THE RELATIONSHIP OF TELIDON AND COMPUTER GRAPHICS STANDARDS

H. Newman

Communications Research Centre

ABSTRACT

Metafiles are files used for storing or transporting graphical data in a device independent form. By developing a standard for graphics metafiles, picture transfer between computer graphic devices and computer graphic installations is facilitated.

Telidon, a Canadian alpha-geometric videotex system, is concerned with the transmission of pictorial information. The Picture Description Instructions (PDI) used in Telidon are drawing primitives. PDI have impact on the graphics metafile standards. Computer graphics and alpha-geometric videotex are converging and compatibility between the two can exist by developing a metafile standard which satisfies the requirements of both. PDI could serve as a basis for such a general graphics metafile standard.

RÉSUMÉ

Les métafichiers sont des fichiers qui servent à emmagasiner ou à transporter de l'information graphique de façon indépendante du terminal utilisé. L'élaboration de normes pour les métafichiers graphiques facilite le transfert d'images entre les terminaux et les ordinateurs graphiques.

Télidon, un système Canadien de vidéotex alphagéométrique, a un rôle important à jouer dans la transmission de l'information graphique. Le système Télidon utilise les instructions de description de l'image (IDI), des éléments géométriques promitifs du tracé permettant l'indépendance des terminaux. Les IDI ont des répercussions sur l'élaboration de normes en ce qui concerne les métafichiers graphiques. L'infographie et le vidéotex alphagéométrique ont des points de convergence et la compatibilité est possible si l'on établit des normes pour les métafichiers satisfaisant aux exigences des deux systèmes. Les instructions de description de l'image peuvent servir de fondement pour l'établissement de normes pour ces métafichiers traitant l'information graphique.

1. Introduction

Sections 2-4 of this paper describe the alphageometric videotex system, Telidon, which was developed in the Image Communications Laboratory of Canada's Department of Communications. They contain some excerpts from [1], which gives a complete and detailed specification of Telidon and its coding schemes. The coding schemes used in the alphamosaic videotex system are also described. Since alphamosaic videotex uses character cells of fixed size to form pictures, this type of system does not have any relationship to computer graphics. Discussion of the relationship of videotex to computer graphics is really limited to the alphageometric variety.

Section 5 describes the current work in computer graphics with respect to standards and the role played by Telidon.

2. What is Videotex?

Videotex is a service which combines the technologies of computers and telecommunications for the purpose of disseminating information into the home or office. A user of the service can access pages of textual and graphical information supplied by information providers -- corporations and individuals who create and put the information in the videotex data bases. A television receiver or a video business terminal, augmented by a microcomputer controlled interface device, assembles and displays the information that was requested by the user. The transmission medium used in the service can be the common carrier telephone line, other interactive networks or a broadcast system.

There are two kinds of videotex services. Interactive videotex is a service based on the use of dedicated two-way communications lines between a videotex terminal and a central data bank. Broadcast videotex, or teletext, is a service based on the use of one-way communication channels, such as over-the-air television or cable television signals. The entire repertoire of data pages is continuously transmitted and the user's terminal waits for and selects the requested page. Except for the delay and the number of pages available, as far as the user is concerned, both modes of videotex operate in essentially the same way.

Historically, the first attempt to merge the technologies of telecommunications and computers for information dissemination to the public was made by the British. They developed an alphamosaic system called Viewdata [2] commonly known today as Prestel. Shortly thereafter, other countries began experimenting with similar systems. France introduced a system based on a somewhat improved display presentation coding called Antiope. In Canada, a system called Telidon, which differs radically from the others in its display presentation format, was developed. The Telidon design is based on computer graphics principles i.e. pictures are built from their geometric elements.

The basic Telidon system consists of a keypad, a CRT display unit, a decoder (including display generator), a telecommunications link and a central computer containing a Telidon data base. Once connected with the data base, users can select information by keying the appropriate command into their keypad. Starting from an index page which lists major categories of selectable information items, users choose an item and follow successive index pages to the one of interest. For example, a user may initially select "sports" and follow successive branches in the tree-structured data base to obtain

statistics on a specific football team. The decoder converts the CRT display unit - an ordinary or slightly modified TV set - into a videotex display unit. It receives the pages from the Telidon data base and converts them into a form suitable for display on the screen.

3. Alphamosaic Picture Coding

The mosaic videotex terminals, as developed in both the United Kingdom and France, are fixed format character oriented systems which restrict the display of information to rigid format textual messages and low resolution graphic mosaic images. The display screen is divided into a fixed number of character positions, typically 24 rows of 40 character positions for a total of 960. Each character position is divided into a 3x2 matrix forming six sub-areas. Thus, the effective resolution over the entire screen is 72 by 80 positions. Each sub-area can be assigned a colour value. By combining the differently patterned character positions, pictures are formed. The pattern effect is achieved by filling each sub-area of the character position with the same or different colour. The character positions are stored in the alphamosaic data bases and transmitted over communications channels in the same mosaic format in which they are later displayed.

4. Alphageometric Picture Coding

Pictorial information for an alphageometric videotex system, such as the Canadian Telidon videotex system, is defined through a specially designed code called Picture Description Instructions (PDIs). There are 3 types of PDIs: drawing primitives, attributes and control. The drawing primitives have been defined in terms of basic geometric primitives -- POINT, LINE, RECTANGLE, POLYGON and ARC. For example, a line is drawn by specifying its end points. It is the responsibility of the terminal to decode this description and to draw the best line possible between the two end points. On a high resolution display, finer increments are used to draw the same line that would be displayed in a coarse manner on a low resolution display. The accuracy with which coordinate positions are specified to describe these geometric primitives is a controlled parameter in the communications code. It is simply left to the terminal to truncate the coordinate description to the accuracy that it can handle.

Each drawing PDI has the ability to set the current drawing position to anywhere in the drawing space. Each has a defined final drawing position. The current drawing position at the completion of a drawing primitive is the defined final drawing position. For each drawing primitive the coordinate at which drawing begins is either explicitly defined or is taken as the final drawing position of the previous drawing primitive. The exception to this is POINT, for which a new coordinate must always be specified.

The Picture Description Instructions (PDIs) are a compact set of commands for describing pictures. Each command consists of an opcode followed by a number of bytes of data. These commands are:

POINT - set the drawing position and optionally draw a point.

LINE - draw a line based on its end points.

ARC - draw a circular arc based on a three point definition.

RECTANGLE - draw a rectangular area of specified width and height.

POLYGON - draw a polygonal area

based on a series of vertex points.

CONTROL - provide control over the modes of the drawing commands.

The basic character set used for text is the ISO 646 seven bit character set. This is CSA Set No. 1 in Canada and ASCII in United States.

Attributes may be applied to the drawing primitives as well as to text. They are: colour, blink, transparent, area style, boundary style and text format.

The coordinate system for the description of geometric drawing primitives is based on a normalized Cartesian number system ranging from 0 to 1 over the visible area of the display screen. This is independent of the physical resolution of the apparatus which may be a television set of on the order of 256 positions of resolution in the horizontal direction, or a high resolution display apparatus of 1024 positions or any other resolution. Since coordinate positions are specified as a fraction of the width of the display screen, the least significant bits may be dropped when they are not needed.

5. TELIDON and Computer Graphics

5.1 Graphics Standards

In the world of computer graphics standards, the PDIs of the Telidon system define what is known as a graphics metafile. A graphics metafile is a mechanism for the transfer and storage of graphics data in a form that is both device and application independent. The standard that is being developed for graphics metafiles would require that pictures must be storable on different media, transportable among different graphics systems and displayable on different graphic devices. Implementation of a metafile standard would enhance the degree of interworking of the many different graphics systems and would allow the portability of graphics data among these systems.

Although several graphics metafile definitions exist today (several universities, laboratories and corporations have developed their own), the standardization effort has only begun recently. Several national standards bodies, in particular DIN (Germany) and ANSI (United States), have been working in this direction.

ANSI is working on what they call a Virtual Device Interface standard. The VDI is a standard functional and syntactical specification of the control and data exchange between device-independent graphics software and one or more device-dependent graphics device drivers. In conjunction with the Virtual Device Interface, ANSI is working on a Virtual Device Metafile standard. The VDM contains a device-independent description of a picture at the level of the VDI.

DIN has developed a 2-dimensional software package called Graphical Kernel System for supporting portable Computer Aided Design applications. This is the basis for a ISO 2-D computer graphics standard. A metafile specification is included in it.

The connection between alphageometric videotex and graphics metafiles was made for the first time when this type of videotex was assigned to the ISO computer graphics working group in November 1979. [3] was submitted to this working group shortly thereafter. It gives a functional and syntactic description of the PDIs and demonstrates that PDIs are suitable to serve as a graphics metafile for applications other than Telidon.

5.2 Telidon and Graphics Metafile Standards

A graphics metafile can be used to retain graphical data and it also can be transmitted over a communications link (eg. telephone network). In order for Telidon terminals to communicate with other kinds of graphics terminals, a mechanism for the transfer of graphics data that is device independent must be developed i.e. a graphics metafile standard. Before the information is transferred across the network, it is translated into a specific data format as defined by the standard. When a graphics system receives the information from the network, it then translates the graphics metafile into the form expected by its device driver. The application, either Telidon or some other, then receives the data as if they had come from some local device.

Functionally, the information that is transmitted over the network is the same if it were written on magnetic tape. However, the coding schemes used for each medium differs. The information on the tape may be segmented into certain block and record sizes. The information that travels over the network is formatted into ISO 7-bit communications codes. The direction which the ISO computer graphics working group is taking is that, in any graphics metafile standard, the functional specification must be separated from any coding specification. The standard, then, enables the use of any transfer medium which is the most suitable for the application, without compromising device independence.

Computer graphics terminals as well as Telidon terminals may be plugged into the same network. A graphics metafile standard could, in fact, define a graphics virtual terminal which would eliminate some of the incompatibilities between Telidon and computer graphics. Computer graphics terminals could be used to input information into Telidon data bases, and Telidon terminals could be used as low-cost computer graphics terminals. In order to move toward compatibility, Telidon concerns should be considered when developing a graphics metafile standard.

6. Conclusion

Since alphamosaic videotex uses character cells of fixed format to form pictures, this type of system does not have any relationship to computer graphics. The Canadian alphageometric videotex system, Telidon, is based on computer graphics principles. The Picture Description Instructions in Telidon are geometric drawing primitives used to define pictures. They are device independent and therefore, are suitable to serve as the basis for a graphics metafile standard.

Telidon currently addresses a different audience than computer graphics but the differences between the two fields are rapidly diminishing. The convergence can be hastened and assured by developing a graphics metafile standard in which the requirements for both Telidon and computer graphics are satisfied.

REFERENCES

1. H.G. Bown, C.D. O'Brien, W. Sawchuk, J.R. Storey, "Picture Description Instructions for the Telidon Videotex System", Technical Note 699, Communications Research Centre, Canadian Dept. of Communications, Nov. 1979.

2. S. Fedida, "Viewdata: An Interactive Information Service for the General Public", Proceedings of the European Computer Conference on Communications Networks (1975).

3. H. Newman, "A Computer Graphics Metafile", ISO/TC97/SC5/WG2/N87.