DIPLOMACY AI

13 May, MMXX

(Felix and Colin)

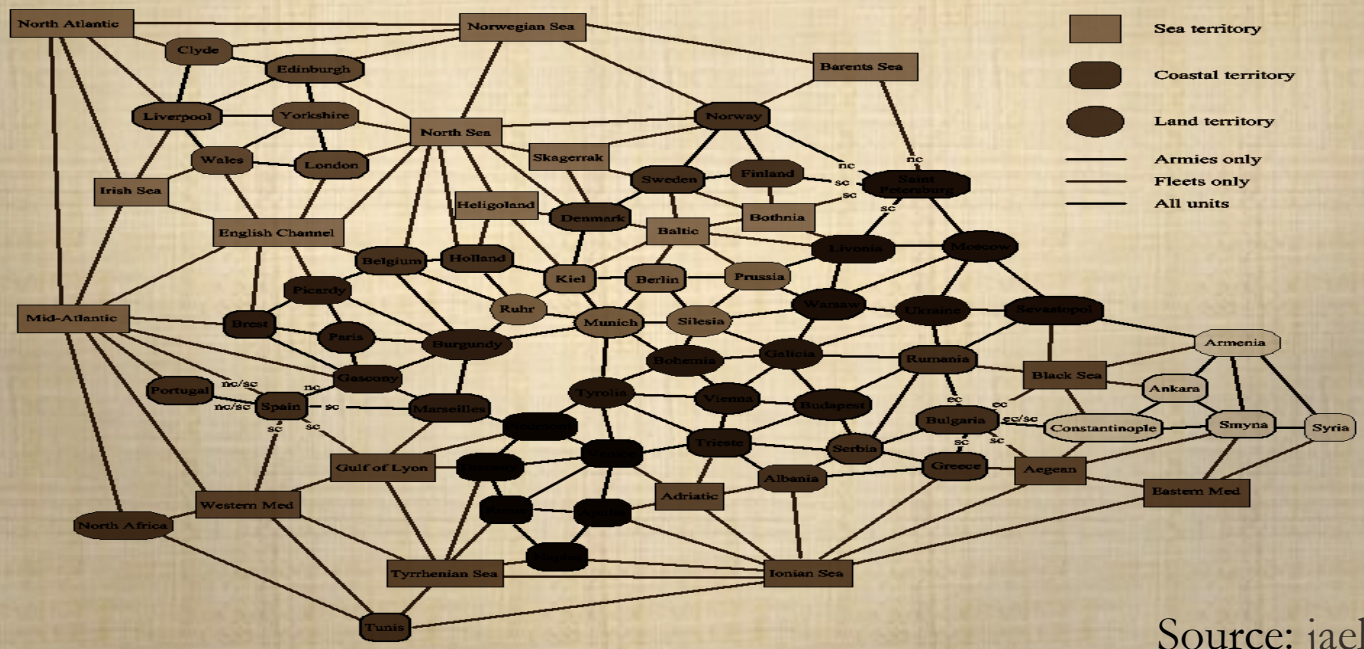
NON-LINGUISTIC GAMES

- chess (IBM, Deep Blue)
- go (DeepMind)
- poker (incomplete information; six player; Brown & Sandholm)
- Dota 2 (OpenAI)
- Quake III Arena CTF (DeepMind)

DIPLOMACY

- seven asymmetric European powers
- 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 each others' units as easily as their own
- game play: 5 minute introduction here
- win by controlling strict majority (18/34) of the Supply Centres
- sample game, including messages, here

EUROPE, 1901



Source: jaelis

DIPNET

- Paquette et al. (2019, NIPS) introduces DipNet gunboat bot
  - trained on 150,000 human games (c. 33,000 gunboat)
  - after supervised learning, does self-play reinforcement
    - reward function: local (SCs won/lost) + terminal
    - state space: board state × previous phase orders
  - outperforms benchmark bots, e.g. Albert
- Python 3 code on GitHub

WEBDIPLOMACY.NET

- GitHub project to play Diplomacy online
  - implemented Paquette et al. bots (Sept 2019); API available
  - Sept/Oct 2019 ran Terminator Tournament: bots v humans
- Discord channel here

"drastically increased traffic … due to the pandemic … moderators … had to cut back … If you [can volunteer] please send us a quick email to webdipmod@gmail.com" #announcements (12/05/20)

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
  - 2019: all fail round 1; Oslo_A strongest in round 2, but Saitama wins on points
  - 2020: discontinued

BANDANA FRAMEWORK

- BANDANA: Java framework for developing automated agents
  - "simplified negotiation language" allows proposals of:
    1. order commitments for forces
    2. demilitarized zones
    - agreed proposals: supposedly binding but unenforced
    - no classes to represent convoys
    - thus, slightly restricted DAIDE Level 30 syntax
  - "informal messages" with "no formal meaning"
- uses Parlance (Python 2) to run tournaments over network

DAIDE SYNTAX

Level 0	no press
Level 20	order proposals
Level 30	multipart Level 20
Level 50	nested Level 30
Level 80	accusations
Level 90	future discussions
Level 100	conditionals
Level 120	forwarding press
Level 130	explanations

PLAN OF ATTACK?

1. proof of concept: basic messaging on top of DipNet
   - e.g. BANDANA Level 30 syntax
2. add higher levels of DAIDE's formal syntax
3. add informal messaging / true NLP

At each step, implement, test on e.g. webDiplomacy v humans, bots

PLAYING WITH TURING

- can negotiation be kept to DAIDE's syntax, avoiding NLP?
  1. real negotiation does not look like 'code'
  2. if a bot is detected, other players may ally against it
     - conjecture: a successful AI might need to pass Turing
  3. if a human suspects a bot, might it ally to try to finish in second place?
     - conjecture: humans and bots might both want to selectively pass Turing
- how self-play dialogue while remaining human intelligible?

COMPLEXITY

Information type	complete, imperfect
Number of players	7
Action space (Shapiro &c., 2002)	~ 10^{27} × message space
Moves/game	~ 1,000 × messages
State space	~ 20,000?

STATE SPACE

- rounds: Spr orders; retreats; Aut orders; retreats; build/disband

(5 rounds/year) (8 occupying powers) ×

{[19 seas] + [10 landlocked non-SCs]

+ [(7 landlocked SCs) × (8 controlling powers)]

+ [(3 bicoastal SCs) × (3 type/loc'ns) × (8 controlling powers)]

+ [(12 unicoastal non-SCs) × (2 type/loc'ns)]

+ [(24 unicoastal SCs) × (2 type/loc'ns) × (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* hold
    2. each Fleet: move *xor* support *xor* hold *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