Argumentative agents for online deal-making

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(PhysOrg.com) -- Software agents that play devil's advocate and quarrel with each other may not sound like something you would want in your computer. But, say a team of European researchers, argumentative agents promise faster, cheaper and more efficient online transactions.

Argumentative agent technology relies on software imbued with artificial intelligence that is able to make reasoned decisions by weighing up the pros and cons of different options.

Just as a human shopper might browse different online stores in search of a certain product, evaluating prices, quality and shipping times, a smart software agent representing a company or individual in an electronic marketplace carries out a similar reasoning process autonomously. When it comes to striking a deal, the agent enters into negotiations with other agents representing one or more counterparties in the marketplace, in effect haggling with them to obtain the best deal for the company or person it represents.

“In a grid environment in which services and resources are distributed… agents function as intelligent entities that represent sellers and buyers. You might describe them as proxies for companies and people in electronic marketplaces,” says Francesca Toni, a computer scientist at Imperial College London.

Though software agents are not new, argumentative ones represent a key innovation that addresses a very real need for faster, cheaper and more efficient electronic marketplace solutions. Because of their human-like

ability to reason, negotiate and make decisions, argumentative agents have the potential to greatly reduce the need for humans to trawl through listings of products, providers and potential buyers, while also reducing or even eliminating the need for human input in negotiating a deal.

“Say you want to buy a book. You could tell the agent to find it for you at the best price and with the fastest shipping time. It would then provide you with the best offer it has found based on those criteria, even negotiating with the seller to secure a better price or other benefits,” explains Toni.

Arguing on the grid

Toni has spent the last three years coordinating the Argugrid project, a pioneering EU-funded initiative to develop argumentative agents for grid computing environments. Within the project, the team developed and implemented a broad array of technologies to build a comprehensive argumentative agent system with a near infinite range of applications.

The system uses a peer-to-peer (P2P) infrastructure known as PLATON which makes it possible for users to search for and identify other users, each hosted by peers in the network. It is integrated with a distributed platform called GOLEM that supports the software agents, whose artificial intelligence is in turn powered by the MARGO argumentation engine. An interface for human users, along with a workflow engine and semantic engine, is powered by a KDE system, while agents and services are hosted on GRIA grid sites.

Though the underlying architecture is a complex mesh of different technologies, the argumentative processes themselves are designed to be simple for human users to understand. Instead of using mathematics and numbers to evaluate products and services, as is common with agent technology, the Argugrid team used text-based arguments, making them

intelligible to human users.

“People can follow and understand what is going on at any stage of the process… If they wanted to it would also be possible for them to intervene and provide their own input to the decision-making and negotiating processes,” Toni says.

As well as making decisions themselves and carrying out negotiations, additional software, which also uses argumentation, helps the agents evaluate the trustworthiness of potential business partners and even mediate in contract disputes.

The Argugrid team developed demonstrators to highlight one potential application for the technology: earth observation. They showed how, in the event of a wild fire or oil spill, Argugrid agents operated by emergency services, local authorities, interested parties or the media could be used to rapidly and cost-effectively obtain accurate satellite imagery of the affected area.

In a different use case studied by the researchers, argumentative agents were envisioned as being modelled on procurement experts specialised in matching customer needs for electronic ordering systems with the offers currently on the market. By using a specialised agent, preloaded with the knowledge of a human expert, a buyer of such a system would avoid the need to turn to costly consultants for advice before deciding which system to purchase.

“The demonstrators and use cases showed what the technology can do but they are just a fraction of the potential applications. In fact, Argugrid technology could be put to use in any sector where goods and services are sold or traded online, from books and holidays to energy contracts and data storage,” Toni says.

Several of the project's industrial partners are planning to incorporate components of the Argugrid system into their own products, while some of the academic partners have not ruled out setting up a spin-off firm to commercially exploit the project results in the mid to long term.

More information: Argugrid project: www.argugrid.eu/

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