THE PROBLEMS OF COMPUTER-ASSISTED ANIMATION

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ABSTRACT

In the last few years several systems have been written for aiding in the conventional two-dimensional animation process. The main purpose of these systems has been to let the computer produce missing drawings based on extreme drawings produced by animators. While there has been some success and a great deal of optimism, the promise of higher output and quality using a computer has not been realized. The transition from simple drawings optimized for use on the computer to the complicated and detailed drawings of quality conventional animation has been much harder than expected. The principle difficulty is that the animators drawings are really two dimensional projections of three dimensional characters as visualized in the animators head, hence information is lost, ie. one leg obscures another. The problem of making a program infer the original object from its projections is akin to extremely difficult artificial intelligence problems. Efforts to overcome this by drawing skeletons or increasing the number of overlays require more manual intervention thereby offsetting the gains of using the computer. One way to analyze an approach is to determine the average time required of an artist or operator at all stages of animation for every frame. A second problem not generally recognized is that a production animation system requires the management of hundreds of thousands of drawings, hence data base management techniques not normally found in experimental animation systems.

Key words: computer animation, computer graphics, keyframe animation.

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INTRODUCTION

There have been several systems written to aid in the process of animation [see references]. A summary of these has been presented in [2]. Some of these systems have been quite successful and have been used to produce short interesting films, most notably Hunger by Peter Foldes. However, there are some significant problems that remain.

One of the inescapable conclusions one draws after examining the process of conventional animation is that there is a good deal of tedium involved. This observation has led to the idea that the computer can be used to greatly speed up the process and make it cheaper. It is time to examine this idea.

There are several kinds of conventional animation and computer animation. Broadly speaking, in conventional animation there is a continuum from the limited animation of the Saturday morning cartoons to the full animation of the Disney Studios. This continuum is referred to as "character animation." Outside of this continuum are the animation "art" films with a great variety of style, quality, and methods.

With computer animation there are roughly three categories: Art and graphic animation, three-dimensional animation, and computer-assisted character animation, sometimes called "key-frame animation". Art and graphic films are highly varied and will not be part of this analysis. 3-d is one area where the computer offers some exciting possibilities [5,6,10] but also is not part of this paper.

The area to be explored here is the application of computers to character animation. Of course one might legitimately wonder why we are trying to mold the computer into an existing process. While that is not the topic of this paper it should be noted that character animation is a very powerful medium for story telling.

Since character animation is a continuum we should say something about the extremes of that continuum. At the low end, the action is very simple. Movement is more indicated than actually performed. There is a lot of repeat animation, cycles, sound effects to indicate action, etc. Actually, it is hard to imagine how it could be made much cheaper even with a computer. In any case most programmers interested in the problem aren't personally interested in producing low quality animation.

At the other end, the Disney animation is fluid and subtle. It is now so expensive that even the Disney Studios cannot afford to reproduce the quality of Pinocchio or Fantasia. Of course it is not necessary to live up to some past standard, but animators and interested computer professionals share a common goal of producing high quality films. The style may be different but it must be good.