$_1$Formula Graphics Multimedia System

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Description

Formula Graphics Multimedia System will bring your artwork, sounds and animations together to create highly interactive multimedia titles. The system was designed to simplify the task of authoring on a production level, to allow the creative content of a presentation to be as rich as possible, and to make it possible to achieve an unlimited amount of interactivity.

It takes the finished artwork and animations from graphics packages such as Photoshop and Animator Studio, or from image libraries and sound recordings, and it presents this information in ways which give the best possible result for any Windows PC.

Formula Graphics is very quick and easy to use. It can be used by anyone in the home, office or classroom to create very professional looking games and presentations.

Features

Presentation system: Formula Graphics can be used to produce any type of multimedia presentation. Presentations are divided into screens and screens can be made up of any elements such as bitmaps, buttons, animations, hypertext and sounds.

High speed, high performance graphics: Formula Graphics presentations can be 256 colors or 24 bit color. All the latest video technology is used and the system automatically adapts to any hardware. Formula Graphics knows how to get the best performance out of any computer.

Dynamic palette management: Formula Graphics dynamically manages palette colors during 256 color presentations. Any number of backgrounds, pictures and animations with different palettes can be displayed at the same time.

Interactivity: Formula Graphics presentations and games can have an unlimited amount of interactivity. Buttons and hot areas can be clicked to display new bitmaps and screens. Variables can be assigned with values and these can be tested to change the state of the presentation.

Object oriented language: Formula Graphics has a high performance, object oriented language. This language supports dialog controls, file management, operating system functions, printing, database connectivity and arcade style game action. Formula Graphics has all the power to explore the limits of multimedia.

More Features

Formula Graphics is the only multimedia system that has dynamic palette management for 256 color presentations. As the presentation plays, palette colors are automatically allocated and deallocated so that one long stream of ever changing colors can be shown. As each picture is shown on the screen, its colors are instantaneously remapped. Even animations are remapped frame by frame as they are being played.

Animation is the strongest feature of Formula Graphics. The system handles five animation file formats and four styles of playback, as well as Video for Windows. It has powerful animation processing, including programmable editing. Animations can be made to blend subtly into the background as complex shapes

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$_4 1
$_5 Description;Features;Applications

rather than appearing as boring square boxes.

Another key feature of the system is its high performance object oriented language. Similar to Basic and C and highly focused towards multimedia, this language can be used to give your presentations an unlimited amount of functionality. It can be also used to write fully animated sprite based games.

Formula Graphics provides the quickest and easiest way of harnessing all of the multimedia power that the Windows operating system has to offer. It is so simple to use and yet it places no limits on the author's creativity. No other package has found such an effective solution to multimedia authoring.

Applications

* **CDROM titles** - everything you need to produce top quality multimedia titles.

* **Multimedia training** - educate the workforce with hypertext and animated graphics.

* **Sales presentations** - build an exciting animated demonstration to sell your product.

* **Multimedia databases** - The power to process and display database information.

* **Action and adventure games** - with infinite amounts of interactivity.

* **Screen savers** - design your own screen saver.

Bitmaps and palettes

The way a computer works is by using bits. A bit can be either zero or one. Groups of bits can be used to represent numbers. Bits are usually grouped together in multiples of 8. With all the possible combinations of zeros and ones, 8 bits can be used to represent any number between 0 and 255.

Bitmaps

A bitmap is a way of storing an image. The image is divided up into tiny units of color called pixels. The size of a bitmap can be given as X pixels wide and Y pixels high. The color resolution of the bitmap refers to the number of bits used to store each pixel color.

A 256 color bitmap uses 8 bits per pixel and has a corresponding table of colors called a palette. Each pixel can have a value between 0 and 255, and each value refers to the position of a color in the palette. Each color in the palette has 8 bits of red, 8 bits of green and 8 bits of blue.

A 16 bit color bitmap does not use a palette, the red, green and blue color components of each pixel are stored using 16 bits. There are two variations: RGB555 uses 5 bits of red, 5 bits of green and 5 bits of blue (32768 colors). RGB565 uses 5 bits of red, 6 bits of green and 5 bits of blue (65536 colors).

A 24 bit color bitmap has 8 bits of red, 8 bits of green and 8 bits of blue for each pixel. There are 16 million possible color variations and the smallest differences between them can barely be distinguished by the eye.

A 32 bit color bitmap has 8 bits of red, 8 bits of green, 8 bits of blue, and 8 bits of alpha channel for each pixel. The alpha channel decides the level of transparency for each pixel in the image. An alpha value of 0 is totally transparent, and a value of 255 is totally opaque.

Palettes

A palette is a table of colors. There are 256 colors in a palette, and each color has 8 bits of red, 8 bits of green and 8 bits of blue. Palettes are only used with 256 color bitmaps or 256 color video modes. 256 color bitmaps are the most common types of bitmaps, and most video cards have 256 color modes.

Microsoft Windows maintains a palette called the system palette. When Windows is running in a 256 color video mode, the system palette is used by the video card. Windows reserves 20 colors in the system palette for visual elements such as windows and icons, this leaves only 236 colors which can be used for presentations.

When Formula Graphics is the active application, it takes control of the system palette. When a 256 color bitmap is displayed, first the colors in the bitmap's palette will be copied to the system palette, then the bitmap will be displayed using those colors.

Optimizing a palette

An area can be selected with a capture rectangle before choosing **Optimize Palette** from the Graphics menu. After choosing the appropriate options and pressing the Optimize button, the selected area of the graphics window will be analyzed and a new palette will be constructed using the most popular colors. If

6$ Bitmaps and palettes
7# 1_bitmaps_and_palettes
8+ 1
9K Bits;Bitmaps;Palettes;256 colors;16 bit color;RGB555;24 bit color;Load bitmap;Subtract bitmap;Save bitmap;Bitmap file formats;BMP;GIF;JPEG;TGA;VDO;WDO; Optimizing a Palette;Palettes;Bias color;Foreground bias

no area was selected, then the entire contents of the graphics window will be analyzed.

The number of colors to be used in the new palette can be specified, all other colors will be set to black. If the Foreground bias option is set, then the new palette will be made up of 3/4 popular colors and 1/4 wide spectrum of colors. This wide spectrum will include all used color groups regardless of how seldom they were used.

A bias color can be given. Preference will be given to colors that are nearest to the bias color. Biasing towards light colors generally produces a palette of more useful and visually appealing colors. The default settings in the color optimization dialog box will usually produce the best results.

^{10} #^{11} +^{12} K^{13} **Animations**

An animation is a series of bitmaps. When the bitmaps of an animation are displayed one after the other, they give the appearance of movement. Each bitmap in an animation is called a frame, and a typical frame rate for an animation is 12 frames per second. Any slower and the motion becomes jerky, any faster and the system resources will be strained for no reason.

File formats

The **AVI** format can have any color resolution, can use any compression technique, and it can also contain a sound track. This format is supported by the MCI (Media Control Interface) component of the Windows operating system and is the recommended video file format.

FLC is a 256 color animation format. It uses run length compression which gives moderate compression ratios and good playback speed. This is a popular format and is convenient for exchanging 256 color animations between different applications.

GIF is a 256 color animation format. It uses a technique called LZ compression which has high compression for complex images but slow playback speed. This format is very popular on the internet.

VDO is a custom 256 color animation file format. This format uses run length compression. This format is optimized for this presentation system and is the recommended file format for 256 color animations.

WDO is a custom 16 bit color (RGB555) animation file format. This format uses run length compression. This format is also optimized for this presentation system and is the recommended file format for 16 and 24 bit color animations.

10$ Animations
11# 1_animations
12+ 1
13K Animation;Simple;Delta;Overlay;Sprite;Transparency
;AVI;FLC;VDO;WDO;Playback;Antidither;Optimize

$¹⁴ #¹⁵ +¹⁶ ¹⁷ Overview

The following steps will give you some guidelines on using Formula Graphics Multimedia System to create a multimedia presentation.

Producing the artwork

1. Design the presentation. A storyboard should be developed which outlines the contents of the presentation on a screen by screen basis. Each screen would usually contain a heading, some text, a picture or two and maybe an animation.

2. Use a graphics package such as Photoshop to create the artwork. Start by designing some backgrounds which suit the theme of the presentation. Then design each screen of the presentation by laying out pictures and text on the backgrounds.

3. An animation package can be used to create 2D and 3D animations for the presentation. Animations are a great way to enhance a presentation and are particularly good for product demonstrations.

4. Sound and motion video can be recorded or captured from tape. Voice overs, background music and video sequences are an important part of any presentation.

Authoring with Formula Graphics

1. You can start a new project by selecting New Project from the Project menu. As it is opened you can choose the options for the project. These options include the resolution of your presentation window. The most presentations are 640 x 480 with 256 colors. If you can afford the luxury then you should choose 16 or 24 bits of color.

2. A project can be made up of any number of screens. After opening your first screen you can begin adding elements. The first element on any screen is usually a background. If you want to use a plain color or a color gradient then you can use a Rectangle as a background.

3. You can add a picture to the screen by selecting Picture from the Element menu and choosing a filename. You can also add a picture by loading the artwork using Load Artwork and selecting an area of the graphics window before choosing Picture. The selected area will be cut out and saved as the new picture. An optimum palette can be determined automatically.

The most efficient way to build a screen is to load the screen layout, subtract the background, and then cut out the remaining images as picture elements. As each picture is added to the presentation its subtracted area can be chosen to become transparent.

4. One advantage of using Formula Graphics is that each picture and animation can have a different palette. The dynamic palette management system continuously adjusts the palette as the presentation is playing so that every element has the colors it needs. You should try to make sure that each element uses only the necessary number of colors so that no more than 236 different colors are displayed at the same time.

6. AVI and FLC animations can be added directly to the screen as Video and Animation elements. By converting your animations to the VDO and WDO formats you can improve the performance and take advantage of the additional features these formats provide.

14$ Overview
15# 2_overview
16+ 2
17K Content;Authoring;Overview;Palettes;Subtracting;Animations;Pictures

7. You can add interactive elements such as buttons to the screen. When the presentation is playing and after all the elements on the screen have been displayed, the system can wait for some response from the user before continuing. If the user clicks on a hot element such as a button, then that hot element might carry out any number of possible actions.

These actions may be to display or undisplay another element, to jump to another screen or exit the presentation. They may also be to execute a procedure in the project script.

8. A script written in Formula Graphics multimedia language can be included with a project. A script can be used to control almost any part of the project or operating system. Some elements need to use a script. Graph elements use a script to get the data they are supposed to display. Dialog elements use the script to set and get the contents of the control.

9. Any screen in the project can be opened by double clicking its name in the project window. Any element can be opened by double clicking its name. Any number of elements can be selected by shift dragging, control clicking or double clicking their positions in the graphics window. Selected elements can be dragged to new positions or fine tuned with the cursor keys.

10. A final presentation can then be prepared by archiving all of the artwork into one easily distributable file and a password can be given to secure the work. An installation utility can be written using the multimedia language. The "formula.exe" file can be renamed to become a standalone runtime player.

$^{18} #^{19} +^{20}$ ^{21} Projects

A new project can be opened by selecting **New** from the Project menu. A New Project dialog box will open and you can select the name of the new project and the directory that the new project will use for all its files. Several configuration windows will then be opened for you to select the options for your project.

Projects are divided into screens. The names of all the screens in a project will be listed in the project window. A new screen can be added to the project by selecting **New Screen** from the Project menu. As each new screen is added to the project, its name will be added to the screen list.

Screens are made up of elements. When a screen is open, its list of elements will appear in the project window. Elements are things like pictures, animations and sounds. As each new element is added to the screen, its name will appear on the element list.

A project can be played by selecting **Play Project** from the Project menu. When a project is being played, the screens in the screen list will be played one after the other until they are finished. As each screen is played, its elements will be displayed one at a time in the order they are listed.

The order of the screens and elements can changed by clicking the desired screen name in the screen list or element name in the element list and pressing the up or down cursor keys to move the item. A screen or element can be deleted from the list by clicking its name and pressing the delete key.

Starting a new project

To begin a project select **New** from the Project menu. After choosing some options you will be asked to open your first screen. A screen properties window will open and the screen name will be added to the project window's screen list. The graphics window will open with the size and color resolution given in the project graphics options.

As our first element, choose **Background** from the Element menu. A Load Background dialog box will open. The background bitmap we select will be displayed in the graphics window. A Background element window will open, and the background name will be added to the project window's element list.

Now we can add a picture by choosing **Picture** from the Element menu. A Load Picture dialog box will open. The picture bitmap we select will be displayed in the graphics window. A picture element window will open, and the picture name will be added to the project window's element list. The picture can be selected by double clicking on it in the graphics window. The selected picture can then be moved to a new position by dragging it with the mouse.

We can add a sound by choosing **Sound** from the Element menu. After selecting a sound from the Load Sound dialog box, a sound element window will open and the sound name will be added to the project window's element list. We can test the sound by pressing the Play button in the element window.

Finally, we can add an input by choosing **Input** from the Element menu. After entering an element name, an input element window will open and the input name will be added to the project window's element list. Select the "key press or mouse click" option in the input element window. Because we have added our own input to the end of the screen we should disable the "Activate hot elements" option in the screen properties window.

18$ Projects
19# 2_projects
20+ 2
21K Projects;Screens;Elements;Play project;New screen;Starting a project;Tutorial;Play screen;Project options;Password;Window title;Project script;Archive file;Graphics window;Resolution;Scripts;Project script;Variables;Screen saver

Now that we have put together our first screen, we can test it by choosing **Play Screen** from the Project menu. First the background will be displayed, then the picture, and then the sound will play. When the project gets to the input, it will stop and wait for the user to either click on a mouse button or press any key on the keyboard.

$\text{\$}^{22}$ #^{23} +^{24} ^{25} Screens and elements

A screen or element can be selected by clicking its name in the project window. More than one screen or element can be selected by holding down the shift or control keys.

Screens and elements can be arranged in any order by selecting them and moving them up or down with the cursor keys. The order in which they are listed will be the order in which they are played. Selected screens and elements can also be copied and pasted using the Project menu.

If you double click on a screen name, the selected screen window will open and its elements will be listed in the project window and displayed in the graphics window. If you double click on an element name, the selected element properties dialog will open.

Most elements can also be selected by double clicking the element's position on the graphics window. More than one element can be selected by holding down the control key while clicking once on each element's position or by holding down the shift key and dragging a capture rectangle over an area of elements.

Screens and elements can be deleted from the project by selecting them and pressing the delete key.

Displaying and undisplaying

Elements can be displayed and undisplayed. When a picture element is displayed, the area of the screen under the picture is preserved. When the picture is undisplayed, the area under that picture is restored. It is important that elements are undisplayed in the reverse order that they were displayed, otherwise they may leave artifacts.

Elements can also be removed. When a picture element is removed, the preserved area under the picture will be discarded without being restored. When a background element is displayed over the top of other elements, these elements are removed rather than undisplayed so that the new background is not disturbed.

After a screen is finished, the elements on the screen may be undisplayed by choosing the "Undisplay screen elements when finished" option in the screen properties dialog. The current background will always remain displayed until it is replaced with another background.

Palette management

Formula Graphics dynamically manages the system palette while playing a 256 color project. Before an element with a palette is displayed, any colors used by that element are allocated to free color positions in the system palette. If two elements use the same color, they will share that palette position. If no free positions are available, the nearest color will be found.

As each element is displayed, its colors will be remapped to the system palette. In the case of bitmaps, only colors that are actually used in the image are allocated positions. In the case of animations, any colors that are not used in the animation should be set to black so they won't be allocated. After an element is undisplayed or removed, its palette positions will be freed.

22$ Screens and elements
23# 2_screens_and_elements
24+ 2
25K Screens;Elements;Selections;Capture rectangles;Deleting elements;Deleting screens;Element position;Position;Undo position;Displaying;Undisplaying;Remove element;Palette;Palette management;Colors;Screen options;Next screen;Function key;Condition;Backscreen;Activate hot elements

Care should be taken to ensure that there are no more than 236 colors being used on the screen at one time. The other twenty colors are reserved by Windows. Formula Graphics provides excellent color optimization to reduce the number of colors in each element to the minimum possible number.

$^{26} #^{27} +^{28} \ ^{29}$ Distribution

A project can be played as a standalone presentation in a window of its own. You can specify the name of any project on the Formula Graphics command line. If the project files are in a different directory then the full path of the project file must be given.

formula**.**exe *project***.**fgx

If the file "formula.exe" is renamed to "*project***.**exe", and if the project files are in the same directory, then the project can be played by simply executing the "*project***.**exe" file with no parameters. This method only applies to registered projects (see below).

For example, the "formula.exe" file can be renamed to "example**.**exe" and when this file is executed, the project called "example**.**fgx" will be played as a stand alone presentation. Only when Formula Graphics is called "formula.exe" will it be a project editor.

A final project can be distributed by including the following files:
     *project***.**exe - Formula Graphics (renamed from formula.exe)
     formsync**.**dll - used for timing (only required for 16 bit formula**.**exe)
     *project***.**fgx - project file (remember to use a password)
     *project***.**fga - optional archive file containing all artwork
     other files

All of the bitmaps, animations, scripts and other files used by your project can be compiled into archive files which will be included with your project. This can make distribution easier and more secure. Otherwise these files must be included individually. Files such as AVI, or MIDI which require MCI playback must always be included with the project.

Registered projects do not show any banner or any other obvious sign that they were authored with Formula Graphics. For more information on registering Formula Graphics, choose Registration from the Help menu.