Composite Mouse Gestures: Toward an Easier Tool for Behavior Authoring

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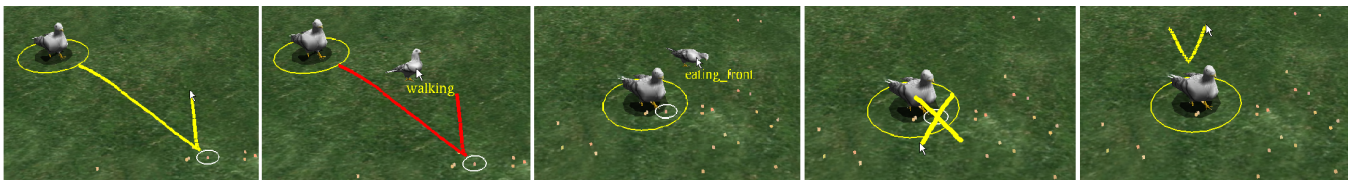

(a) (b) (c) (d) (e)

Figure 1: "Teaching" a pigeon how to forage by (a) drawing an arrow from a character to its target, (b) selecting walking animation for moving, (c) selecting eating animation, and (d) destroying the target food. Finally, (e) a check sign indicating the construction is finished.

1 Introduction

An authoring tool with graphical user interface has been a long-unsolved problem in behavioral animation production. We propose a solution by introducing a breakthrough of utilizing mouse gestures - Composite Mouse Gestures (CMG).

2 Behavior Authoring

Behavioral animation design acts an important part in animation production. Authoring behaviors for virtual characters means to specify *how* and *when* actions take place, such that autonomous, interactive, and lifelike behaviors can be brought. Previous works for behavior authoring (also referred to as behavior modeling) can be broadly categorized into two divisions, including script languages and learning approaches. Script languages such as CML (Cognitive Modeling Language) [Funge et al. 1999] provide high-level syntaxes that benefit programmers to describe behaviors more easily than using conventional languages. Learning approaches, on the other hand, attempt to generate behaviors with nearly no programming interventions, such as Dinerstein et al. [to appear]'s neural networks. Although these works have brought great conveniences, they are mostly designed for professionals. Authoring with these techniques still takes time, and manipulations may not be reflected interactively. In other words, none of them provides a *graphical direct manipulating environment*. An intuitive, interactive editing tool is required by both novice users and programmers.

3 Composite Mouse Gestures

To this end, we develop a language-like UI metaphor, Composite Mouse Gestures, with which users can convey complicated meanings that barely describable by conventional GUI. CMG comprises three main components: vocabularies, grammars, and implicated computational models. A vocabulary (gesture) is a mouse action that can be interpreted as a predefined meaning through recognition, such as a single-click, a double-click, an x sign, or an arrow. Grammars are combining rules for vocabularies. Each mouse gesture in a gesture sequence can be viewed as a word in a sentence, and an input sentence is valid only if it can be mapped into one of the specified grammars. The implicated computational model determines how the temporal order of input series encodes the logic mechanism. In behavior authoring, preceding gestures suggest preconditions that fire succeeding ones. For example, in the process of defining a forage behavior, as shown in Figure 1, the temporal relationship between dragging the walking animation and dragging the eating animation suggests the precondition of the eating action - close enough to the feed.

CMG is suitable for behavior authoring because it enables: 1) Descriptions of spatial properties (e.g. distance, directions, positions, shapes, etc). 2) Direct manipulations on social interactions (by drawing gestures on both characters). 3) Conditional statements (by temporal orders). 4) Real-time response to the manipulation. 5) Graphical user interface. 6) Low learning barrier by all users. 7) Succinct input (10-20 input actions for one behavior).

CMG is superior to previous techniques according to these advantages, which, furthermore, can be brought neither by natural languages nor by traditional GUI elements.

4 Results

Using CMG, we successfully designed more then ten behaviors as a sum for pigeons and dogs in a virtual environment, such as forage (Figure 1), cleaning-self, and wandering for pigeons, sitting and wandering by running or by walking for dogs, and chasing-escaping between dogs and pigeons. Each behavior can be built within at most five minutes, and our system will generate text representations for all the created behaviors automatically such that programmers can make further refinements.

In conclusions, for software developers who seek for a better solution of input method, we provide a new thinking. CMG benefits both novice users and skilled developers in behavior authoring, verified by its efficiency, user-friendliness, real-time response, and succinctness.

References

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