

AN AUTHORIZING TOOL FOR GENERATING SHADOW PLAY ANIMATIONS WITH MOTION PLANNING TECHNIQUES

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ABSTRACT. *Shadow play is a Chinese art that has not yet transformed into a digital form. In this work, we attempt to develop an authoring tool to generate shadow play animations according to user's high-level inputs by utilizing motion planning algorithms. The motion of a character in a shadow play show usually consists of intended primary motion and reactive secondary motion. We propose to use the RRT-Connect algorithm to generate primary motions and design two methods to facilitate the generation of secondary motions. For the character's upper body, we try to bias the search in the planner to prefer some motion pattern. For the lower body of the character, we modify its motion path by a simple pendulum model and a collision-avoidance correction mechanism in a post-processing step. Through several illustrative examples, we have shown that we are able to generate realistic compliant motions for a character in a shadow play animation.*

Keywords: Animations, Motion planning, Rapid-exploring random tree (RRT), Chinese shadow play, Secondary motion

1. Introduction. Chinese shadow play, as depicted in Figure 1(a), is one of the most ancient genre of drama in China. It is a dramatic form which uses lanterns to project shadows of silhouettes made of hard paper and hide onto a white screen. The artistic effect of the play is produced through light, screen, music, signing and puppet operation. A performer manipulates the characters behind the screen while singing the libretto to tell the story. Motions of a character are realized by transforming various parts of a character via a few sticks on the hands of the animators as shown in Figure 1(b). Usually a good play is the result of tireless practice of an experienced animator. In addition to moving characters, a typical scene in a shadow play also consists of environmental objects such as tables, chairs, and bridges. Since the projection screen is flat, these objects may intersect with the characters from an audience's point of view. For example, a character may move across a table or a tree by assuming that they are in different layers. However, there are also many cases requiring the characters to stay collision-free with environmental objects in order to stand on a ground, sit on a chair, walk on a bridge, etc.

Despite its beauty, this traditional art has been sinking in recent years due to the wear-off of senior performers. One way to preserve and promote this valuable traditional art is by designing easy-to-use authoring tools in computers to attract potential performers and present the art in a digital form for easier dissemination. However, so far we have not seen many shadow plays being presented in a digital form partly due to the enormous time