

An evaluation tool for Multiagent development techniques

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ABSTRACT

Masev¹² (MAS Software engineering EVAluation framework) is an online application that allows analyzing and comparing methods, techniques and environments for developing MAS. Moreover, Masev allows the evaluation of how these methods and tools support the development of Organizational MAS and Service-oriented MAS. Finally, Masev provides a quantitative comparison based on a simple metric whose parameters can be modified by the users.

Categories and Subject Descriptors

D.3.3 [Software Engineering]: Design Tools and Techniques

General Terms

Design

Keywords

Agent development techniques, evaluation

1. INTRODUCTION

In the last few years the evaluation of multiagent systems (MAS) software engineering techniques has gained the research community attention, deriving in standardization efforts. Despite this, there is no tool that implements and simplifies the evaluation process and the comparison task. The works related with this topic only provide theoretical guidelines and some comparison of a few methods and tools in a specific moment. If any of these methods or tools improves or adds new functionality, the evaluation results will be outdated. Furthermore, there is no comparative repository of the current methods and techniques to develop MAS. In this paper we try to solve some detected drawbacks of this topic implementing a framework that analyzes the whole development process, that offers comparison and recommendations depending on the application requirements, that could have

¹<http://masev.gti-ia.dsic.upv.es/>

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continuity over time (the criteria and the analysis could be easily updated) and that offers a comparative repository of current methods and techniques.

2. MASEV

Masev allows analyzing methods and tools through a set of criteria derived from previous studies [2, 4]. These criteria are related to both system engineering dimensions and multiagent system features. They analyze the MAS development process from the requirement stage to the implementation of the final code taking into account the most important features and tools involved in the process. The gap between what can be defined by the methodology and what can be modeled with the modeling tool is also analyzed. Moreover, the gap between what is modeled and what can be directly translated into code is also analyzed. Finally, the support for developing organizational [1] and service-oriented MAS is studied [3]. The main objective of Masev is to facilitate and simplify the evaluation and comparison task. For that reason, the criteria are presented as a set of questionnaires. The use of questionnaires makes the answers be more concrete and easy to compare. Also it reduces the evaluation time and simplifies the evaluation process.

Other objectives of Masev are to achieve the greatest possible number of evaluations and to keep these evaluations constantly updated. For that reason, Masev is implemented as an online application that can be accessed anywhere and anytime. Moreover, the evaluation process has been simplified and the time needed to evaluate a tool has been reduced as much as possible.

3. MASEV FUNCTIONALITIES

The main functionalities of Masev are the analysis and the qualitative and quantitative comparison of methodologies, modeling and implementing tools for developing MAS. Masev offers a personal site where users can define their own evaluations of tools and their own metric parameters.

3.1 Analysis of methods and tools

The evaluation process consists of completing a sequence of forms about the method or tool to evaluate. Firstly, the user has to specify what he is going to analyze. It can be a methodology, a modeling tool, an implementing tool or a toolkit, i. e., a group of related methods and tools. For example a toolkit can be a methodology that has its own modeling tool associated.

Finally, users can view and modify their previous evaluated methods and tools and update them at any time. This

Figure 1: Masev comparison of 4 methodologies

functionality allows users to update their evaluations if a feature is improved or when adding a new feature.

3.2 Comparison of methods and tools

Users can compare different evaluations of a specific method or tool and also they can compare some methods or tools of the same type.

The results of the qualitative comparison are presented as summarized tables like Figure 1. These tables allows comparing the engineering tool taking into account the selected evaluation criteria.

Masev also implements a simple metric that allows obtaining quantitative comparison of the evaluated tools. A quantitative evaluation offers a fast and general evaluation overview which allows to compare and evaluate methods and tools easily.

$$result = \frac{\sum(W \cdot R)}{\sum(W \cdot \max(P))} \cdot 100 \quad (1)$$

Each established criterion is associated with a weight (**W**) that represents the importance of this criterion. **max(P)** represents the best possible answer for each criterion. **R** represents the evaluator answer for each criterion. Each possible answer is associated with a weight.

The default weight of each criteria and the value of each answer has been defined taking into account the study of the state of art and the experience of Masev authors and collaborators. Despite this, users can define their own vector of weights. This fact simplifies the selection task between one engineering tool or another. Users can adapt the metric parameters to the specific requirements of their application, so they would obtain a ranking of the most appropriate methods and tools to develop a specific application. Figure 2 shows the numerical comparison of four methodologies obtained using this metric and Masev default criteria weights. These results allow an overview comparison of these methodologies. For example, the results of the Concepts and Model dimension show that there are no significant differences between them in this area. The good results obtained in the Economical dimension show that they are free and offer good documentation. Obviously, none can base the decision of selecting one or another tool only in the numerical results. It

Methodology	ANEMONA	RT-Message	GORMAS
Concepts	78.13	66.67	69.79
Modeling language	83.29	78.05	80.48
Model	68.33	71.67	60.00
Process	98.30	97.41	59.26
Pragmatic	51.47	39.71	55.08
Supportive	81.25	75.00	70.31
Economical aspects	100.00	100.00	100.00
Total Methodology	80.35	67.59	67.35

Figure 2: Quantitative comparison of 4 methodologies

is only a general idea that can be more specific by the use of personal metric values.

4. CONCLUSIONS AND FUTURE WORK

This paper presents an evaluation framework for MAS software engineering. It is an online evaluation framework that allows analyzing and comparing methods, techniques and environments for developing multiagent systems.

The comparison module simplifies the comparison task and could help developers to select the most appropriate MAS method and tools for developing a specific system. Developers can obtain qualitative and numerical comparisons of MAS engineering tools. The metric used in the quantitative comparison can be modified by the users by means of the definition of personal criteria weights. These parameters can be adapted taking into account the requirements of the system to be developed. With this information, Masev shows a ranking of the most appropriate methods and tools.

Masev questionnaires summarizes the most important issues for developing MAS, organizational MAS and service-oriented MAS, so it could be used for MAS software engineering developers to detect and improve lacks in their methods and tools. Also, developers of new tools can understand this application as a way to publish their tools and demonstrate which is their contribution to the state of the art.

Currently, we are working in order to provide a repository of the most used MAS software engineering methods and tools. For that reason, our main objective is to publish Masev in order to obtain the highest possible number of evaluations. Masev evaluating criteria is always being revised and updated. Finally, we plan to integrate other types of metrics into Masev and to add formal evaluations methods and tools

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