DOI: 10.20396/revpibic2720191872

ALTERNATIVE METHODS OF SELECTION OF ACTIONS IN COGNITIVE ARCHITECTS USING ANIGRAFS IN CST

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Abstract

This project consists of studying and implementing several different choices of action policies, as suggested in the book "Anigrafs - Experiments in Cooperative Cognitive Architectures", incorporating them in CST, a toolkit for the construction of cognitive architectures, developed in the research group of Prof. Ricardo Gudwin at FEEC-UNICAMP. As a basis for this study, we mainly used the method presented in the book, tol be added to CST, contributing to the different methods currently available in it. To test these different policies, we developed small experiments in a virtual environment.

Key words:
Cognitive Archtecture, Anigrafs, CST

Introduction

The main purpose of a cognitive architecture is to provide aids for the construction of artificial minds for intelligent agents, taking advantage of models inspired by the phenomena of cognition and behavior in animals and humans.

The Cognitive Systems Toolkit (CST) is based on the work of many micro-agents called codelets, small pieces of non-blocking code, each of them executing a well defined and simple task. The second element to understanding the core of CST is the memory object, a generic information holder, necessary for the cognitive archicture perform its behavior.

In this project, the aim is to develop alternative behavioral mechanisms, complementing those being currently used in the toolkit for implementing subsumption architectures. According to the Anigraf theory, the lowest forms of animals, living in complex environments, make decisions for actions that are often also complex. In this treatment, the array of choices and models are cast as a graph, where the choice evaluation procedure involves the Condorcet method.

Therefore, in CST we helped in the improvement of a specific entity, called Memory Container, equiping it with the ability to use a designated graph, and allowing its use in order to obtain a final action selected by the Condorcet method.

Results and Discussion

First, we conducted a study regarding Anigrafs and evaluated how to incorporate it into CST. The goal was for old projects to remain functional after these modifications. The first step was to work on the Memory Container, providing enhancements with Anigrafs, while maintaining its previous functions for legacy applications.

We reworked the implementation of the Memory Container, reformulating the use of the "getI" method and using a new calculation format for the action selection. Now it requests new parameters defining the action graph, as can be seen in figure 1. These parameters can be the Cartesian position or the connection between the codelets or both.

In the examples we used for tests (figure 2), the Memory Container dealt with the motor codelets, which are the outputs available to perform an action. Finally, the Dijkstra's algorithm interprets the graph and the Condorcet method performs its voting system on the graph to determine the most voted action, which will be executed by the motor codelet.

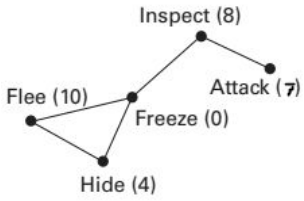

Figure 1. Graph representing the competing proposed actions and their relations.

The choices of action policies we tested were the subsumption architecture, three different types of anigrafs systems and the vectorial, also present in the book.

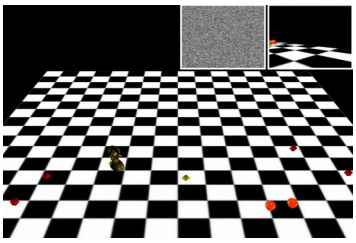

Figure 2. One of the simulations, in the virtual environment. WorldServer3D Aplication.

Conclusions

The use of Anigrafs in CST is now available. It was not possible, though, to evaluate the full potential of Anigrafs in cognitive architectures in a complex environment. In the next steps of our research, we intend to use it together with the V-REP robotic simulator in order to develop a more complex situation, where the potential of Anigrafs could be evidenced.

Acknowledgement

The first author thanks CNPq/PIBIC for a fellowship and DCA-FEEC-UNICAMP for supporting this work.

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