Acquiring common sense by playing games

Proposer(s) / Proposatzailea(k): names / izenak

Aitor Soroa
Gorka Azkune

Contact / Kontaktua: a.soroa@ehu.eus

Description / Deskribapena

Computer based adventure games are simulations in which an agent interacts with the world to resolve a series of puzzles and quizzes. Often these games are text based, and the interaction between the human and the world is performed purely through natural language. Other game types are not text based, but represent very complex game dynamics that are difficult even for humans to master. One such example is the game called 'Nethack', a complex game with hundreds of items and monster types and the rich interactions between these, the player, and the environment. Many of these games are complex, but the player has a clearly defined goal. For example, in Nethack the player has to descend more than 50 deadly dungeon levels to retrieve an amulet before ascending to demigodhood.

Real world activities can be thought of as a sequence of sub-goals in a partially observable environment. Many of these activities --turning on a lamp if it is dark, for example-- are considered trivial for humans because of common sense knowledge, i.e., the set of facts, beliefs, and procedures shared among many people in the same society or culture. Adventure games are ideal environments for automatic agents to acquire common sense knowledge. However, to an agent that knows only what it has learned from interacting with the environment, even tasks that humans take for granted can involve considerable trial-and-error effort.

Goals / Helburuak

In this project we propose to learn an agent to play computer based adventure games. The system will interact with the platform that dynamically generates games, and let the automatic system play millions of interactions. Examples of such systems are "TextWorld"[1] and "The NetHack Learning Environment"[2]. Usually, these systems allow developing Reinforcement Learning (RL) modules where automatic systems play millions of times to learn the best strategies.

Requirements / Betebeharrak

While pursuing the main objective stated above, the student can work on different areas, such as:

- Acquiring world knowledge: Automatically playing games requires representing the knowledge of the world in a meaningful way, so that the agent can take the appropriate decisions at each step.

- Acquiring common sense knowledge: everyday interactions with the environment are often trivial for human players, but present a challenge for agents. One way to overcome this issue is to explore techniques for incorporating commonsense knowledge into agents, by using knowledge bases like ATOMIC[3].

- Understand external resources: human players often have to consult external resources such as the NetHack Wiki to identify critical strategies or discover new paths forward. The system developed within this project can implement a Natural Language Understanding (NLU) module that access wiki-like resources to help the agent resolve the puzzles.