An Architecture To Adapt Scalable Virtual Characters

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ABSTRACT

Virtual humans and avatars are enhancing a lot of current computer applications. This leads to the usage of complex characters for presentations, e-learning tasks and virtual reality applications. Often it might be suitable to have the possibilty of scaling the character to avoid performace problems or to fit the personal needs of the user. An universal architecture to control the scaling of the character is presented. It is based on an Adaptation Engine and different scalability modules which can be configured to the preferences of the user and the graphical system.

Keywords

Virtual Humans, Avatars, Scalability, Architecture

1. INTRODUCTION

Virtual humans and avatars are more and more present in current computer applications. This development includes complex 3D avatars for presentations, e-learning tasks and virtual reality applications. Neverthenless there are an emerging number of avatars guiding the user of small devices like PDAs and smartphones. In this context it could be useful to have the ability to scale the graphical representation of the character to avoid performance problems related to the used hardware, the complexity of the application or to fit the personal needs of the user. This could be especially useful on mobile devices. With this ability there is a wide range of avatar applications even on small computers and with complex and numerous running programms. In this paper we introduce an universal architecture to control the scalability of the avatars regarding different preferences of available scalability modules. With this system it is possible to change the scalability of the avatar when starting the system and during runtime.

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WSCG 2005 POSTERS proceedings ISBN 80-903100-8-7
WSCG'2005, January 31-February 4, 2005
Plzen, Czech Republic.
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2. RELATED WORK

There are a lot of systems dealing with virtual humans in different application context. Normally there is no adaptability of the graphical representation on the running system, if you need a less complex model you make it by loading a different one. Even you can not change other animation capabilities.

Neverthenless there are a some implementations dealing with the scalability of the graphical representation of the virtual humans during runtime. Here should be mentioned the adaptation of face and body animation in some MIRALab publications [Seo00],[Gia03] regarding different MPEG standards and the work of Breton et al. in [Bre01], [Bre02] and [Bre03] dealing with a FaceEngine to adapt an avatar on small devices. Especially Breton affiliated with the France Telecom has the explicit goal to run avatars on small devices, namely on smartphones.

3. ADAPTATION ENGINE

The Adaptation Engine is inspired from the necessity to scale our existing avatar systems to be used on smaller, less performant systems and mobile devices. For this we are developing a flexible system which can be used with different avatar systems incorporating different scalability modules.

One inspiration is the work of Breton et al. Scalability is controlled through scalability modules. Each module is connected with one or several animation modules or LOD-management. The scalability system is organized around a sorted list of scalability modules. The adaptation process starts with the highest module. When the execution process of the module found out that it is not enough performance, the next module is executed and so on. On the contrary, if there is remaining power, the system can go backward. Scalability modules that act on animations only have to decide if they switch them on or off. But scalability modules that act on LOD-management adjust dynamically the resolution of the meshes.

Our idea is to generalize the concept of Breton and additionally make it applicable to different avatar animation systems. The user should decide in which way the avatar is scaled, for this the capabilities of the system and the preferences of the user are important factors. We provide:

- Flexible execution of the scalability modules
- Connectibility with different avatar systems

The scalability modules are grouped in different levels, see Figure 1. The modules in one level are modified at the same time. Is the scalability of one level exhausted then the next level is reached, this works in both directions.

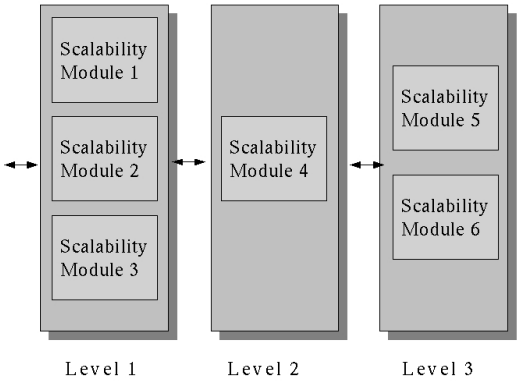

Figure 1 Levels of the Adaptation Engine.

The different modules can configurated with individual parameters like scalability type (linear or on/off), stepwidth, boundaries, startvalue, starttype (static/dynamic) and connection description. This gives the user the possibility to configure each scalability module depending on the requirements of an application.

With the described configuration capabilities scalability modules with different features can be connected with the Adaptation Engine. To connect an existing system including the scalability modules with the Adaptation Engine each module must have a stub for the communication. Another module called Performance Control is used the give the Adaptation Engine information of the current performance condition of the system. The configuration capabilities can be used to fit the Adaptation Engine to the existing scalability facilities of the avatar system and the preferences of a specific application. For the aquisition of more experience about the scalability of avatars we implemented two scalability modules with the basis of a Java3D avatar animation system:

- Number of Morph Targets
- Reduced Mesh

4. CONCLUSION

Starting with our work on avatar systems including scalability facilities and inspired from the work of Breton we introduced an architecture to adapt scalable virtual characters. This architecture includes an Adaptation Engine and scalability and performance modules with stubs. The adaptation Engine is flexible to configure and can be used with different avatar systems. Due to the configuration capabilities it can be adapted to the different needs and preferences of the system, the user and the current application context.

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