



**Breaking and Designing
anew:
Exploring granularity in
analytical wargames with
Artificial Intelligence**

A few questions

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- Can wargames constitute a bridge between machines and strategists?
- In which ways? For which types of games?
- What do we have to be wary of?

Some context

Some key issues in Analytical Wargaming

- Assessing game design
- Granularity
- Replicability

Planning abilities of gameplaying AI agents

- 1997 Deep Blue vs Kasparov
- 2017 AlphaZero
- Since then Pluribus (Poker), Cicero (Diplomacy), Alphastar (Starcraft II), SIMA, etc...

Experiment with Comand AI

- Training an agent able to compete with humans in a rigid tactical wargame through self-play
- Adaptation from a wargame used by French land forces (simplified version)

Why?

Objectives

1. Granularity and generating insights on game design

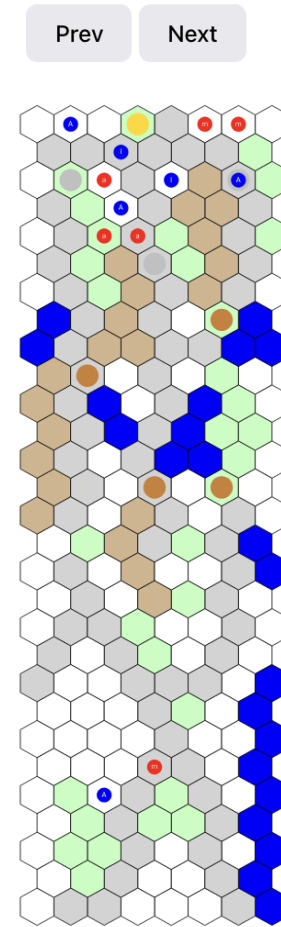
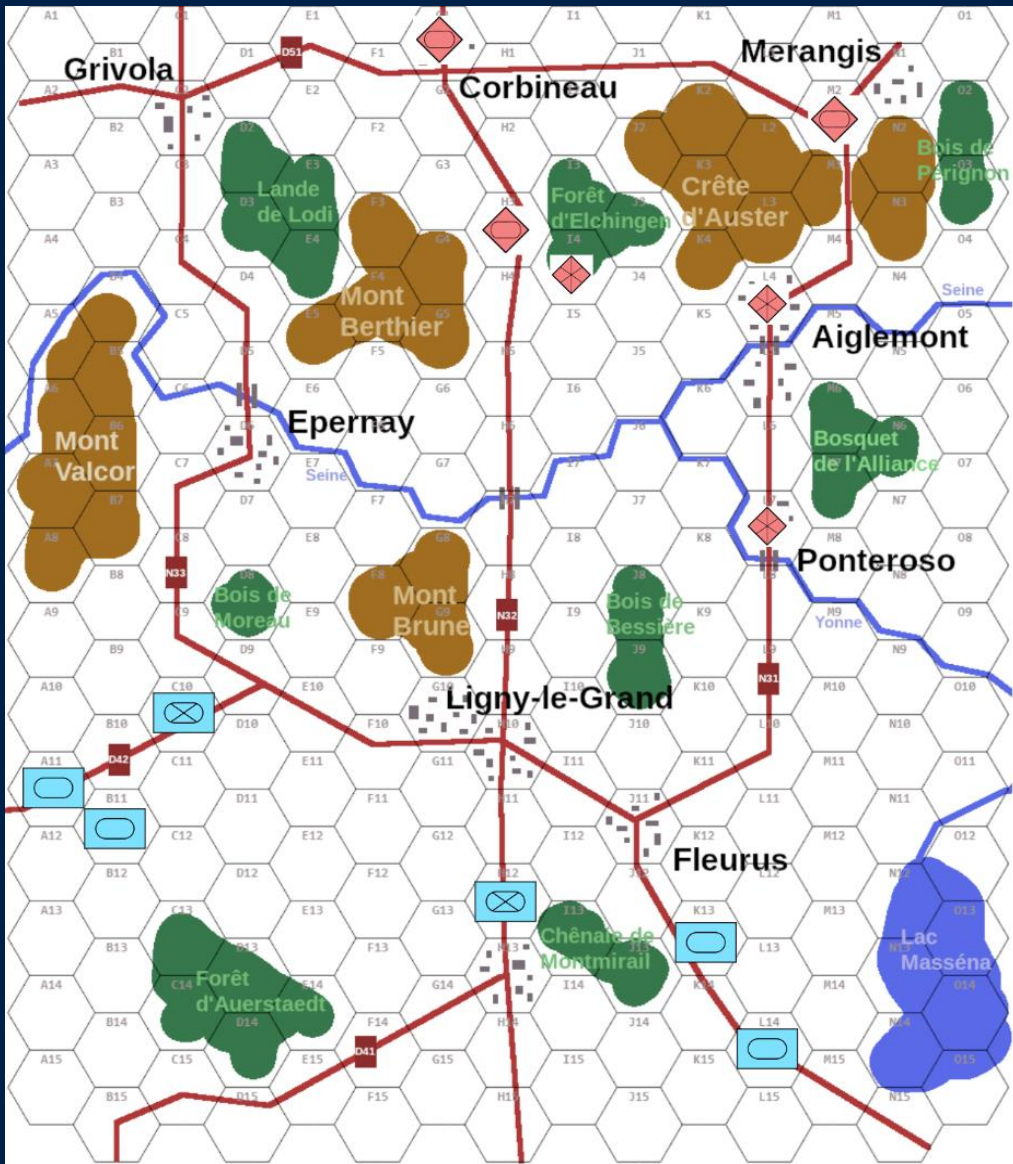
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2. Comparing CoAs

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2. Comparing CoAs
3. Human-Machine teaming experiments

Observations



```

{"turn":70,"number of moves":57,"unit":["m",10],"move":"moves to (5, 28) in position_t.DELAY"}
{"current score":14,"value":35.61443892231232,"visits":3823,"successes":492}

```

Cell(4, 28)

Dealing with game complexity

- 2 ways: algorithmic solutions and game design solutions
- Injecting heuristics
- Constant trade-off between AI's quality of play and avoiding biases

More on exploring granularity

- Explore variants, adjust rules and numbers, modify victory conditions, assess game balance
- How does each element affect the game's balance and outcomes? What happens when we change their weight?

Pitfalls

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1. The “perfect CoA” trap

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1. The “perfect CoA” trap
2. Confirmation biases & epistemological issues
3. Opportunity cost & technical limitations

And yet

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- Planning abilities of AI agents increasingly better and more comprehensive
- A growing literature on the epistemology of wargaming
- Industrial developments and first practical experiments

References

- Ellison, G. and Andrew Shepherd, "Might Wargaming be Another Instance Where “Anything You Can Do, AI Can Do Better”?" Preprints 2024.
- David E Banks, The Methodological Machinery of Wargaming: A Path toward Discovering Wargaming’s Epistemological Foundations, International Studies Review, Volume 26, Issue 1, March 2024
- Anna Knack and Rosamund Powell, "Artificial Intelligence in Wargaming: An evidence-based assessment of AI applications," CETaS Research Reports. June 2023
- Tomašev, Nenad, Ulrich Paquet, Demis Hassabis, and Vladimir Kramnik, "Assessing game balance with AlphaZero: Exploring alternative rule sets in chess." arXiv preprint, 2020
- Sadler, Matthew, Natasha Regan, Garry Kasparov, and Demis Hassabis, Game Changer: Alphazero's Groundbreaking Chess Strategies and the Promise of AI. 2019
- Murtagh, J. “Professional Poker Players Know the Optimal Strategy but Don’t Always Use It”, Scientific American, July 2024



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Thank you