AI design for real-time strategy games

Firas Safadi, Raphael Fonteneau, Damien Ernst

Real-time strategy

- **Fast-paced, real-time multifaceted** action
  - Complex battlefield
  - Multitude of units
  - Economy management
  - Technological development
  - Partial observability

Objective

- Improve current agent performance in real-time strategy games
  - Design **generic and efficient** agent models
  - Add **learning capabilities** to generic models
  - Offer developers a framework to **seamlessly integrate** challenging, adaptive AI

Overcoming complexity

- Abstraction
  - Simplify environment
    - Game state
    - Action potential
  - Simplify objectives
- Efficiently manage complexity

Available units

Action potential

Order processing

Production Order
- Train 8 marines
- Build barracks
- Acquire resources
- Gather minerals

Combat Order
- Attack
- Create 2 squads
- Destroy outpost
- Kill a patrol unit

Results and limitations

- Test setting
  - Starcraft: Brood War
  - Terran vs Zerg opponent
  - Play against default AI
  - 10 games in 1 map
- Efficient model
  - No learning means agent is vulnerable to flaw abuse

Next steps

- Adding **learning capabilities** to the agent design
  - At the strategic level (i.e., build orders)
  - At the tactical level (i.e., unit grouping)
  - At the operational level (i.e., target selection)
- **Build a framework** for the design of intelligent agents for real-time strategy games

Modular and hierarchical design

**Design overview**
Orders travel from the strategy manager down to individual units. They start as abstract orders and are processed by the intermediate managers, eventually translating into concrete unit commands.

Military Squads

Operational

Work Squads

Tactical

Production Manager

Combat Manager

Strategic

Strategy Manager

Available units

Action potential

Efficient model

No learning means agent is vulnerable to flaw abuse

Raphael Fonteneau is postdoctoral researcher of the FRS-FNRS from which he acknowledges the financial support. This poster presents research results of the Belgian Network DYSCO funded by the Interuniversity Attraction Poles Programme, initiated by the Belgian State, Science Policy Office.