by Frank Thomas

The Great Disney Animator Eyes Computer Animation: The Important Difference Between Classic And Computer Animation Is Not Technical But Artistic

CAN CLASSIC DISNEY ANIMATION BE DUPLICATED ON THE COMPUTER?

In the past year or more the author of this article, one of Disney's original great animators, has been exploring animation by computer, sitting in on sessions at universities, visiting leading companies and talking with computer artists. His informal research led him to consider "the most important difference" between classic and computer animation is not technical but artistic. In this article Mr. Thomas reviews the development of classical animation to illustrate this point.

CAN IT BE DONE?
SHOULD IT BE DONE?

In 1968, a confident representative of a computer graphics firm announced, "In six months we will have 'Snow White quality' animation capabilities." An arrogant animator retorted, "But then you'll still be thirty years behind the times!" Even today there is no electronic process that produces anything close to "Snow White quality" and there is little reason to believe there ever will be.

The problem is partially that the computer engineers and scientists, and even many computer artists, do not really understand the ingredients that make up this type of classic animation. Another, more basic problem is that this kind of animation may simply not be suited to this new medium. Nevertheless I have found that many individuals and companies are attempting to recreate Disney-style animation on computers for entertainment and tv commercials. Can it be done? Should it be done?

What must be realized at the outset is that the important difference be-

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tween the work I've been seeing on monitors and what the classic animators do is not technical. It's artistic. The animator, whether an "old-fashioned" hand-artist or a computer operator, must have an advanced knowledge of movement; not so much the actual motions as the adaptation of these actions, what Walt Disney called "believable movement." Real action was too complex, too mundane, too lacking in focus, too restrictive. But believable actions opened the door to whole worlds of fantasy and imagination: dinosaurs and dragons, dewdrop fairies and Donald Duck. To be convincing, the believable had to be based on the real, which is why animators at the Disney Studio studied motion in art classes, action analysis classes, at the zoo, in vaudeville acts, and on endless pieces of film, frame by frame.

Frank Thomas (l.) with Ollie Johnson, co-author of "Disney Animation: The Illusion of Life."

ELEMENTS OF MOVEMENT

We discovered that the body has so many systems of checks and balances, of tiny moves in reaction to major moves, of interactions, that it was far too complicated for any one person to master. There seemed to be no constants, except perhaps that gravity was trying to pull everything down to the ground and the cells in each organism were trying desperately to hang together and stay erect.

Fortunately, we did not have to learn it all. Our work was in the field of entertainment, and that gave a special direction to what we needed to know. And our studies focused on these movements that conveyed precise meaning; action identified with personality, emotions, acting, and the theater were studied closely. Everything else was pretty much put aside. We had to communicate with our audience and we could do it only with the gestures and actions that had become symbols of what a person is feeling and what he might be thinking.

Something we did not discard, however, were the movements that gave the feeling of weight to the figure. That was the prime ingredient in making any action convincing. Without it, an individual would float on invisible wires or skid about on an imaginary plane. Every gesture, every turn and, especially every step, had to feel as if it carried an appropriate amount of weight for that particular character. To make one figure heavy and ponderous while another was equally heavy, but quick and muscular was asking a lot from drawings, and asking the audience to believe more than it should.

Further study revealed more complications than answers. We found that there were relatively few precisely geometric shapes in nature, and that these were difficult to move easily because they were static in form and tended to be stiff in action. The plastic shape that is full-bellied and in active balance, pliable and ready to move, was much easier to handle. Moreover, the parts of the body never seemed to move along the X and Z coordinates, but instead, were full of arcs and curves, and tilts and twists that defied analysis or duplication.

Everyone seemed to move differently, which was an added nuisance. A youth from "Muscle Beach" moved differently than Baryshnikov, who also had very developed muscles. A fat woman was not the same as a German hausfrau, who might be fat also. Girls moved differently than boys, and both were unlike either the old or the very young. Understanding the human figure in movement was an amazingly complicated procedure.

Even the moves that seemed to define attitudes or mood proved to be annoyingly elusive. To make a figure sad, we slumped the body, dropped the shoulders and the head, dragged the feet when walking, and timed the action slowly. But these elements of sadness could also mean despair, or listlessness, or exhaustion. How could we make the audience feel sadness? Occasionally we added a tear, but unless it was carefully drawn, it could be interpreted as a drop of perspiration, and the wiping of the eye was too close to the gesture of wiping the brow—especially if the character had large hands, as most did.

Eventually we shot our own home movies in order to understand the actions that eluded us. We studied these in projection rooms, on the moviola, and best of all on the photostats that were printed from the film. We brought in dancers to assist in developing choreography and actors to create personalities that were unique. We took film of each other doing the actions we were trying to draw, and we shot endless footage of animals doing everything.
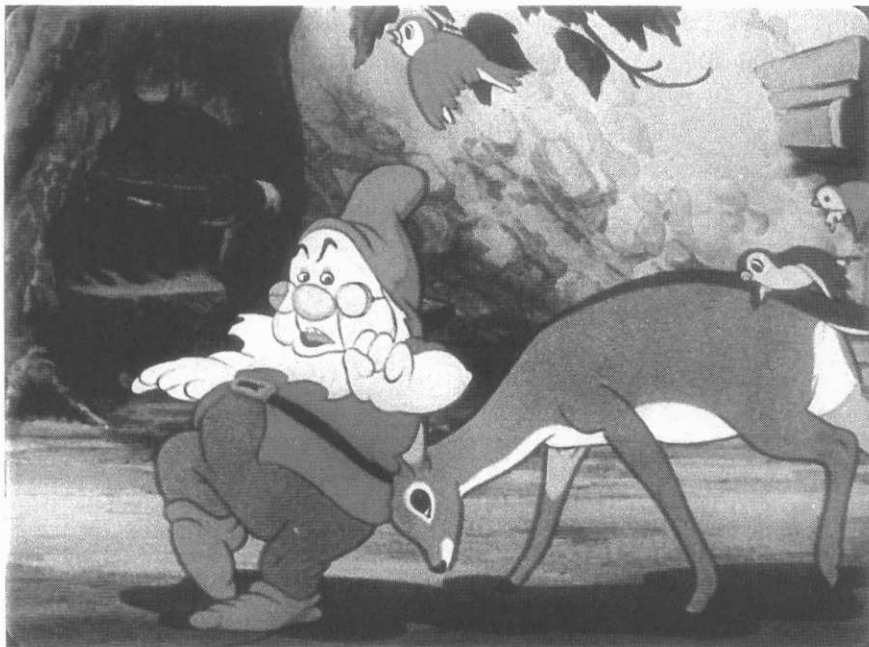
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charm and sprightly actions and, as a drawing, worked quite well in those areas. It was when we needed a larger palette of emotions that we ran into trouble.

PRINCIPLES OF ANIMATION

While we were learning principles of movement, we were building a series of principles of animation. We constantly fought the battle against stiff action. If Grumpy leaned forward excitedly to tell another dwarf of impending danger, the drawings were apt to make him look more like a cardboard cutout about to fall on its face than a flesh and blood person issuing a warning. Ways had to be found to make the action appear loose and casual, as well as sparkling with life.

"Squash and Stretch" became the most important ingredient as the discovery was made that all living flesh is supple and stretches or bulges or sags or becomes taut in reaction to the forces working upon it. Some people working in computer graphics fail to realize the importance of the relationship of the various parts of the face and the body when applying this principle. The whole figure moves all at once only if it is bouncing on a trampoline. The importance of squash and stretch is in the related moves—what the lifting shoulders do to the curve of the back, or a frowning eyebrow pressing the eye against a cheek. Further subtleties come from the difference between bones and muscles. The ultimate problem here was that Donald Duck and Goofy could have bones or not have them, depending on the action, while Snow White had to have them consistently, and in the proper locations.

A long list of other principles was assembled as we found ways of clarifying the animation, making it communicate better and, especially, making it more entertaining. Anticipation, Staging, Timing, Overlapping Action, Follow Through, Secondary Action, Exaggeration, all contributed to the depiction of the cartoon character.

The computer engineer who prophesied "Snow White quality" was hardly aware of all these ingredients, and the same is true of many computer artists today. He was think-

Through it all, we searched for the elements we knew we had to have for our scenes. If we tried to use too much of what we saw on the film, the result was invariably confusing, lacking in clarity and dull. We had to caricature the important actions, no matter how seemingly insignificant, in order to emphasize what we wanted to say and to eliminate the extraneous. Amazingly, it was all of those small moves drawn in proper relationships that gave the strong overall attitudes that we needed.

There were additional problems in adapting the actions to the design of the character. Pinocchio had a long neck, no shoulders, and arms that literally would not reach to the top of his oversized head. He could not take off his hat unless he tilted his head over and down. Yet much of his acting involved shrugging shoulders and pointing up in the air, or dropping his head to his chest in guilt or shame. He had been designed for

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ing only of duplicating the line that surrounds the drawn figure, which is such a small part of the animator's problem. Reproducing the line by itself gains little. It is all the elements of our communication that shapes that line and changes it bit by bit from drawing to drawing. We could barely achieve the results that Walt wanted when we called upon all the knowledge at our command, yet even those carefully conceived drawings offered more freedom of expression than any of the electronic machines of today.

Animation is certainly one of the most challenging and demanding disciplines in the whole field of Art, and at the Disney Studio we never had even twenty animators who fully mastered the craft. And that was out of a staff of over a thousand. Why was it so difficult to get acceptable results when we were all qualified artists. Partly it was Walt's high standards, constantly asking for something nobody knew how to do, but mainly it was the intricacies and demands of the art form itself.

The type of animation that is seen on Saturday morning tv could be done by most college art students, but even the best animators have difficulty when confronted with the assignment of bringing a cartoon actor to life, having him emote, making him believable and most importantly, memorable.

AUDIENCE INVOLVEMENT

The goal of our communication efforts was audience involvement, which was achieved mainly through personality development. Unless the viewers care about your cast of players and what happens to them, there will be no interest in your story. And if that occurs, your film will die at the box office. So you work to create a character with a personality that is entertaining, specific, and readily recognizable. It is best if they find something inside themselves, some emotional response from childhood which they have learned to hide or control as they have grown up. There is a bit of Donald Duck in all of us!

The expressions, the attitudes and the feelings of each animated per-

former must all be in the drawings. And beyond the obvious traits, there must be the shades of temperament that come out only in relation to another personality. Doc, the self-appointed leader of the dwarfs, was pompous but sensible until he met Snow White. Then he became a flustered teenager on his first date. Dopey was like a first-grader in love with his teacher, while Grumpy was defiant, suspicious and selfish. Their relationship to each other, as well as to the girl thrust into their midst, made the difference between a believable situation and a meager series of empty drawings. It was not easy to do. And these are the things that are not part of the computer hardware. These must come from the human mind—from the artist.

As important as the personality was the story that created the situations where these personalities could flower. Tales of adventure and formidable antagonists were not enough. There had to be stories of the heart, and compassion, and difficult decisions facing the heroes and heroines before they would come alive. The moods that developed from these situations in turn inspired great musical scores, beautiful colors, fine paintings and outstanding sound tracks.

As the animator's skills advanced, more sophisticated acting became possible. Where sorrow had once been represented by Mickey Mouse clasping his hands and squirting enough tears from his tightly closed eyes to water his whole backyard, we were able, in 1938, to present a very moving sequence of dwarfs crying around Snow White's bier. Subtle moves had replaced the crude symbols of grief.

The ultimate discovery in this process of increasing knowledge was the ability to show the character thinking. Once he contemplated a new predicament, turned it over in his mind and came to a conclusion that was unique to him and his personality, he became undeniably alive. It was only a further projection of personality and acting combined with the right story situation, but it required very sensitive drawing and timing and handling of the movements.

A few characters like Pluto and

Dopey had to rely on pantomime to get their ideas across, but most of our cartoon actors had their personalities reinforced with a careful choice of words that only they would say. There was prudent selection of an actor to read those lines in a spontaneous and personal way, and long consideration by the animator of just what the acting should be while the lines were being spoken. Until the voice has been chosen, the personality is only a general type; he is a villain, or a mischievous kid, or a serious and stodgy, hard working dwarf. With the voice, he becomes a specific individual, unlike any other.

The elusive part is that the animator must get inside of his cartoon character in order to make the drawings that show what they both feel. As he listens to the sound track, he unconsciously lets his body move through the actions being considered. He must feel the properties of his drawing before he ever sets his pencil to the paper. Many nights he goes home with a stiff neck or a sore back from being a quizzical Pluto all day. The procedure of creating the personality first on the storyboards, then making him specific with the recording of the voice, and finally, bringing him to life through the study of the track, has long been well known throughout the industry. It is astounding how many producers think they are saving money and still getting "Disney quality" by adding the voice after all animation has been done.

Animation cannot afford ambiguity. It has to speak quickly and directly to its audience. General kinds of movement are not enough to sustain a film of this type and the moves that are used must be completely convincing, natural and fluid.

COMPUTER CREATIONS

Today's computers can generate cartoon actors with rich personalities and put them in story situations that achieve full audience involvement. Weight and convincing movements are not too big a problem, and many facets of acting are within their capabilities. It is even possible to make the computer figures appear to

think, but there it ends. The subtle pantomime, believable dialogue, appealing drawings, and most of all that personal artistic statement may be beyond our reach in the mechanical area of electronic circuitry.

It is fine for engineers to seek improvements that will replace more and more of the chore work, the tedious, time-consuming functions of the animated film, for there is commercial value there in this—not to mention appreciation from the workers. It is also well to use those classic Disney films as a model while seeking new abilities and refinements. It is always good to have a definite goal with high standards. But is it really worthwhile to keep struggling for that "Snow White quality" when so much is involved in the creation of this unique art form? Of course many computer animators are not seeking to recreate that quality, working out of entirely different premises. But enough of them are to make this a valued question.

I have always felt that the computer should not try to duplicate work that has been done by an artist; rather the artist should search for artistic ways to use the capabilities of the computer. I'm often wrong when I make such profound statements, but surely there is more potential in new ideas than in a hackneyed attempt to repeat the past.

The main disadvantages with computers as they exist today are a lack of flexiblility, overwhelming expense and the time needed to generate complex pictures. An artist must sit at a console for long periods to program a motion, or create a movement that is complicated both in action and keyboard input. It is so much quicker to pick up a pencil and simply draw the action. Old-fashioned animation has more control and more freedom, and also offers a greater range of expression.

Improvements in manipulation potential and faster responses are helping, but there will always be a dearth of good animators. The few with the special talents will do the best work and there is simply no way of making it so easy that everyone else can be an instant animator.

Today, however, thousands of youngsters around the world are working after school making their own animated films in various stop-motion techniques. Some work with drawings, some use clay or cutouts or models, others are being attracted to computers. Very soon there will emerge a new wave of artists who are adept at expressing themselves in many other ways than making a series of drawings in continuity, and computers will obviously play a testing role in this development. But it will not make great animators out of average animators.

COMPUTER POTENTIAL

Computers are exciting in their capabilities and every day, it seems, more gains are made. The ease with which 3-D figures in 3-D surroundings can be generated brings visions of space and depth in a cartoon film far beyond what we could do with drawings. There is a fascinating potential in the machines that echo human movements, suggesting a quicker way to put the actions of a mime into a new form. Techniques of digitizing drawings or photographs are opening the way to unlimited situations in a fantasy world, where both timing and action can be manipulated in a variety of ways.

Ultimately the breakthrough in the use of endearing characters generated by computers will not be in an awkward duplication of Snow White or Bambi. It will be something new and vital, something probably as different from classic animation as the very successful Muppets have been. But the new characters, whoever they are, will only find public acceptance if they will entertain, and communicate, and involve the audience. They must have appeal and good acting and appear to think. They must use the same principles that have prevailed in the theater for over 2,000 years. The only real question now is, who will be the first to do it?