

An Alternative Technique using Median Filter for Image Reconstruction based on Partition Weighted Sum Filter

Pisit Srisaiprai¹, Wilaiporn Lee²

Communication and Computer Network Research Group (C2NRG), Electrical Engineering, Department of Electrical and Computer Engineering, Faculty of Engineering, King Mongkut's University of Technology North Bangkok, Bangkok, Thailand
e-mail : aof_en42@hotmail.com¹, wilaiporn.lee@gmail.com²

Vorapoj Patanavijit³

Department of Computer and Network Engineering, Faculty of Engineering, Assumption University, Bangkok, Thailand
e-mail : patanavijit@yahoo.com³

Abstract—In this paper, we propose an alternative technique for image reconstruction which it is combined existing methods for better performance in spatial domain using the median (MED) filter based on partition weighted sum (PWS) filter. Four noise models are considered including additive white Gaussian noise (AWGN), poisson noise (PN), salt and pepper noise (SPN) and speckle noise (SN) under different image types such as aerial image, face image, scenic image, and text image. The simulation results show that the median based partition weighted sum (MPWS) filter provides better results than the MED and PWS filters in case of AWGN and SPN when the noise probability is not less than 20% for all image types. However, this filter takes longer average simulation time than the MED and PWS filters.

Keywords : Image reconstruction, median filter, partition weighted sum filter, vector quantization

I. INTRODUCTION

The digital image processing is a general term for the wide range of techniques that exist for handling and modification images in various ways such as image enhancement, image restoration, image reconstruction, and others. Over the last ten years, image reconstruction has important with improvement the quality image. The purpose of image reconstruction is to reconstruct the image with acceptable quality from the degraded image.

The PWS filter [1-5] is commonly used for linear filter to eliminate with additive white Gaussian noise (AWGN) which divides the observation space into Voronoi regions using vector quantization (VQ) based on the Linde-Buzo-Gray (LBG) algorithm [6-7]. This filter has poor performance when encountered salt and pepper noise (SPN). On the other hand, the MED filter [8] is famous used for nonlinear filters to remove SPN which replaces with the value of a pixel by the median of the intensity levels in the neighborhood of that pixel. This method obtains low performance in case of AWGN.

From our previous paper [9-10], we compared the performance between PWS filter and S-PWS (subspace partition weighted sum) filter for image reconstruction with

AWGN under different image types. The simulation results in spatial domain show that both filters get good performance for all image types except for text image.

In this paper, we combine two existing techniques of MED filter and PWS filter in spatial domain. The proposed filter is called the median based partition weighted sum (MPWS) filter which can eliminates AWGN and SPN which takes well performance for all image types. In addition, we can also problem-solving with the text image obtain poor performance. The outline of this paper is as follows. The proposed filter is presented in Section II. The simulation results are showed in Section III. Finally, we conclude the study in Section IV.

II. PROPOSED ALGORITHM

The proposed algorithm consists of two stages. Firstly, median filter process which estimates by sorting all the pixel values from the surrounding neighborhood and replacing the pixel with the center pixel value. Secondly, partition weighted sum filter process which divides the observation space into the specific regions using VQ based on the LBG algorithm. It is shown in "Fig. 1".

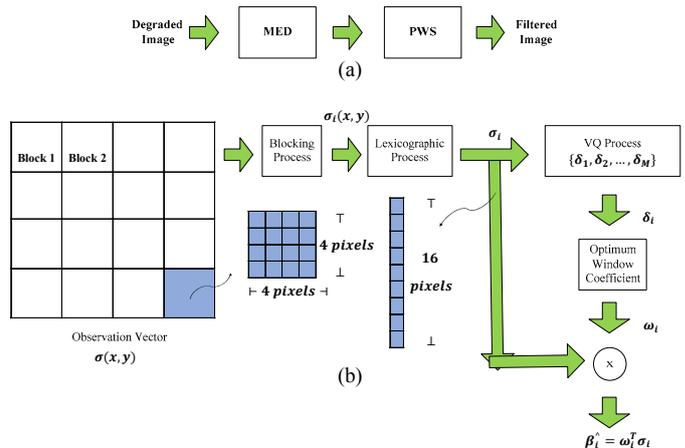


Fig. 1. The proposed system for image reconstruction (a) MPWS (b) PWS