A Multi-Agent System with Negotiation Agents for e-Trading Products and Services

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Abstract. This paper presents an approach using multi-agent system to support small and medium enterprises in breaking up the traditional distributor chains and trading products and services over the web. Commonly, these small and medium enterprises are not able to put a lot of effort in finding international actors that sell products and services in international markets. The language is one barrier and the enterprises’ accustomed distributors is another complex issue. Nonetheless, competition does not allow expensive products and services, hence, requires effective and efficient organizations. To find international actors, no matter the language, and support buying products and services to the best possible conditions, we provide a multi-agents system with search agents, meta-agents, matching agents and negotiation agents for e-trading products and services. The agents search for the desired products, select and categorise web pages and ontologies and negotiate to find the best solution, which is the right product, the right amount of products, with the absolute best quality and price, at the right time.

Keywords. Multi-agent systems, Negotiation Agents, Meta-agents, Matching.

1 Introduction

International trade is important for companies that want to expand their market place. The trade in a global market allows the companies to provide products and services that, otherwise, may not be available. As a result, the market contains greater competition and, thereby, more competitive prices. Hence, international trade can bring a rich set of cheaper products to the consumer [1].

One way to make small and medium enterprises (SMEs) grow and become more competitive, internationally, is to use e-business. E-business has become an important retail location where many manufacturers buy products and services through business-to-business (B2B) transactions. These B2B transactions make it possible to get sub-components and raw material, as well as, services of all kinds, which are traded at a certain price and under certain conditions. However, the trading of products and services on the web, might be hindered by the size of the enterprise, and obsolete distribution chains that are distributing parts to the enterprise. The enterprises’ commonly used business management software systems, often include
the suppliers and customers, which make the distribution chains static, but, nonetheless, minimize the possibility to incorporate new distributors.

The size of the enterprise is problematic. The small and medium enterprises, usually, do not have enough staff for finding products, internationally, since it requires a lot of time to search for and find requested products. The web contains a myriad of web pages and ontologies and it is difficult, tedious and time-consuming to find the relevant ones. Moreover, providing products are equally difficult. The large enterprises can provide all sorts of sites and ontologies, as well as, marketing their products but the small and medium enterprises usually cannot.

In addition to the problem of handling enormous number of web pages and ontologies for products or services, there can be language problems. The sites that are of exceptional interests might be in a language not manageable to the enterprise and, therefore, not used when searching for specific product or service. For example, there are a lot of minority languages with special character letter in their alphabet. The language problem is especially a problem for small companies, who usually provide web sites in native language or sometimes in an international world-wide language.

To envisage a break-up of the traditional distributor chains and benefit both national and international business and stimulate competition, we provide an approach using a multi-agent system (MAS). The software agent technology can support the e-business [2] by adopting the software agents or the intelligent agents to negotiate on the web. Commonly, the negotiation is prices with or without multi-attributes for auctions [3, 4], or for e-marketplaces [5, 6, 7] and can easily be used for trading on the web.

Our MAS uses search agents, meta-agents, matching agents and negotiation agents for e-trading products and services on the web. The use of multi-agent system with negotiating agents and knowledge base technology can support small and medium sized enterprises to search and find web pages and ontologies, match the contents and negotiate, automatically. The negotiation agents must be able to negotiate an acceptable price but also take into account delivery time, amount and quality. The goal is to find the right product, the right amount, with the absolute best quality and price, and at the right time.

2 Related Work

Multi-agent systems work well for e-business systems [8, 9, 10, 2]. These systems include agent approaches to e-business with negotiation and user preference. The applications range from buying and selling products, including information products, to optimizing travelers’ arrangements, where agents have all kinds of roles.

A common role for the negotiation agents is negotiating for auctions [3, 4]. Many of these use negotiation protocols, and negotiation strategies [5, 3] with constraint based-reasoning or reasoning using Bayesian theorem [4,11]. The benefit with the protocols and strategies is to handle bid submissions. In our case, we do not work with interactions between negotiators and, therefore, our solution does not include protocols. The exclusion of protocols affects the protocol handling strategies, which are also neglected. However, we need strategies to work with rules for the negotiation. These rules are established by the enterprise and work as guideline values for the negotiation that the agents must conform to.