The Seventh International Automated Negotiating Agents Competition (ANAC2016)

Organizers:
Dr. Reyhan Aydogan, Ozyegin University
Dr. Katsuhide Fujita, Tokyo University of Agriculture and Technology
Dr. Tim Baarslag, the University of Southampton
Dr. Koen Hindriks, Delft University of Technology
Prof. Dr. Takayuki Ito, Nagoya Institute of Technology
Prof. Dr. Catholijn Jonker, Delft University of Technology
ANAC2016 COMPETITION SET-UP
Motivations

• to encourage the design of practical negotiation agents that can proficiently negotiate against unknown opponents and in a variety of circumstances

• to provide a benchmark for objectively evaluating different negotiation strategies

• to explore different learning and adaptation strategies and opponent models

• to collect state-of-the-art negotiating agents and negotiation scenarios, and making them available to the wider research community.
ANAC2010 - 2015

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
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<tr>
<td>Agents</td>
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<td>18</td>
<td>17</td>
<td>19</td>
<td>21</td>
<td>24</td>
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<td>Domains</td>
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<td>8</td>
<td>24</td>
<td>24</td>
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<td>10</td>
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<td>New Feature</td>
<td>Discount Factor</td>
<td>Reservation Value</td>
<td>Bid History</td>
<td>Nonlinear Domain</td>
<td>Multilateral Negotiation</td>
<td></td>
</tr>
</tbody>
</table>

Organizers

- Tim Baarslag, the University of Southampton
- Kobi Gal, Ben-Gurion University
- Enrico Gerding, University of Southampton
- Koen Hindriks, Delft University of Technology
- Reyhan Aydogan, Ozyegin University
- Takayuki Ito, Nagoya Institute of Technology
- Katsuhide Fujita, Tokyo University of Agriculture and Technology

- Nicholas R. Jennings, University of Southampton
- Catholijn Jonker, Delft University of Technology
- Sarit Kraus, University of Maryland and Bar-Ilan University
- Raz Lin, Bar-Ilan University
- Valentin Robu, University of Southampton
- Colin R. Williams, University of Southampton
Competition Setup

- **Multi-party Closed Negotiation**
  - Stacked Alternating Offers Protocol (SAOP)
  - Negotiation among three agents
  - Negotiation without any knowledge of the preferences and strategies of the opponents.
- Real time with a deadline after 3 minutes
- Discounting Factor (from 2011)
- Reservation value (from 2012)
- Utility functions are linear
  - Agents negotiate about the large set of previously unknown domains
- Best overall average of the individual utility = Winner!
Stacked Alternating Offers Protocol (SAOP)

- All participants around the table get a turn per round
  - Turns are taken clock-wise around the table
- The first party starts the negotiation with an offer that is observed by all others immediately.
- Whenever an offer is made the next party in line can take the following actions:
  - Make a counter offer (rejecting and overriding the previous offer)
  - Accept the offer
  - Walk away (e.g. ending the negotiation without any agreement)
- This process is repeated in a turn taking clock-wise fashion until reaching an agreement or reaching the deadline.
  - To reach an agreement, all parties should accept the offer.
  - If at the deadline no agreement has been reached, the negotiation fails.
Participants

- **16 Teams Entered**
- **7 Institutions from 6 countries**
  - The Chinese University of Hong Kong, Hong Kong
  - Nanyang Technological University, Singapore
  - University of Isfahan, Iran
  - Nagoya Institute of Technology, Japan
  - Tokyo University of Agriculture and Technology, Japan
  - Delft University of Technology, Netherlands
  - Ozyegin University, Turkey
16 domains for “smart energy grids”

<table>
<thead>
<tr>
<th>Name</th>
<th># of Issue</th>
<th>Domain Size</th>
<th>Discounted</th>
<th>RV</th>
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<td>ParsCat</td>
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<td>20</td>
<td>1</td>
<td>0</td>
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<tr>
<td>Granma</td>
<td>3</td>
<td>24</td>
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<td>0</td>
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<tr>
<td>ParsAgent2</td>
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<td>1</td>
<td>0</td>
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<tr>
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<td>35840</td>
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<td>0.4</td>
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<td>MyAgent</td>
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<td>SYAgent</td>
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<td>Farma</td>
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<td>25</td>
<td>0.2</td>
<td>0.05</td>
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<td>AgentSmith</td>
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<td>Caduceus</td>
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<td>80</td>
<td>1</td>
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</table>
QUALIFYING ROUND RESULTS
Qualifying Round

- Each three-party negotiation will negotiate against the winners of ANAC 2015
  - The Submitted Agent v.s. Atlas, Pars and RandomDance
- The top 10 performing agents considering the individual utility can proceed to the final
- 16 domains for “smart energy grids”
  - Their domains are submitted by all participants
- Deadline: 3 min.
- The results are the average of 2 trials
Qualifying Round Setup

- GENIUS 5.3.5
- Allocating the entire matches to 10 computers in Japan
  - For finishing the qualifying round in some weeks
Qualifying Round Results

<table>
<thead>
<tr>
<th>Rank</th>
<th>Agent</th>
<th>Score</th>
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<tr>
<td>1</td>
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<td>2</td>
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<td>6</td>
<td>Terra</td>
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<td>7</td>
<td>Atlas3</td>
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<td>MyAgent</td>
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<td>9</td>
<td>Granma</td>
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<td>AgentHP2</td>
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<td>11</td>
<td>AgentLight</td>
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<td>12</td>
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<td>15</td>
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<tr>
<td>16</td>
<td>AgentSmith</td>
<td>0.535744566</td>
</tr>
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</table>

Finalists

- Caduceus (Ozyegin University)
- ParsCat (University of Isfahan)
- Ngent (The Chinese University of Hong Kong)
- Farma (Nagoya Institute of Technology)
- AgentYX (Nanyang Technological University)
- Terra (Nanyang Technological University)
- Atlas3 (Nagoya Institute of Technology)
- MyAgent (Nanyang Technological University)
- Granma (Delft University of Technology)
- AgentHP2 (Tokyo University of Agriculture and Technology)
FINAL ROUND RESULTS
Final Round

- The tournament among 10 finalists
- 6 domains for “smart energy grids”
  - They are submitted by the non-finalists
- Deadline: 3 min.
  - 720 negotiation sessions per a trial
  - The results are the average of 5 trials
- GENIUS 5.3.5
## Prizes

<table>
<thead>
<tr>
<th>Place</th>
<th>Prize</th>
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<tr>
<td>1\textsuperscript{st} Place</td>
<td>$500</td>
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<tr>
<td>2\textsuperscript{nd} Place * 2</td>
<td>$250</td>
</tr>
</tbody>
</table>

With thanks to our sponsors:
Interactive Intelligence Group
Prof. Dr. Takayuki Ito / Makoto Lab., Inc.
Results in Each Domain

AgentSmith

# of issues: 4, Size: 320, Discount: 0.2, RV: 0.3

SYAgent

# of issues: 4, Size: 240, Discount: 0.9, RV: 0.9
Results in Each Domain

ParsAgent2

- ParsCat
- Fama
- Terra
- YXAgent
- Ngent
- AgentHP2
- Atlas3
- Caduceus
- Grandma
- MyAgent

MaxOops

- ParsCat
- Fama
- Terra
- YXAgent
- Ngent
- AgentHP2
- Atlas3
- Caduceus
- Grandma
- MyAgent

# of issues: 3, Size: 612, Discount: 1, RV: 0
# of issues: 7, Size: 7200, Discount: 1, RV: 0
Results in Each Domain

AgentLight

- ParsCat
- Farma
- Terra
- YXAgent
- Ngent
- AgentHP2
- Atlas3
- Caduceus
- Grandma
- MyAgent

# of issues: 4, Size: 20, Discount: 1, RV: 0

ClockWork

- ParsCat
- Farma
- Terra
- YXAgent
- Ngent
- AgentHP2
- Atlas3
- Caduceus
- Grandma
- MyAgent

# of issues: 3, Size: 120, Discount: 0.6, RV: 0.4
Overall Ranking

<table>
<thead>
<tr>
<th>Agent</th>
<th>Overall Ranking</th>
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<tbody>
<tr>
<td>Terra</td>
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<td>AgentHP2</td>
<td>0.6894</td>
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<td>Grandma</td>
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<td>Ngent</td>
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<td>Farma</td>
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<td>YXAgent</td>
<td>0.7435</td>
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<tr>
<td>Caduceus</td>
<td>0.7574</td>
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</tbody>
</table>
Winners in ANAC-2016

1. Caduceus by Burak Atalay, Taha Doğan Güneş, Bahadır Kirdan: $500
2. AgentYX by Tan Yi Xin: $250
2. ParsCat by Delaram Javdani, Maedeh Najar: $250