

C2SIM

Noah Syrkis

IT University of Copenhagen

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1 | Overview

2 | SMAX

3 | Behaviour trees

4 | Language model

1 | Overview

The project¹ uses JAX² throughout, with JaxMARL's³ [1] SMAX as the main environment. The agents are modelled using behaviour trees (BT) stored in a sqlite3 database (we call it BTBank). The ollama⁴ library is used for the language modelling to map game states to human language and BTs, and vice versa.

¹<https://github.com/syrkis/c2sim/>

²<https://github.com/google/jax/>

³<https://blog.foersterlab.com/jaxmarl/>

⁴<https://ollama.com/>

1 | Overview (cont.)

- ☒ SMAX visual playback (`src/{plot,smax}.py`).
- ☒ BT function constructor (`src/{bt,atomics}.py`).
- ☒ BT based trajectory (`src/smax.py`). (yet to JIT compile)
 - ▶ Must traverse all leafs always (for array programming)⁵.
- ☐ Implement the BTBank (`src/bank.py`).
- ☐ Language out (`src/llm.py`).
- ☐ Language in (`src/llm.py`).

⁵Has no effect on performance, as we are always as slow as slowest action

2 | SMAX

- ▶ Extensive work on visual playback of trajectory fig. 1.
 - ⊗ Costum SMAX vizualization.
 - ⊗ Show unit type, team, health, attacks, and reward.
 - ⊗ Successfully runnning 10K+ parallel environments.

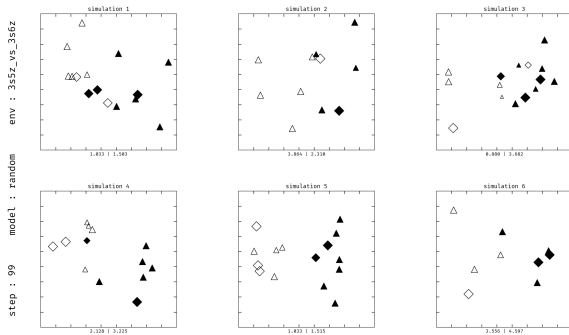


Figure 1: SMAX in parallel

3 | Behaviour trees

- ▶ BT is for now is located in a .yaml file.
- ▶ Beginning move to sqlite3 database.
- ▶ JAX based tick functions for node and leafs.
- ▶ Full traversal happens every tick, using logical operations.
- ▶ No JIT compilation yet.

3 | Atomics

- ▶ Atomics are the leaves (actions/conditions) of the tree.
- ▶ They are JAX functions.
- ▶ Keep them simple and fast (complex behavior should come from the tree).
 - ▶ E.g. `move`, `attack`, `is_enemy`, `is_dead`, `n_in_range`, etc.
 - ▶ Maybe map out desired atomic functions.

3 | BTBank

- ▶ BTBank is a library for creating and running BTs.
- ▶ It is written in Python.
- ▶ sqlite3 is used to store the trees.

4 | Language model

- ▶ The language model is a transformer model.
- ▶ I/O architecture.
- ▶ The output is a sequence of tokens.

References

- [1] Alexander Rutherford et al. *JaxMARL: Multi-Agent RL Environments in JAX*. Dec. 2023. DOI: **10.48550/arXiv.2311.10090**. arXiv: 2311.10090 [cs].