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Efficient Motion Search in Large Motion Capture Databases

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Abstract

Large human motion databases contain variants of natural motions that are valuable for animation generation and synthesis. But retrieving visually similar motions is still a difficult and time-consuming problem. This paper provides methods for identifying visually and numerically similar motions in a large database given a query of motion segment. We propose an efficient indexing strategy that represents the motions compactly through a preprocessing. This representation scales down the range of searching the database. Motions in this range are possible candidates of the final matches. For detailed comparisons between the query and the candidates, we propose an algorithm that compares the motions' curves swiftly. Our methods can apply to large human motion databases and achieve high performance and accuracy compared with previous work. We present experimental results on testing a database of about 2.9 million frames, or about 27 hours of motions played at 30 Hz.

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1 Introduction

Recently, large motion capture databases have become commonplace due to real-world projects requiring expressive character motions. These databases contain many di erent kinds of actions and any action can have many variants. Theoretically, it seems that we do not need to capture motions redundantly and that we could create realistic motions simply by connecting the required motions in the database. This might be feasible if only we could find appropriate motions fast enough. This is not as easy as it looks, especially with large databases.

The main reason is that the currently used retrieval strategy involves hand-annotating each motion with a descriptive label. The annotations are often far from describing the motion clearly. For example, a label "punch" may represent many di erent motions. Di erent annotations may also be unable to reflect the relations between motions. For instance, a "punch" may related closely with a "dodge a counter-blow". A real world user often has to scan the database, examine every possible candidate motion, and crop the frames of interest. Manually searching a large database is an insu erably time-consuming job.

There exist approaches that allow the query to be a short motion segment, and that automatically retrieve all motion segments in the database containing parts or aspects similar to the query. The basic idea of these kinds of approaches is that the database is preprocessed using an indexing strategy for fast retrieval. Various indexing strategies have been developed in the past few years,

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