Macromedia Flash: An Introduction to the Technology

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Abstract

By high tech standards, Flash is old news. The Flash technology has been around in one format or another since the mid 1990s. In spite of the fact that the average user has been viewing Flash content for several years, the population as a whole is still underinformed about this technology. Web design has a rich history. Traditional web developers will benefit from a technical examination of Flash.

Introduction

Macromedia insists that their product Flash has revolutionized the internet, claiming that 98.3% of all computers have their Flash Player installed in order to view Flash-based content over the web (http://www.macromedia.com/software/flash/). While it's true that more and more Flash-based web sites pop up every day, it is also true that the average user does not know the basic difference between Flash and non-Flash content. In fact, the average user does not even know what Flash is. Moreover, designers have not been overly ambitious to jump on the Flash bandwagon. Most seem intimidated by the idea of having to learn a new technology, and many remain doubtful of Flash's chances at longevity. This paper will attempt to shed some light on the still-mysterious phenomenon known as Flash.

Definitions

To understand the basic differences between Flash and other types of content, two key technical terms must be defined.

Raster–Raster programs store and edit graphics as small square dots each with individual color values. The quality of a raster image is determined by it's resolution, or the amount of pixels present per inch. Raster elements should not be scaled dramatically. Increasing physical size often results in less quality, while decreasing physical size can result in excessive quality (Chandler, 1996).

Vector–Vector graphics are computer generated artwork such as logos, graphs, charts and other objects that are defined by mathematical equations represented by lines and fills (Chandler, 1996). Because vector drawings are representations of mathematical equations, they can be scaled freely. Increasing or decreasing their size has no effect on quality.

A Brief History of Web Design and Animation

In its infancy the world wide web looked nothing like it does today. The first free web browser, Mosaic, offered web site developers very limited layout options. Web sites were "page" oriented, often displaying their content on one long page with indexed hyperlinks and isolated images. These "first generation web sites" were linear and served as a good way for scientists and intellectuals around the world to share information (Siegel, 1997).

The web has always been a slave to the bandwidth that carries it. In the earlier years, modem speeds prevented significant advances in web content delivery. However, as connections began to get faster, the Web became more visual. Driven by the improvements in HTML, sites began to pop up with sleek designs and graphical interfaces that made innovative use of tables; unfortunately, these sites were few and far between. Many second generation web sites succumbed to superfluous use of new features like flashing icons and rainbow colored backgrounds (Siegel, 1997; Gilmour, 2002).

The third generation of web design can be characterized by an increase in design consciousness. Talented web designers helped create sites with a new degree of aesthetic appeal. Web interfaces were intuitive and content was catered to each site's target audience. The web came into it's own as a marketing tool. Gilmour has this to say about Third Generation Web Sites:

> *The web designer has now realised that they have responsibility to present content and navigation appropriate to the purpose. Similar to creating a corporate identity for print, what colour, what symbols are appropriate to visually communicate their mission statement or what ever their client is about (Gilmour, 2002).*

We are currently in the midst of the Fourth Generation of web design. Fourth Generation Web Sites are like their third generation counterparts but make greater attempts to incorporate rich multimedia content. Fourth generation sites are more dynamic and more visual, making particularly good use of audio and animation technologies.

Sometime around the mid 1990's, in the midst of this newer, dynamic web, a presence called Flash made itself known. Up until this time, web presentation relied solely on raster image technology. Flash gave designers the ability to present vector-based content on the web, which opened up new worlds of design options. Key among these new options was the ability to incorporate low-bandwidth vector animations into web sites.

Animations in raster format were present on the web long before Flash. To understand the impact that Flash has had and the success of the technology behind Flash, a quick explanation of animation is necessary.

Animation is a visual change in an object over time. Traditional animation properties include changes in size, shape, location, rotation, color, etc.. Before Flash, all animations on the web were raster files that changed frame-by-frame. This technique, while successful for film and television animators, did not lend itself to web applications. In frame-by-frame animation, each momentary change in an object must be separately drawn. A simple movement like an object traveling from the left side of a banner to the right side would require multiple images, each with a small degree of change, sent in short time intervals to create the illusion of movement. Even with sophisticated compression techniques, these animations had serious limitations because their large file sizes created long download times. Flash uses a completely different system of animation. In Flash, every object that is to be animated must first be converted to a *symbol*. When

an object becomes a symbol, it is stored in a *library* and can be used multiple times within the animation without increasing file size and download time. Frame-by-frame animation is still possible in Flash, but a more sophisticated system is built into the application. Using *keyframes*, the designer can define the starting and ending values of a particular animated property and Flash will interpolate the actual change. This system has been dubbed *tweening*. Tweening is similar to the animation process found in other motion graphics software like Adobe After Effects and Macromedia Director and is therefore very intuitive to designers.

Overview of Technology

Interface

Anyone who has used multimedia or video development software will be familiar with the basic aspects of Flash's interface. The main window is divided into three sections (Figure 1). At the top we find the timeline. By default, the timeline is subdivided into individual frames. To the immediate left of the timeline is the layers window. Much like Photoshop, Flash animations are layered. Below the timeline and the frames window is the editing area, or stage as it is commonly called in multimedia development programs. Items are placed on the stage and then animated in the timeline.

There is a floating, vertically oriented panel that contains drawing, view and color tools. This is the Tools window (Figure 2), where most of the content creation tools are found. By default this window appears to the left of the main window.

A recent addition to the Flash interface, the Property Inspector is a floating horizontal window similar to the one found in Adobe PageMaker. Based on which item you have selected on the stage, the Property Inspector contains contextual options. This innovative feature has consolidated many toolbars and panels into one interface element.

Figure 1
Macromedia Flash: Main Window (Layers, Timeline and Stage)

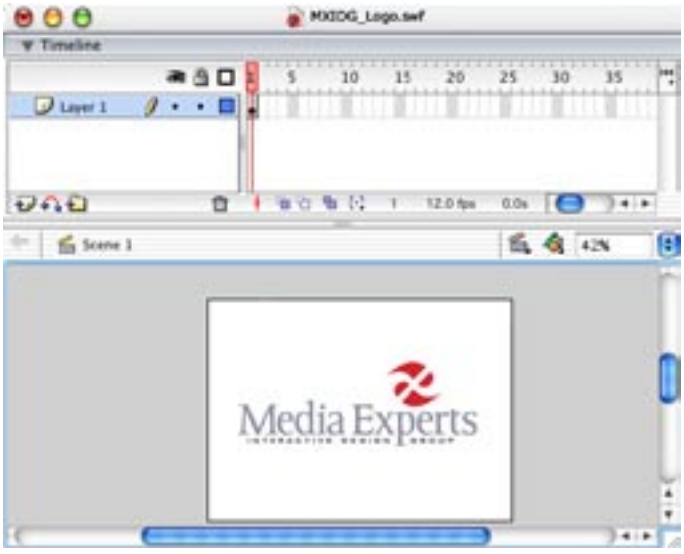

Figure 2
Macromedia Flash: Tools Window

Draw and Paint Tools
The primary content creation tools in Flash

View Tools
Control the magnification and orientation of the project

Stroke and Fill Controls
Control the color of the inside of an object and its outline color

Options
Control specific properties of each draw and paint tool

There are a number of additional toolbars and panels with different functions that can be confusing to someone unfamiliar with the program or Macromedia interfaces. Suffice to say that many of the panels and tools are very similar to those found in Macromedia's other vector drawing program, FreeHand. Numerous books specifically address the topic of learning the functions of the tools and panels in Flash, therefore that subject matter will be left to those who have already handled it with success. Flash does have a series of built-in, basic lessons that give a tour of the tools and panels.

One unique interface feature is the library. As previously mentioned, the library is a virtual "container" for storing elements that will be included in the Flash animation. Items imported into Flash are stored and indexed in the library. You can use them as many times as you wish within your animation but the program only needs to store one copy.

Organization

Flash animations have several levels of organization. Within each ".fla" file, multiple *scenes* can be defined. Scenes help organize long animations, similar to separating a book into chapters. Within each individual scene, Frames can be defined within the timeline as points of organizational significance. Flash movies can also contain *movie clips*. This gives Flash the ability to organize

hierarchical content for complex web sites and CD-ROMS.

Buttons
Flash can also be used to develop interfaces. Flash incorporates a powerful button creation system that is easier and faster than similar systems in existence. Any graphic, animation or text can instantly be converted into a button. It takes mere seconds to define the Up, Over, Down and Hit states of a basic button.

The Up state is how the button appears when the mouse pointer is not clicking or hovering over it. The Over state is how the button appears when the pointer hovers over the button. The Down state is how the button appears when the pointer clicks the button. The Hit state is the actual area of the button; when the cursor passes into the Hit area, the Over state becomes active and when the mouse is clicked within the Hit area, the Down state becomes active. The action of any button (what happens when you click it) is defined by ActionScript

ActionScript
Flash's integration of a scripting language called *ActionScript* (also known as Flash Script) makes it a powerful development tool. Much like the Lingo scripting language found in Macromedia's other professional multimedia development application Director, ActionScript can be applied to objects as well as moments in time. The inclusion of a scripting language transforms Flash into an object oriented programming environment. With each new version of Flash, ActionScript becomes more powerful. For basic users, ActionScript is necessary to point buttons to new moments in time as well as to control aspects of the animation. The drawing and animating tools in Flash are used to create the visual aspects of a project while ActionScript operates behind the scenes by expanding functionality and interactivity.

Flash is marketed as a design tool, and as a rule designers aren't programmers. Because of this, ActionScript can be entered in two different modes: normal and expert. Normal mode entry involves selecting a command from an organized list and then filling in basic attributes. This wonderful feature allows the user to program with ActionScript without having to be familiar with syntax rules. Macromedia experimented with a similar system of "programming for designers" in Director but the Flash system is far more intuitive and successful. Expert mode allows text entry of ActionScript and is the only way to take full advantage of the high-end features of the language. Normal and expert mode can be toggled, making it common for users to program simple tasks with normal mode and switch to expert mode for complex scripting.

File Formats
The animations created in Flash are stored in a native file format called .fla files. This file format is editable, and only usable by the Flash application. The data in the .fla file is not suitable for web or multimedia application. To get the data into a format that can be used on the web, the .fla file must be exported, or published. Flash data can be exported to a variety of file types. These types are listed below, along with the advantages and disadvantages of each format.

Standalone Application
Flash has the ability to export animations in standalone application formats that will run on both PC and Macintosh computers. Essentially, the animation becomes a program that runs in a window from start to finish. It does not rely on any outside plugins or viewers, and has thus become a powerful way to package multimedia content for distribution on CD-ROM. This type of presentation is not suitable for the web because the content must be downloaded in it's entirety before viewing and can not be displayed in a browser window.

Shockwave
Flash animations can be exported as shockwave files and distributed on the web. A shockwave file exported from Flash is a compressed version of the .fla file that displays in a user's browser window if they have the flash player plugin installed. Flash is perhaps the most popular program that creates shockwave data, but certainly not the only program. Macromedia Director creates shockwave data for web and multimedia use and also requires the user to have a special plugin installed to view the shockwave content in a web browser. Other popular vector animation programs such as Adobe's LiveMotion can also create shockwave content, and they too require users to have a plugin installed. Shockwave files can be imported into the Flash application and edited unless this option is disabled when the file is first exported but certain features like complex scripts often don't import correctly. Shockwave files tend to be smaller and are more suitable for web presentation, but are often subject to browser and plugin incompatibility.

QuickTime Movies
Flash animations exported as QuickTime movies can also be distributed on the web. Developed by Apple, QuickTime is perhaps the most popular multimedia distribution technology available. It is a cross platform application and has good compatibility with all popular browsers. Unfortunately, Flash animations exported as QuickTime movies are subject to internal problems. QuickTime does not handle certain aspects of Flash's scripting language as well as the Flash Player plugin.

RealPlayer Movies
Once a very common format of multimedia delivery on the web, RealPlayer has faced competition from newer viewers like QuickTime and Windows Media Player. There is no significant advantage to exporting Flash animations as RealPlayer files.

Common Uses of Flash

Flash is used primarily as a web design and development tool. It is becoming increasingly common to see a site that is built entirely in Flash. These sites still rely on HTML to embed the Flash content, but little or no HTML coding is required. Other sites have found that Flash can be used to add spice and movement to an existing

HTML based site. These sites treat Flash movies as small parts of the whole site and embed them into organized HTML tables.

Aside from being web application, Flash is beginning to catch on in the multimedia world. With easy interface creation tools, a simple but powerful scripting language, and on-board content creation tools, many feel that Flash is being groomed to replace Macromedia's current multimedia authoring giant, Director. Previous versions of Flash had limited capabilities for importing and working with digital video formats but Flash MX not only handles imported QuickTime smoothly, but also comes with a powerful video CODEC built-in. Flash's ability to export to both Mac and PC application formats makes it an attractive choice for those who want to create cross-platform multimedia content and don't want to shell out $2,400 for both Mac and PC versions of Director.

Flash is also being used as an animation tool. Artists who want to create digital animations find Flash's content creation tools easy to adapt to. Tweening also presents a wonderful alternative to frame-by-frame animation. As previously discussed, Flash animations can be exported to a variety of multimedia formats. Examples of these animations can be found on sites like www.AtomFilms.com.

Conclusion

Flash is used primarily as a web design and development tool. It is becoming increasingly common to see a site that is built entirely in Flash. These sites still rely on HTML to embed the Flash content, but little or no HTML coding is required. Other sites have found that Flash can be used to add spice and movement to an existing HTML based site. These sites treat Flash movies as small parts of the whole site and embed them into organized HTML tables.

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