Apparatus and Method for Coding Binary Image with Improved Efficiency

The present invention generally relates to object-shape coding apparatuses for coding of a binary image representing an object's shape in units of one rectangular block.

An object image is comprised of texture images and object-shape data. In the object-base coding, therefore, both texture coding and shape coding are performed. Shape data include binary data that only represents the object's shape, as well as multi-level data that represents the object's level of transparency. The present invention relates to the binary data that only represents the object's shape.

Figure 1 is an embodiment of an object-shape coding apparatus according to the present invention.

The apparatus includes an inferior symbol detecting unit 1, a small block generating unit 2, a block map detecting unit 3, a pixel-line direction checking unit 4, a pixel-line generating unit 5, an in-line-pixel rearranging unit 6, a pixel-line map coding unit 7, and a pixel-line coding unit 8.

The following describes the operations of the apparatus. As input signals to the apparatus, the inferior symbol detecting unit 1 receives a rectangular macro block that may include both object-interior and object-exterior pixels. The inferior symbol detecting unit 1 outputs a macro block bit pattern that represents an image according to two statuses, i.e., inferior symbol of lesser occurrence between the interior pixels and superior pixels in the macro block and superior symbol of greater occurrence in the macro block. Furthermore, the inferior symbol detecting unit 1 supplies information about the inferior symbol, which is transmitted along with coded data.

The macro block bit pattern supplied from the inferior symbol detecting unit 1 is input to the small block generating unit 2, which outputs a plurality of small blocks of bit patterns generated by dividing the macro block.

The present invention is not limited to a particular method of dividing a macro block into small blocks. As in the example shown in Fig. 2, a macro block having both inferior and superior symbols may be divided in both the vertical and horizontal directions, thereby generating four small blocks.

The bit pattern of the small block, which is output from the block map detecting unit 3 in Fig. 1 or supplied from the small-block-inferior-symbol detecting unit 1, is input to the pixel-line direction checking unit 4. The pixel-line direction checking unit 4 outputs information indicative of the direction of a pixel line, i.e., either the vertical or horizontal direction, which is transmitted together with the coded data. This information may be defined for each macro block, or may be defined for each small block.

Controlling factors as to which direction is selected as the pixel-line direction are not limited to the particular implementation in the present invention. In this embodiment, the controlling factor is the number of lines in which an inferior symbol is present, and the direction is selected such as to make the number of lines smaller than otherwise.

The bit pattern of the small block and the information indicative of the pixel-line direction are supplied to the pixel-line generating unit 5 by the pixel-line direction checking unit 4. The pixel-line generating unit 5 outputs a plurality of pixel lines of bit patterns generated by dividing the small block into pixel lines. The bit patterns of the pixel lines are inputted to the in-line-pixel rearranging unit 6, which outputs pixel rearrangement information and the bit patterns of pixel lines in which pixels are rearranged as specified by the pixel rearrangement information.

The pixel-line map coding unit 7 receives the bit patterns of bit lines from the in-line-pixel rearranging unit 6, and obtains coded data that only represents the object's shape.

The pixel-line map information and the bit patterns of horizontal pixel lines having an inferior symbol included therein are input to the pixel-line coding unit 8. The pixel-line coding unit 8 assigns codes to the bit patterns, and the obtained coded data is transmitted to the decoder side.

Accordingly, a binary rectangular block in which object interior pixels and object exterior pixels are both present is easily and efficiently coded.