1 Introduction

People recognize a complex phenomenon divided into units, and animation is divided into three main elements: "How did, what and when" too. These Elements can be subdivided more, but the subdividing levels have to be in the user’s hands. This proposal provides “ReTeMo” to be composed by three tree structures as “Region, Tempo and Movement.” ReTeMo does need complex algorithms for its execution, however it has excellent analyticity and reusability, and it is a user-friendly data structure.

2 Exposition

2-1 concept

It frequently happens that a person cannot understand the data that he or she had created after some time has elapsed. Accordingly, ReTeMo is designed based on the concept that the data structure should be “easy for people to understand.” ReTeMo arranges motion data as an easily understandable schema, such as,

“Raise, right arm, after two beats.”

A Cardinal point of the three is “Movement.” Accordingly, we understand “How did, what and when” to see the movement tree. This style has every reason. In the first, we can make any groups from “small motion of two or three frames” to “multilevel motion” without hindrance of objects. And also, in case to change elements as Region at root, these become reason of difficulties. Everything is likely to change. In addition, movement oriented system gives natural to abstraction. How easier “virtual object, virtual timing and inherited method” or “inherited object and virtual method” is it? The reason to make “virtual object and timing” is based on “Movement oriented.”

Region and Tempo (Timing) tree have features too.

With ReTeMo`s Region, the gap between “concepts peculiar to computer graphics” and “ordinary concepts” can be suppressed, and “right arm” may be expressed as “right arm.” There is a linked structure called “forward kinematics” in CG software, and without the knowledge of this the reason for the use of “upper arm” or “shoulder for “arm” may not be understood. I separate the physical structure and the conceptual system on ReTeMo, and by the construction of Region data on the conceptual system side.

In current computer graphics “time” is subject to keyframe data. However, people recognize time itself as an independent concept. This is reproduced in ReTeMo. For example, in a usual system, a user must remember different meanings of timing in the same time oneself. ReTeMo can record timings with these meaning. In addition, there are subtle timing gaps from physical factors that should be the same, and expressing this may show “real movements.” By using the nested structure, both this “conceptually synchronized” and “actually slightly apart” can be made compatible. This construction is important as an increase in the number of timings leads to an increase in the amount of work.

2-2 Execution

With its consistent concept and nested structure, ReTeMo presents an easily comprehensible data structure. However, on the other hand, complex algorithms are required to generate animation. Firstly, since it has “physical structure” as well as “region,” it is necessary to convert data for the display object from “Region.” Also, ReTeMo performs key frame interpolation in the same way as other systems of CG animation; however, in order to do so, the key frames must be lined up in the time sequence order. According to the traditional method, the key frames are lined up directly in a “Channel,” however, as ReTeMo uses nested key frame sequences, there is a part that cannot be lined up in the time sequence order. This means that it is necessary to generate a special “Channel” separately in ReTeMo.

2-3 Application

ReTeMo is expected to be applied in many different fields. For example, it is able to automatically generate “motion” from “scenario” by using a database. A number of similar researches are already being carried out, however, since ReTeMo has a generic data format, it is not in direct competition with these researches, and may rather act as an infrastructure to provide practical data. It may also be easy to apply in fields that employ “movement,” such as sports, dance and the theatre, since it is able to assign respective meanings (nesting).

3 Conclusion

This method of arranging and storing the motion data as "Region, Time and Movement" that is the conceptual system can classify data according to their desire on user side, though it complicates the system for execution. Moreover, because the annotation is naturally included in the data structure, the compatibility of recycling and automatic processing is also high.

4 References

TVML (TV program making language) [Hayashi.1998]