Backstab diplomat agent for the ANAC 2019 Diplomacy challenge:

ANAC 2019 diplomacy challenge:

The goal of the challenge is to implement a negotiation algorithm on top of an existing Diplomacy player.

The winner of the challenge will be the algorithm that outperforms all other participants as well as a non-negotiating agent.

In the previous years, no participant has yet been able to write an algorithm that managed to significantly outperform the non-negotiating agents.

That is the reason why this league is arguably more challenging compared to the other ANAC leagues.

ANAC 2018 CoalitionBot

Our negotiating agent is based on the CoalitionBot by Ido Westler, Yehuda Callen, Moche Uzan, Arie Cattan, Avishay Zagury from Bar Ilan University Israel.

CoalitionBot is a very passive player. It only proposes demilitarized zones and it accepts any incoming proposal.

In the first turn, it proposes a bilateral deal to every other Power. This deal proposes that the other Power will not invade any of the CoalitionBot’s own supply Centers during the current turn, and in return the CoalitionBot will not invade the other power’s Supply Centers during the same turn.

Any agent that accepts this proposal will be considered an ally for the rest of the game. In all other turns, CoalitionBot proposes to all its allies that they will not attack each other’s Supply Centers

CoalitionBot was able to perform strongly in the first round of the competition (playing with 4 copies of itself against 3 copies of the non-negotiating D-Brane agent), but not in the second round of the competition (playing against other negotiating agents)

Given this analysis we can conclude that the weakness of the CoalitionBot agent is that it does not ty to exploit its opponents. It seems that its implementation is based on the idea that it can always completely trust its opponents.

This behavior explains why the agent performed well when playing against copies of itself but not when playing against non-passive negotiating agents.

Backstab Diplomat agent

When creating the Backstab Diplomat agent, we tried to make an agent that is based upon the CoalitionBot but is more active.

Since the passiveness of the CoalitionBot reflected by the fact that it doesn’t try to exploit its opponents, we wanted to try and implement a strategy that will exploit our opponents (or previous-to-be allies).

The main concept of such strategy is the idea of Back-stabbing.

Back-stabbing strategy -

According to Webb Chin et al (3), the method of making peace with allies (similar to the CoalitionBot’s behavior) works very well early to mid-game, however, as soon as 1 power starts to dominate, this kind of strategy might hold him back from concurring more supply centers.

Keeping a “peace to all” strategy after mid-game phase may lead to a situation where the participating powers could never break free of their general areas, and none of them would ever break over the 10 supply centers mark, or at least not for many years.

Observing the results of the CoalitionBot when playing against non-negotiating D-Brane agents, we see the exact same phenomena.

The number of supply centers owned at the end of the game by the different copies of the CoalitionBot has very low variance, and the game always ends with a draw (no agent has ever succeeded to achieve at least 18 supply centers)

Applying a back-stabbing strategy will enable an agent to abandon its old allies, as the game goes on to its final rounds, and to prevent from weak allies from to hold it back from winning the game.

This strategy of abandoning old allies is also being used by many expert human players who tend to realize the opportune moment for disregarding friendships, and take over other powers, thus making themselves a larger power on the board.

Implementation of the Back-stabbing strategy -

In order to implement a variation of this back-stabbing strategy we made the following adaptations over the CoaliationBot implementation:

We defined 2 different back-stab modes

1. Total back-stab mode – when the game phase is late enough, and our agent is strong enough (has enough supply centers) we will enter this mode. While in this mode we will not make any negotiations at all, nor expect any proposal, effectively enabling our bot to maximize its utility (not interfering with the D-Brane moves tactics) and attack agents previously known as allies.

We will stay in this mode for each one of the following rounds as long as the conditions for enabling it still applies.

1. Strategy back-stab mode – this mode is a mild version of the above one. We will enter this mode when the game phase is late enough and our coalition (at entirely is strong enough).

While in this mode, we will apply a probabilistic model for removing coalition members and adding new ones, depending mostly on their strength in current round.

While in this mode we will also apply a probabilistic model for accepting and denying proposed deals – increasing the chance of denying deals involving weak powers or powers that are not part of our current coalition.

As for the total back-stab mode - we will stay in the strategy back-stab mode for each one of the following rounds as long as the conditions for enabling it still applies.

1. When not applying one of the back-stab modes (mainly at the first round of the game) our agent acts identical to the CoalitionBot.
2. Another enhancement made over the CoalitionBot is related to the deals our agent proposes to its allies.

Beginning from the second round of the game, the CoalitionBot offers for each of its allies a DMZ deal containing all the other coalition members, **together** in the same deal.

Because of our back-stab strategy we could not continue to offer only this sort of deals, since 1 “back-stabbing” coalition member, not accepting the deal is enough to deny the deal in its entirely. (a deal in the Bandana framework can be accepted only in its entirety, meaning by all of its participating powers).

In summary – keeping the CoalitionBot offers without a change will results with no deals is being accepted, at all, in case of at least one “back-stab mode” agent.

In order to overcome this scenario, we adapted the DMZ deals offered to coalition members. Instead of offering only one deal, including all the coalition members, we are offering the power set of this such deal. For example – in case of a coalition containing 4 members (including ourselves), our agent will offer 7 DMZ deals at total (neglecting the empty deal).

This way we could overcome the scenario when one of the coalition members would not accept the deal – and we will be able to apply a deal containing only the other coalition members

Papers based on:

1. The rules of diplomacy: <https://www.wizards.com/avalonhill/rules/diplomacy_rulebook.pdf>
2. The challenge of negotiation In the game of Diplomacy: <https://www.researchgate.net/publication/332197127_The_Challenge_of_Negotiation_in_the_Game_of_Diplomacy>
3. Automated negotiation in the game of Diplomacy <http://www.daide.org.uk/external/TheDiplominator.pdf>
4. ANACE 2018 results: <http://web.tuat.ac.jp/~katfuji/ANAC2018/Results_Diplomacy.pdf>.