Virtual Environments as Multimedia Contents Integrators

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Abstract

Broadband networks, the digital nature of current multimedia contents and the increasing crossover between Internet and television are marking the beginning of a cultural revolution.
As a tool for the integration of multiple media technologies in three-dimensional virtual spaces, Siru is the ideal environment for the convergence of different sources of information in a unified context. Streaming video and audio, 3D objects, and hypertexts can all be integrated with Siru to build homogeneous compelling digital experiences.

1. Introduction

The unifying nature of being digital that characterises current multimedia contents and the increasing crossover between Internet and television are marking the beginning of a cultural revolution. The availability of multiple and concurrent ways of gathering and distributing information offers new opportunities to programme creators, producers, information managers: but at the same time it requires suitable tools to manage incoming data flows. Broadband networks, providing high-speed pipes and new media rich services to offices and homes, are opening even more options to distribute customised and interactive channels at low budget levels.

The digital landscape of the upcoming broadband era is therefore waiting to be leveraged. The media industry is seeking for effective programming models that tap the best aspects of both worlds: Internet and television. As a tool for the integration of multiple media technologies in three-dimensional virtual spaces, Siru is the ideal environment for the convergence of different source of information in a unified context.

While borrowing the idea that scripting languages are better suited as higher-level gluing languages [1], just like Alice [2] does, Siru offers the unique possibility of taking advantage of multiple media contents such as streaming video and audio, 3D objects, hypertexts, and of integrating them into homogeneous compelling digital experiences.

In the next section we sketch the basic structure of Siru and the way virtual environments are made and configured. Section 3 explains how multimedia contents are dealt with. The following sections describe possible uses of Siru's environments.

2. Basic Structure

Siru integrates different technologies (3D graphics, speech, audio and video) in a runtime environment founded on Apple's Open Scripting Architecture (OSA) [3]. Each Siru project is made up of a collection of interactive objects having a set of attributes called properties. Some properties affect the way objects appear and behave, and can be modified at any given time either in scripts or through the provided graphical property browsers; other properties are available for reading only, and provide status information. A property deserving special mention is the script property, in which handlers are defined for all messages relevant to the object itself, if any. Siru converts all user actions into messages delivered to the forefront object; additionally, objects can actually send messages to each other and thus work collaboratively to achieve some goal. Message handlers are composed using AppleScript, a dynamic, object-oriented language that supports inheritance, delegation, compiled libraries and features an easy English-like syntax. Other OSA-compliant scripting languages can be used as well. Scripts can be composed in the integrated script editor or using an external tool. Advanced features such as message passing and delegation are fully supported. Further, since objects belong to a contain-

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ment hierarchy, inheritance is also supported, therefore providing a powerful programming model which is suitable for creating vast environments and implementing complex algorithms

2.1. Inter-Application Communications

The Open Scripting Architecture is a horizontal programming layer offered by the Macintosh Operating System. By placing OSA compliant scripts at the centre of Siru scripting capabilities, Siru objects gain access to a system-wide resource: any object can interact and exchange data with other application programmes or the system software itself. This can happen because Siru translates any internal, incoming or outgoing message into Apple Events, which are the building bricks of the standard inter-application communication protocol on the Mac OS. Further, since Apple Events also work across networks, communication and interaction with remote computers or users is allowed as well, and does not require any special handling.

As the OSA matures new libraries and system services become available. Recent additions are *folder actions* and the *URL Access* library. Thanks to *folder actions* an AppleScript script can be attached to a folder and get executed whenever something changes in that folder. *URL Access* is a new system component that enables programmes to transfer information to and from the Internet using HTTP or FTP. *URL Access* provides applications with the capability to upload and download information using HTTP (optionally using 40-bit RSA encryption) and FTP, to access local files using the `"file://"` URL scheme, to gather various data about URLs, and more. Even if *URL Access* misses some of the capabilities needed by a high-end Web browser, it's a perfect platform for Internet utilities and custom applications such as Siru owing to its accessibility from AppleScript and other OSA scripting environments.

3. Multimedia Contents

Multimedia contents are placed inside a virtual environment using this simple rule of thumb: if the multimedia item requires its own spatial location, then it will be an object on its own; if it depends on the location of another object, then it will be embedded within that object as part of its properties. Therefore images and movies, which can be used as textures painted over object surfaces, are expressed as object attributes. Sounds, on the other hand, are full blown objects because they can spatially filtered, so that they appear to be emanating from a specific location and distance from the user. Hypertext can be added to a scene as a text object with a script implementing any action linked to the text.

It is important to notice that all the object attributes, especially those concerning multimedia contents, are dynamic and not static. Any script associated to an environment object or belonging to an external application can change them and automatically get the rendered views update their contents accordingly.

3.1. Media Streaming

A recent addition to Siru's capability is audio and video streaming. There are basically two types of streaming: HTTP streaming and RTP streaming. HTTP streaming works by downloading an entire movie to a remote computer. RTP (for real-time protocol) is a just-in-time streaming technology that keeps the remote computer in constant touch with the server running the movie. Digital data is transferred, displayed and immediately discarded (actually, a few seconds cache of data is stored to compensate for occasional network slowdowns that might otherwise compromise playback quality). RTP streaming, thus, is ideal for full-length movies and live events. Through the recently released QuickTime 4.0 technology, Siru supports both types of streaming, in addition to interactive 3D graphics and immersive navigation of virtual environments. Video streams can be mapped on 3D objects and controlled by direct interaction with such objects in the virtual space.

Thanks to Siru's inter-application communication capabilities, information generated by external application programmes can be integrated and automatically displayed in a variety of contexts. Thus, while a video stream is playing on some virtual surface, news from the Internet can be displayed in a convenient location nearby, along with incoming email messages; and local information can be browsed via some 3D metaphor in the same virtual environment. Therefore, for instance, news channels can use the scripting facilities to automate the visualisation of periodic messages and their updating; educational programmes can use inter-application communication to show e-mailed questions; talk shows can create a virtual set where video and 3D graphics are joined by an automated rendering of a internet chat facility.

4. Working Scenarios

The world of content and services enabled by the latest PCs in the coming broadband era is vast and unexplored. The implications for interactive entertainment, education and e-commerce are enormous. A tool like Siru can help deploy new interactive services in a way that does not overwhelm the average user, because innovative techniques are delivered in familiar three dimensional container spaces. Additionally Siru may be thought as tool to aid exploration and reshaping of well known formats.

A rough classification can be done: on the one side there are the end-user applications, on the other side there are the applications regarding what we may call media producers (directors and the like). The former class of application must face limited processing power, enough to decode one, maybe two streams of video, but can take advantage of the

lower resolution TV-sets require. The latter class must produce crisper, cleaner images, but can count also on multiple incoming streams of video and audio. Thus a shopping mall built on the end-user side, will allow the navigation inside an essentially static, yet interactive, world (no streamed data on shop windows); while the same shopping mall built on the media-producer side can show many animated shop-windows, but will lose all the interactivity by the viewer.

4.1. Augmented TV

The first example shows how 3D graphics can enhance the production of TV programmes. In Figure 1 we suppose that a poll is going on concurrently with a live programme. Whenever the director wants to, the poll results, updated automatically by object scripts, can be shown by getting the video window slide back.

The same approach can be used, on the end-user side, to show a programme with additional, time-varying data. Data are collected on the remote site into graphs that are displayed in perspective side by side with the TV programme. The user can choose to which part of the scene give greater importance; by sliding the *direction of sight* he or she can bring the TV programme completely in the foreground, or mix TV and graphics, or get a closer look at the time-varying data.

4.2. The Channel Gallery

The second example shows how multiple streams can be used. Instead of forcing the user to zap through the tv channels, a selection of them can be shown at the same time, as in Figure 2 making the choice more straightforward.

The dychotomy of end-user versus broadcaster side has wide effects. If the end-user decoder cannot handle the processing of all the displayed video streams (possibly at a reduced resolution spatially and/or temporally), the *Channel Gallery* can only be rendered on the broadcaster side, but then the end-user looses the possibility of choosing the point of view and use this environment as a kind of flexible picture-in-picture.

5. Conclusions

We have presented Siru – a programme that handles multimedia rich virtual environments. Streaming video and audio, 3D objects, and hypertexts can all be integrated with Siru to build homogeneous compelling digital experiences. Moreover, thanks to the possibility of decoding multiple streams concurrently, Siru can be used to explore environments suited to both end-users and media producers.

The latest release of Siru, together with any additional information, can be requested to `sirudev@tin.it`

References

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Figure 1: *User controlled display of automatically updated poll results.*

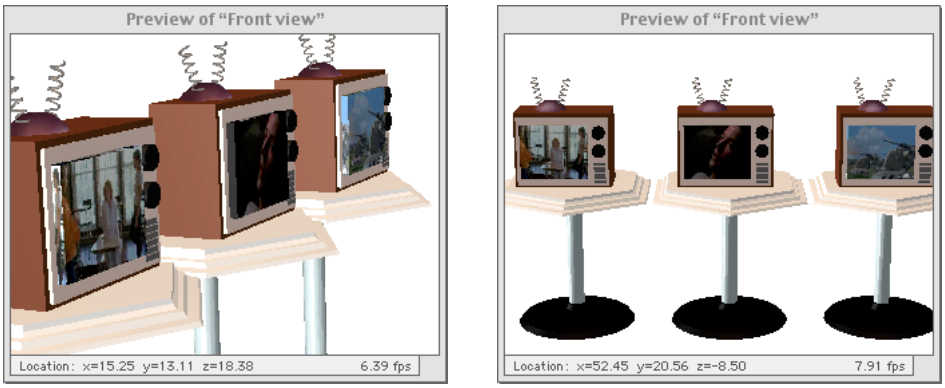

Figure 2: *Multiple live streams displayed in a single environment.*