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INTRODUCTION

- > specifically focusing on lossless and lossy schemes for image compression.
- ➤ It discusses the different types of redundancy in digital image representation: local redundancy, related to gradual variation and coherence within the image data, and global redundancy, which arises from repeated patterns.
- The paper aims to propose a lossless image compression algorithm that effectively exploits both local and global redundancy, and it outlines a mathematical analysis of image characteristics and presents a new compression algorithm based on the findings.

Run-length coding



All pixels in a block are of the samecolor (maximum difference within the block is zero), run-length coding is used.



The block is represented by one pixel (the base) and the size of the block.



In our scheme, each pixel is encoded as an offset relative to its neighboring pixels (north, east, northeast) or the average of two neighboring pixels (north and east).



The base pixel is not explicitly represented; instead, the direction of the selected reference pixel is specified using two bits.

Run-length coding contd...



The reference pixel selection follows the nearest neighborhood principle.

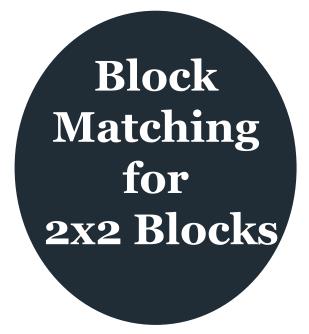


The header entry for this block includes the category (implicit encoding of block size) and is stored separately.



Three categories (0, 1, and 2) are used to classify blocks of different sizes (as shown in Table I).

- > The search space area is chosen as four times the size of the block being considered.
- > The codeword for this coding scheme includes the differences along the z and y directions from the current pattern and an identical pattern found within the search space.



- > The length of the codeword depends on the area of the search space. For a 2x2 block, the codeword length is eight.
- Block matching is implemented only for 2x2 blocks in our algorithm to reduce computational complexity associated with the search process.

Compression Coding Schemes

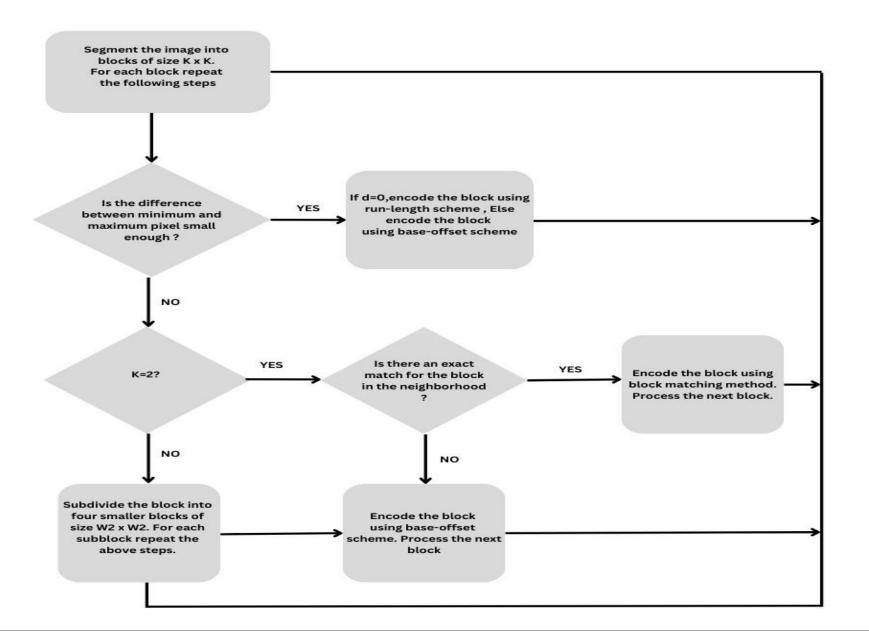
Base-Offset Coding

- > Small non-zero maximum difference (d) within the block.
- > Codeword: Offsets for all pixels and direction of base pixel.
- Categories 3, 4, and 6-26 (Table I).
- Codeword length: n * log(Maximum offset)
 + 2 bits for base pixel direction.

Direct Pixel Representation

- > Applicable when none of the above schemes are suitable.
- > Pixels in the block are represented as they are.
- > Four bytes are required to represent the block.

Flow Chart for the proposed algorithm





- > Two of the most common image characteristics have been analyzed with a goal to develop an algorithm that works well on most images.
- > A lossless compression algorithm is presented that utilizes both local and global properties of images.
- > The performance of the proposed scheme is compared with the Huffman, the arithmetic, the Lempel-Ziv and the JPEG lossless schemes.

