

# proposed optimal method for GIS image noise removal

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## **Abstract :**

Traditional Noise removal methods are depending on studying one method such as winner filter. This method yield to noise analysis with different intensity for the same method. The aim of this method is to detect area that makes filter working on, so the noise removal depending on this way is not useful for above reason.

The suggest method deals with knowing the noise distribution and extracting Features of this noise and selects the best way to remove the noise, with using all possible knowledge. This method benefits from the traditional methods which classify noise to multi level depending on it intensity.

In Noise distribution, we depend on statistic methods according to goodness of fitting (Gof). This distribution has two phases, the first one is hypothesis and the second is statistic test. The hypothesis phase assuming normal distribution. We accept this hypothesis if it is satisfied with the condition. Gof uses different methods including chi-square, Kolmogorov-Smirnov, and moments.

Features extracting for additive noise are including two types; block –base and filter base. Block-base includes dividing image to small blocks then selects the best homogenous one to extract features from this block. Filter-base is an applied filter on image (laplace and sobel) and by using threshold to remove all details of image to compute the average. For impulse noise we are uses noise definition.

In Geographic Information Systems (GIS), we applied the suggested methods by using data base information as feature in each step.

## **1- introduction**

Image processing is a rapidly growing area of computer science. Its growth has been fueled by technological advances in digital imaging, computer processors and mass storage devices. Fields which traditionally used analog imaging are now switching to digital systems, for their flexibility and affordability. Important examples are medicine, film and video production, photography, GIS , remote sensing, and security monitoring[1] .

Digital image processing is concerned primarily with extracting useful information from images. Ideally, this is done by computers, with little or no human intervention. Image processing algorithms may be placed at three levels. At the lowest level are those techniques which deal directly with the raw, possibly noisy pixel values, with denoising and edge detection. In the middle are algorithms which utilize low level results for further means, such as segmentation and edge linking. At the highest level are those methods which attempt to extract semantic meaning from the information provided by the lower levels, for example, handwriting recognition [2]

Image restoration is distinct from image enhancement techniques, which are designed to manipulate an image in order to produce results more pleasing to an observer, without making use of any particular degradation models. Image enhancement refers to the techniques by which we try to improve an image such that it looks subjectively better by improving the visual appearance of the image [3]

GIS are commonly defined as an information system that manages, manipulates, and analyzes spatial data. GIS are used to produce information that is useful in decision making.[4]. a GIS is based on a structured database that describes the world in geographic terms, database . A GIS is a unique kind of database of the world—a geographic database (geodatabase), As part of a GIS geodatabase design, users specify how certain features will be represented of Ordered collections of vector-based features (sets of points, lines, and polygons), Raster data sets, networks, Terrains and other surfaces and Survey data sets.. GIS data sets include traditional tabular attributes that describe the geographic objects. These tabular information sets and relationships play a key role in GIS data models, just as they do in traditional database applications [5].

## ***2- estimation of noise type***

The problem of testing normality is fundamental in both theoretical and empirical research, the validity of parametric statistical inference procedures in finite samples depends crucially on the underlying distributional assumption. Consequently, there has been extensive focus on whether hypothesized distributions are compatible with the data.

There are two main approaches to checking distribution assumption [6][7][8].one involves empirical procedures which are easy to understand and implement and are based on intuitive and graphical properties of the distribution that we want to assess. Empirical procedures can be used to check and validate distribution assumption .there are also other, more formal, statistical procedures for assessing the underlying distribution of a data set. These are the goodness of fit (GoF) test. They are numerically convoluted and usually require specific software to perform the lengthy calculations. But their result is quantifiable and more reliable than those from the empirical procedure. Here, we are interested in those theoretical GoF procedures specialized for small samples

Gof tests are essentially based on either of two distribution element ,cumulative distribution function(CDF) or the probability density function(PDF).The normality assumption is at the core of a majority of standard statistical procedures, and it is important to be able to test this assumption. The null hypothesis for this test is normally distributed. Alternative hypothesis is concluded that the sample does not come from a normal distribution. This test of normality defines a criterion and gives its sampling distribution. When the probability associated with the criterion is smaller than a given  $\alpha$ -level [9].

Kolmogorov-Smirnov (KS) and Anderson darling (AD) procedure is used to test the null hypothesis that a sample comes from a particular distribution. It does this by finding the largest difference (in absolute value) between two CDFs .one computed directly from the data; the other, from mathematical theory. If the probability is low (significant) that indicates that the data are significantly different from the test distribution

The chi-square test ( $\chi$ ) is conceptually based on the PDF of the assumed distribution .if this distribution is correct, its PDF (yielding an area of unity)should closely encompass the data range [8].

## ***3. estimation of noise***

Noise reduction is very important in digital image processing. It can improve the accuracy or performance of other processing techniques that follow, such as image segmentation or recognition. Many noise reduction algorithms assume that the noise level is known a priori; and the algorithms are adopted to the amount of noise instead of using fixed parameters. To make the assumption come true, noise estimation becomes an important research topic.

They are classified into two different approaches: filter-based (or smoothing-based) and block-based. In filter-based methods, the noisy image is first filtered by a low-pass filter to suppress the image structures. Then the noise variance is computed from the difference between the noisy image and the filtered image. The main difficulty of filter-based methods is that the difference image is assumed to be the noise but this assumption is not true for images with structures or details. In blocked-based methods, images are tessellated into a number of blocks. The noise variance is then computed from a set of homogeneous blocks. The main issue of block-based methods is how to identify the homogeneous blocks. There were different approaches proposed for noise estimation [10].

## ***4. The suggested method***

Traditional Noise remover methods are depending on studying one method such as winner filter. This method yield to noise analysis with different intensity of noise for the same method. The aim of this method is to detect area that makes filter working on.

The suggested method is benefited from traditional method and determined best method for each level(intensity) of noise by choose suitable measure such as variance of noise for additive noise or probability of noise for impulse noise. The suggested methods are passed in multistage given below.

- 1- Image is tessellated into a number of blocks and selected the homogenous block then applied statistic test.
- 2- Extracted of feature, variance to additive noise and probability for impulse.
- 3- remover noise by choose suitable traditional method .

A schematics diagram of different stages is shown in Figure 1. Image have only color data but GIS image have color data and features therefore noise remover form GIS image is easy compared to image. GIS image remover is return to feature in each stage of the suggested method and deal with each region due to each important. First convert map to image and choose homogenous area from interest region then select remover method depend on detail of region

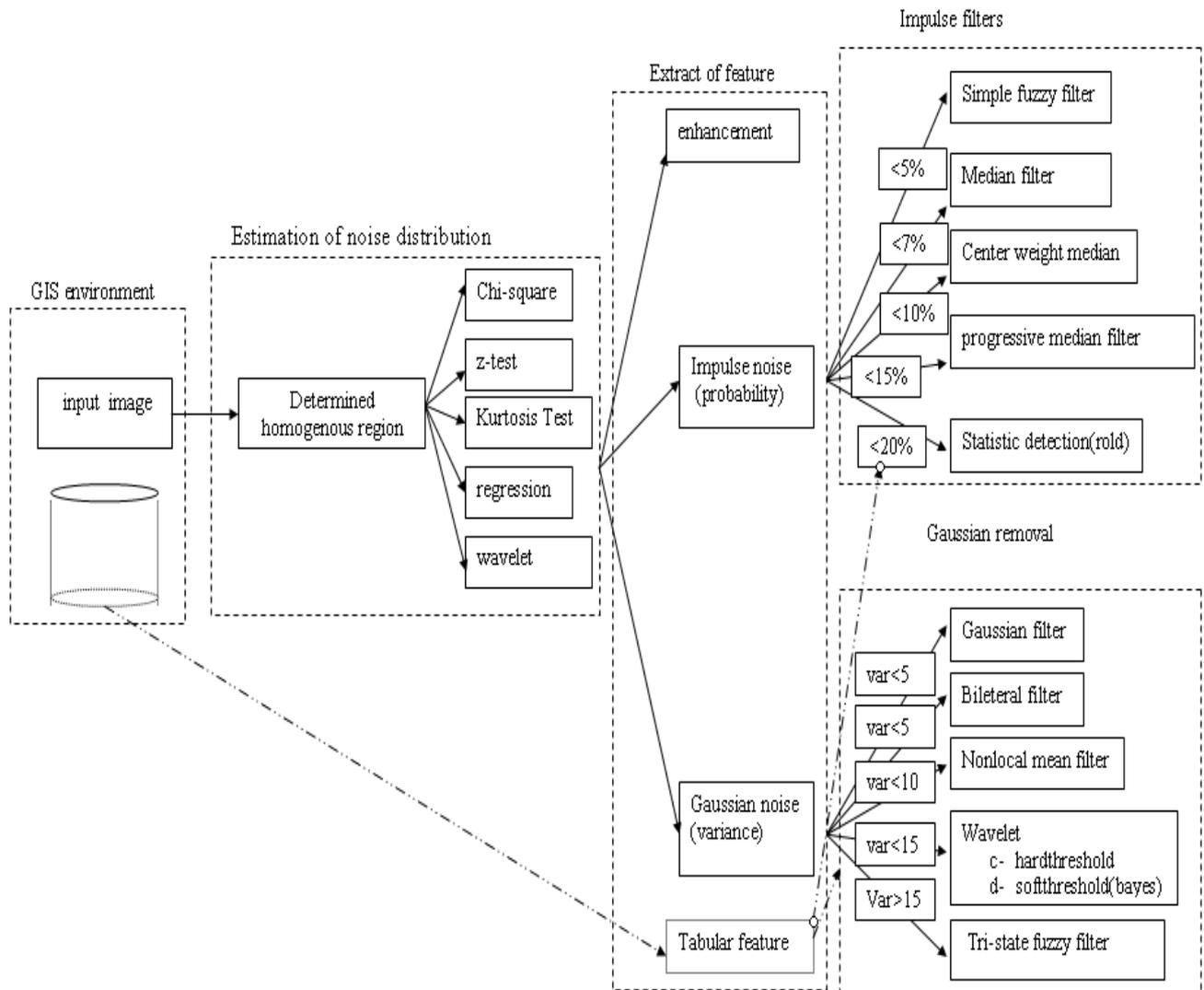


Figure 1. block diagram of suggested system

#### 4. Conclusion

To demonstrate the performance of the suggested method, extensive simulation experiments have been conducted on a variety of standard test images to select best method with distribution of noise and best method for extracted of feature, chi-square and KS is best in distribution of noise testing because they can applied with large sample more than 30, easy to apply, good for high level of noise and failed with low noised. Filter-base is best in extracted of feature than block-base but fail with low level of noise .Level of noise is variance less than 5 for additive noise and probability less than 3% for impulse noise.

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