HyperCard - 2 Years On!

Hypercard has been around for about 2 years now, so it seems appropriate to look at how things have developed since it was first released.

The Hypercard Concept:

According to Bill Atkinson, the man responsible for the concept of Hypercard, it takes about a year for a professional programmer who is unfamiliar with the Mac to learn how to use the ToolBox in order to program the Macintosh User Interface. Bill created Hypercard with the express purpose of putting simple programming techniques back into the hands of individual users as opposed to professional programmers. He intended that the users would at first learn to customize the basic software, and then graduate to producing completely new applications that would serve their individual needs. The name Hypertalk used for the built-in programming language comes from the two main influences behind the program. These were the Smalltalk object-oriented programming language first developed at Xerox Parc a number of years ago, and Hypertext, a visionary new concept developed by Ted Nelson in the 1960s as the successor to conventional text.

One of the main ideas behind Hypertext is that if you were to read about a particular topic in one document, you could also have instant access via the computer to any other documents which related to that topic, or you could point to a word which you did not know, and call up a definition or explanation. HyperTalk is not HyperText, but it is a tool for exploring the ideas of HyperText. Especially when combined with the large storage capacity of the new CD-ROMs, which may be used to hold up to 630 MBytes of any combination of speech dialogue, sound effects, music, photographs, moving video, animations, graphics and text. It is no coincidence that the maximum stack size in Hypercard is 550 MBytes, as the potential of CD-ROM was an important factor in Bill Atkinson’s planning and creation of Hypercard.

Object-oriented programming aims to provide re-usable program code, so that new programs may be built up more quickly using these ‘software components’. An ‘object’, in this context is a data structure with a collection of its own programs (called ‘methods’ in this case). Thus an object may be as little as a collection of data and code for one simple purpose, or could be a full-blown simulation of something like a desk calculator. An individual object is a member of a class, and its class is a subclass of another class, and so on, to form a hierarchy of classes. All the characteristics of the parent class, particularly the methods specific to the parent class, also belong to the new class and to any objects of that class, a property known as inheritance. This inheritance characteristic is what makes it possible to develop powerful new objects so quickly in a true object-oriented language. Hypertalk is not a true object-oriented programming language since it does not allow you to create new object classes, but it does let you create new instances of the 5 object classes (stacks, backgrounds, cards, fields, and buttons) that do exist, and it does let you create objects that inherit methods from objects further up in the hierarchy.

So, two of the central ideas behind Hypercard are the inclusion of a tool for exploring the new Hypertext medium, and the inclusion of what must be the simplest programming language currently available to allow people to write their own Macintosh programs quickly and easily. Now that the ideas behind the creation of Hypercard have been outlined, you may ask how Bill Atkinson’s vision has turned out in practice!

What is Hypercard?
John Sculley of Apple calls Hypercard a 'hypermedia toolkit'. He feels that the strength of the program lies in its ability to allow professional users to use their specialist expertise to create customized Hypercard applications capable of handling information of various types in the exact ways which they require - without becoming expert programmers in C, Pascal, or Assembly languages.

The basic unit in Hypercard is the 'card', and cards are organised into 'stacks', which is what Hypercard documents are called. A stack may be thought of as a drawer full of library index cards, each containing the details, say, of one book - author, title, subject, cataloguing information, and so on. With Hypercard, you can move sequentially from one card to another, just as you would with physical cards. However, in Hypercard you can create links between cards within the same or different stacks. There are also built-in search and sort capabilities. Hypercard’s basic functions resemble those of databases or filing programs: Hypercard stores its text in fields, and each card within a stack may be thought of as a separate record in a file. Thus a stack is analogous to a database file containing a number of separate records.

Hypercard cards also contain 'buttons' with associated Hypercard 'Scripts' written using Hypertalk. When you click on such a button, the script will instruct Hypercard to carry out some action. This may be to simply take you to another card or stack, or to activate some much more complex activity. Other powerful features are the useful variety of painting tools, (which you might have anticipated from Bill Atkinson, the man who wrote the original MacPaint program), and Hypercard’s ability to store imported graphics within stacks.

Clearly, it is possible to look at Hypercard in a number of different ways:
As a Personal Computer Tool it can be used to allow users to write their own custom programs (ranging from the very simple to the very complex) as required. Hypercard has all the features of the low-end database programs. Fields are used to contain data, and cards are equivalent to records. You can sort the cards, find data on them, and perform arithmetic operations on values contained in the fields on those cards. However, Hypercard does not aim to compete with the more powerful database programs, which cope better with very large files, complex queries, relational look-ups of information, and sophisticated report-writing capabilities. Hypercard is ideally equipped to work with several different types of data. It can handle structured data, as in a spreadsheet or database. It can include text information of the type that can be entered into a wordprocessor application, and it can include graphics (possibly animated), scanned images, and synthesized or sampled sounds(to provide sound effects, music, or dialogue). All these different types of data can be put together in ways that allow them to trigger one another and be linked together.

A very important aspect of this is that Hypercard is effectively a new information publishing medium in its own right. It is supplied free with every Macintosh, and therefore information distributed via Hypercard stacks, or accessible from CD-ROM via Hypercard will potentially reach a very large audience. Still on the subject of publishing, Hypertext is an exciting new way of presenting information to readers, and Hypercard has many Hypertext-like features. Cards can be easily linked, and scripts can be created to allow 'browsers' to go from one word to a linked card at the click of a mouse button. Although Hypercard does have limitations as a hypertext program, it has sufficient capabilities to provide a very useful entry point into Hypertext programming.

Many people are now realising that custom Mac applications can be written very quickly using Hypercard as a programming language. A key element of Hypercard is the powerful object oriented-like programming language called Hypertalk. This is widely regarded as one of the easiest programming languages to learn and use which has been developed for the Macintosh to date. This is because it uses a very flexible, English-like syntax, and allows quick and simple programming of the basic Macintosh user-interface functions. Most
of the user interface is already done for you and it is easy to create the rest. External commands and functions can be written in assembly language, C, or Pascal, to allow more direct control of the Macintosh Toolbox, or to write low-level 'drivers' to communicate with the outside world. For experienced computer programmers who are unfamiliar with the Mac and its toolbox, Hypertalk allows them to program Macintosh applications which make use of the User Interface in a much shorter amount of time than if they had to learn how to use the Toolbox.

As a Painting Program, Hypercard can work with a large number of pictures in the same file, and has a set of painting tools that compares well with any of the painting programs on the market. Again, there are limitations. It won't work with colour or grey-shaded images. It cannot create or manage object-oriented graphics like Macdraw-type, or Postscript files like those created with Adobe Illustrator or Aldus Freehand. And you cannot make pictures that are larger than a Hypercard card - the size of the original Mac screen. However, the graphic capabilities are excellent, and can include scanned images which may even be animated.

All in all, then, Hypercard is a very powerful and comprehensive program environment to work with on the Macintosh, and its features have been enhanced throughout the last 2 years with the help of feedback from many users.

Hypercard and its Potential as a Multimedia Tool:

Digitised Sounds may be created by recording sounds into the Mac via a hardware device such as Farallon's MacRecorder. A HyperSound stack allows control of the Recorder hardware from within Hypercard. You may sample a sound, manipulate it suitably, and then store it as a 'SND' resource directly into a stack. Two Meg of memory is recommended when using MacRecorder with Hypercard, as with many of today's more memory-intensive applications, and a more sophisticated stand-alone application, 'SoundEdit', is also supplied for more advanced applications.

Using Hypercard Scripts, these sound fragments may be built up into a full-length 'show', synchronised with graphics. Such a show is similar to a video production, and can be played straight through, or interactively controlled. Such techniques may be used to create presentations or training materials, create narrated tours of a Hypercard database (as the BBC Interactive Television Unit have done recently in their EcoDisk CD-ROM project - see below), or you could design your own music videos. A typical example of an application which could easily be created using digitised sound narration would be a language teaching aide featuring native speakers.

A hard disk is essential for use with sound stacks, because the IWM (Infernal Woz Machine) chip which drives floppies and the old-style HD20 hard disk momentarily turns off the sound when accessing the disk! Also, the fastest disk drive and Macintosh model which you can obtain is recommended to get best results. In general, older disk drives have slower access times and transfer rates than newer disks. You should bear in mind that the Mac II models and the SE30 are all faster than the SE's, which, in turn, are faster than the Mac Plus.

Contact scanners may be used to take pictures of existing artwork; or video digitisers, like MacVision, may be used to grab images from video camera, videotape, or videodisk. Such images will often need to be touched up using a paint program. Some useful animation programming facilities exist within Hypercard already, but for more serious work, you should use Videoworks, which provides fairly consistent results across all machine speeds, something which cannot be achieved using other animation techniques. To run with Multifinder, 2.5 Meg is the minimum recommendation, but 4 Meg is more desirable.
Sound on System 7.0:

Early in 1989, Apple announced that System 7.0 is being developed to extend the capabilities of the Mac in various directions. In particular, a new Midi Manager is being developed to provide a standard means to communicate with electronic musical equipment. A new sound compression utility will be made available to reduce the amount of disk space needed for sound files, and a sound sequence manager will be provided to help Multimedia applications to synchronise sounds with other activities like animation.

Apple vs Apple Litigation:

Around the same time as this announcement was made, George Harrison apparently realised that Apple was starting to involve the Macintosh in music-making activities. As there was a prior agreement between the Beatle’s Apple Corporation and Apple Computers to the effect that Apple Corporation would stick to musical activities and Apple Computers would not involve themselves with music, Apple Corporation have decided to sue Apple Computers for being in breach of this agreement! The outcome of this litigation has yet to be determined, but there has to be a possibility that it will affect plans to include the Midi Manager in System 7.0! When the Macintosh was first launched, Midi was in its infancy as well. Things change fast these days, however! Midi is now an established standard means of communication and control for virtually all electronic musical equipment, and much recording equipment, and personal computers such as the Mac are ideal for use as controllers for Midi equipment. So, with the advent of Multimedia applications which mix text, visuals, and sounds (whether dialogue, effects, or music), it is only natural that Midi should be involved somewhere along the line. So, personally, I think that George Harrison trying to stop the Macintosh having anything to do with music is like King Canute trying to order back the incoming tide!

Hypercard and CD-ROM:

Hypercard is uniquely suited to the capabilities of CD-ROM. The most important characteristic of CD-ROM is the large amount of room it gives you - as much as 600 MegaBytes of information - equivalent to about fourteen hard disks, or seven hundred 800 KiloByte floppies. So, large amounts of information may be stored on disk and distributed at relatively low cost. CD-ROM is a publishing medium that allows publishers to distribute information including text, pictures, and sound so you can browse through that information as you would a book. They are read-only, and have slower access times than hard or floppy disks. For instance, hard disks allow you to access any place on the disk in about 20 milliseconds, as opposed to about 100 milliseconds on a CD-ROM, so this must be borne in mind when deciding whether to use CD-ROM as opposed to hard disks. The CD-ROM disk appears on the Finder desktop and from within Hypercard as if it were just another hard disk, so there is very little that is new to learn about actually using CD-ROMs as opposed to normal hard disks. You just have to bear in mind that you cannot modify stacks on a CD-ROM in any way, although you can easily copy information from a CD-ROM to a hard disk.

Over the last 2 years, several professional organisations have started to develop CD-ROM applications using Hypercard as the 'front-end', and their efforts are now coming to fruition.

Interesting Hypercard Applications:

BBC Interactive Television Unit:

The BBC Interactive Television Unit have worked closely with Apple to develop the EcoDisk CD-ROM for use in their Future Worlds multimedia project. To quote Max Whitby of the ITU from a recent article in
MacUser magazine, "The Future Worlds project consists of a large multimedia database, including more than 1000 still pictures and over 30 minutes of moving video, about a wide variety of ecological subjects from the destruction of rain forest to science fiction speculation about the distant future. There are text articles on threats to the environment and selected audio recordings from the BBC Sound Archive. The mediabase also includes over 2 hours of speech commentary and almost 30M of digital colour graphics commissioned specially for the project." To assist the user in accessing this wealth of information, 'guides' are used to take the user on narrated tours of the disk. An image of a 'guide', who may be either a real person or a fictional person, appears in the form of a small photo in a window at the top right of the screen. As soon as the guide appears, he introduces his subject, and then takes you through an illustrated tour. His words are reproduced in high-quality audio from the CD-ROM. When picture-in-picture video cards become available, it will be possible for a guide to appear in the guide window as an animated talking head, with synchronized speech. This is the point at which television and a whole range of computer techniques will start to truly interact to provide extremely exciting new multimedia applications.

BBC Television Centre Weather Forecasts:

The BBC as an organisation do seem to be using the Macintosh for a wide range of different tasks. The weather forecasts are prepared from Meteorological Office data sent via a direct link to the BBC's Microvax II mainframe computer at the Weather Centre in Shepherd's Bush in London. A Quantel Paintbox TV computer graphics system is linked in to the mainframe to help assemble and process visual data. However, the weathermen are not particularly expert users of mainframes and sophisticated computer graphics equipment, so user-control of this equipment is now done via the Macintosh, using customised Hypercard software.

Using a Symbol Editor written in Hypercard, the weathermen can easily select the familiar weather symbols, isobars, wind speed and direction indicators and so on, to build up a complete frame of information. Frames can then be displayed singly, or arranged in groups and run as an animated sequence to show the effects of cloud or rain patterns. As each frame is finished it is sent to the Microvax where it is combined with the Met Office data, and then it is passed on to the Paintbox for final assembly into a full-colour, high-resolution, computer-generated weather map ready for transmission.

When the frames for a particular forecast have been completed and grouped together in the Microvax, they are then assembled into the correct running order for transmission using a second Hypercard application, the Bulletin Editor. On-air the Macintosh acts like a high-tech 'slide projector' relaying commands from the weatherman to the Microvax to deliver the next frame on demand.

University of London Audio Visual Centre:

Here Hypercard has proved itself to be invaluable in preparing a video-disk database of 25,000 images for the Getty Foundation. At the Centre, batches of variously shaped and sized prints have to be photographed onto 35mm film for subsequent transfer first to video-tape, then to video-disk. Each of the prints is bar-coded on the back, and they need to be entered into a database as they arrive. Hypercard is used here for its database capabilities, which are so easily customizable. Again, ease of use was a big factor in the choice of Hypercard, because the person doing this work had no previous computer experience. The next step in the process is to photograph the prints one-by-one using a rostrum camera. Hypercards used here to control the rostrum camera via the Mac's serial port. This would not be as easy to do from any other database program on the market.
Each roll of film has coded synchronisation marks for each frame (known as SMPTE Time-Code), and these are also logged in the database with the records of each picture. When the film is transferred to videotape an edit list can be produced to allow final decisions to be made about selecting and assembling the final videotape from the individual pictures on the film. Finally, the videodisks are pressed from the videotape 'master'.

Hypercard is then used as the 'front-end' controller to replay the videodisks from your videoplayer. Hypercard software 'drivers' are available for each different make of videodisk player on the market, and a stack can be programmed to instruct the videodisk player to display any frame from the disk that you wish to see. Typically, you would use the database to search for a particular picture, and then it would be automatically retrieved from the videodisk and displayed on screen.

This type of system has obvious applications that would allow Art Galleries and Museums to catalogue or publish information about their collections in a very useful way.

The Music Recording Industry:

Hypercard is starting to be used quite a lot in the Music Recording industry, where a large number of Macs are already in use to run music software. Individual musicians/engineers (like Mike Roarty who assists Howard Jones) are writing simple controllers for their Midi synthesizers; freelance programmers (like myself) are being asked to put together custom programs to control recording studio equipment; and commercial programs such as 'Hyperstudio' are coming onto the market. This Hyperstudio program provides a wide range of useful facilities for large recording studios installations, to allow the many pieces of studio equipment to be itemised so that they can be located quickly; to record details of all the recording sessions for billing purposes; to print out information sheets and tape labels relating to the recording projects, and so on.

BBC Radiophonic Workshop:

Hypercard has allowed the staff at the Radiophonic Workshop to develop a complete music recording control environment on the Macintosh. According to Hypercard programmer Mark Wilson, “The Radiophonic Workshop project would not have even been practical but for the existence of Hypercard! It proved possible to develop the whole system in a fraction of the time it would have taken using traditional programming techniques, and completely justified the Workshop's decision to equip all their composers with Macintosh II systems.” (For more information see the cover story in the July issue of Apple Business.)

Conclusions:

The two main intentions of Hypercard's designers were to provide a simple but powerful programming environment for specialist users unfamiliar with conventional Macintosh programming techniques, and to provide a 'front-end' controller for a range of new multimedia techniques.

It is obvious from the brief look at what just a few people have achieved in the last 2 years that Hypercard has at very least succeeded in what it set out to do. So what does the future hold in store? Well, as the Macintosh is developed to interact better with TV, I think we will see a 'marriage' between TV and the computer which will bring 'offspring' which nobody can even visualise as yet. This is obviously an area to watch with a lot of interest.
And as the message gets home to more people that they can harness the power of the computer directly to create their own applications without spending years learning programming languages and having to digest everything in the 'Inside Mac' books which document the large number of user-interface routines, then the Macintosh may fulfil one of the main goals of its first creator, Steve Jobs, who saw his 'dream-machine' as a sort of household appliance or work utility, like the telephone or the Hoover, which no home or office should be without because of the useful functions which it could perform on a daily basis.

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