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## A Method for Group Animation Based on Artificial Life

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### Abstract

The hierarchical group animation system model is deeply discussed by introducing the theory of artificial life. In order to effectively display the group animation and real time control, it adopted the control method with packet as the unit by hierarchically dividing the object structure (crowd, group, individual), instead of employing the animation techniques with the virtual character individual as the unit. In addition, the model mainly focuses on the animation technique of behavior level, and also established the hierarchical structure of the behavior model by the method of artificial life, which makes the model more in line with the nature of life and more flexible.

*Keywords:* artificial life; group animation; hierarchical model

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### 1. Introduction

Computer animation technology, from the parameter keyframes, morph animation, process animation, and then to the joint animation, the animation based on physics, behavior animation technology and the others, has been widely used.

Among them, the group animation technology is undoubtedly a great difficulty, and is getting more and more attention as a new hot spot. Based on the previous studies, this paper introduced the theory of artificial life, deeply discussed the hierarchical group animation system model, and it is highly interactive. In order to effectively display the group animation and real time control, it adopted the control method with packet as the unit by hierarchically dividing the object structure (crowd, group, individual), instead of employing the animation techniques with the virtual character individual as the unit. In addition, the model mainly focuses on the animation technique of behavior level, and also established the hierarchical structure of the behavior model by the method of artificial life, which made the model more in line with the nature of life and more flexible, and achieved better scalability in the realization as well. Indicate references by<sup>1</sup> or<sup>2,3</sup> in the text.

The system is designed by referring to some domestic and foreign achievements, such as ViCrowd system

(EPFL2001),etc. The following is the model framework of the Uniture system as shown in figure 1.

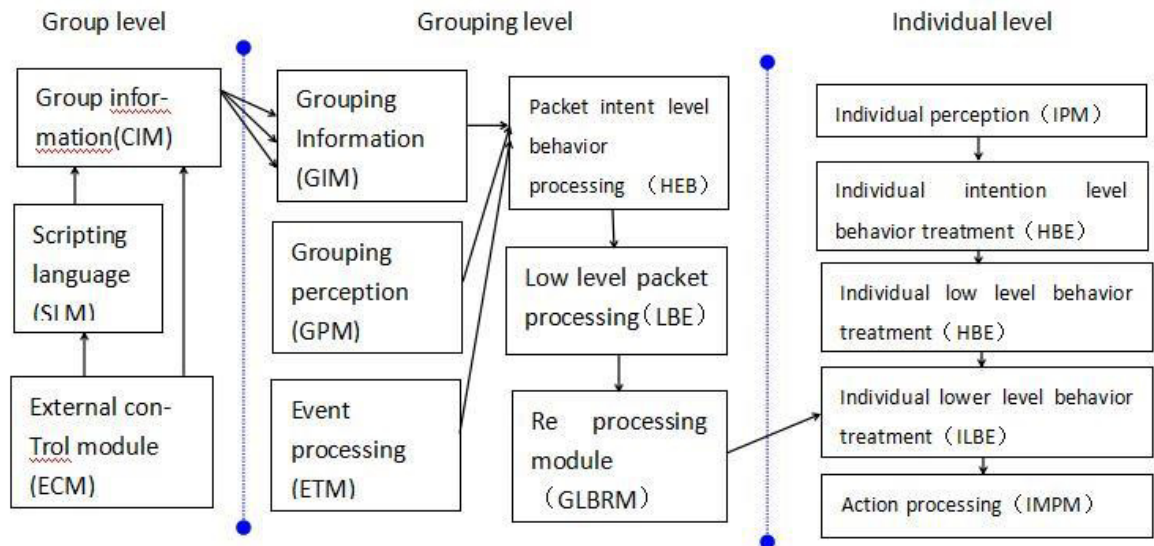


Fig. 1 The Model Framework of Uniture System

As seen in Figure 1, the group granularity is divided into three levels: individual, group and crowd. The crowd is all agents “living” inside our 3D virtual scene. The group is processed as the basic unit by our system, basically it can be understood as a relatively small crowd with the common intention and coordinative action, and usually there is a leader (Leader) for it, basically putting the leader's intention as the group's intention usually can achieve very good results. As for the individual of the agent, it is the smallest granularity unit processed by the system and a separate agent itself as well.

One of the goals of the Uniture system is to construct a model to describe, define and control the crowd based on Group, rather than purely based on individual. During design, the group is the more “intelligent” and reasonable structure, generally the individual should follow the will and information of the group itself. On one hand, this decision was due to a real-time requirement of the Uniture system which puts the main part of the work and operations on the first level, to simplify the individual level control, thereby to improve the efficiency of the Uniture system; on the other hand, it is for optimizing our control architecture, because the group is more in line with the objective facts of the biological world and is more conducive to the organization of group animation performance and interaction.

At the crowd level, the receiver / translation module is mainly designed to operate the external control commands (ExternalControl, EC). It can process the command sent over by the network (or GUI OS), or the script pass over by the script module and convert them to a unified format control data, in fact, the external control commands are also expressed in the script, in Uniture, the script is the most basic method of user control. The control data includes the definition or change of the parameters of the scene object, the real-time control of the group behavior of the agent, and so on. The control data are going to be processed further in Crowd Information Module and distributed to each of the related groups.

At the group level, Group Information Module receives the information distributed by the CIM. The generation process of the group information is basically processing and distributing the predefined script information and external script information, such as those information split for those groups.

The group information continues to flow to High-Level Behavior Engine, Group Perception Module (achieving information by the group actively interacting with environment) and Event Treatment Module (achieving information by the group passively and possibly triggering some behavior rules as one of conditions). To transfer the appropriate high-level behavior according to the decision of the high-level behavior (such as priority) to the low-level behavior engine module, HFSM of the high-level behavior input by LBE will produce Group Low-Level Behavior, and it is the group low-Level behavior re-processing module will distribute the behavior to each

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