Exploring biologically inspired algorithms towards imitation, transfer, and adaptive learning with an application in computer games

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Overview

The aims of the study are to develop biologically inspired algorithms that will be implemented in agents that imitate human gameplay behaviour, and then transfer and adapt that gameplay behaviour to a different computer game. This will involve building simulation computer games as proof of concept.

Imitating and learning from coordinating multi-agents is a daunting task that involves identifying and learning policies at different hierarchies for individuals and groups of agents. Methods used are widely categorized into behavioural cloning and inverse reinforcement learning (Osa, et. al., 2018) methods, and are especially applied to robotics. However, biology and nature in general provide many avenues for mimicry and imitation, providing inspiration for more algorithms.

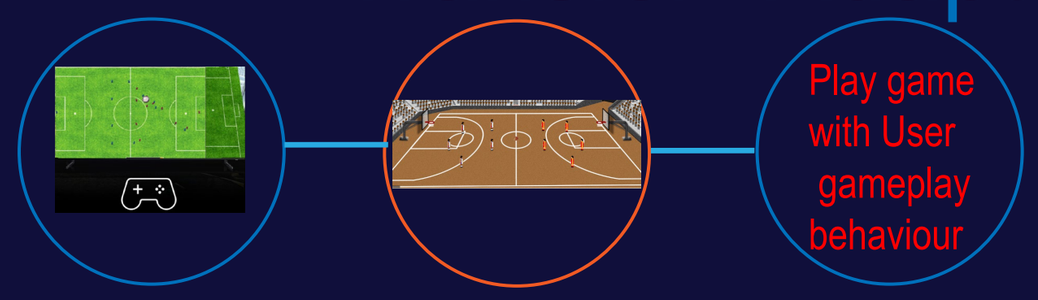
HYPOTHESIS

Imitation is natural to human beings as we often learn by copying from other humans. This does not only stop at imitating specific actions, but rather encourages us to explore other similar and different tasks using that acquired knowledge.

For us to enjoy playing computer games, especially competitive simulation games, we need to feel like we are playing an equally adept opponent. An opponent that is neither too easy nor too hard to play against.

With only training data for one domain, in this case, expert knowledge for a specific computer game, it should be possible to utilize that data to train a similar computer game. This is called transfer learning. The new game agents should then be able to adapt and improve performance.

This research aims to show that it is possible to imitate, transfer and adapt human gameplay behaviour to result in the production of agents that present human-like gameplay.



References

- Osa, T., Pajarinen, J., Neumann, G., Bagnell, J.A., Abbeel, P. and Peters, J., 2018. An algorithmic perspective on imitation learning. Foundations and Trends® in Robotics, 7(1-2), pp.1-179.