

Building an agent-mediated electronic commerce system with decision analysis features

Nikos Karacapilidis^{a,*}, Pavlos Moraitis^b

^a *Industrial Management Laboratory, Department of Mechanical Engineering and Aeronautics, University of Patras, GR 26500, Rion Patras, Greece*

^b *LAMSADE, University of Paris-Dauphine 75775, Paris Cedex 16, France*

Abstract

This paper describes a web-based electronic commerce system in which customers and merchants delegate the related tasks to their personal software agents. Messages passed between these agents can fully encapsulate the associated parties' points of view towards a market transaction. More specifically, an offer request consists of a list of the product attributes the customer wants to know about, a partial order of their importance, and the constraints imposed. On the other side, an offer proposal can be tailored according to the information conveyed in the corresponding offer request. Advanced features of the system include the permanent existence of our agents in the market, thus being able to learn from it, their ability to act proactively in order to initiate a transaction, and the integration of an interactive multiple criteria decision-making tool, with which a buying agent performs a comparative evaluation of the proposals in a semi-autonomous way. © 2001 Elsevier Science B.V. All rights reserved.

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1. Introduction

Research work done during the last few years has dealt with a diversity of tasks involved in buying and selling goods and services in an electronic market (e-market) [1,19], and resulted to the implementation of a plethora of systems automating tasks such as product brokering, merchant brokering, and negotiation [5,17]. Moreover, as many analysts predict, agent-mediated electronic commerce would further revolutionize Internet Commerce (see, for instance, Ref. [16]). This is mainly due to the fact that most

basic characteristics of software agents, such as autonomy, proactiveness and “intelligence”, together with their ability to cooperate, make them suitable for the delegation of traditional commercial transactions.

This paper describes a new agent-mediated electronic commerce system for the contemporary e-market. Its overall framework is not based on pre-classified ads; instead, the system's agents cooperate and get the related information in a real-time mode. Contrary to the majority of the already implemented systems, the one presented here addresses efficiently all of the following important issues.

(i) The permanent existence of agents in the e-market; that is, agents that do not “live” only during a specific transaction but much longer, upon

* Corresponding author.

E-mail addresses: nikos@mech.upatras.gr (N. Karacapilidis), moraitis@lamsade.dauphine.fr (P. Moraitis).

the subscription paid by their owners at the time they were launched (an actor may “hire” an agent for a month, a year, etc.).

(ii) The proactiveness and semi-autonomy of agents; that is, agents that take the initiative to contact their actors in order to start a transaction that seems “interesting” to them (e.g., when a new product, which matches one’s profile, appears in the market). Semi-autonomy of agents assures the right level of control for the actions they could take (a fully autonomous agent could cause problems).

(iii) The maintenance of each actor’s profile through the personalization of the agents involved; for instance, a customer’s agent is supplied with a number of general interests (e.g., classical music, cruises) and preferences (e.g., one may dislike the black color on any product) of its actor, which can be enriched with more detailed ones each time the customer initiates a transaction. This gets extra value when agents “live” permanently in the e-market (see first issue above).

(iv) The ability of a seller agent to refine some of the customer’s purchase criteria, argue in favor or against them, or even bring up new information to persuade him/her to accept its offer.

(v) The ability to handle incomplete, inconsistent and conflicting information during a purchase transaction, and perform a progressive synthesis and comparative evaluation (across a set of attributes) of the existing proposals. This requires a highly interactive

tool, based on multiple criteria decision theory, that enables customers easily examine alternative scenarios (by selecting which of the proposals’ attributes to be taken into account) and recommends the best solution according to the information at hand.

Table 1 provides a comparative insight of our approach against four representative e-commerce systems, regarding the abovementioned features (the checkmark symbol denotes the existence of the related feature, “×” declares its absence, while the asterisk stands for a partial or alternative implementation of it). More specifically, Excite’s *Jango* (<http://www.jango.com>) provides a comparison shopping Internet site, just allowing users to specify the name and category of an item before searching on-line stores for the lowest prices available. It is based on a rather low-level approach, which does not address any of the above issues. Being more sophisticated, *PersonaLogic* (<http://www.personalogic.com>) provides a set of predefined, category-based “guides”, and allows customers impose constraints, to be then exploited by a constraint satisfaction engine in order to prune alternatives that do not satisfy them. Regarding the issues above, only a comparative evaluation of the matched offers is supported; however, the constraints imposed are pre-determined, upon the “guide”, and cannot be refined or amended.

Kasbah [2] helps users creating agents to negotiate the buying and selling of goods on their behalf,

Table 1
Features provided in our and some representative e-commerce system approaches

	Jango	PersonaLogic	Kasbah	Tete-a-Tete	Our approach
Permanent existence of e-market agents	×	×	×	×	✓
Proactiveness & semi-autonomy of agents	×	×	*	*	✓
Maintenance of each actor’s profile	×	×	*	✓	✓
Argumentation & criteria refinement features	×	×	×	*	✓
Handling of incomplete, inconsistent & conflicting data	×	×	×	*	✓
Progressive synthesis & comparative evaluation	×	*	×	*	✓

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