3. A Digital Video Design

This chapter describes the hardware and software used by The Electronic Scrapbook, and explains why a fast-access storage medium such as a digital video database is desirable.

3.1 Current Hardware

The Electronic Scrapbook is being developed on an Apple Macintosh IIx computer with two Macintosh color monitors. The second monitor is being driven by a Mass Microsystems Colorspace II and Colorspace fx board set. These boards allow video to be displayed in a window on the Macintosh monitor.

3.1.1 A Digital Video Scrapbook

Ideally, the system should use a digital video database. The user would hook a camcorder up to the serial port, and use a digitizing board to capture selected segments of video. Putting a video signal in digital form allows it to be stored on a fast-access device such as a hard disk drive. This allows seamless playback of video clips without the gap caused by rewinding a video tape or seeking a laserdisc player. Video can be added or removed from such a system at any time.

Once a video has been digitized, it can easily be viewed, edited, and manipulated. Viewing video on the computer screen could be the final product, or the user could transfer an edited video back to video tape. The edited video could be taken from the digital material; or, alternatively, if two serial-controllable video-tape players are available, then it could perform a tape-to-tape edit from the original source tapes. In video terminology, the digital environment could be used to perform an *off-line* edit, and the system could later perform an *on-line* edit to create a final, high-quality version.

This traditional way of viewing the process misses an important point. The electronic format should not be viewed as merely an intermediate state used as a means to an end. The digital environment has interactive features which are desirable. An electronic scrapbook is a new media form. While the ability to make a video tape is convenient if one wants to send video to Grandma in Oregon, it is an added feature and not the goal of the system.[1]

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[1] In the future, it will be possible to send Grandma the electronic, interactive version over a computer network.

3.1.2 Laserdisc as a Stand-in for Digital Video

At the time this project was started there was no reasonable digital video hardware or software for the Macintosh, but it was clear that it would be available in the near future. The Electronic Scrapbook was designed using a Pioneer LD-V4200 laserdisc player as a stand-in for digital video. A laserdisc player has several disadvantages. While it can access video much more quickly than a tape player, it is not fast enough to play clips back seamlessly -- there is a brief seek time in jumping from one part of the disc to another which appears as a moment of black on the screen. Second, it is necessary to send a laserdisc out to be professionally pressed, and once it is pressed its content is fixed. Furthermore, a laserdisc can hold only half an hour of video.

However, the process of editing video down to half an hour to be placed on a laserdisc is analogous to selecting and digitizing video for a digital video database. Laserdisc is an effective temporary substitute for digital video.

In June of 1991, Apple Computer released an alpha version of its QuickTime™ digital video software. Work is currently under way to convert the Electronic Scrapbook to this format.

3.2 Software

The Electronic Scrapbook is being developed in Macintosh Common Lisp (MCL) 2.0 together with **Arlotje**, a knowledge representation language developed by Kenneth Haase [Haase 90]. Arlotje provides a semantic knowledge representation system with sophisticated inferencing capabilities and tracking of dependencies.

The important pieces of terminology in Arlotje are *collections*, *instances*, *slots*, *values*, and *units*. Consider the example of a child's red ball. All toys in the world form the collection "toys." A particular toy, my red ball, is an instance of the collection toys. "My-color" is a slot on objects. The value of the slot my-color on "my red ball" is "red." (Red is an instance of the collection "colors.") Anything defined in Arlotje can be referred to as a unit. For further explanation of this terminology, see [Haase 90].

Arlotje is in many ways more powerful than the Common Lisp Object System (CLOS), the object system which is built into MCL 2.0. Arlotje is used for all significant knowledge representation in this project. However, the MCL window system is written in CLOS. Therefore, all of the interface code for the project had to be written in CLOS. Most interface objects are represented in both systems -- the Arlotje objects have a slot `my-clos-object`, and the CLOS objects have a slot `my-arlotje-object`. This double representation helps to make the two object systems work together in a complementary fashion.