Computer Simulation of Character Display on TV Telephones

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1. *Introduction*

A TV telephone which has been explored as a means of face-to-face communication may be used as a CRT display device. Coded information is transduced into visual information in the telephone station and only the TV telephone signal carrying the displayed patterns is transmitted to subscribers. The information transducer, which we call a video response equipment (VRE), is implemented at the trunk side of the TV telephone switch and hence shared by all TV telephone subscribers belonging to the switch. A subscriber can communicate with a computer through a pushbutton telephone set and a TV telephoneset in the same manner as with another subscriber.

2. *Outline of the Video Responce Equipment*

The experimental video response equipment is designed as a peripheral equipment of a central controller, which is simply a commercial computer. Since the TV telephone of standard type has the bandwidth of 1 MHz and 275 scanning lines, the element matrix size of the whole picture is taken to be 275 (vertical)×240 (horizontal). Each picture element can take one of the two values 0 (blanked) and 1 (bright). A shift register containing 275×240 bits, called a video memory, is employed to secure the refreshing rate of 30 Hz. Each bit of this memory has its own 18 bit address. The picture pattern is transmitted through the data channel. The VRE analyzes the command code and then receives the data. The first three bytes (1 byte=6 bits) indicate the video memory address. The command code can specify the width of the patterns; the full width (18 bits), the 2/3 width (12 bits) and the 1/3 width (6 bits). If the width is full (or 2/3, 1/3), the next three (or two, one) bytes of the received data are written in the video memory at the consecutive positions starting from the indicated address. Then the address is incremented to the position just below the original one. This procedure terminates at the end of the transferred data.

The character patterns are provided from the central controller. At the CC, the Chinese characters (full letters) arerespresented by the 20 (V)×18 (H) matrix and stored in the magnetic drum memory, while the Japanese alphabets, the

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English capital letters and the numeric figures (2/3 letters) are represented by the 20×12 matrix, and the miscellaneous symbols (1/3 letters) by the 20×6 matrix. These 2/3 and 1/3 letters are stored in the core memory instead of the drum. The control program converts a code into the corresponding character pattern, calculates the position of the character to be displayed, and attaches the address to the pattern. Then the data transfere instruction gives control to the channel.

Although the picture matrix is of size 275×240, considerable portions of the picture elements are not used for the display purpose. During the period of the retrace of the horizontal and vertical scanning lines, the picture is blanked out. Also, the frame of the TV screen usually covers four edges of the raster. Thus the effective picture matrix turns out to be of size 215×170. The number of characters displayable on the screen is 81 full letters (9 full letters in a row and 9 rows on the screen).

The VRE can also display simple graphic patterns. Frequently used picture patterns are stored in the drum memory in the form of the picture matrix. Bar graphs and simple graphic patterns mainly composed of line segments are drawn by the graphic display program.

3. *Simulation*

The simulation is performed using the same computer as the central controller. Hence the most part of the display program used for the simulation can be used to control the VRE. The displayed picture is outputed to a line printer in this simulation. An example is shown in the Fig. 1.

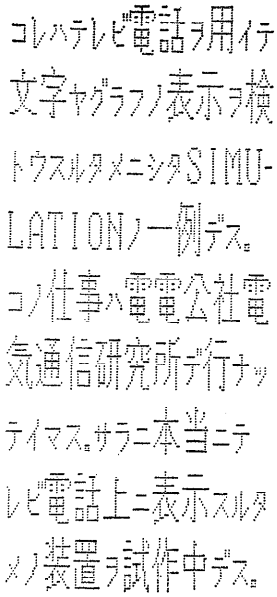

Fig. 1. A sample of the simulated display picture.

The simulation program consists of the EDIT program which converts codes into patterns, the ADRES program which calculates and attaches the video memory address, and the DOUT program which constructs the picture in the form of dot patterns and types it out on the line printer.

Several information services are also simulated by using this line printer display.