holonic concepts can be used to design MAS and give birth to holonic MAS in which agents group together to form holons. A holon can play roles like an agent and can be seen as a design concept. Dynamics of a holarchy can be based on the roles of the holarchy and a set of transitions defined or based on affinities or satisfaction which are criteria for transition between roles. Finally, applications dealing with complex problems and implemented as holonic MAS were presented: adaptive meshing problem or simulation of the traffic flow inside an industrial plant (Peugeot).

In the afternoon session, Stefan Poslad (University of London), as chair of CASA, gave a report to the AOSE TFG, on the activities of CASA. In essence, during the second CASA TFG meeting, some potential areas for standardisation were identified

and reported in this talk. Among them, some AOSE concerns such as enabling a MAS developer to create his/her own methodology, the aim is then to achieve modularity in order to integrate and customise different methodologies. CASA is also interested in different issues shared by AOSE that can be summed up by questions such as what is the audience for methodologies or models? what kind of tools are needed? when will these tools be mature enough? The talk by S. Poslad was also about FIPA's activities of standardisation and this led a discussion towards what were the standards needed by AOSE and how FIPA could help. The main questions raised during the discussion concerned first the lack of standardisation of modelling languages which is mainly due to the fact that FIPA is more interested in concepts than notations. Then it was wondered whether having models from FIPA Modelling/Methodologies TC was interesting for FIPA yet and what was expected. A positive answer let the participants to think that a standardisation of concepts related to AOSE was still imaginable in FIPA. More details on this joint meeting can be found in the CASA TFG report.

This was followed by Brian Henderson-Sellers (University of Technology, Sydney), who gave an overview of the new ISO/IEC 24744 standard relating to methodologies. This standard, entitled "Software Engineering. Metamodel for Development Methodologies", to be published early in 2007, uses a three level architecture designed around people and their software development practices and defines the metamodel component using the concept of powertypes. Together, these support not only process/method modelling but also enactment – not possible using earlier process metamodels such as those from the Object Management Group based on pure instantiation semantics. The metamodel is technology-agnostic and is thus equally applicable for describing and supporting methodologies for object-oriented, agent-oriented etc. developments. It also provides "hooks" to an appropriate modelling notation (e.g. AUML, UML) so that the semantics of both process and product elements are aligned.

This session was closed by a talk of Massimo Cossentino about past experiences in FIPA and new possibilities of standardization for agent-oriented methodologies. During this talk he presented the work done during the activities of the FIPA Methodology Technical Committee (2003-2005): the most important contribution is the definition of a method fragment meta-model; this was used to represent some agent-oriented methodologies using a process description language (the TC adopted OMG SPEM - Software Process Engineering Metamodel); the described methodologies are: ADELFE, Gaia, and PASSI; from the previously listed methodologies members of the TC extracted several method fragments according to the defined method fragment meta-model, a new fragment that is specific to deal with complex systems has been created by J. Peña; and finally, the TC worked on the identification of some approaches and guidelines for methods integration. Because of the sudden close of FIPA and its moving under the IEEE Standards Committee, the standardization process of the first and most important result (the method fragment definition) stopped. At the end of his talk M. Cossentino proposed to start the activity of a new group within FIPA with the objective of continuing in the same direction, first of all by standardizing the already proposed method fragment definition.

Other Contributions

Because of the long and interesting debates, one of the talks (Tools for Methodologies Construction by Massimo Cossentino) had to be cancelled with the promise of presenting part of the topics during a talk in the main conference. In the following we report the content of the contribution as it can be deduced by the contributed materials (see the event website) and the EUMAS talk.

The contribution deals with a tool built to support method engineering experiments. This tool (called Metameth) can be used to define a new (agent-oriented) design process and can support the design phases in both research activities as well as real or students' projects, where different stakeholders can participate in the design of an unique system in an asynchronous and distributed way. Metameth is essentially composed of 4 main components:

- the process definition component (an open source graphical tool that allows the definition of a process in form of a workflow process);
- the process execution component that orchestrates the different activities allowing their distributed, asynchronous, and (in a limited way) collaborative execution;
- the personal agents: each designer essentially works in tight relationship with a personal agent that takes care of executing recursive tasks;
- the modelling tools: designer performs his/her work also with the support of a UML modelling tool built as an IBM Eclipse plug-in.

The repository of method fragments is one of the other important parts of this project; it includes by now only fragments from a few methodologies but efforts are in progress in order to enrich it.

For this fourth event our TFG also received an off-line contribution (a contribution that has not been presented during the meeting but sent in form of a paper): "PERICLES: Improving Agent Communication Capabilities in AgentService" by A. Passadore, C. Vecchiola, A. Grosso, A. Boccalatte. The paper describes Pericles, a design environment for the development of ontologies and interaction protocols integrated in the AgentService framework for Multi-Agent systems. After a brief introduction on the framework, the paper presents the ontology service that allows AgentService users to clearly represent knowledge bases and message contents. Another interesting aspect of the framework is represented by the interaction protocol service that provides a simple way to represent structured dialogues among agents. Pericles allows developers to graphically design these dialogues through AUML diagrams and to automatically generate the code representing the interaction protocols. A Pericles diagram defines agent roles, which evolve sending and receiving messages through alternative paths and loops. The generated code allows an agent to participate to a conversation with peers, playing a role through a behaviour object.

Further details on this contribution as well as on the talks given during the event can be found in the EUMAS AOSE-TFG website.

AOSE-PROMAS joint session

The joint session with PROMAS turned to be a kind of plenary session involving members of AOSE, PROMAS and SELFORG TFGs. During this session, Juan Pavón presented the European WP7 Framework thus triggering several discussions about the best solutions the agent community could find for getting a project approved by EU Commissions in the next calls. The most relevant remark that emerged from the discussion is that the word 'agent' has not been given a great attention in these calls (it is cited only once) but concepts like autonomy and intelligence are present in several documents and open interesting scenarios of participation of our community. Another crucial aspect seems to be that the presence of some technological platforms (like for instance NESSI) should be considered and conflicts with them avoided.

The last part of the session was spent on discussing about the organization of a new scientific event for the agent community. Several participants identified in the quality of submissions and proceedings the keys for the success of such an event. A proposal for a first event was analyzed but no decision taken.

Conclusions

The AOSE Technical Forum Group meeting in Lisbon was a very fruitful and packed event. Several people attended the meeting and actively participated in the discussion. The absence of a scholarship probably affected the number of PhD students who participated to the event but nonetheless some of them were present thus confirming that the interest that this group have always had for them is well perceived.

The relevant number of talks and their quality has again confirmed that the AOSE community is moving at a relevant speed and achieving very good results. We think that contributions we received can be ideally clustered in three categories: (i) new research works: as it usual in such a context, several authors presented new research activities and their results; (ii) new research works on consolidated streams: a few contributions dealt with the extension of existing approaches to face new challenges, we evaluate this is as an important sign that AOSE research is consolidating its results and it is going towards its maturity; (iii) standardization activities, software engineering has always cared about standardization because this is a sensitive topic for people who work in industry; such a standardization need is now strongly perceived by the AOSE community too and several contributions have been presented during this meeting about that.

Debates after each talk and during the joint session with Promas were very active and dialectic, giving the participants the opportunity to exploit their position and argue their points of view. The joint session with Promas TFG confirmed the affinity of ideas and the tight relationships that already in the past linked these groups; further collaborations and common events are planned and welcomed by the members of the AOSE TFG.

At the end of the event participants expressed their will to continue the work of the AOSE TFG and organize further meetings.