International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435(Online) Volume 6, Issue 5, May 2017)

A Review on Color Filtering Techniques

Gaurav Gulati[1], Garima Garg[2]

[1]*M. Tech Scholar,* [2]*Assistant Professor, Computer Science Department, SGI, Samalkha*

Abstract-- **Recognition object from image plays a vital role in digital image processing. There are many schemes for identifying object from images. The good detection scheme must able to retrieve as much of image details even though the image is highly affected by noise. Noise in images is caused by the random fluctuations in brightness or color information. Noise represents unwanted information which degrades the image quality and creates difficulty to detect an object. Noise is defined as a process which affects the acquired image quality that is being not a part of the original image content. There are many source from where noise can mix with digital image. During acquisition process, digital images convert optical signals into electrical one and then to digital signals and are one process by which the noise is introduced in digital images. So in this paper we study about many filters that are used for de-noising image and helps in detection of right object.**

Keywords-- **Image, Pixel, Color, Object, Filters**

I. INTRODUCTION

Color is one of the most important properties of vision. The color filters, either reflective or Trans missive, issue the power to choose particular colors from a light that is white, which is the prerequisite of colorful imaging and display. Pigment and dye are the most popularly used color filters, which are based on the material selective absorption in the visible band [1]. Many pigments or dyes have to be deployed together by multistep processing to generate a colorful image. For example, in an image sensor with pixels arranged in Bayer's array, three aligned photolithography processes are necessary to define the red, green, and blue color pixels [2]. Alternatively, color can be generated by manipulating the propagation of light, for example, using dispersive gratings based on the light diffraction theory. It can be found in nature like the wings of butterflies [3, 4], where different structures on the wings show different colors. Structural color is depended on the cross section between light and the structures rather than the material features.

As a result, a complete set of structural color filters can be readily achieved in the same material by single-step patterning of different structures, which provides structural color with a great chance to gain high compactness and cut down the cost. Furthermore, structural color has high resistance to the chemicals and high stability to the heat and radiation and therefore can be used in the extreme environment like the aerospace.

In this review, we will discuss the mechanisms of various structural color filtering techniques for both reflective and trans-missive color filters and then focus on the integrated applications of structural color in the fields of imaging, display, and colorful solar cells. Finally, we will summarize the current issues of structural color and possible resolutions.

II. LITRETURE SURVEY ON DENOISING TECHNIQUES

A technique from all these, when outcomes in form of hardware, that needs rather simple extra circuitry. These two techniques can easily be deployed into optimal hardware realizations for median filters [5, 6].

Two more rapid techniques were implemented to calculate a set of parameters, known as Mi's, of weighted median filters for integer weights and real weights, respectively. The features of Mi's, are statistical by nature of weighted median filters and are the critical parameters in designing optimal weighted median filters, are defined as the cardinality of the positive subsets of weighted median filters. The first algorithm, which is for integer weights, is about four times faster than the existing algorithm. The second algorithm, which applies for real weights, reduces the computational complexity significantly for many applications where the symmetric weight structures are assumed [7].

International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435(Online) Volume 6, Issue 5, May 2017)

Givoanni in 1997 proposed the use of the median filter (MF) within the Bayesian framework which allowed to develop global methods for both image smoothing and image approximation by the MF ‘roots’. Then a method for solving the approximation problem was proposed, which was based on stochastic optimization with constraints. Results of the proposed method for both simulated and real binary images were illustrated and compared to results from a known deterministic method [8].

New type of adaptive center weighted median filters was developed in year 2000 for impulsive noise reduction of an image without the degradation of an original signal. This controller classifies an input vector into some cluster according to its feature and gives the weight corresponding to the cluster. The parameters in the weight controller are adjustable by using the learning algorithm. The degradation of the original signal can be reduced by the proposed technique [9].

Vector median filter suitable for color image processing was presented in 2001 and was based on a new ordering of vectors in the HSV color space [10]. Weighted vector median filters (WVMF) emerged as a powerful tool for the non-linear processing of multi-components signals in 2002. These filters are parameterized by a set of N weights the two optimization techniques of these weights for color image processing were introduced. Both approaches are evaluated by simulations related to the de-noising of textured, or natural, color images, in the presence of impulsive noise. Furthermore, as they are complementary, they are also tested when used together [11].

An effort was made in 2004 for improving the median-based filter to preserve image details while effectively suppressing impulsive noises and achieved its effect through a summation of the weighted output of the median filter and the related weighted input signal. The weights are set in accordance with the fuzzy rules. In order to design this weight function, a method to partition of the observation vector space and a learning approach are proposed so that the mean square error of the filter output can be minimum.

Partition fuzzy filter provided excellent robustness with respect to various percentages of impulse noise in our testing examples and outperformed the present filters of the time in literature [12]. Current pixel can be estimated by using assumed maximum–minimum median process. Implementation outputs signaled towards that the assumed filter impressively good performs other algorithms in terms of noise suppression and detail preservation across a wide range of impulse noise corruption, ranging from 1% to 90% [13].

Yuksel in year 2006 generated an operator for removing impulse noise from digital images is displayed. The assumed operator was a hybrid filter constructed by combining four center-weighted median filters (CWMF) with a simple adaptive neuro-fuzzy inference system (ANFIS). The results showed that the proposed operator significantly outperforms the other operators and efficiently removes impulse noise from digital images without distorting image details and texture [14]. In the same direction a new adaptive center weighted median (ACWM) filter was proposed in 2007 for improving the performance of median-based filters, preserving image details while effectively suppressing impulsive noiseThe noise filtering procedure is progressively applied through several iterations so that the mean square error of the output can be minimized [15]. Quing Hua Hang in 2008 showed that the median filters can be used for reducing interpolation error and improving the quality of 3D images in a freehand 3D ultrasound (US) system. Compared with the voxel nearest-neighborhood (VNN) and distance-weighted (DW) interpolation methods, the four median filters reduced the interpolation error by 8.0–24.0% and 1.2–21.8%, respectively, when 1/4 to 5 [16].

The original switching median filter cannot detect the noise pixel whose value is close to its neighbors if the threshold is designed for emphasizing the detail preservation , so in 2009 was modified by adding one more noise detector to improve the capability of impulse noise removal based on the rank order arrangement of the pixels in the sliding window [17].

International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435(Online) Volume 6, Issue 5, May 2017)

Yakup in 2010 showed that the performances of recursive impulse noise filters can be improved by the use of image rotation and fuzzy processing [18].

A two-phase median filter based iterative method for removing random-valued impulse noise was proposed in 2010. Implementation outputs signaled that the assumed technique performs better than many existing techniques while preserving its simplicity [19].Use of Median Filters are extended in year 2011 for de-noising infrared images. Ozen in 2011 showed that Median filter can be used in fingerprint recognition algorithm [20]. Zhouping recently used medina gaussian filtering framework for noise removal in X-ray microscopy image [21].Directional weighted median filter is modified for de-noising salt and pepper noise corrupted image [22].Faster approach for noise reduction in infrared image is shown recently in January [23]. An inverse ill-posed problem was considered in 2002 coming from the area of dynamic magnetic resonance imaging (MRI), where high resolution images must be reconstructed from incomplete data sets collected in the Fourier domain. The behavior of some regularization methods such as the truncated singular value decomposition (TSVD), the Lavrent'yev regularization method and conjugate gradients (CG) type iterative methods were analyzed [24]. Color image processing is an essential issue in computer vision. Variational formulations provide a framework for color image restoration, smoothing and segmentation problems. The solutions of variation models can be obtained by minimizing appropriate energy functions and this minimization is usually performed by continuous partial differential equations (PDEs). The problem is usually considered as a regularization matter which minimizes smoothness plus a regularization term. In 2007, Olivier proposed a general discrete regularization framework defined on weighted graphs of arbitrary topologies which can be seen as a discrete analogue of classical regularization theory. The smoothness term of the regularization uses a discrete definition of the p-Laplace operator. With this formulation, families of fast and simple anisotropic linear and nonlinear filters which do not involve PDEs were used [25].

In year 2009, for image recovering, edge-preserving regularization technique was performed to solve a main issue whose target function has a data fidelity term and a regularization term, the two terms are balanced by a parameter λ. In some aspect, the value of λ determines the quality of images. A new model to estimate the parameter and propose an algorithm to solve the problem was established. The quality of images was improved by dividing it into some blocks [26]. Non-blind image de-convolution is a process that obtains a sharp latent image from a blurred image when a point spread function (PSF) is known. However, ringing and noise amplification are inevitable artifacts in image de-convolution since perfect PSF estimation is impossible. The conventional regularization to reduce these artifacts cannot preserve image details in the de-convolved image when PSF estimation error is large, so strong regularization is needed. A non-blind image de-convolution method was proposed which preserves image details, while suppressing ringing and noise artifacts by controlling regularization strength according to local characteristics of the image [27]. Stochastic regularized methods are quite advantageous in super-resolution (SR) image reconstruction problems. In the particular techniques, the SR problem is formulated by means of two terms, the data-fidelity term and the regularization term. The experimentation is carried out with the widely employed L2, L1, Huber and Lorentzian estimators for the data-fidelity term. Generalized output is that in matter of the potential processes show general data-fidelity or continuation concept, and collections are without noise, the method which employs the most robust continuation or data-fidelity term should be performed [28].

III. Problem Statement

Transportation professionals will be involved in technical analyses to determine their actual benefits, and policy debates concerning whether public policies should encourage or require autonomous vehicles.

International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435(Online) Volume 6, Issue 5, May 2017)

Development cost and prices for retail counter is much higher than hoped, So their profits may be less and issues higher than predicted, and technical constraints, privacy concerns or personal preference may reduce consumer acceptance, resulting in a significant portion of vehicle travel remaining human-driven even after market saturation, indicated in the graph by dashed lines. Every movement of vehicle depends on the attached cameras in front and rear. The main issue is created here about to understand the signal of right object, suppose there are two objects which has same color and nearly same shape then it is very difficult for a vehicle to get right object. So we use color filtering technique which helps driverless vehicle to move in right direction.

IV. Motivation

Many categories of mis-happening are raised on express highway road, highway road, off road just due to low level uncertain events. Rash driving, system failure, collision due to obstacles, exiting speed control limit, cross red signals etc. are just some causes of accidents. For prevention of this accident, government made some rules. Such as helmet, seat belt compulsion etc. Control movement of vehicle at particular type of road is also necessary to avoid accidents. For this, there is no any system to control the movement/direction of moving vehicle. That's why, there is need to invent such system which control the direction of vehicle automatically at given limit at particular limiting distance. If this idea of technical model is feasible, the issues related to traffic as well as accidents due to collision will be controlled. Now it is possible to control or set the movement of vehicle at a given gap on the roads like highways, express high ways and any area where the speed limit is desired by the technique suggested in methodology described in this synopsis.

V. Conclusion

In this review paper we study about many filtering techniques like mean, median, fuzzy, wavelets etc. which plays important role in evolution of digital image processing.

These techniques also provide some facts which led to develop a new technique. Scientists and researchers have applied these techniques on the images to get good results in case of de-noising and object detection. So by observing this process we get an idea of identifying right object from an image.

REFERENCES

[1] H. K., M. Chen, and P. Pan, "LCD-based color filter films fabricated by a pigment-based colorant photo resist inks and printing technology," Thin Solid Films, vol. 515, no. 3, pp. 896–901, 2006.

[2] M. C. Gather, A. K¨ohnen, A. Falcou, H. Becker, and K. Meerholz, "Solution-processed full-color polymer organic light emitting diode displays fabricated by direct photolithography," Advanced Functional Materials, vol. 17, no. 2, pp. 191–200, 2007.

[3] T. Xu, H. Shi, Y. Wu, A. F. Kaplan, J. G. Ok, and L. J. Guo, "Structural colors: from plasmonic to carbon nanostructures," Small, vol. 7, no. 22, pp. 3128–3136, 2011.

[4] J. J. Cowan, "Aztec surface-relief volume diffractive structure," Journal of the Optical Society ofAmericaA, vol. 7, no. 8,pp. 1529–1544, 1990.12

[5] Kundu, Amlan and Mitra, Sanjit K. and Vaidyanathan, P. P. (1984). "Application of two-dimensional generalized mean filtering for removal of impulse noises from images", IEEE Transactions on Acoustics, Speech, and Signal Processing, 32 (3). pp. 600-609.]

[6] H. M. Lin and A. N. Wilson, Jr., "Median filters with adaptive length,'' IEEE Trans. Circuits Svst., vol. 35, no. 6, June 1988.

[7] Ruikang Yang, Moncef Gabbouj, Yrjö Neuvo, "Fast algorithms for analyzing and designing weighted median filters", Signal Processing, Volume 41, Issue 2, January 1995, Pages 135-152.

[8] Giovanni Sebastiani, Sebastiano Stramaglia, "A Bayesian approach for the median filter in image processing", Signal Processing, Volume 62, Issue 3, November 1997, Pages 303-309.

[9] Mitsuji Muneyasu, Nobutaka Nishi, Takao Hinamoto, "A new adaptive center weighted median filter using counter propagation networks", Journal of the Franklin Institute, Volume 337, Issue 5, August 2000, Pages 631-639.

[10] M. I. Vardavoulia, I. Andreadis, Ph. Tsalides, "A new vector median filter for colour image processing", Pattern Recognition Letters, Volume 22, Issues 6–7, May 2001, Pages 675-689.

[11] Laurent Lucat, Pierre Siohan, Dominique Barba, "Adaptive and global optimization methods for weighted vector median", Signal Processing: Image Communication, Volume 17, Issue 7, August 2002, Pages 509-524.

[12] Tzu-Chao Lin, Pao-Ta Yu, "Partition fuzzy median filter based on fuzzy rules for image restoration", Fuzzy Sets and Systems, Volume 147, Issue 1, 1 October 2004, Pages 75-97.

[13] Haixiang Xu, Guangxi Zhu, Haoyu Peng, Desheng Wang, "Adaptive fuzzy switching filter for images corrupted by impulse noise", Pattern Recognition Letters, Volume 25, Issue 15, November 2004, Pages 1657-1663.

[14] M. Emin Yüksel, "A median/ANFIS filter for efficient restoration of digital images corrupted by impulse noise ", AEU - International Journal of Electronics and Communications, Volume 60, Issue 9, 2 October 2006, Pages 628-637.

[15] Tzu-Chao Lin, "A new adaptive center weighted median filter for suppressing impulsive noise in images", Information Sciences, Volume 177, Issue 4, 15 February 2007, Pages 1073-1087.

[16] Qing-Hua Huang, Yong-Ping Zheng, "Volume reconstruction of freehand three-dimensional ultrasound using median filters ", Ultrasonic, Volume 48, Issue 3, July 2008, Pages 182-192.

[17] Chung-Chia Kang, Wen-June Wang , "Modified switching median filter with one more noise detector for impulse noise removal", AEU - International Journal of Electronics and Communications, Volume 63, Issue 11, November 2009, Pages 998-1004.

[18] Yakup Yüksel, Mustafa Alçı, M. Emin Yüksel, "Performance enhancement of image impulse noise filters by image rotation and fuzzy processing ", AEU - International Journal of Electronics and Communications, Volume 64, Issue 4, April 2010, Pages 329-338.

[19] Jianjun Zhang, "An efficient median filter based method for removing random-valued impulse noise", Digital Signal Processing, Volume 20, Issue 4, July 2010, Pages 1010-1018.

[20] Ayyüce M. Kızrak, Figen Özen, "A new median filter based fingerprint recognition algorithm", Procedia Computer Science, Volume 3, 2011, Pages 859-865.

[21] Zhouping Wei, Jian Wang, Helen Nichol, Sheldon Wiebe, Dean Chapman, "A median-Gaussian filtering framework for Moiré pattern noise removal from X-ray microscopy image", Micron, Volume 43, Issues 2–3, February 2012, Pages 170-176

[22] Ching-Ta Lu, Tzu-Chun Chou, "De-noising of salt-and-pepper noise corrupted image using modified directional-weighted-median filter", Pattern Recognition Letters, Volume 33, Issue 10, 15 July 2012, Pages 1287-1295.

[23] Chih-Lung Lin, Chih-Wei Kuo, Chih-Chin Lai, Ming-Dar Tsai, Yuan-Chang Chang, Hsu-Yung Cheng, "Novel approach to fast noise reduction of infrared image", Infrared Physics & Technology, Volume 54, Issue 1, January 2011, Pages 1-9.

[24] E.Loli Piccolomini, F. Zama, G. Zanghirati, A. Formiconi, "Regularization methods in dynamic MRI", Applied Mathematics and Computation, Volume 132, Issues 2–3, 10 November 2002, Pages 325-339.

[25] Olivier Lezoray, Abderrahim Elmoataz, Sébastien Bougleux, "Graph regularization for color image processing", Computer Vision and Image Understanding, Volume 107, Issues 1–2, July–August 2007, Pages 38-55.

[26] Xiaojuan Gu, Li Gao, "A new method for parameter estimation of edge-preserving regularization in image restoration", Journal of Computational and Applied Mathematics, Volume 225, Issue 2, 15 March 2009, Pages 478-486.

[27] Jong-Ho Lee, Yo-Sung Ho, "High-quality non-blind image deconvolution with adaptive regularization", Journal of Visual Communication and Image Representation, Volume 22, Issue 7, October 2011, Pages 653-663.

[28] Antigoni Panagiotopoulou, Vassilis Anastassopoulos, "Super-resolution image reconstruction techniques: Trade-offs between the data-fidelity and regularization terms", Information Fusion, Volume 13, Issue 3, July 2012, Pages 185-195.