Accordingly, the video encoding apparatus 10 may classify pixels according to edge directions and edge shapes, may determine an average error value between pixels having the same characteristics as an offset value, and may determine offset values according to categories. The video encoding apparatus 10 may encode and transmit offset type information indicating an edge type, offset class information indicating an edge direction, and the offset values.

The video decoding apparatus 20 may receive the offset type information, the offset class information, and the offset values, and may determine an edge direction according to the offset type information and the offset class information. The video decoding apparatus 20 may determine an offset value of reconstructed pixels of a category corresponding to an edge shape according to the edge direction, and may adjust pixel values of the reconstructed pixels by the offset value, thereby minimizing an error between an original image and a reconstructed image.

An embodiment of classifying pixels based on a band type according to an SAO technique will now be described in detail.

According to an embodiment of the present invention, each of pixel values of reconstructed pixels may belong to one of a plurality of bands. For example, the pixel values may have a total range from a minimum value Min of 0 to a maximum value Max of 2^(p-1) according to p-bit sampling. If the total range (Min, Max) of the pixel values is divided into K (대문자 K는 전체 구간의 개수를 나타내는 constant값이고, 소문자 k는 '1, 2, .. k, .., K-2, K-1, K번째 구간들 중 k번째 구간'과 같이 어느 한 구간을 나타냅니다. 필요한 부분에서는 대문자 K로 바꾸겠습니다)periods, each period of the pixel values is referred to as a band. If B_k indicates a maximum value of a kth band, bands $[B_0, B_1-1]$, $[B_1, B_2-1]$, $[B_2, B_3-1]$, ..., and $[B_k-1, B_k]$ may be divided. If a pixel value of a current reconstructed pixel Rec(x,y) belongs to the band $[B_k-1, B_k]$, a current band may be determined as k. The bands may be equally or unequally divided.

For example, if pixel values are classified into equal 8-bit pixel bands, the pixel values may be divided into 32 bands. In more detail, they may be classified into bands [0, 7], [8, 15], ..., [240, 247], and [248, 255].

From among a plurality of bands classified according to a band type, a band to which each of pixel values of reconstructed pixels belongs may be determined. Also, an offset value indicating an average of errors between original pixels and reconstructed pixels in each band may be determined.

Accordingly, the video encoding apparatus 10 may classify pixels according to edge directions and edge shapes, may determine an average error value between pixels having the same characteristics as an offset value, and may determine offset values according to categories. The video encoding apparatus 10 may encode and transmit offset type information indicating an edge type, offset class information indicating an edge direction, and the offset values.

The video decoding apparatus 20 may receive the offset type information, the offset class information, and the offset values, and may determine an edge direction according to the offset type information and the offset class information. The video decoding apparatus 20 may determine an offset value of reconstructed pixels of a category corresponding to an edge shape according to the edge direction, and may adjust pixel values of the reconstructed pixels by the offset value, thereby minimizing an error between an original image and a reconstructed image.

An embodiment of classifying pixels based on a band type according to an SAO technique will now be described in detail.

According to an embodiment of the present invention, each of pixel values of reconstructed pixels may belong to one of a plurality of bands. For example, the pixel values may have a total range from a minimum value Min of 0 to a maximum value Max of 2^(p-1) according to p-bit sampling. If the total range (Min, Max) of the pixel values is divided into K periods, each period of the pixel values is referred to as a band. If B_k indicates a maximum value of a kth band, bands $[B_0, B_1-1]$, $[B_1, B_2-1]$, $[B_2, B_3-1]$, ..., and $[B_k-1, B_k]$ may be divided. If a pixel value of a current reconstructed pixel Rec(x,y) belongs to the band $[B_k-1, B_k]$, a current band may be determined as k. The bands may be equally or unequally divided.

For example, if pixel values are classified into equal 8-bit pixel bands, the pixel values may be divided into 32 bands. In more detail, they may be classified into bands [0, 7], [8, 15], ..., [240, 247], and [248, 255].

From among a plurality of bands classified according to a band type, a band to which each of pixel values of reconstructed pixels belongs may be determined. Also, an offset value indicating an average of errors between original pixels and reconstructed pixels in each band may be determined.