The Eighth International Automated Negotiating Agent Competition (ANAC)

Motivation, impact, and expected outcomes

The Automated Negotiating Agent Competition (ANAC) brings together researchers from the negotiation community and provides a unique benchmark for evaluating practical negotiation strategies in multi-issue domains. The ANAC has the following aims:

- to provide an incentive for the development of effective and efficient negotiation protocols and strategies for bidding, accepting and opponent modeling for different negotiation scenarios
- to collect and develop a benchmark of negotiation scenarios, protocols and strategies
- to develop a common set of tools and criteria for the evaluation and exploration of new protocols and new strategies against benchmark scenarios, protocols and strategies
- to set the research agenda for automated negotiation.

The previous competitions have spawned novel research in AI in the field of autonomous agent design which are available to the wider research community. This year, we would like to introduce a variety of negotiation research challenges:

- Repeated Multilateral Negotiation for arbitrary domains (Genius framework)
- Negotiation Strategies for the Diplomacy Strategy Game (Bandana framework)
- Human-Agent Negotiation (IAGO framework)

 We expect innovative and novel agent strategies will be developed and ANAC 2017 Agents will serve as a negotiating agent repository in accordance with the aforementioned frameworks to the negotiation community. The researchers can develop novel negotiating agents and evaluate their agents by comparing their performance with the performance of the ANAC 2017 agents.

Problems Abstract

In multilateral negotiation league, entrants will to design and implement a smart negotiating agent, which negotiates with two opponents and is able to learn from its previous negotiations. The participants will develop their agents in GENIUS platform. Challenges regarding this league are what are winning strategies for bidding, opponent modeling and bid acceptance strategies when negotiating repeatedly with agents in a multilateral setting.

In diplomacy strategy game league, entrants to the competition have to develop a negotiation algorithm for the game of Diplomacy. Diplomacy is a strategy game for 7 players. Each player has a number of armies and fleet positioned on a map of Europe and the goal is to conquer half of the "Supply Centers". What makes this game very interesting and different from other board games however, is that players need to negotiate with each other in order to play well. Players may form coalitions and make plans together in order to defeat other players.

Every participant in this competition must implement a negotiation algorithm using the BANDANA framework. This negotiation algorithm will then be combined with an existing non-negotiating agent (the D-Brane Strategic Module) to form a complete negotiating Diplomacy player. The BANDANA framework is a Java-based platform specifically designed for the development of negotiation algorithms for Diplomacy.

The Human-Agent Negotiation league is proposed in order to further explore the strategies, nuances, and difficulties in creating realistic and efficient agents whose primary purpose is to negotiate with humans. Previous work on human-agent negotiation has revealed the importance of several features not commonly present in agent-agent negotiation, including retreatable and partial offers, emotion exchange, preference elicitation strategies, favors-and-ledgers behavior, and myriad other topics. To understand these features and better create agents that use them, this competition is designed to be a showcase for the newest work in the negotiating agent community.

The Human-Agent Negotiation competition will involve each entrant submitting an agent that will be tested against human subjects in a study run through the University of Southern California. All agents must be compliant with the IAGO (Interactive Arbitration Guide Online) framework and API, which will allow

standardization of the agents and efficient running of subjects on MTurk. Agents will all be run on the same set of multi-issue bargaining tasks.

Infrastructures

- **GENIUS** is a Java-based negotiation platform in which you can create negotiation domains and preference profiles as well as develop negotiating agents. The platform allows you to simulate automated negotiation sessions and run tournaments. More details can be found by following this link:

    http://ii.tudelft.nl/genius/

- **BANDANA** is a Java framework designed for the development of automated agents that play the game of Diplomacy. It comes with a tutorial that explains how you can implement your own Diplomacy-playing, negotiating agents, and how you can let them play a game of Diplomacy, or even an entire Diplomacy tournament. BANDANA is an extension of the DipGame framework. However, it provides a new negotiation server and uses a simplified negotiation language. More details can be found by following this link:

    http://www.iiia.csic.es/~davedejonge/bandana/

- **IAGO** is a Java-based platform developed by Mell and Gratch at the University of Southern California. It is intended to serve as a testbed for Human-Agent negotiation specifically. IAGO is a web-based servlet hosting system that provides data collection and recording services, a human-usable HTML5 UI, and an API for designing human-like agents. More details can be found by following this link:

    http://people.ict.usc.edu/~mell/IAGO.

Tentative Competition Schedule

January 10th - June 1st

Website URL

The competition webpage will be released here.

Organizers

Dr. Reyhan Aydoğan is an Assistant Professor at Ozyegin University, Istanbul and at the same time part-time postdoctoral researcher in Interactive Intelligence Group at Delft University of Technology, the Netherlands. Her research focuses on the modeling, development and analysis of agent technologies that integrate different aspects of intelligence such as reasoning, decision making and learning. She is applying artificial intelligence techniques such as machine learning and semantic reasoning in designing and developing agent-based decision support systems, particularly negotiation support systems and automated negotiation tools. Dr. Aydoğan is one of the main organizers of the International Automated Negotiating Agents Competition (ANAC) since 2014. She co-organized the following workshops: Conflict Resolution in Decision Making Workshop (COREDEMA) in PAAMS 2013 and ECAI 2016, The Eighth-Ninth-Tenth International Workshop on Agent-based Complex Automated Negotiations (ACAN) in AAMAS 2015-2017. She is serving as a program committee member in reputable conferences such as AAMAS (2012-2017), IJCAI(2015), ECAI (2014,2016) and senior program committee member for IJCAI 2017.

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Dr. Tim Baarslag is a Researcher at the Centrum Wiskunde & Informatica (CWI), the national research institute for Mathematics and Computer Science in the Netherlands. He is a Visiting Assistant Professor at Nagoya University of Technology and Visiting Fellow at the University of Southampton. Dr. Baarslag's research interests include agent-based negotiation, coordination and cooperation, preference elicitation, decision making under uncertainty, privacy and consent, and smart grid systems. Dr. Baarslag has been one of the main organizers of the International Automated Negotiating Agents Competition (ANAC) since its inception in 2010 and is the lead developer of the supporting negotiation platform Genius. He serves as an SPC member in IJCAI, as a PC member in AAMAS, AAAI, and ECAI and as a reviewer in high-ranking journals such as Artificial Intelligence and JAAMAS. He is also an organizer of the Workshop on Conflict Resolution in Decision Making (COREDEMA) and The International Workshop on Agent-based Complex Automated Negotiations (ACAN).

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Prof. Dr. Katsuhide Fujita is an Associate Professor of Faculty of Engineering, Tokyo University of Agriculture and Technology. He received the B.E., M.E, and Doctor of Engineering from the Nagoya Institute of Technology in 2008, 2010, and 2011, respectively. From 2010 to 2011, he was a research fellow of the Japan Society for the Promotion of Science (JSPS). From 2010 to 2011, he was a visiting researcher at MIT Sloan School of Management. From 2011 to 2012, he was a Project Researcher of School of Engineering, the University of Tokyo. He is an Associate Professor of Faculty of Engineering, Tokyo University of Agriculture and Technology since 2012. He serves as a PC member in AAMAS, AAAI, and IJCAI and as a reviewer in high-ranking journals such as Artificial Intelligence. He is also an organizer of The International Workshop on Agent-based Complex Automated Negotiations (ACAN).

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Dr. Takayuki ITO is Professor of Nagoya Institute of Technology. He received the B.E., M.E, and Doctor of Engineering from the Nagoya Institute of Technology in 1995, 1997, and 2000, respectively. From 1999 to 2001, he was a research fellow of the Japan Society for the Promotion of Science (JSPS). From 2000 to 2001, he was a visiting researcher at USC/ISI (University of Southern California/Information Sciences Institute). From April 2001 to March 2003, he was an associate professor of Japan Advanced Institute of Science and Technology (JAIST). From 2005 to 2006, he is a visiting researcher at Division of Engineering and Applied Science, Harvard University and a visiting researcher at the Center for Coordination Science, MIT Sloan School of Management. From 2008 to 2010, he was a visiting researcher at the Center for Collective Intelligence, MIT Sloan School of Management. He was a board member of IFAAMAS, the PC-chair of AAMAS2013, PRIMA2009, General-Chair of PRIMA2014, and was a SPC/PC member in many top-level conferences (IJCAI, AAMAS, ECAI, AAAI, etc). He received the JSAI(Japanese Society for Artificial Intelligence) Achievement Award, 2016, the JSPS Prize, 2014, the Fundamental Research Award of Japan Society for Software Science and Technology,2014, the Best Paper Award in the 66th annual conference of 66th Information Processing Society of Japan, and the Super Creator Award of 2004 IPA Exploratory Software Creation Projects. Also, he is/was as a principal investigator of the Japan Cabinet Funding Program for Next Generation World-Leading Researchers (NEXT Program), and JST CREST project.

Website:http://www.itolab.nitech.ac.jp/~ito/

Dr. Dave de Jonge is a researcher at Western Sydney University. He received a Master of Mathematical Physics under supervision of Robbert Dijkgraaf in 2008 at the University of Amsterdam, and a PhD in Artificial Intelligence with Carles Sierra in 2015 at the Autonomous University of Barcelona. His research lies at the intersection of Automated Negotiations, Game Theory, Logic, General Game Playing, and Constraint Satisfaction. More specifically, his work focusses on Automated Negotiations in domains where determining the negotiators' utility values is a hard problem, for example, because they are defined as the outcome of some non-zero-sum extensive-form game. For his PhD thesis he developed negotiation algorithms for the game of Diplomacy. He is the winner of the Computer Diplomacy Challenge at the ICGA Computer Olympiad 2015 and runner-up of the ANAC 2014 competition.

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Dr. Catholijn M. Jonker is Full professor since 2004. Chair of De Jonge Akademie (Young Academy) of the KNAW (The Royal Netherlands Society of Arts and Sciences) in 2005 and 2006 (member from 2005 to 2010). Member of the Koninklijke Hollandsche Maarschappij der Wetenschappen, and of the Academia Europaea. President of the Netherlands Network of Female Professors (LNVH) 2013 – 2015 (board member 2008-2015). ECCAI Fellow since 2015. She was Program Chair of AAMAS 2013, and General Chair of AAMAS 2016. Currently her Google Scholar H-index is 40. Her publications address cognitive processes and concepts such as negotiation, teamwork and the dynamics of individual agents and organizations. In all her research lines Catholijn has adopted a value-sensitive approach. In particular, she works towards intelligent agents that can interact with their users in value-conflicting situations when also meta-values no longer solve the situation. In Delft she works with an interdisciplinary team to create synergy between humans and technology by understanding, shaping and using fundamentals of intelligence and interaction.

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Mr. Johnathan Mell is a Doctoral candidate at University of Southern California's Department of Computer Science working under advisor Jonathan Gratch at the USC

Institute for Creative Technologies. He works as a part of the ICT emotion group, where he attempts to design more human-like computers for a variety of applications. Current research interests include the impact of favor exchange on negotiations with a computer partner in an effort to make automated negotiators and negotiation training programs find integrative solutions over time, as well as efficient designs for systems that are used by a non-AI "man behind the curtain", called "Wizard of Oz" systems. This work, and the ongoing work on behavioral framing with virtual humans, is part of an ongoing effort to create tools for the design of emotive and realistic virtual characters. Johnathan is also the primary designer of the Interactive Arbitration Guide Online (IAGO) system used for this competition.

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