AN ENCODING SCHEME FOR PRESENTATION GRAPHICS WITH ANIMATION

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ABSTRACT

Bit-mapped raster graphics systems are used in the majority of personal computer systems. As the resolution of these systems increases, and the number of levels of grey-scale, or the number of colours, is increased, encoding of images becomes of greater concern, particularly for interactive systems, or those using animation.

This paper presents a variation of run-length encoding which is faster, but is similar in its degree of space encoding, to run-length encoding. Its application to a menu-driven presentation graphics system is discussed.

One particular advantage of this scheme is its adaptability to the types of animation possible on personal computer raster systems.

KEYWORDS: raster graphics, encoding, animation

INTRODUCTION

Bit-mapped raster graphics systems are very commonly used, particularly on personal computers. These systems typically have a dual-ported frame buffer, which is accessible both to the display hardware, and to the central processor (by mapping the frame buffer into the processor's address space) [FOLEY82]. As memory capacity and speeds go up, and costs go down, it is possible to have higher resolution screen displays, and to display more grey-levels, or colours.

The increased size of the frame buffers means that images are larger, and hence occupy more disk space, take longer to read, and take longer to copy into the frame buffer. This has particular implications to applications in which speed is of major importance, such as those which operate interactively, or which contain animation.

One system making use of such technology is a menu-driven graphics presentation system being developed for Parks Canada. In this system, an IBM PC-XT equivalent is being used to provide interpretive information to park visitors. Each menu page is displayed in a resolution of 640 by 400 pixels, with 16 colours possible for each pixel. Simple animation sequences are used to present the information. For example, to demonstrate the creation of sinkholes, an animation sequence shows rain falling, the water soaking into the ground and dissolving the gypsum, the ground being undermined, and then the ground collapsing. Since each image takes 128,000 bytes of storage, an encoding scheme is required to reduce the disk space, the main memory space, the disk transfer time, and the display time.

EXISTING ENCODING SCHEMES

A large amount of attention has been paid to the problem of encoding graphical images. (See [HALL79] for an overview of such techniques). However, the majority of such schemes are not adequate for this particular application. Techniques such as Huffman encoding, which use variable length bit strings, are simply too slow for the computing power of a personal computer. Most image creation packages for personal computers (such as Apple's MacDraw [APPLE85]) encode a picture as the objects which were used to create it (e.g. as a sequence of line segments, polygons, etc.). This is the same approach that is used in presentation systems such as Telidon [CSA83]. Again, for real-time animation functions, this approach is too slow. In fact, one of the early objectives of the Parks Canada system was that it was to be much faster than existing museum systems based on Telidon.

A lesser degree of space encoding is provided by run-length encoding, in which an image is stored as a set of tuples,