



DIPLOMACY AI

3 April, MMXIX

(Felix and Colin)

TWO PLAYER GAMES

- ❖ Chess
- ❖ Go
- ❖ Poker (incomplete information)
- ❖ Dota 2
 - 2017: for 1v1 & specific player
 - 2018: for 5v5, subset of players
- ❖ n.b. Dota 2 5v5, Quake III Arena CTF have 2 pre-defined teams

DIPLOMACY

- ❖ seven asymmetric European powers beginning in Spring 1901
- ❖ each campaign season has two main phases:
 1. negotiation: private, non-binding (inc. 'backstabbing'), natural language
 2. movement: simultaneously announced; conflict resolved deterministically; allies can support, convoy each others' units as easily as their own
- ❖ game play: 5 minute introduction [here](#)
- ❖ win by controlling strict majority (18/34) Supply Centres
- ❖ sample game, including messages, [here](#)

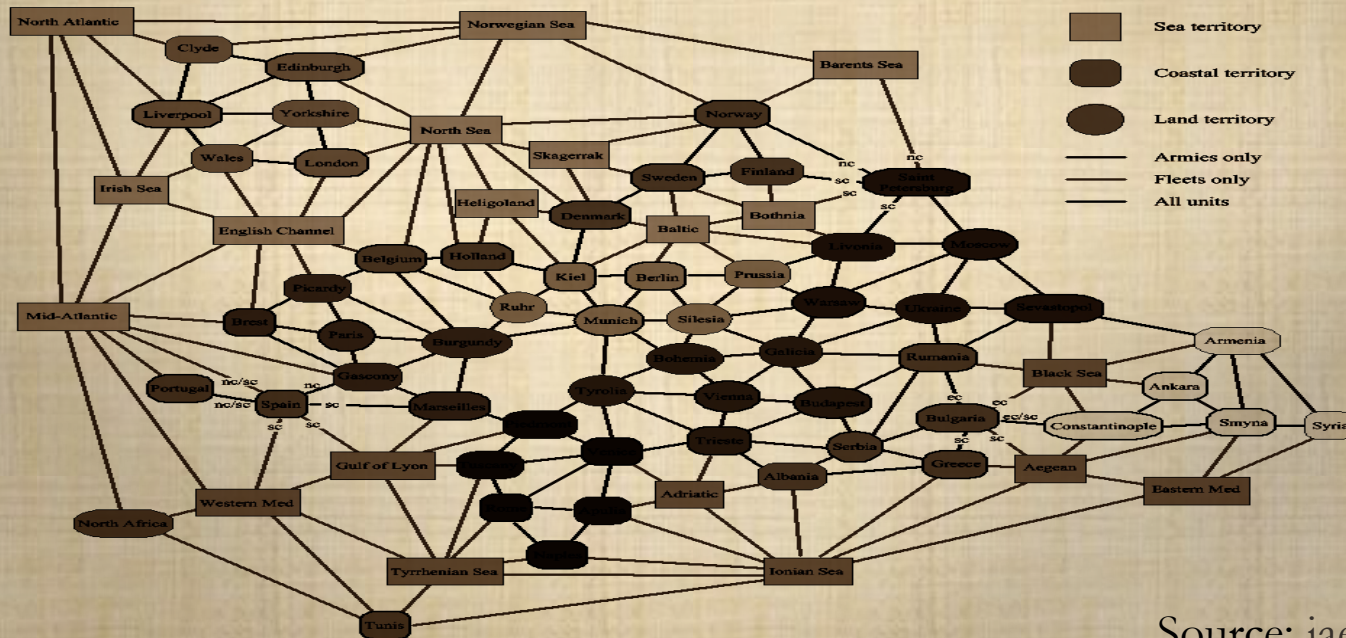
ANAC DIPLOMACY LEAGUE

- ❖ Automated Negotiating Agent Competition uses BANDANA
 - entries only negotiate; D-Brane moves for them
- ❖ Diplomacy league winners:
 - 2017: FRIGATE (Fujita/Kawata)
 - 2018: no winner as even best bot failed round 1
- ❖ hard-coded bots, not learning AIs
- ❖ don't play against humans

BANDANA FRAMEWORK

- ❖ BANDANA: Java framework for developing automated agents
 - “simplified negotiation language” allows proposals of:
 1. order commitments for one’s own forces
 2. demilitarized zones
 - proposals can be accepted or rejected
 - a ‘deal’ is an agreed set of proposals; binding if confirmed [?]
 - no classes to represent convoys
- ❖ uses Python’s Parlance to run tournaments over network

EUROPE, 1901



Source: [jaelis](#)

PLAN OF ATTACK

1. BANDANA play without negotiation
 - play online 'Gunboat' Diplomacy games
2. BANDANA play & negotiation
 - play v ANAC, BANDANA agents
 - 2 variants: binding & non-binding commitments
3. BANDANA play & NL communication
 - play online, face-to-face full Diplomacy games

COMPLEXITY

Information type	complete, imperfect
Number of players	7
<u>Action space</u>	$\sim 10^{27} \times$ message space
Moves/game	$\sim 1,000 \times$ messages
State space	$\sim 20,000?$

OBJECTIVE FUNCTION

- ❖ solo victory: 12 points
- ❖ 2 player draw: 6 points
- ❖ 3 player draw: 4 points
- ❖ 4 player draw: 3 points
- ❖ 5-6 player draw: 2 points
- ❖ 7 player draw: 1 point
- ❖ eliminated: 0 points

(The World Diplomacy Database also lists other scoring systems)

STATE SPACE

- ❖ rounds: Spr orders; retreats; Aut orders; retreats; build/disband
(5 rounds/year) \times (8 occupying powers) \times
{[19 seas] + [10 landlocked non-SCs]
+ [(7 landlocked SCs) \times (8 controlling powers)]
+ [(3 bicoastal SCs) \times (3 type/loc'ns) \times (8 controlling powers)]
+ [(12 uniconastal non-SCs) \times (2 type/loc'ns)]
+ [(24 uniconastal SCs) \times (2 type/loc'ns) \times (8 controlling powers)]}
- ❖ can economise a bit: home SCs can't be uncontrolled

ACTION SPACE

1. Spring orders
 1. each Army: move *xor* support *xor* stand
 2. each Fleet: move *xor* support *xor* stand *xor* convoy
2. Spring retreats: each Army, Fleet: move
3. Autumn orders: as Spring orders
4. Autumn retreats: as Spring retreats
5. Autumn build/disband: each excess unoccupied SC: build

PLAYING WITH TURING

- ❖ if negotiation is so simple, why care about NLP?
 1. if a bot is detected, other players may quickly ally against it
 - conjecture: for an AI to survive, it might be useful to mimic human players
 2. if one human player detects a bot, might it ally to try to finish in second place?
 - conjecture: humans and bots might both want to selectively appear bot-like
- ❖ how self-play dialogue while remaining human intelligible?