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Implementation of Modified Jpeg-Ls Algorithm

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***Abstract*: JPEG LS algorithm is the most simple and efficient algorithm which uses two different stages for the compression of the image ie context modeling and encoding this paper focuses on the implementation of modified JPEG LS algorithm which reduces the process time of the present JPEG LS algorithm With this method, while finding the best domain block for each range block, instead of calculating complete distance, only partial distance is found. If this partial distance is more than the previous value of distance, that domain is rejected before finding the complete distance. This reduces lot of computations and hence searching time reduces.**

***Keywords*- JPEG LS ,LOCO 1,TIC-TAC,MODE 0, MODE 1**

I. INTRODUCTION

In recent years, the development and demand of multimedia product grows increasingly fast, contributing to insufficient bandwidth of network and storage of memory device. Therefore, the theory of data compression becomes more and more significant for reducing the data redundancy to save more hardware space and transmission bandwidth.
In computer science and information theory data compression or source coding is the process of encoding information using fewer bits or other information-bearing units than an un encoded representation. Compression is useful because it helps reduce the consumption of expensive resources such as hard disk space or transmission bandwidth.
By combining simplicity with the compression potential of context models, the algorithm enjoys the best of both worlds. It is based on a simple fixed context model, which approaches the capability of the more complex universal techniques for capturing high-order dependencies.
The model is tuned for efficient performance in conjunction with an extended family of Golomb-type codes, which are adaptively chosen, and an embedded alphabet extension for coding of low-entropy image regions. LOCO-I attains compression ratios similar or superior to those obtained with state of- the-art schemes based on arithmetic coding.
Moreover, it is within a few percentage points of the best available compression ratios, at a much lower complexity

level. LOCO-I is an Image compression algorithm for compression of images. This algorithm is comparable to other lossless compression algorithms in terms of compression ratio and complexity. JPEG-LS use a predictive algorithm that encodes prediction errors rather than encoding the pixel value itself.

II.JPEG LS ALGORITHM

The LOCO-I / JPEG-LS algorithm aims at providing lossless compression ratios but with a much lower algorithm complexity. Official designation of JPEG-LS is ISO-14495-1/ITU-T.87. JPEG-LS is a simple and efficient algorithm that mainly consists of two stages modeling and encoding. Thus it divides the whole compression process in two phases of spatial pixel prediction and entropy coding and uses contexts in the first as well as the second phase. The algorithm uses a predictive technique and the resulting prediction error is encoded using Golomb-Rice coding. Fig1 shows the block diagram of Existing JPEG LS technique

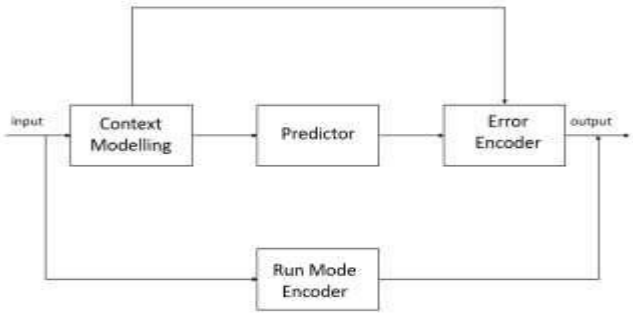

Figure1 Block diagram of JPEG LS

From the block diagram we come to know that there are 2 important steps in the image compression of existing JPEG LS technology prediction and context modeling.

A. PREDICTION

For the Prediction x is considered as the current pixel and a, b, c, d are the neighboring pixels. The method in LOCO-I consists of a test to determine the presence of vertical and horizontal edges. Adaptive correction is also provided with

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the prediction step. When a horizontal edge is detected for the current pixel x, then value of a is chosen as the expected value for the current pixel x. If no edge is detected around the current pixel x, then it results in a prediction function that assumes that x belongs to a plane defined by a, b, c. X med is found with the specified conditions as shown below,

$$\hat{x}_{\text{MED}} \triangleq \begin{cases} \min(a, b) & \text{if } c \geq \max(a, b) \\ \max(a, b) & \text{if } c \leq \min(a, b) \\ a + b - c & \text{otherwise.} \end{cases}$$

B. CONTEXT MODELING

In JPEG-LS the selected context makes use of the pixels a, b, c, d. instead of using the pixel value itself it rather uses the differences g1=d-a, g2=a-c, g3=c-b, and g4=b-e as contexts.

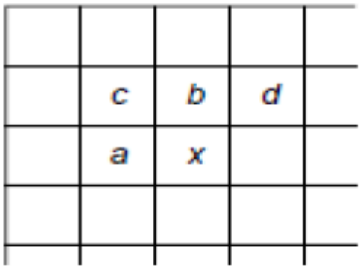

Figure 2 Context modeling

The difference values g1, g2, g3 are quantized to small regions this reduces the resource and storage space. smoothness of the image is defined by the context.

The difference regions are used for three stages in the LOCO-I algorithm. Firstly it is used in the pixel prediction step, where an adaptive correction of the prediction error is also performed. Second use of context in LOCO-I algorithm is to maintain some statistics for the selection of entropy coding parameters. Third use of context is for the run length encoding of flat regions (g1=0, g2=0, g3=0).

In this project both the existing algorithm and modified algorithm will be implemented and the comparison will be made with the help of simulated results.

III.MODIFIED JPEG LS ALGORITHM

In the improved JPEG-LS Algorithm, faster methods are developed to accelerate the encoding stage in JPEG-LS compression.

The Proposed JPEG-LS compression method is developed to accelerate the encoding step in JPEG-LS compression. Encoding step in JPEG-LS compression is slow because, most of the time is spent in searching and discarding of unrelated domain blocks. Again, during this process, significant fraction of computational lost lies in the actual calculation of distances between domain and range blocks. The time required for the search is reduced by improving the efficiency of these calculations. With this method, while finding the best domain block for each range block, instead of calculating complete distance, only partial distance is found.

If this partial distance is more than the previous value of distance, that domain is rejected before finding the complete distance. This reduces lot of computations and hence searching time reduces.

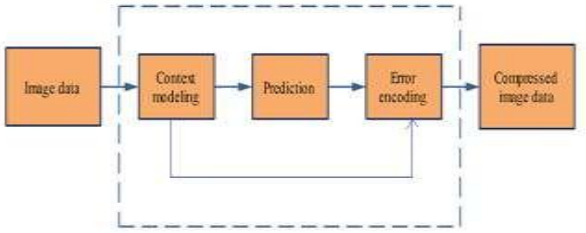

Figure3 Block diagram of Modified JPEG LS

From the above block diagram it is clear that by avoiding the run mode and treating the image samples wih mode 0 we will be reducing the compression time of the image and computational loss is also reduced,the results are compared in matlab using simulation results.

IV.EXPERIMENTAL RESULTS

Both the existing algorithm and the proposed algorithm is implemented in matlab and the simulated results are compared to check which algorithm works better in response to time and quality.

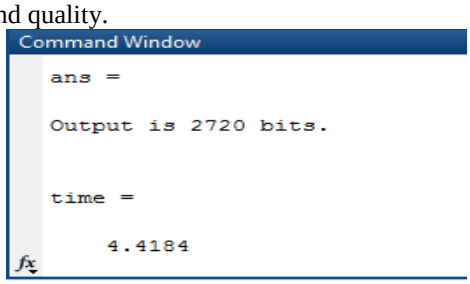

Figure 4 Computational result of JPEG LS algorithm

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With the help of tic tac command we calculate the computational time of the algorithm, fig 4 shows the computational result of Existing JPEG LS algorithm.

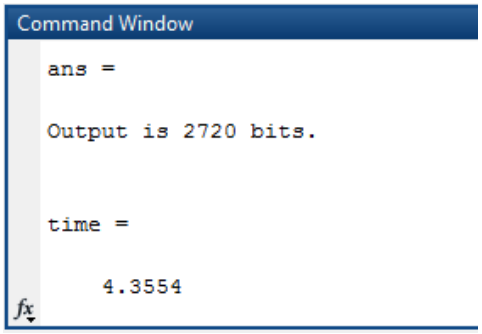

Figure 5 Computational result of modified JPEG LS algorithm

The time in computational result is expressed in terms of seconds, fig 5 shows the computational result of modified JPEG LS algorithm. The comparison between the two algorithms will be obtained graphically as shown in fig 6

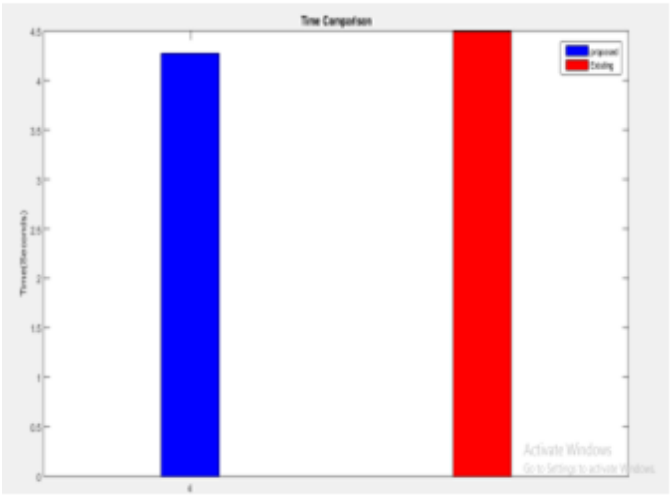

Figure 6 Time comparison of Proposed and Existing JPEG LS technology

From the computational results and comparison between the existing algorithm we may conclude that necessary improvements are made on the existing algorithm to make it work faster than the earlier algorithm.

V. CONCLUSION

In this project we have designed and implemented both JPEG LS algorithm and Modified JPEG LS algorithm and we found that the modified algorithm is more efficient and fast than the previous JPEG LS algorithm as we conclude from the simulation results.

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