

BUSINESS: Technology and Innovation

Letting the computers conduct the haggling

Ken Belson

Could haggling pairs of computers eventually put human negotiators out of work quickly -- and rationally -- coming to agreement over price, delivery schedules and other complex terms?

Such a scenario already plays out regularly online, in the form of negotiations over claims between doctors and insurers, who have enlisted computers to represent them. Software developed by a company called SplitTheDifference makes proposals on behalf of insurers, relying on algorithms to gauge what discount a doctor might accept in exchange for a faster payment.

The software, which has been used in 20,000 negotiations over the past 18 months, is just one of the ways in which computers are playing a larger role in a growing variety of everyday transactions. The innovations are rooted in advances in mathematics that enable computers to mimic human behavior and in some cases replace people altogether.

Most uses of automated negotiations have so far been simple: settling insurance claims, selling excess telecommunications capacity and so on. But the scope for such negotiations is vast.

The electronics company Fujitsu is in the early stages of commercializing software that could enable consumers to negotiate deals for air, travel mobile-phone service or other products.

Human beings continue to set the parameters, but computers, which have the capacity to consider millions of offers and, counteroffers in seconds, hold out the possibility of crossing the subtlety of the human intellect with the raw power of the processor. "The big difference between humans and machines is that humans are really smart but slow, while machines are stupid but fast," said Steve White, a senior manager in the IBM autonomic computing group. "Machines don't make mistakes, either."

There is an emotional component to negotiation that goes beyond numbers, and computers cannot fully account for it. "What happens in negotiations is, both sides have their own interests so we never both get what we want," White said. "So what we are concentrating on is getting computers to talk to each other."

Software advances have extended the automated negotiators' potential scope. Instead of considering price alone, computers can weigh the relative merits of variables including quantity, delivery time and technical specifications. Computers have moved beyond merely matching bids with offers or arbitrating between adversaries; they now can incorporate factors into the negotiations that people may not have considered.

The trick to making automated negotiation software work is finding a niche where the humans involved will not feel either that the computer is fleecing them or giving too much away to the other side. The software must give both sides some control over the process.

In practice, that has meant finding industries or business practices that are already digitized and have a high volume of data traffic, like financial markets and telecommunications providers.

While IBM and others have had some success creating negotiation software for such areas, most companies are still a long way from being ready for digital dealing because the bulk of their data is on paper or in human memory, not on hard disks. Aside from the money and time needed to digitize such information, managers tend to be wary about ceding job functions or decision-making to a machine, a hurdle that must be overcome before negotiation software can achieve broader acceptance.

Still, SplitTheDifference, focusing more narrowly, found an opportunity to help insurers and doctors haggle over payments that are too small to be handled economically by conventional methods. Ordinarily, insurance companies have 45 days after processing a claim to send the payment to the doctor. The doctors want to get the money sooner, while insurers have an incentive to pay out less money.

SplitTheDifference's software adjusts itself as the negotiations proceed. The company has found that most doctors reject the first offer and come back with a counteroffer. The software then formulates a new offer that takes into account shifts in the doctor's position reflected by the counteroffer. The process continues until a deal is sealed or the doctor has rejected three proposals, in which case the insurer pays the full claim under the original time frame.

The average negotiated settlement reached using the software has been \$2,000, and the settlements saved the insurers an average of \$500, or 20 percent. SplitTheDifference gets 20 percent of any money the insurer saves.

Dave Marvit and a team of researchers at Fujitsu Laboratories of America have worked for two years on a software program that can run through millions of potential scenarios in seconds. Unlike "matching" software, which aims to bring together parties with similar preferences, Fujitsu's program tries to narrow differences between groups that initially disagree.

"We can run millions of prices and have 1,000 or more negotiations that ask how about this, how about that," said Marvit, whose background is in neuroscience. "Humans look for all these clues to psych out our opponents. Now, you can figure that out by making enough offers back and forth."

As it moves to make the software commercially available, Fujitsu is hoping it will appeal to companies that swap foodstuffs, computer chips and other commodities. But it could in theory be used to negotiate to get a better rate on a hotel room or cheaper mobile-phone service as well. In an example offered by Marvit, a traveler might bargain with an airline, offering a mixture of money, frequent-flier mileage and a flexibility over route and destinations in exchange for a lower fare on the ticket and other benefits.

In such a case, the traveler would presumably negotiate with the computer by entering preferences in an online form. The traveler could choose to use software to negotiate on his behalf as well, raising the possibility of a computer-to-computer confrontation.

The theory suggests that a stalemate is unlikely even in a computer face-off, however, because the automated negotiators' power to search for potential solutions is so much greater than humans'.

The Fujitsu software is relatively simple to use. Negotiators select preferences for categories like quantity, delivery time, shipping and handling costs, unit prices and reliability. Buyers can specify one priority, like the lowest price, or they can negotiate over several terms at once. They might continue asking for a 1 percent discounts and tell the computer to stop when the price stops falling.

Although the software may run thousands of iterations during a negotiation, the last round does not always yield the best price. In tests of the software, the optimum outcome is often found about halfway through the process. "Good negotiators know you can do better if you add more business terms to the discussions," Marvit said. "Not just price, but time and others. The computers can handle more parameters so more value can be squeezed out of the transaction. It's the opposite of a zero-sum game."

The article appeared in the International Herald Tribune Friday, September 12, 2003, p. 14, and was originally published in the New York Times.