9-2005

Forms of Expression for Designing Visual Languages for Animation

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Abstract

We present further steps in our research into visual languages for animation. Animation is a rich mode of communication that is currently accessible to few, because animation systems are complex. Some systems try to make animation simple but put severe limits on users' creative expression. Our field studies are demonstrating that would-be animators need to express animation in a wide variety of ways. We are developing a taxonomy of forms of expression for animation that will help the designers of visual languages for animation to determine which expressive forms to support. Our end goal is to build animation sketching systems that use pen input to make animation universally accessible.

1. Introduction

Animation is a rich and increasingly popular mode of communication. It is a convenient way to express moving visual images, it can represent dynamic concepts, and it can make information more attractive and engaging [7]. It can be argued that the ability to create animated visuals would make anyone a better communicator, but animation is still out of reach for many. While one can create animation by drawing a series of images in a flip-book, the process is tedious. Many software tools attempt to speed up the process of animation, but only if users can master their complex interfaces.

Our research seeks to improve access to animation through an intuitive interface for animating sketches [2]. By focusing on informal sketches and gestural input, we hope to make animation a medium for spontaneous communication that is as natural and fast as drawing. To meet this goal, we are investigating the types of animations that users wish to create and users' natural ways of expressing motion. The taxonomy of forms of expression for animation we are creating will allow us to design a sketch-based visual language that balances simplicity and expressive power.

2. Related Work

Commercial animation tools such as Macromedia Flash and Adobe AfterEffects demonstrate the complexity of current tools. Microsoft PowerPoint makes animation somewhat simpler by allowing users to apply animation "effects" to graphical objects. This approach has promise, but PowerPoint supports 199 different effects, which can be overwhelming for some users. By determining which expressive forms are most important, we can make animation tools that are simpler while sacrificing very little expressive power.

There have been several attempts to build animation sketching tools, but none have used field studies to determine which forms of expression to support. Some tools such as Sketchy [3] require animations to be expressed frame-by-frame, but expressing animation this way is tedious. Other tools such as MorphInk [5] generate in-between frames through morphing, but it is difficult to express many motions this way. Visual languages for animation [4] and related demonstration-based animation systems [1,6] are capable of supporting a wide variety of forms of expression. Our work builds on this tradition with field studies that investigate which forms of expression are most important.

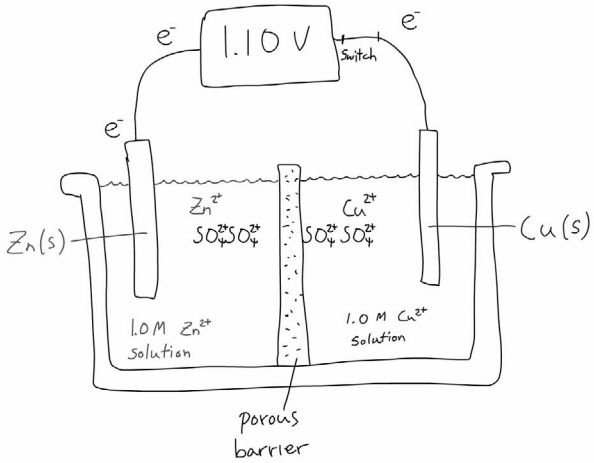

Figure 1: Battery animation from our studies.

3. Field Studies

We interviewed two groups of potential users in our field studies. Seven people who currently produce 2D animation on a regular basis were interviewed to better understand their work practices. Eight others who wish to produce animation but do not know how were interviewed to identify new uses of animation. All participants were asked to imagine a sketch pad that allowed them to easily animate their drawings and were asked for specific examples of how they would use it. Figure 1 shows an example from a Chemistry teacher.

The wide variety of examples collected from both sets of interviews suggests that a general animation tool should not place severe restrictions on the kinds of animation that a user can express. However, it is possible to express changes over time in many ways, and supporting too many types of expression can make an animation tool complex. From our pilot study data, a taxonomy of different forms of expression for animation is starting to emerge. Table 1 lists the twelve forms of expression we have identified so far. The table shows how many animators and how many non-animators suggested animations that could be expressed in each way. Note that any animation can be expressed frame-by-frame, and in this case we count only animations that cannot be expressed in any other way.

While this data is preliminary, it does hint that certain types of motion are more common. Translation appears to be useful in many cases. Some forms of expression seem more useful to animators (sound and cel-based animation), while others appear more useful to animation novices (appearance/disappearance and scaling). This discrepancy reflects task differences between animators and non-animators that may be the result of differing domains or differing purpose (prototyping vs. rough communication/visualization). Other forms of expression (scaling, translation+rotation, copying, repeating, and morphing) are useful in several cases for both groups. Physical actions and motion hierarchies seem to be used rarely.

Form of Expression	Animators Needing	Non-Animators Needing
Frame-by-frame animation	3	1
Translation of objects	4	5
Rotation of objects	1	0
Scaling of objects	1	3
Simultaneous translate and rotate	1	2
Appearance/disappearance of objs.	1	6
Copying of motion	3	4
Repeating motion	3	3
Morphing of objects	3	3
Physical actions / collisions	0	1
Motion Hierarchy	0	0
Synchronization with sound	3	1

Table 1: Forms of Expression for Animation. The columns at right show how many animators and non-animators made use of each expressive form.

4. Conclusions

This data is useful for designing a universally accessible animation system. The data presented here is incomplete and will grow as we conduct more interviews, analyze more examples, and build a more complete taxonomy of expressive forms for animation. This will help us and other designers of visual languages for animation to focus on the most important forms of expression for animation.

5. References

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