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Time & Memory Efficient Corner Detection Algorithm Using the Concept of Error Tolerant For Color (RGB) Noisy Images

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Abstract:-In present era every multimedia device are require fast and good quality image/video. Due to Machine to machine & Internet of Things, there is rapid demand of real time transmission applications so for those applications there is need of some application specific processing unit which also make justice with batter power consumption. As we know in present stage there are some area where we need to find the corners point those are related to Defense, Aeronautics, Traffic. In this type of application there is need of some device which will detect the corner points. In this application there is need fast processing unit which is not possible by pure accurate unit so for reduction of those issue in this work we will present a Novel algorithm which involve Corner detection algorithm. This proposes algorithm is able to find the corner points from the color (RGB) noisy images. Here we target the concept of error tolerant. According to this concept we will develop the fast algorithm with improvement image quality. For quality analysis we use Image quality parameters and I will compare my proposed algorithm & architecture with previous existing approach. Implementation of proposed algorithm will be done by Matlab.

Keywords: DTCWT, Memory, Sub pixel, Harris algorithm, corner point, corner detection, 2D Gaussian smooth filter.

I. INTRODUCTION

A. Image

An image defined in the "real world" is considered to be a function of two real variables, for example,

a(x,y) with a as the amplitude (e.g. brightness) of the image at the real coordinate position (x,y). Modern digital technology has made it possible to manipulate multi-dimensional signals with systems that range from simple digital circuits to advanced parallel computers. The goal of this manipulation can be divided into three categories:

- Image Processing (image in -> image out)
- Image Analysis (image in -> measurements out)

An image may be considered to contain sub-images sometimes referred to as regions-of-interest, ROIs, or simply regions. This concept reflects the fact that images frequently contain collections of objects each of which can be the basis for a region. In a sophisticated image processing system it should be possible to apply

Specific image processing operations to selected might be processed to suppress motion blur while another part might be processed to improve color rendition.

This processing technique may be Image enhancement, Image restoration, and Image compression

B. RGB Color Model:

The RGB color model is an additive color model in which red, green, and blue light are added together in various ways to reproduce a broad array of colors. The name of the model comes from the initials of the three additive primary colors, red, green, and blue. The main purpose of the RGB color model is for the sensing, representation, and display of images in electronic systems, such as televisions and computers, though it has also been used in conventional photography. RGB is a device-dependent color model: different devices detect or reproduce a given RGB value differently, since the color elements (such as phosphors or dyes) and their response to the individual R, G, and B levels vary from manufacturer to manufacturer, or even in the same device over time. Typical RGB input devices are color TV and video cameras, image scanners, video games, and digital cameras. Typical RGB output devices are TV sets of various technologies (CRT, LCD, plasma, etc.), computer and mobile phone displays, video projectors, multicolor LED displays, and large screens such as JumboTron.

C. *Corner Detection*

the gray gradient of corner is acutely mutative, it has a high accuracy in control point matching process based on gray level. For this reason, corner detection is the first step of many full-automatic or semi-automatic image registration algorithms. SUSAN operator, Harris operator, Wang operator and Shenjun operator are universal corner detection methods. Especially

SUSAN operator, it is non-directional, easy acceptable, noise eliminated, and high accuracy. But it requires so much image information; also, it is difficult to choose correct luminance threshold and geometry threshold.

A corner can be considered as the intersection of two well-defined edges. The Harris corner detection algorithm searches for corner points by looking at regions within an image which contains high gradient values in all directions. A window is iteratively scanned across the X and Y gradients of the input image, and if high changes in intensity exist in multiple directions, then a corner is inferred to exist within the current window.

Corners, which are also called junctions/ key points/ dominant points or interesting points, play an important role in many image analysis applications such as image registration, shape analysis, object recognition, motion analysis, scene analysis, stereo matching, etc. Therefore most of the work on two-dimensional features has concentrated on corner detection.

II. METHODOLOGY & IMPLEMENTATION DETAILS

Here we will propose a novel algorithm of corner detection with the motto of reducing the time complexity at algorithm level. According to that concept we will design fast algorithm and we will reduce the time complexity. Here we will design our corner algorithm for RGB color image.

Here we propose a new derivative mask which will follow diamond structure, using this mask time complexity is reduce because of less values:

$$p = [0\ \ 0\ \ 0.5\ \ 0\ \ 0]$$
$$d1 = [0\ \ 0.25\ \ 0\ \ -0.25\ \ 0]$$
$$d2 = [0\ \ 0\ \ -0.5\ \ 0\ \ 0]$$

Here we create fixed point derivative points this fixed point also reduce the algorithmic calculation complexity.

At initial stage we will design our own novel algorithm after that we will design of our architecture of proposed novel algorithm. We will apply our proposed logic with previous existing logic & make a comparative analysis in terms of time & image quality. At algorithm Level we are use error resilient logic.

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Implementation Details:

In these section we present implementation of some existing cornner detection approach like harris, gabor, wavelate. Here we also implement our proposed corner approach.

Implementation of Harris :According to this approach first we will find the derives value than we will apply filter approach after that we will apply corner detection formula which will generate the output in terms of corner value.

Implementation of Gabor Based Corner: According to this approach first we will filter the input with the help of gabor filter approach after that , we find the derives value than we will apply filter approach after that we will apply corner detection formula which will generate the output in terms of corner value.

Implementation of Wavelate Based Corner: According to this approach first we will filter the input with the help of wavelate filter approach after that , we find the derives value than we will apply filter approach after that we will apply corner detection formula which will generate the output in terms of corner value.

Implementation of Proposed Corner detection: As we already discussed about our proposed corner detection. So here we will implement proposed by using of Matlab. Here basically we use Two types of image for comparative analysis between time, image quality, number of corners. Basically here we design our algorithm for RGB noisy images. At input we apply rgb noisy image and according to our proposed approach it wilted output. Here basically our proposed algorithm is designed in three steps:

1. RGB image analysis
2. derivatives detection using new metrics
3. corners detection using threshold logic
4. store generated output images

III. RESULT & ANALYSIS

According to human nature every one need fast and good quality system which is very hard to maintain that balance between both parameters. So here basically we will design our algorithm which is based on RGB corner detection approach. So for quality analysis point we have to use some existing scientific parameters which will do comparative analysis between previous and proposed approach.

Various parameters are used to evaluate the proposed algorithm at both levels. The various parameters are:

1. Time Complexity Analysis
2. PSNR (Peak signal-to-noise ratio)
3. SSIM (structural-similarity-based image quality assessment)
4. FSIM (Feature Similarity Index for Image Quality Assessment)

5. Gradient Magnitude Similarity deviation (GMSD)
6. Riesz-transform based Feature Similarity metric (RFS-IM

Test Noisy Images:

Analysis with graphs

1.Time Complexity Analysis:

Image EYE:

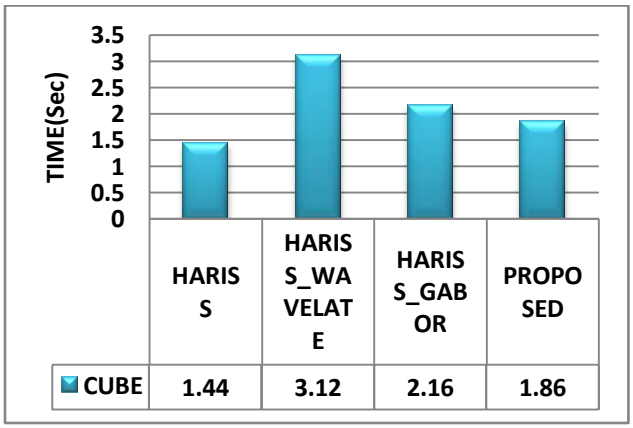
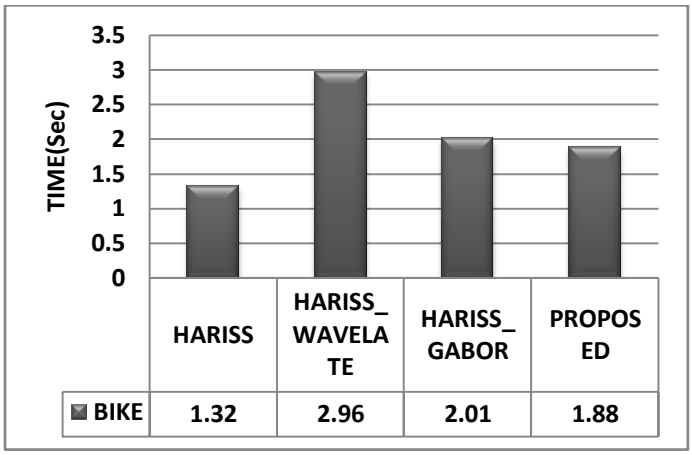


Image TAJ:



2. PSNR Analysis:

Image EYE:

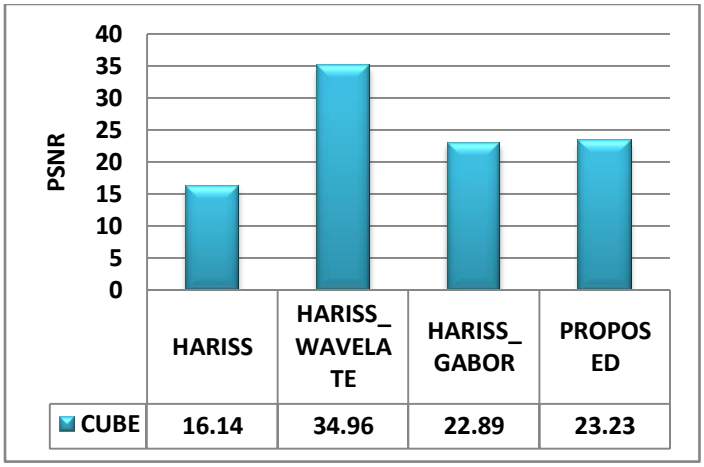
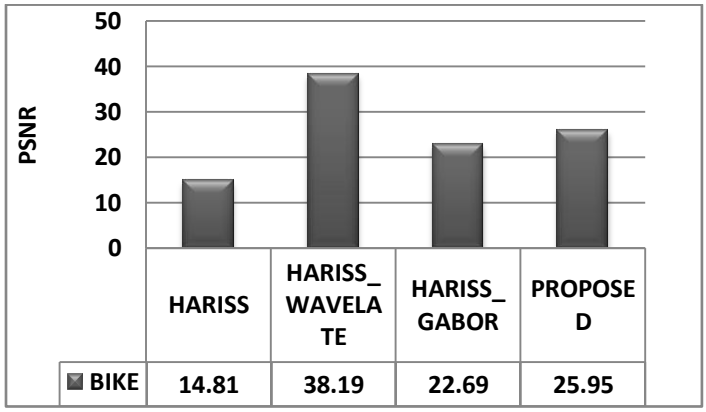


Image TAJ:



3. *SSIM Analysis:*

Image EYE:

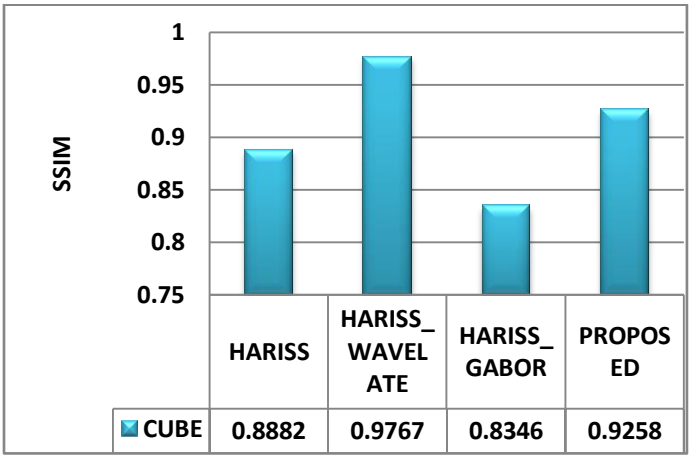
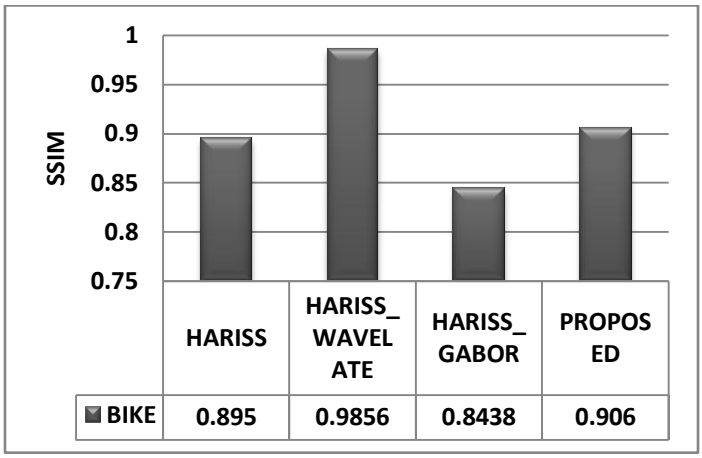


Image TAJ:



4. FSIM Analysis:

Image EYE:

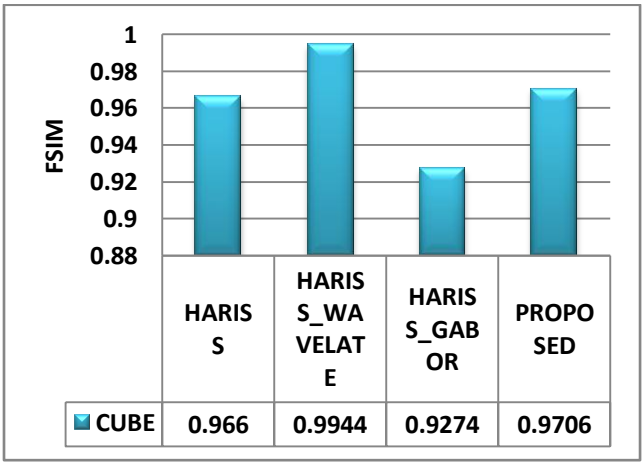
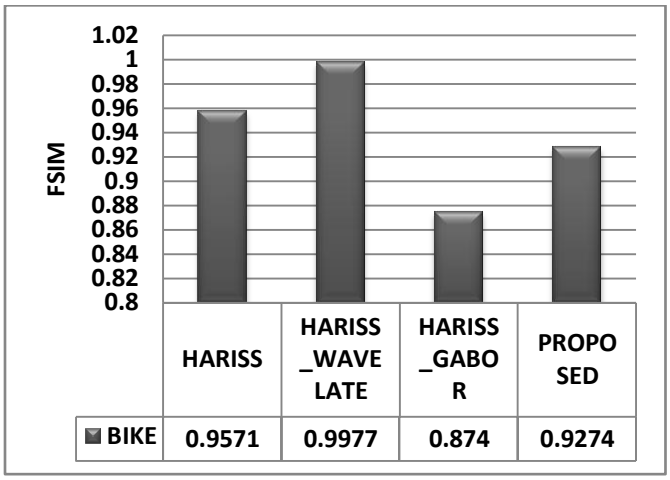


Image TAJ:



5. GMSD Analysis:

Image EYE:

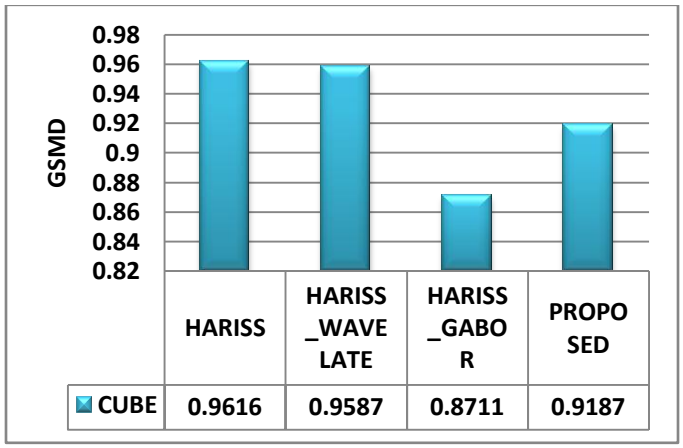
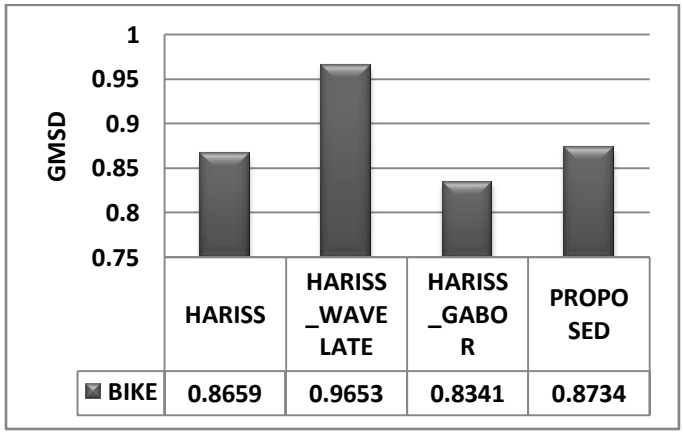


Image TAJ:



6. CORNNER Analysis:

Image EYE:

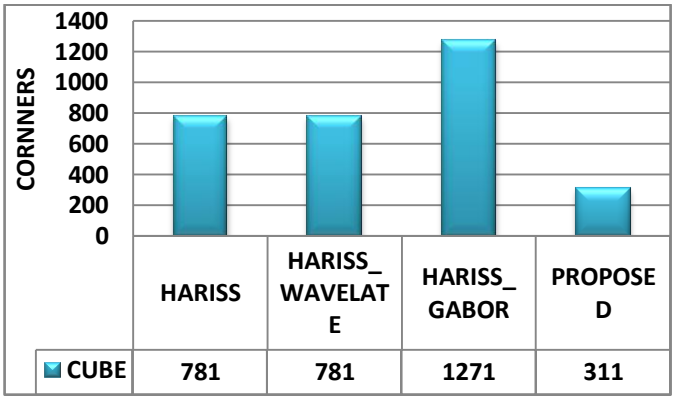
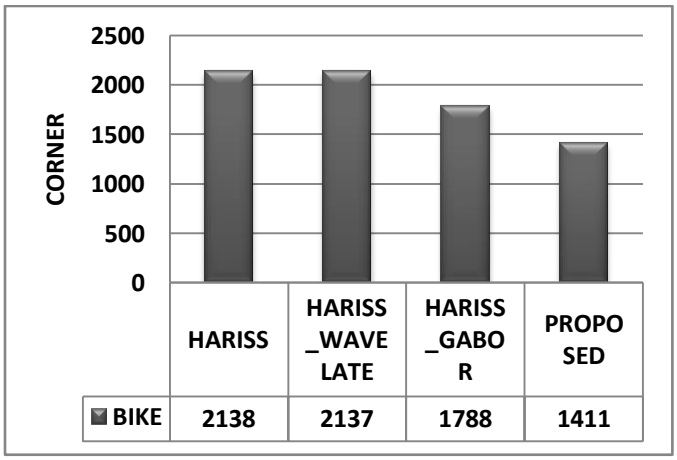
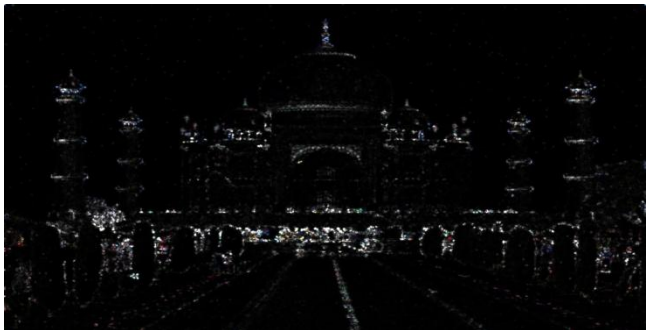


Image TAJ**:**

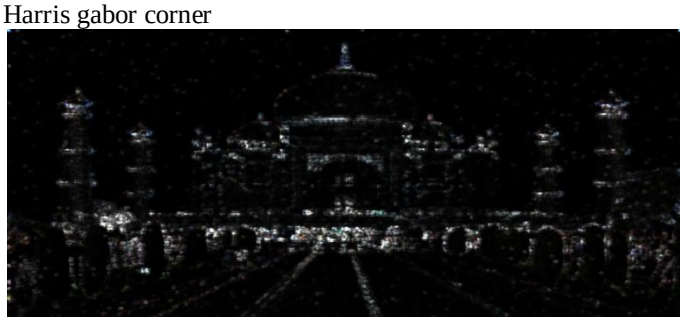


Corner Analysis:

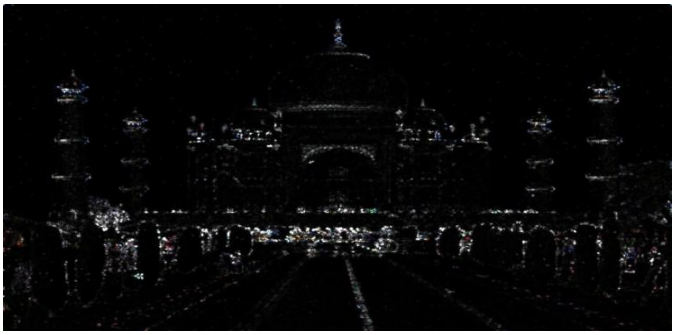
Harris Corner



Harris gabor corner



Harris Wavelate Cornner



Harris Proposed Corner

According to previous analysis our proposed technique is far better than gabor & wave late based approach because my proposed approach require less time complexity with very less reduction in image quality also my proposed approach generate very few false corners which is tolerable. Even our proposed algorithm is very good for noisy images because it generate very few false corners as compare to gabor and haris approach

.

IV. CONCLUSION

According to this paper we will resolve the previous existing problems which are latency, and false corners issue on RGB noisy image. The key contribution of

this work is to develop a fast corner detection algorithm. This proposed corner detection unit will require less time as compare previous existing issue. In this approach I will propose a new approach of approximation algorithm which will reduce some amount of accuracy. In proposed approach I will use only fixed point logic. Here we also proposed a diamond logic based derivative. According to our proposed approach we will find the derivatives values which is defined by fixed point techniques similar we change the formula of corner detection. Using this approach we reduce the timing complexity and hardware complexity with 30-40%.

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