Design and Evaluation of a Sketch-Based Gesture Animation Tool

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Abstract

We present a sketch-based animation tool that allows non-expert users to efficiently create simple 3D animations of gesturing characters. Such animations are useful both to tell conversational stories and to develop gesture libraries for autonomous character systems. The tool operates by inviting the user to sketch paths on 2D planes that specify the 3D animation trace of the wrist, the variation of hand shape over time and to control wrist flexion. The goal of our system is to remove the complexity barrier of commercial animation packages in order to allow non-expert users to create a variety of animations quickly. Controlling depth information and synchronizing various aspects of the animation are major challenges in using 2D sketch-based systems to produce 3D animation. The system provides two mechanisms for both depth and synchronization control. These are compared experimentally to better understand how a user can most effectively employ sketch to these tasks. Our results shown that all four methods are effective, but the use of synchronization markers makes this task easier than direct timing performance. Users were also quite satisfied with the overall output they generated with the system.

System Overview

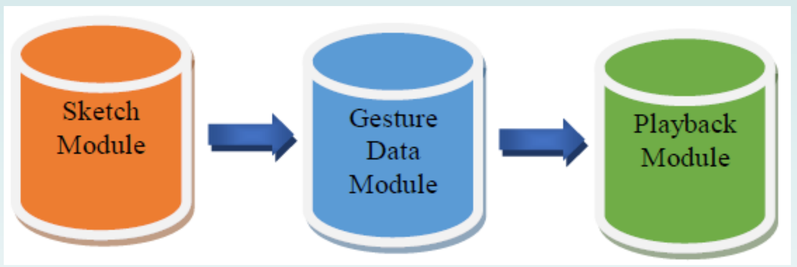

Figure 1: System Architecture

- Our system provides an intuitive drawing environment for novice users to quickly create gesture animation.
- We compare different methods for specifying depth information and synchronization across different channels of the animation. Experiments reveal that both alternatives are effective, but the use of alignment marks makes synchronization easier than direct timing control.
- Users were generally satisfied with the quality of the animation they could produce with the tool.

Implementation

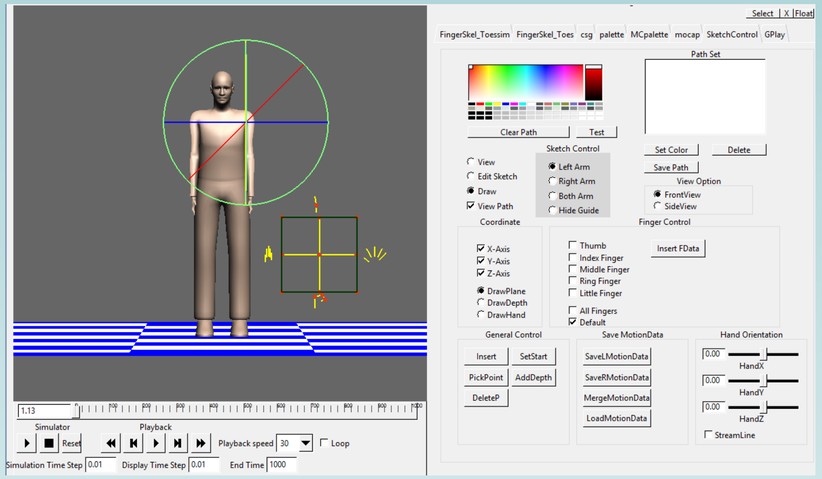

Figure 2: The main user interface consists of a sketch and display window on the left and a control palette on the right.

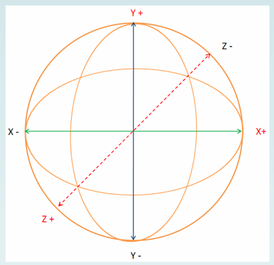

Figure 3: Coordinate System

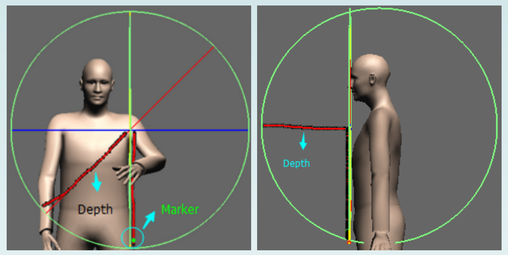

Figure 4: Front and Side view with Depth Information

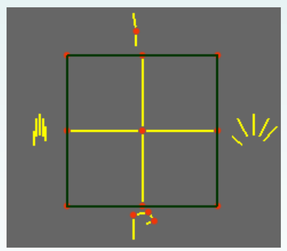

Figure 5: Input space for hand shapes

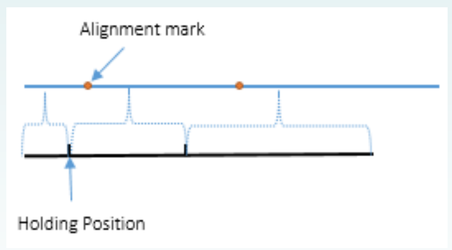

Figure 6: Synchronization with Alignment marks

Results

Twenty subjects (8 male and 12 female) have been randomly chosen from the University community to participate in this study.

Each participant watched 9 short video clips of a person performing a gesture motion and then were asked to replicate the motion in animation using our sketch-based system

	FrontView	SideView	Front V.S. Side
T	-1.93		-0.27
P	0.061		0.79
Mean	1.4	2	-0.1

Table 1: *Mean and T-test Results for Depth Control*

	Timing	Marks	Timing V.S. Marks
T	1.41		-0.27
P	0.167		< 0.001
Mean	1.35	0.7	1.2

Table 2: *Mean and T-test Results for Synchronization Control*

The subjects did not show a significant preference for either interface

Tasks	Mean		T	P
1a-1c	F:3.5667	S:3.9667	-1.69	0.0996
2a-2c	T:3.5833	M:3.9833	-3.35	< 0.05

Table 4: Mean and t-test Score for Depth and Synchronization Control

Table 4 show that depth control using the front view (F) or side view (S) method does not show a significant difference for motion quality

Task	Rating	Percent	Mean	Standard Deviation
3a	2	2.50	4.100	0.744
	3	15.00		
	4	52.50		
	5	30.00		
3b	3	27.50	3.875	0.648
	4	57.50		
	5	15.00		
3c	2	7.50	3.100	0.496
	3	75.00		
	4	17.50		

Table 5: Percentage, Mean and Standard Deviation for Replication Task

Rating	Frequency	Percent	Mean	Standard Deviation
-3	0	0.00	1.55	0.686
-2	0	0.00		
-1	0	0.00		
0	1	5.00		
1	8	40.00		
2	10	50.00		
3	1	5.00		

Table 7: Overall Satisfaction of User's Output

Tasks	Sketch Tool	Maya
1a	20s	4mins 28s
2a	1min 6s	16mins 20s
3a	37s	7mins 5s

Table 6: Comparison Between Sketch tool and Maya

From Table 5 we can see that most of the subjects can achieve the simple and intermediate tasks. However, the complex iconic gesture task is not performed well.

From Table 6 we can clearly see that our system takes much less time to generate gesture motion compared to Maya.

From Table 7, we can clearly see that about 50 percent of the users are quite satisfied with their overall output.