

# Rhythmic Character Animation: Interactive Chinese Lion Dance

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## 1 Introduction

Being able to create a stylistic animation with high-level controls has always been a design goal for computer animation software. In this paper, we propose a procedural animation system, called RhyCAP (Rhythmic Character Animation Playacting system), that allows a designer to interactively direct the animated characters by adjusting rhythmic parameters such as tempo, exaggeration, and timing. We use the Chinese lion dance as an example to illustrate the effectiveness of the interactive system in generating expressive character motions. Enacting the lion in the real life is a great challenge requiring seamless coordination between the two dancers acting for the head and the tail of the lion. Similarly, it is also challenging and labor-intensive to create the animation of a dynamic lion dance with traditional animation software or with the motion capture techniques.

## 2 System Design

The proposed RhyCAP system [Chen 2004] uses a procedural animation framework consisting of two levels of controls: *play-acting* and *pose-to-pose*.

At the playacting level, the system accepts a user's high-level commands from a playacting console or a script file. The commands include specifying a dynamic goal for the lion to pursue and a sequence of actions selected from a motion repertoire for the lion to perform while pursuing the goal. A geometric description of the obstacles in the virtual environment is given to the system as input. A potential-field-based path-planner is used to compute and maintain a collision-free path connecting the current configuration of the lion to the dynamically changing goal in real time. The path is pursued by the head and loosely followed by the tail such that constant distance is kept between the two dancers. The system's task at this level is to control the high-level behavior of the lion such that a feasible path can be generated (as shown in Figure 1) and a sequence of motion components, called *actions*, can be determined and passed to the lower level.

At the pose-to-pose level, the locomotion of the dancers is determined in a procedural way. The lion dance is performed with martial actions that require certain parts of the body to reach specific positions with distinct postures. These actions include hand gestures for manipulating the lion head and foot stances for moving the lion body. In general, these gestures and stances can be decoupled and considered independently. A lion dance play consists of a sequence of actions, each of which is considered as a major key-frame determined by an animation procedure. The transition from one action to another usually requires additional key-frames, called *poses*, for the purpose of emphasis or avoiding self-intersection. Therefore, reaching a specific martial form from different stances may require different transitional poses.

The number of transitions among actions becomes large when the number of available actions increases. Nevertheless, these actions are mainly composed of common fundamental motion controllers (called *posers*) such as lifting leg, shifting leg, lowering down torso, etc. To facilitate the implementation of these animation

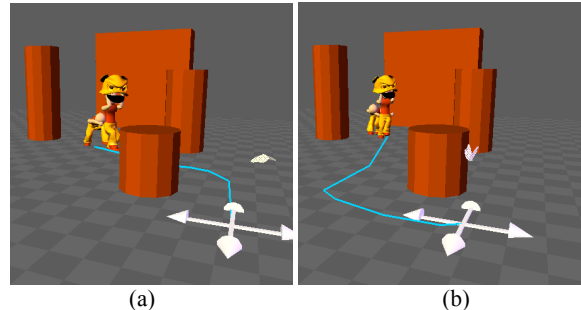


Figure 1: Snapshots of two lion dancers pursuing a butterfly (in white) with various actions along a real-time planned path

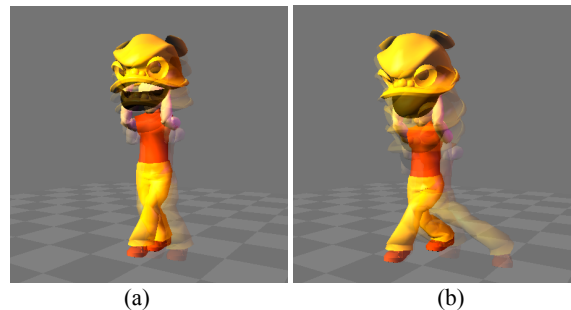


Figure 2: Postures with (a) weak (b) strong rhythmic parameters

procedures, we represent the relations between these actions and posers in a concise graph called *action graph*. The nodes in this graph represent posers while each arc between two nodes contains the list of actions that use this poser as their transition.

The Chinese lion dance is a rhythmic performing art accompanied with several drummers. Varying the rhythm of the drums yields different motion styles for an action with different *tempo*, *exaggeration*, and *timing*. The tempo parameter determines the duration of each action while the timing parameter rearranges duration of the phases in an action. For example, a lagged preparation may imply a sudden movement with a slow heavy damping to terminate the action. The exaggeration parameter indicates how close the key poses in an action are to the extremes of the limbs or the body. In Figure 2, we show the snapshots of two lion dance actions with weak and strong rhythmic parameters, respectively.

## 3 Conclusion

Complex character animations such as Chinese lion dance can be realized interactively in a procedural way by adopting global path planning techniques and rhythmic motion parameterization. The proposal RhyCAP system provides novice animators an intuitive interface to create expressive character animations.

## References

CHEN, J.R. 2004. *Rhythm & Motion: Animating Chinese Lion Dance with High-level Controls*. Master thesis, Computer Science Dept., National Chengchi Univ.

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