Computer animation: The Animation capabilities of the Genigraphics 100C

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Rochester Institute of Technology

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The College of Fine and Applied Arts
in Candidacy for the Degree of
Master of Fine Arts

Computer Animation:
The Animation Capabilities of the
Genographics 100C

By
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Date: August 31, 1990
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Date: August 31, 1990
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1. Introduction

My thesis, a video entitled "Computer Animation: The Animation Capabilities of the Genigraphics 100C" was created for animators who will benefit from seeing moving examples of animation produced on the Genigraphics 100C. Beginning animators may find it useful because it provides an overview of the Genigraphics animation functions and capabilities. The video can also serve as a helpful refresher for Genigraphics animators who already have a little experience.

In this written report about my thesis I will be reviewing several stages of its development. These include the idea and objectives development, media selection, and storyboard development.
2. Developing the Idea

During my studies as a beginning Genigraphics animator I became aware of a need for animators, such as myself, to see real time examples of basic Genigraphics functions and techniques.

This need is due mostly to an inadequacy in the Genigraphics system itself. It is not capable of providing real time animation preview of an entire sequence. The frame-by-frame preview it does possess is not enough to allow animators to make accurate judgements about motion and timing.

This deficiency makes it very difficult for animators to effectively utilize a function or technique, especially when they are using it for the first time. Errors in understanding become readily apparent only after filming the animation from the screen frame-by-frame and viewing it with a projection camera. Creating animation in this manner is very time consuming and can be frustrating. This is especially true for beginners who are struggling to understand the basics.

One way to increase productivity and decrease the learning curve for beginning animators is to give them some help in understanding the basic animation functions and capabilities. Providing real time examples is one good approach.
3. Determining the Content

The main focus of my thesis is to provide real time examples of Genigraphics 100C animation capabilities. The next step in developing the presentation was to determine exactly which capabilities to present.

In Section 2 of the Genigraphics 100C Animation User Guide it says "There are 8 Functions which may be utilized in the construction of a Genigraphics animated sequence." These are Move, Frame, Transform, HVC Color, RGB color, Rotate, Orbit and Inhibit. Because these eight functions are the building blocks upon which all other capabilities are based, it seemed appropriate for me to concentrate my efforts here.

In determining how much information to include about the eight functions, I considered the purpose of the presentation and what needed to be communicated. My intention is not to replace the Genigraphics 100C Animation User Guide or Genigraphics Animation classroom instruction with this presentation. It is not appropriate to include detailed information about animating on the Genigraphics that can be effectively communicated by other means. The goal is to briefly describe what each of the eight functions does and show a simple example of how it can be used. This is information that animators would have trouble getting any other way. With this type of approach, there is enough information to help the beginning animator understand the eight animation functions. There is also enough information for the more experienced animator who would like a review.

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In addition to a brief description and demonstration of each function, all functions are organized into a simple outline. The viewer can easily follow along with the information as it is presented and can see related functions grouped together in the outline. Adding several advanced animation sequences to the presentation helps make the presentation more interesting. These demonstrate to the viewer that simple animation functions can be combined to form complex animation sequences. Information about storyboarding and how it plays such an important role in the animation process is also included.

For a complete look at the presentation content, see appendix A: The Content Outline.
4. Selecting the Presentation Medium

In selecting the appropriate medium for communication, several points about the presentation were considered. First of all, showing motion is the single most important ingredient of the intended message. Also, showing color is important in order to take advantage of the excellent color capabilities of the Genigraphics 100C. Sound is a significant consideration, because while the functions are demonstrated they are also verbally described. The description of the movement in text form is too much information for the viewer to read.

When the characteristics of the presentation are considered, film or video became logical media selections. However, both have their own sets of advantages and limitations that need to be weighed. What the equipment can and cannot do played a major role in determining how the final product was produced. In addition, time, cost, equipment availability, and skill level requirements were all considered.

After the animation artwork was complete and the animation sequences were finished, the next step would be to record them. I knew from previous experience that the only way to record animation from the Genigraphics was to shoot it frame-by-frame from the screen using a special 16mm camera that was customized to expose a single frame at a time. Recording directly to video was not technically possible. Luckily, I still had access to the customized 16mm camera and knew how to use it. There is one disadvantage to recording the animation this way, however. It is a very time consuming process to shoot each frame manually.
After the animation was recorded, the next step would be to edit the recording and mix it with the sound and narration. Because I did not have access to 16mm film editing and sound mixing equipment, and did have access to the same video equipment, the final production stages of the presentation would take place in video. Video was a good choice because editing and mixing sound with the images was quicker and easier than film. Duplicating the video is also easier and viewing it is more convenient.

Some disadvantages of using video were important to keep in mind during the design and production of the presentation. Video has a lower resolution than film so it doesn't hold all the detail that film can. Also, color does not record as well on video as it does on film. Finally, some image quality is lost when the film recording is transferred to video.²

5. Developing the Storyboard

In developing the storyboard, several items were taken into consideration. The order of presenting the eight functions follows the order given in the Genigraphics manual. Also, each function is presented in basically the same order. First the functions are presented in outline form. Then, each function is highlighted in the outline. A simple animation sequence then demonstrates the function, while a simple narration describes the action. In places were a break is needed, more complex animation sequences are included.

The presentation has four different types of visuals. Text sequences introduce and outline the functions as they are presented. Simple animation sequences demonstrate each function individually. Complex animation sequences demonstrate several animation functions combined. Closing credits acknowledge individuals and organizations that contributed to the creation of the video.

Even though there are four types of visuals, they all have a cohesive and consistent appearance and presentation. Color is used to tie elements together, present new information, as well as draw attention to specific elements. Type is kept to a minimum and is consistent in size, style and position. Graphics are bold and free of unnecessary detail. Motion is used with graphics to demonstrate functions and with type to assist in presenting the outline.

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Text sequences consist of the opening frames and the outline sequences. They both have a similar format which consists of a blue background with a dark blue horizontal bar across the top of the viewing area. Beneath the bar is the text for that sequence. All text is Helvetica and flush left. The text in the opening frames is white. (See illustration 1.)

In the outline sequences, the main topic is positioned in the upper left corner and is colored white. Subtopics are positioned in the center of the frame area and are colored light blue. When subtopics are being introduced, they fade in from the top. (See illustration 2.) As each subtopic is presented, it is highlighted with a dark blue bar while the text changes to white. (See illustration 3.)

In some cases, one of the subtopics becomes a main topic. It does this by moving from the center of the viewing area into the upper left corner. (See illustration 4.) New subtopics then fade in as previously described.
The simple animation sequences that demonstrate each function have a format similar to the text sequences. The background is blue and the name of the function is positioned in the upper left corner in white Helvetica type. The shapes used to demonstrate the functions are simple to help keep the message clear and direct. (See illustration 5.)

Even though the complex animation sequences are very different from one another, they are consistent in their use of bold and colorful graphics. They also use several animation functions at the same time to achieve a variety of movements.

The closing credits have similarities to the opening frames only in text style. The centered light blue credits fade in and out of a black background. (See illustration 6.)

The narration was written to follow the visual presentation of the eight animation functions. Its tone is kept informal and conversational. The narration describes what is visually being presented and contains all of the ideas in the content outline.

The completed storyboard is the final blueprint that was used to create the Genigraphics artwork, the animation sequences, and the narration. The storyboard was used to edit the animation sequences with the narration and music to create the final presentation. A copy of the final storyboard is contained in appendix B: The Final Storyboard.
Appendix A:  
The Content Outline
I. The main purpose of the video is to describe and demonstrate the eight animation functions.

A. The Genigraphics animation software allows the creation of animated sequences through the use of several Functions.

B. A Function defines the type of change that will occur in an animation sequence.

C. To better understand these Functions they are divided into three groups. Each group has different requirements in developing an animated sequence.

1. Keyframe Functions

   a. Keyframe Functions require the animator to specify start and finish frames called Keyframes.
   
   b. The system then analyzes the differences between the Keyframes to calculate the changes in the artwork.

1.) Move

   a.) Move has the ability to move an object or group of objects from one point to another either vertically, horizontally or diagonally.
   
   b.) Rate Curves allows control over the rate of action.

       Preset are already built into the system.

       Linear creates a constant rate of change.

       Slofair creates action that first accelerates then decelerates.

       Fairing causes the same effect as Slofair but to a lesser degree.

       Tailored are custom built Rate Curves used to change the speed and direction of action.

2.) Transform

   a.) Transform permits the proportion of objects to be altered either vertically, horizontally, or a combination of both.
   
   b.) Transform permits the shape of objects to be altered by moving their vertices.
   
   c.) Transform permits the orientation of objects to be altered by vertically Flipping or horizontally Flopping them.

3.) Frame changes the size, position and proportion of the frame viewing area anywhere within the artwork.

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5Ibid., p. 2:7.

6Ibid., p. 3:4.

7Ibid., p. 2:8.
a.) pan  
b.) tilt  
c.) zoom  
d.) or a combination  

4.) The Color Function changes the color of objects.  
a.) HVC Color uses Hue, Value and Chroma parameters.  
b.) RGB Color uses Red, Green and Blue parameters.

2. Angle Functions require the animator to use the angle command to indicate the direction as well as the number of revolutions for a rotate or orbit entry. 
   
a. Rotate spins an object around a center point by changing its angular orientation.  
   1.) around the center of the screen (which is the default)  
   2.) around a vertex on another object  
   3.) around a vertex on the object  

b. Orbit moves an object around a center point in a circular path without changing its orientation.  
   1.) around the center of the screen (which is the default)  
   2.) around a vertex on another object  
   3.) around a vertex on the object

3. A Discrete Function can turn objects on and off. 
   
a. Inhibit  
   1.) create a blinking effect  
   2.) create a cycling effect  
   3.) mask and unmask other objects

II. The next most important point of the video is to demonstrate that simple Functions can be combined to form complex animation sequences.

A. Bouncing Ball: combine Rate Curve Timing with the Move and Transform Functions.

B. Butterfly: use Image Assembly technique with Move, Transform, Tailored Rate Curves, Frame, and Color.  
   - Image Assembly: The artwork in the last frame of the animation sequence is created first and then designated as the finished frame. The objects in the artwork are then moved to their start frame positions. With this technique the objects appear to assemble themselves.

C. Color Blocks: combines several HVC Color entries.

D. Clock: combines Rotate, Orbit and HVC Color

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8 Ibid., p. 3:4.

9 Ibid., p. 3:4.

10 Ibid., pp. 6:15-18.
E. Earth and Moon: combines Orbit, Transform, Tailored Rate Curves and Move.  \[\text{11}\]

III. Another topic in the video is storyboarding.
A. Storyboarding must be concise\[12\] so that the animator is aware of each objects size, shape, color, position, animated path and rate of change.\[13\]
B. Storyboarding aids in the preplanning process
C. Storyboarding helps the animator break up animation into separate actions to determine which functions will be used and how the artwork should be constructed.\[14\]
D. The animation artwork must first be created to accommodate all the movements in an animated sequence.\[15\]

IV. Miscellaneous Tips
A. Animators should have a complete understanding of the Genigraphics Functions and capabilities before animation begins.\[16\]
B. Do not to exceed the frameout limits of the Genigraphics viewing area.\[17\]
C. The effect of multiple entries is cumulative. For example, two Color entries on one object over the same period of time could yield unpredictable results.\[18\]

V. Introductory Information and Closing Credits
A. Introductory Information
1. Title: Computer Animation: The Animation Capabilities of the Genigraphics 100C
2. Created by: Pamela Barth, Master of Fine Arts Degree Candidate, Rochester Institute of Technology, March 30, 1985
3. Created for: James VerHague, College of Fine and Applied Arts, Rochester Institute of Technology

B. Closing Credits
1. Produced and Directed by Pamela Barth

\[\text{11}\text{Ibid., pp. 6:29,6:32.}\]
\[\text{12}\text{Ibid., p. 1:8.}\]
\[\text{13}\text{Ibid., pp. 1:8, 1:10.}\]
\[\text{14}\text{Ibid., p. 1:10.}\]
\[\text{15}\text{Ibid., p. 1:8.}\]
\[\text{16}\text{Ibid., p. 1:8.}\]
\[\text{17}\text{Ibid., p. 2:7.}\]
\[\text{18}\text{Ibid., p. 2:7.}\]
2. Editor: David Cronister
3. Sound: Dave Stone
4. Narrator: Candy Clark
5. Music: Kraftwerk
6. Acknowledgements: Instructional Media Services, WOKR 13, Rochester, NY, and Genigraphics Corporation
7. Special Thanks: Erik Timmerman
8. Thesis Committee: James VerHague, Roger Remington, Robert Keough
9. Copyright 1985, Pamela Barth/RIT, All Rights Reserved
Appendix B:
The Final Storyboard
Computer Animation

The Animation Capabilities of the Genigraphics 100C

Frame: 1
Action: Fade in from black... blue background, dark blue bar at top of viewing area, white text.
Sound: Music fades in and continues through entire video.

Frame: 2
Action: Cut

Created by Pamela Barth
Master of Fine Arts
Degree Candidate
Computer Graphics Design
Rochester Institute of Technology
March 30, 1985

Frame: 3
Action: Cut

Created for James VerHague
College of Fine and Applied Arts
Rochester Institute of Technology
Functions

1. Move
2. Transform
3. Frame
4. HVC Color
5. RGB Color
6. Rotate
7. Orbit
8. Inhibit

Frame: 4
Action: Cut to blue background with dark blue bar. "Functions" fades in as white.
Narration: Computer animation. The Genigraphics animation software allows you to create animated sequences through the use of several Functions.

Frame: 5
Action: New items fade in as light blue from top to bottom.
Narration: A Function defines the type of change that will occur in an animation sequence. These Functions give you the ability to change the position, size or shape of any given artwork object. They also allow you to adjust frame size and position, change color, rotate, orbit and inhibit, or turn objects off.

Frame: 6
Action: All text fades out except "Functions".
Narration: Functions may be overlapped in time and used in many combinations to create an unlimited variety of movements.
Functions

1. Keyframe
2. Angle
3. Discrete

叙述：为了更好地理解这些功能，它们被划分为三个不同的组。每个组都有不同的要求来开发一个动画序列。

Frame: 7
Action: 新的项目以亮蓝色从顶部逐渐淡入。
Narration: 为了更好的理解这些功能，它们被划分为三个不同的组。每个组有不同的要求来开发一个动画序列。

Frame: 8
Action: 深蓝色条缓缓淡入，而“1. Keyframe”变为白色。
Narration: 关键帧功能要求您指定开始和结束帧，称为关键帧。

Frame: 9
Action: 所有的文本都淡入背景，除了“Keyframe”外，它会移动到左上角位置。
Narration: 系统然后分析关键帧之间的差异来计算变化。
Keyframe

1. Move
2. Transform
3. Frame
4. Color

Frame: 10
Action: New items fade in as light blue from top to bottom.
Narration: Move, Transform, Frame and Color are Keyframe Functions because they require you to specify start and finish frames.

Frame: 11
Action: Dark blue bar fades in while "1. Move" changes to white.
Narration: Move gives you the ability to move an object or group of objects from one point to another either vertically, horizontally or diagonally.

Frame: 12
Action: Cut to blue background with white text and white square moving horizontally across viewing area.
Narration: The system will automatically generate the inbetween frames for you.
Rate Curves

Frame: 13
Action: Cut to blue background with dark blue bar. "Rate Curves" fades in as white.

Narration: You are also given the alternative to control the rate of action through the use of Rate Curves.

Rate Curves

Frame: 14
Action: New items fade in as light blue from top to bottom.

Narration: The rate at which artwork changes over a period of time is defined as Rate Curve Timing.

Frame: 15
Action: Dark blue bar fades in while "1. Preset" changes to white.

Narration: Preset Rate Curves are built into the system for your convenience. Linear as well as automatic fairing calculations may be selected. Linear creates a constant rate of change.
Frame: 16

Action: Cut to blue background with white text and white square moving horizontally across viewing area.

Narration: The rate of change, however, for the Preset Rate Curve Slofair is not constant. The action first accelerates then decelerates to a stop.

Frame: 17

Action: Cut to blue background with white text and white square moving horizontally across viewing area.

Narration: Fairing causes the same effect as Slofair but to a lesser degree. Both Slofair and Fairing allow you to create more natural types of movements and may be selected in the Rate Timing menu.

Frame: 18

Action: Cut to blue background with white text and white squares moving horizontally across viewing area. Text fades out before movement is complete.

Narration: This comparison illustrates the different rates of change accomplished by the three Preset Rate Curves.
Rate Curves

1. Preset
2. Tailored

Narration: The Tailored Rate Curve is one in which you create and control. Timing posts are selected with the Newframe option in the Rate Timing menu. To create any type of Rate Curve other than the Preset Rate Curves timing posts are used. Tailored Rate Curves can achieve two basic results.

Speed

Action: Cut to blue background with white text and white square moving horizontally across viewing area... at first quickly, then slowly.

Narration: You can change the speed of action...

Direction

Action: Cut to blue background with white text and white square moving horizontally across viewing area... at first from left to right, then right to left.

Narration: ...or you can change the direction of action.
Frame: 22

Action: Cut to yellow gradated ball bouncing across blue floor.

Narration: Rate Curves can also be combined with several objects to achieve the movement that you want. It is important to note that the initial artwork was created to reflect all the desired movements.

Frame: 23

Action: Cut to "Rate Curves". Dark blue bar fades out while "2. Tailored" changes to light blue.

Narration: Tailored and Preset Rate Curves may be used for any of the Keyframe and Angle Functions.

Frame: 24

Action: Dark blue bar fades in while "2. Transform" changes to white.

Narration: Transform is similar to the Move Function in that it permits you to change the position of objects.
**Frame: 25**

**Action:** All text fades into background except "Transform" which moves to upper left position.

**Narration:** However, Transform also permits you to change the size and shape of objects as well.

---

**Frame: 26**

**Action:** New items fade in as light blue from top to bottom.

**Narration:** When using this function you can achieve several results in manipulating the proportion, shape and orientation of many objects.

---

**Frame: 27**

**Action:** Dark blue bar fades in while "1. Proportion" changes to white.

**Narration:** Altering the proportion of an object...
Frame: 28
Action: Cut to blue background with white text and white square moving horizontally across viewing area while vertical proportion is decreased.
Narration: ...vertically...

Frame: 29
Action: Cut to blue background with white text and white square moving horizontally across viewing area while horizontal proportion is decreased.
Narration: ...horizontally...

Frame: 30
Action: Cut to blue background with white text and white square moving horizontally across viewing area while vertical proportion is increased and horizontal proportion is decreased.
Narration: ...or a combination of both is possible.
Transform

1. Proportion
2. Shape
3. Orientation

Frame: 31
Action: Cut to "Transform". Dark blue bar fades in while "2. Shape" changes to white.
Narration: It is also possible to animate an object by changing the position of its vertices.

Frame: 32
Action: Cut to blue background with white text and white square moving horizontally across viewing area which gradually changes into a star.
Narration: The initial object was created with the eleven vertices required to create the finished object, a star.

Frame: 33
Action: Cut to "Transform". Dark blue bar fades in while "3. Orientation" changes to white.
Narration: Changing the orientation is another way you can Transform objects.
Frame: 34

Action: Cut to blue background with white text. White triangle vertically changes orientation across viewing area.

Narration: Using the flip or flop options in the console operating menu you can make an object...

Frame: 35

Action: Cut to blue background with white text. White triangle horizontally changes orientation across viewing area.

Narration: ...appear to be flipping or flopping in three dimensional space.

Frame: 36

Action: Cut to dark blue background with orange butterfly wing frames.

Narration: One method of transformation is termed image assembly.
Frame: 37
Action: Orange and violet circles start to move into proper size and position on wing frames.
Narration: The finished image is created first and designated as the finish frame.

Frame: 38
Action: Orange and violet circles continue to move into proper size and position on wing frames.
Narration: The pieces are then moved to their start positions.

Frame: 39
Action: Orange butterfly body fades in.
Narration: With this technique the objects appear to assemble themselves.
Frame: 40

Action: Butterfly wings begin to change proportion horizontally...

Narration: The transformation of the horizontal proportion of the butterfly wings...

Frame: 41

Action: While viewing area frames in on center of butterfly.

Narration: ...coupled with the use of the Tailored Rate Curve...

Frame: 42

Action: Butterfly body fades into blue.

Narration: ...helps to achieve the effect of a butterfly in flight.
Keyframe

1. Move
2. Transform
3. Frame
4. Color

Frame: 43
Action: Cut to "Keyframe". Dark blue bar fades in while "3. Frame" changes to white.
Narration: The third keyframe function is frame.

Frame: 44
Action: All text fades into background except "Frame" which moves to upper left position.
Narration: Frame enables you to change the size, position...

Frame: 45
Action: New items fade in as light blue from top to bottom.
Narration: ...and proportion of the frame viewing area anywhere within the artwork. The frame function uses the principles associated with using a movie camera.
Frame: 46

Action: Cut to desert mountain scene. Pan across scene from left to right.

Narration: You have the option of panning the frame across the artwork scene...

Frame: 47

Action: Continue to pan across scene from left to right.

Frame: 48

Action: Continue to pan across scene from left to right.
Frame: 49
Action: Cut to desert scene. Tilt across scene from bottom to top.
Narration: ...tilting upward or downward...

Frame: 50
Action: Continue to tilt across the scene from bottom to top.

Frame: 51
Action: Cut to desert scene. Zoom into scene.
Narration: ...or zooming into or out from the artwork.
Frame: 52

Action: Continue to zoom into scene.

Frame: 53

Action: Cut to desert scene. Distort scene by increasing the vertical proportion.

Narration: Another use of the frame function is to distort an image...

Frame: 54

Action: Continue to distort scene by increasing the vertical proportion.

Narration: ...by changing the proportions of the viewing area.
Frame: 55
Action: Cut to "Frame". Text fades up from background while "Frame" moves to lower position.
Narration: In using the Frame Function...

Frame: 56
Action: Dark blue bar fades out while "3. Frame" changes to light blue.
Narration: ...it is advisable not to exceed the frameout limits of the Genigraphics viewing area.

Frame: 57
Action: Dark blue bar fades in while "4. Color" changes to white.
Narration: The Color Function allows you to change the color of objects.
Frame: 58

Action: All text fades into background except "Color" which moves to upper left position.

Frame: 59

Action: New items fade in as light blue from top to bottom.

Narration: Both HVC Color and RGB Color require you to establish start and finish frames.

Frame: 60

Action: Cut to blue background with white text. Yellow square changes to blue.

Narration: HVC Color uses the Hue, Value and Chroma parameters to change the color of objects. A Hue predominate ratio, that results in colors that are bright and close to pure, is used to compute the intermediate frames.
Frame: 61
Action: Cut to blue background with white text. Yellow square changes to black.
Narration: RGB Color results in colors that appear dull and subdued by using a color averaging process of red, green and blue.

Frame: 62
Action: Cut to blue background with white text. Both squares change from yellow to blue.
Narration: Both methods of changing color are effective.

Frame: 63
Action: Cut to color example. Squares change from orange to blue and blue to orange using HVC Color.
Narration: Which you choose is a matter of aesthetic choice. It is important to keep in mind that effect of entries is cumulative.
Keyframe

1. Move
2. Transform
3. Frame
4. Color

Narration: For example, two Color entries on one object over the same period of time could yield unpredictable results.

Frame: 65

Action: Cut to "Functions". Dark blue bar fades out while "1. Keyframe" changes to light blue.

Narration: Color, as well as all the Keyframe Functions, requires you to provide start and finish frame information in order for the system to compute the inbetween frames.

Functions

1. Keyframe
2. Angle
3. Discrete

Frame: 66

Action: Dark blue bar fades in while "2. Angle" changes to white.

Narration: The Angle Functions, on the other hand, require different information.
Angle

1. Keyframe
2. Angle
3. Discrete

Narration: These are called angle functions because they require you to use the angle command to indicate the direction as well as the number of revolutions for a rotate or orbit entry.

Angle

1. Rotate
2. Orbit

Narration: Both Rotate and Orbit require a center point about which to revolve.

Angle

1. Rotate
2. Orbit

Narration: Rotate spins an object around a center point changing its angular orientation. Only point-to-point lines and areas may be rotated.
Frame: 70
Action: Cut to blue background with white text. White arrow rotates about the middle of the screen.
Narration: The default center point for Rotate is the center of the object.

Frame: 71
Action: Cut to blue background with white text. White arrow rotates around center circle.
Narration: Or you can designate a center of rotation on another object by capturing a vertex and selecting the Center command.

Frame: 72
Action: Cut to blue background with white text. White arrow rotates about its far right corner point.
Narration: The center of rotation may also be designated as a point on the object itself.
Frame: 73

Action: Cut to clock. Minute and hour hand rotate around center of clock...

Narration: In this sequence the center of rotation is the center of the clock.

Frame: 74

Action: ...while viewing area frames in on center of clock.

Narration: Rotate was also coupled with RGB Color and Frame entries.

Frame: 75

Action: All items fade to blue.
Angle

1. Rotate
2. Orbit

Frame: 76
Action: Cut to "Angle". Dark blue bar fades in while "2. Orbit" changes to white.
Narration: Orbit allows you to move objects around a center point in a circular path without spinning the objects. Only point-to-point objects may be orbited.

Frame: 77
Action: Cut to blue background with white text. White arrow orbits about the middle of the screen.
Narration: The center of an Orbit entry, by default, is the center of the frame area.

Frame: 78
Action: Cut to blue background with white text. White arrow orbits around circle.
Narration: However, you may designate a center point either on another object...
Frame: 79

**Action:** Cut to blue background with white text. White arrow orbits about its far right corner point.

**Narration:** ...or on the object that is being orbited by utilizing the center command.

Frame: 80

**Action:** Cut to earth and moon scene. Moon vertically and horizontally transforms while orbiting earth...

**Narration:** In this sequence Orbit was combined with Move and Transform entires...

Frame: 81

**Action:** ...and continents move across earth behind mask.

**Narration:** ...to make the movement seem more like it was occurring in three dimensional space.
Functions

1. Keyframe
2. Angle
3. Discrete

Discrete

1. Keyframe
2. Angle
3. Discrete

Narration: The Discrete Function Inhibit does not require rate timing.

Discrete

1. Inhibit

Narration: It does, however, require you to access the time function to set parameters allowing the objects to be cycled on and off in a predetermined manner.
Frame: 85
Action: Dark blue bar fades in while "1. Inhibit" changes to white.
Narration: Inhibit allows you to make objects appear and disappear within an animated sequence.

Frame: 86
Action: All text fades into background except "Inhibit" which moves to upper left position.

Frame: 87
Action: New items fade in as light blue from top to bottom.
Narration: There are three basic uses for the Inhibit Function, although you are not limited to these.
Frame: 88
Action: Cut to blue background with white text. White square blinks on and off.
Narration: Blinking or flashing...

Frame: 89
Action: Cut to blue background with white text and nine squares in a row...
Narration: ...cycling...

Frame: 90
Action: ...All squares turn off. Then each square turns on one at a time from left to right.
Frame: 91
Action: Cut to blue background with white text. Circle moves from left to right behind square, then right to left in front of square.

Narration: ...and masking are good uses. Here there are actually two squares. One of them turns off, or inhibits, when the circle reverses direction.

Frame: 92
Action: Cut to "Functions".

Narration: You have now been introduced to the eight Genigraphics animation functions and their capabilities.

Frame: 93
Action: New items fade in as light blue from top to bottom.

Narration: It is important to remember that successful Genigraphics animation depends on a concise storyboard that reflects the objects size, shape, color, position, animated path and rate of change.
Frame: 94

Action: Cut to yellow gradated ball bouncing across blue floor.

Narration: To do this you must have a complete understanding of the building blocks of the program before you start to animate.

Frame: 95

Action: Cut to orange and violet circles moving to proper size and position on butterfly wing frames.

Narration: The Genigraphics animation program provides the versatility you need...

Frame: 96

Action: Orange butterfly body fades in.

Narration: ...to create simple to very complex animation.
Frame: 97

Action: Cut to earth and moon scene. Moon vertically and horizontally transforms while orbiting earth.

Narration: With practice the possibilities are as limitless as your imagination.

Frame: 98

Action: Earth and moon scene continues. White text fades in and fades out.

Frame: 99

Action: Fade to black. White text fades in and fades out.
Frame: 100

Action: Blue text fades in and fades out.

Sound
Dave Stone

Frame: 101

Action: Blue text fades in and fades out.

Narrator
Candy Clark

Frame: 102

Action: Blue text fades in and fades out.

Music
Kraftwerk
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Frame: 103
Action: Blue text fades in and fades out.

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Frame: 104
Action: Blue text fades in and fades out.

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Frame: 105
Action: Blue text fades in and fades out.
Frame: 106

Action: Blue text fades in and fades out.

Sound: Music fades out.
Bibliography

