香港浸會大學理學院
HKBU Faculty of Science

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DEPARTMENT OF COMPUTER SCIENCE

PhD Degree Oral Presentation

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Time:	24 February 2012 (Friday) 2:30 pm – 4:30 pm (35 mins presentation and 15 mins Q & A)
Venue:	FSC1111, Fong Shu Chuen Library, HSH Campus

"The Intelligent Behavior of 3D Graphical Avatars Based on Machine Learning Methods"

Abstract

Graphical avatars have gained popularity in many application domains such as three dimensional (3D) animation movies and animated simulations for product design. However, the methods to edit avatars' behaviors in the 3D graphical environment are remained to be a challenging research topic. Because the hand-crafted methods are time consuming and inefficient, the automatic actions of the avatars are required. To achieve the autonomous behaviors of the avatars, artificial intelligent should be used in this research area. In this thesis, we present a novel approach to construct a system of automatic avatars in the 3D graphical environments based on the framework of actors and directors relationship. That is to simplify the designer work and let them to make the avatars behaviors in the 3D graphical environments by giving instructions of doing what task. After that, the avatars will achieve the goal depend on their own intelligence. Whether the intelligent controlling or policy making system has the efficient skill to accomplish such work is essential for the framework. On the other hand, this framework has the potential of solving the problem that small numbers of 3D animation designers face explosive increase of 3D graphical environments as well as avatars. Specific framework is created for controlling the behaviors of avatars, such as classifying the difference among the environments and using theoretical probability model to describe these actions. Because of the requirement of simulating the interactions between avatars and environments after the classification of the environment, Reinforcement Learning is used to compute the policy to control the avatar intelligently in the 3D environment for the solution of the problem of the different situations. Thus, our approach has solved problems such as the structure of levels for the missions and how the learning algorithm will be used to control the avatars.
Moreover, the decision making needs high speed even online ability to control the avatars' actions. To achieve efficient algorithm, the spectral probability density of stochastic process is used to estimate the optimal policy of actions.
In the thesis, our method to achieve these goals will be presented.
The main contributions of this paper are:

- Presenting a novel framework to define the relationship between avatars and environments;
- Presenting an efficient algorithm of reinforcement learning with spectral estimation approach for making the policy of avatars' actions intelligently;
- Presenting a method for avatars to recognize environment.

***** ALL INTERESTED ARE WELCOME *****