Controlling Virtual People

Title: Controlling Virtual People

Author: Mgr. Jakub Gemrot

Department: Department of Software and Computer Science Education

Supervisor: Mgr. Cyril Brom, PhD.

Abstract: In this thesis, we provide a computational formalization of reactive planning as a paradigm for decision making of intelligent virtual agents and videogame non-player characters. We formalize agent decision-making (ADM) as a process of deciding on which body actions to execute next and differentiate it from agent reasoning as a process of computing facts needed for decision making. We show that imperative programming languages are not suitable for ADM specification and explain why they are not suitable. Thereafter, we create a new computational model that we use as the basis for the definition of Behavior Design Language (BDL). We show that BDL can model decision-making specified by scripting, hierarchical finite-state machines, AgentSpeak(L), GOAL, SPOSH and Behavior trees. Importantly, BDL can model these approaches economically in terms of the number of behavior primitives. The key strengths of the BDL language are: versatility (it can mix decision making patterns of multiple languages together), extensibility (it allows developers to devise new language primitives as they see fit), and generality (it can abstract any computable function). In conclusion, we propose to use controlled comparative experiments for determining practical strengths and weaknesses of agent action-selection mechanisms. We describe a few experiments we have conducted and summarize the method for designing and running this kind of experiments.

Keywords: intelligent virtual agents, action-selection mechanisms, reactive planning, productivity, controlled comparative experiments