JADE – extension and utilization (Java Agent Development Framework)

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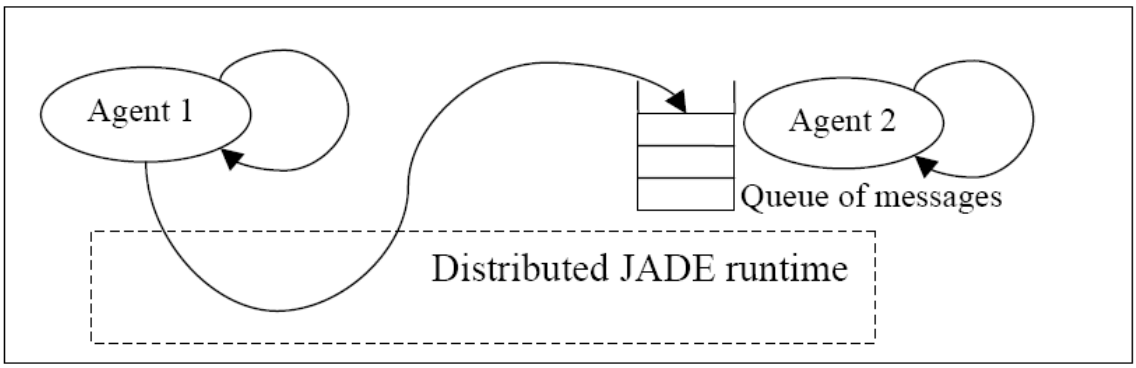
Abstract: The speech gave an overview of a framework for development and management of MultiAgent Systems (MAS). An intention of the contribution was to present and further discuss proposal of an extension handling Bayesian statistics under distributed environment.

Keywords: MultiAgent Systems, MAS, Mixtures, adaptive distributed systems, ADS

1. INTRODUCTION

Development and convergence in logistic, nanotechnology and communication are some of the main stimuli leading to an increased need for reliable adaptive distributed systems (ADS). Both the practitioners and theoreticians are collaborating to cover needs for development in DS domain.

MultiAgent Systems (MAS) theory according (Wooldridge, 2005), covered in given talk, is one of possible approaches. Jade as java-based framework (see Fig. 1) serving for error prone and fast design of MultiAgent Systems has been presented.



The attendee got familiar with the intended utilisation of the given Jade framework for distributed computation of mixtures.

2. ANALYSIS

Possibilities of multiple participant decision making DM were analysed by Šmídl et al. (2006) and the work was motivated by it. Having participants able to communicate and cooperate is so the goal of the research done, presented and further extended.

Šmídl et al. has distinguished three operational parts of each participant

i) Data-processing part. Part serves participant to interact with an environment. This part is common for single decision making participants.

ii) Communication part. The participant exchanges information with its neighbours.

iii) Negotiation part. Participant makes decisions how to act and re-act with respect to its neighbour participants.

Preceding three operational parts are built on the top of five phases i.e. can be overviewed in terms of larger granularity

α) Reading; data are collected, pre-processed and transformed from an environment

β) Learning; knowledge about an environment improved based on observed data

γ) Adaptation; improved knowledge of decision maker is used to strategy

δ) Decision; an action is selected using adaptive decision making strategy

ε) Writing; selected action is transformed and written to the environment

where the environment is common, i.e. similarities exist in terms of
- structure of the model of the environment, and
- structure of the decision making strategy

for all the communicating participants. This constraint comes out of limits given by the computational complexity.

Knowledge of each participant is stored in the form of three pdfs
- factorised model
- factorised pattern
- estimates

and each participant has an ability to communicate this knowledge.

The above vague formulation can be formalised using Bayes apparatus. DM strategy, both optimised and ideal as $f\left(u_t|d\left(t-1\right)\right)$. Predictor of observations and correspondingly formulated pattern as $f\left(y_t|u_t,d\left(t-1\right)\right)$. Observed data i.e. values as $d\left(t\right)$, where the individual values can be understood as a special case of pdfs. Estimates on internal variables as $f\left(\Theta_t|d\left(t\right)\right)$ where these variables are common to interacting participants.

Merging is than used by each participant to propagate their modification or behaviours i.e. modification of model or estimates.
Indirect merging is than used to formalize modification of the estimates, i.e. modifications of the estimates $f_{[1]}\left(\Theta_t|d\left(t\right)\right), f_{[2]}\left(d\left(t\right)\right) \overset{\text{merge}}{\longrightarrow} \tilde{f}_{[1]}\left(\Theta_t|d\left(t\right)\right)$. And direct merging to estimate common internal variables $f_{[1]}\left(\Theta_t|\cdot\right), f_{[2]}\left(\Theta_t|\cdot\right) \overset{\text{merge}}{\longrightarrow} f_{[1]}\left(\Theta_t|\cdot\right)$. Negotiation is than supported using range of communication-selected actions e.g. initiate, accept, reject.

REFERENCES

Wooldridge, M.: (2005). MultiAgent Systems. *John Wiley & Sons, Ltd.* England

Šmídl V. et al.: (2006). Baddyr. *Research repor ÚTIA AV ČR*

Jade – Java Agent Development Framework [http://jade.tilab.com]