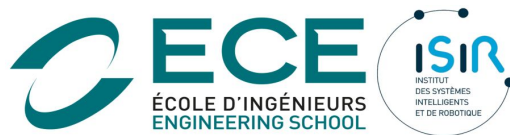


Towards multi-agent communication with a pre-defined discrete language



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I. JIM

- ALA2023
- ECAI2023

II. Multi-agent communication with pre-defined discrete language

- Motivation & Objectives
- Related works
- Method
- Next steps

Paper accepted !

Review #1: "Solid paper, high impact potential, very clear manuscript"

Minor issues to fix:

- rephrasing in Section 3.2
- clarify number of runs used in results
- comment on how the model would scale with more complex environments

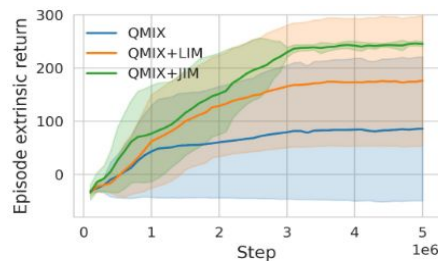
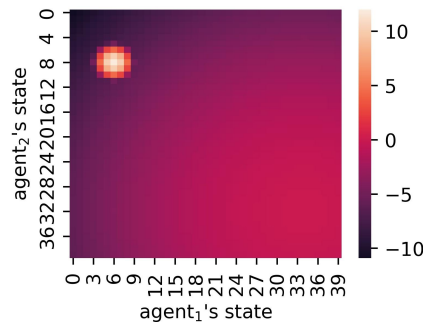
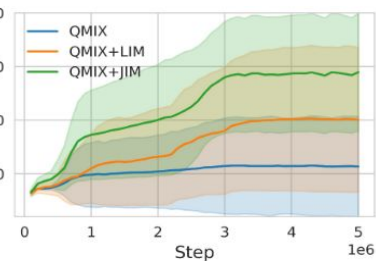
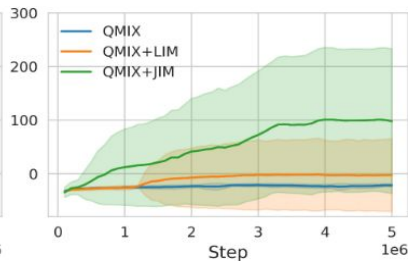
Review #2: "Technically solid paper with reasons to reject: very unclear written manuscript, lack of novelty, lack of proper evaluation", "well written and easy to follow"

Main concern: no comparison to state-of-the-art algo for diverse policies (Lupu et al., 2021)

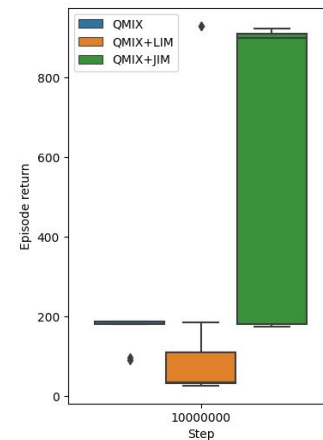
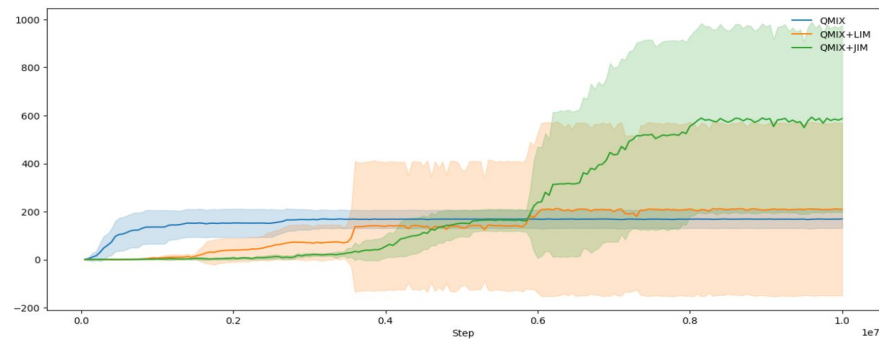
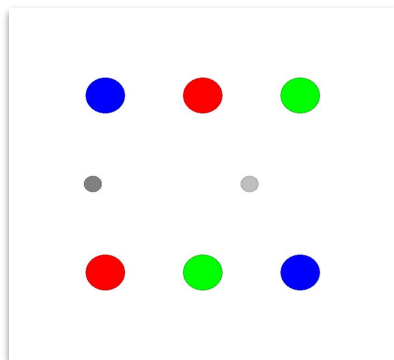
Next steps

- Camera-ready paper (April 14th)
- Workshop in London (May 29-30th)

rel_overgen

(a) easy ($\delta = 30$)(b) hard ($\delta = 40$)(c) very hard ($\delta = 50$)

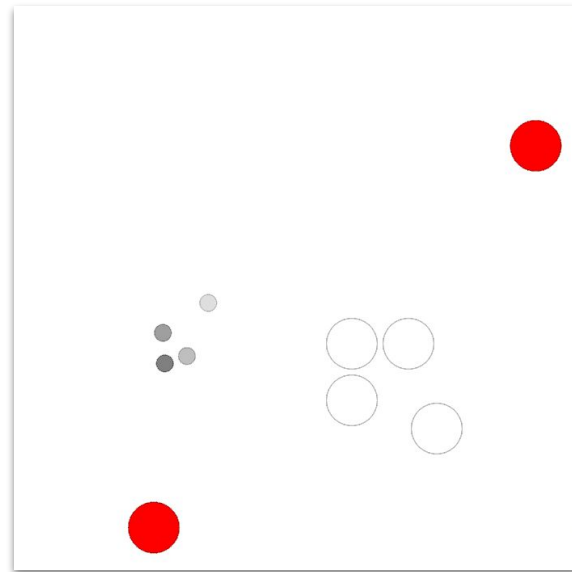
push_buttons



Experiments

- Optimise JIM's hyperparameters
- Try an environment with more agents (foraging)
- Ablation studies

foraging



Writing

- Adding new experiments
- Reworking the paper to fit new experiments (talk more about partial observability)

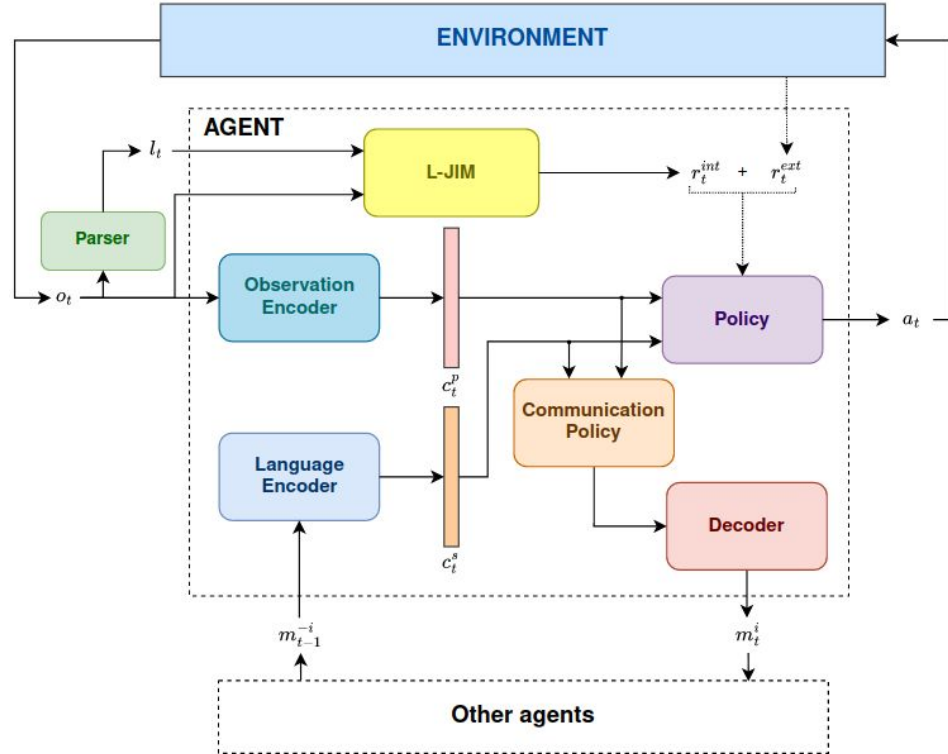
II. Multi-agent communication with pre-defined discrete language

Multi-agent communication with pre-defined discrete language

Motivation & Objectives

“Goal:

Using a pre-defined language to *help agents understand their environment and share information efficiently.*”



MOTIVATION

Language

- Language is in a big hype
- Learning in robotics is starting to combine different sources of information

Communication

- Central to multi-agent problems
- Communication in robotic tasks has not been studied with language

OBJECTIVES

- Show language helps for generalization
- Show language helps for interpreting agent communication and actions (and interaction ?)
- Make a modular approach that allows scaling with bigger/better models

Emergent communication

- *Emergence of Grounded Compositional Language in Multi-Agent Populations*, Mordatch and Abbeel, AAAI CoAI 2018.
- *On the interaction between supervision and self-play in emergent communication*, Lowe et al., ICLR 2020.
- *Compositionality and Generalization in Emergent Languages*, Chaabouni et al., ACL 2020.
- *Emergent Communication at Scale*, Chaabouni et al., ICLR 2022.

=> Works well in MARL benchmarks, but very hard to interpret (if possible).

Communication with natural language

- *Countering Language Drift via Visual Grounding*, Lee et al., EMNLP 2019.
- *Multi-agent Communication meets Natural Language: Synergies between Functional and Structural Language Learning*, Lazaridou et al., ACL 2020.
- *Dynamic population-based meta-learning for multi-agent communication with natural language*, Gupta et al., NeurIPS 2021.

=> Population-based learning and Grounding representations in language and vision helps communication.

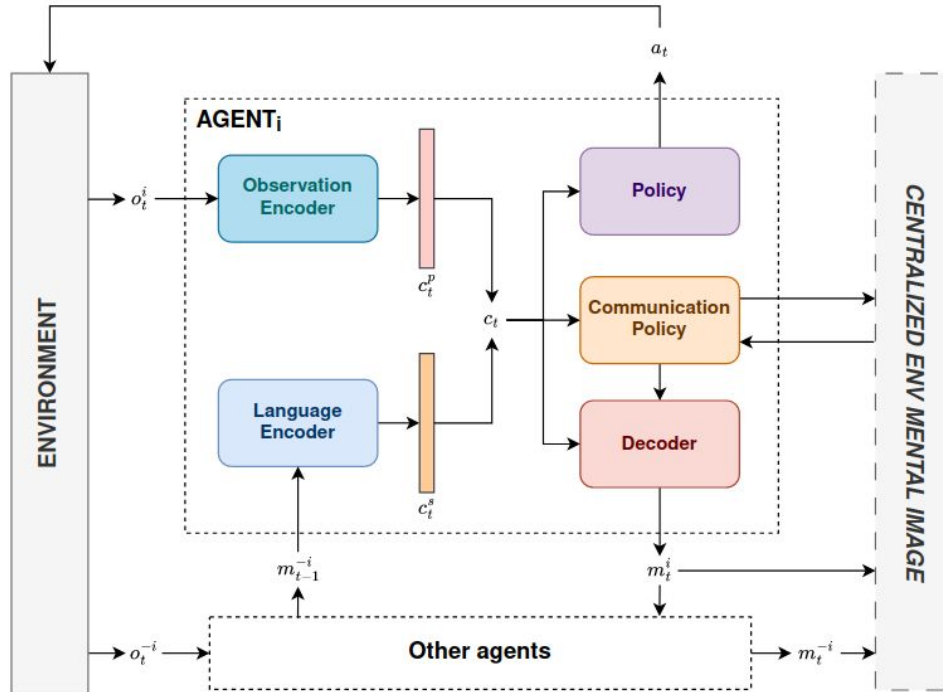
Language-Augmented RL

- *Language and culture internalization for human-like autotelic AI*, Colas et al., Nature Machine Intelligence 2022.
- *Inner Monologue: Embodied Reasoning through Planning with Language Models*, Huang et al., CoRL 2021.

=> Language models help RL for planning and learning from interaction.

Multi-agent communication with pre-defined discrete language

Method



Goal:

Generating messages that are informative and true.

Centralized Environment Mental Image

- Latent representation (in RNN or Memory network)
- Textual description
- State reconstruction

=> Communication policy maximizes information gain with each messages

Multi-agent communication with pre-defined discrete language

Next steps

- Review related works
- Define clearly the approach of centralized environment mental image
- Design a task for testing this approach
- Find a conference to aim for

Thank you for you attention !

Questions ?