International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 3 Issue 4, April - 2014

Automatic 2D-To-3D Image Conversion by Depth Estimation and Removal of Noise using Filter

[1]S. Shafiya Banu , [2] R. Nivedha,[3] M. Lakshmi Chaithra,[4] B. Regina,Asst Prof(SG)
[123]Student,[4]Guide, Department of Computer Science Engineering
Saveetha School of Engineering, Saveetha University,Thandalam,Chennai-602105

***Abstract* - 3D image has become a hot trend within the connected visual process field. However at this stage, the shortage of 3D content is turning into a vital issue that limits its development. The first purpose of image process is to convert image into valuable data. Several 2D-to-3D image and video conversion ways are planned. Ways involving human operators are most undefeated however conjointly time intense and expensive. Automatic ways, which usually create use of a settled 3D scene model, haven't however achieved constant level of quality. There are 2 ways for estimating the depth of the 2nd image: the primary one is predicated on learning a degree mapping from native image/video attributes, like color, abstraction position, motion. The second methodology is predicated on globally estimating the complete depth of an image directly from a repository of 3D pictures. Planned methodology is supported the approach of learning the 2D-to-3D conversion and removing the noise by use of median filter. Before stepping into additional steps the enhancement of clamant image is critical, for removing clamant image that is corrupted by the salt and pepper noise by exploitation mean filter. Presently concentrating on the removing the noise, increasing the bar chart of a picture and purpose mapping based mostly upon the color, abstraction location and motion. Demonstrating the effectiveness and also the machine potency of each depth estimation and image de-noising are mentioned and their drawbacks and advantages are given.**
Index Terms—3D pictures, stereoscopic pictures, image conversion, noise, salt and pepper noise, Guassian filter, mean filter, median filter, histogram, purpose mapping, image de-noising.

1. INTRODUCTION

Digital image process is apace involving fields with growing application in science and engineering. In today's world 3D has become a contemporary trend however still the shortage of 3D content is limiting the event of the 3D.A typical 2nd-to-3D image conversion method consists of 2 steps: depth estimation for a given 2D image and depth-based rendering of a brand new image so as to make a stereopairs[4]. Whereas the rendering step is well understood and algorithms exist that manufacture sensible quality pictures, the challenge is in estimating depth from one image. There are 3 basic approaches to 2D-to-3D conversion: the primary one is manual method(which totally depends on the human operator to estimate the depth) and also the second is that it needs each the human operators and machine referred to as semi-automatic method(where a talented operator assigns a depth to numerous elements of a picture supported this distributed depth assignment, a laptop algorithmic rule estimates dense depth over the complete image sequence).And third one is that it doesn't need human operator is named automatic method(computer algorithmic rule mechanically estimates the depth for associate degree single image by shading, structure from motion or depth)[5]. Image noise is random variation of brightness or color data in pictures, and is typically a side of electronic noise. Noise is that the major disadvantage that is thought to be associate degree unwanted signal or unwanted electrical fluctuation or it represent unwanted data that deteriorates image quality.

This paper highlights the removal of noise or distortion gift in each grey scale image and color image and conjointly to extend the bar chart of a picture that is littered with the salt and pepper noise, before moving to depth recovery half, the depth based mostly rendering method are exhausted the long run. The removal of noise is completed by exploitation some filtering technique like mean, median, guassian, minimum and most filtering[37]. Here we have a tendency to solely think about the median filter so as to get the correct image with the image quality.

2. PREVIOUS APPROACH

There are 2 sorts of 2D-to-3D image conversion methodologies: manual methodology and semi-automatic method. Manual methodology needs human operator to estimate the depth of a picture that is time intense, pricey and error prone too. However in semi-automatic methodology involves human operator and machine, where the trained human operator find the depth of a picture and also the remaining a part of the result execution are done by the machine[8][11]. Ways involving each the human operators and machine are most undefeated however conjointly time intense and also the level of quality isn't however achieved up to needed level[2]. The standard here refers to a picture while not noise and fewer intensity of the image. Several ways are planned so as to cut back the noise in a picture, however those ways were happened to be failing and intensity of a picture isn't achieved.

1. PROPOSED APPROACH

In the previous approaches[1][3][5] it's clear that once we go in manual or semiautomatic methodology is it error prompt and conjointly time intense. Thus we have a tendency to move to automatic ways wherever solely the machine involves so as to estimate the depth of a picture and to get the corresponding result by corporal punishment the pc algorithmic rule. By the automated methodology the depth estimation is completed by the purpose mapping based mostly upon the color, abstraction location and also the motion of a picture[9][15]. And thereby the standard of a picture is achieved by removing the noise and by increasing the intensity of a picture. Image noise is random variation of brightness or color data in pictures, and is typically a side of electronic noise. Noise is that the major disadvantage that is thought to be associate degree unwanted signal or unwanted electrical fluctuation in a picture thus the standard isn't achieved to beat this median filters are used to accustomed take away the noise in a picture

2. DEPTH ESTIMATION

In Automatic ways, no operator intervention is required and a automatic algorithmic rule mechanically estimates the depth for one image. To the present result, ways are developed that estimate form from shading, structure from motion or depth from defocus[7][10]. Though such ways are shown to figure in some restricted eventualities they are doing not work well for absolute scenes. In an effort to equip 3D TVs, Blu-Ray players and recreation consoles with period automatic 2D-to-3D conversion, client physical science makers have developed easier techniques that deem numerous heuristic assumptions however such ways fail on tougher scenes. Recently, machine-learning-inspired ways are planned to mechanically estimate the depth map of one monocular image by applying image parsing[20][25]. Though restricted to field of study scenes, these ways opened a brand new direction for 2D-to-3D conversion. In figure 4.1 describes the depth estimation of a picture based mostly upon the color, abstraction location and motion of a picture, compared to alternative ways automatic depth estimation is a lot of economical and it's improved performance

4.1 Design

The figure shown below explains regarding the Depth estimation from color, spacial location and motion. And also the Black indicates smallest depth. Initially the 2nd image is given as associate input to the method. Additional 3 steps are concerned within the method of depth estimation they are:

- Estimating the depth primarily based upon the color
- Estimating the depth primarily based upon the situation
- Estimating the depth primarily based upon the motion

Output is generatedfor every estimation and everything of those output area unit wrapped along so as to come up with one smallest depth assessable image[6][30]. The wrapped output of every method is denoted by Wc , Wl , Wm as shown below.

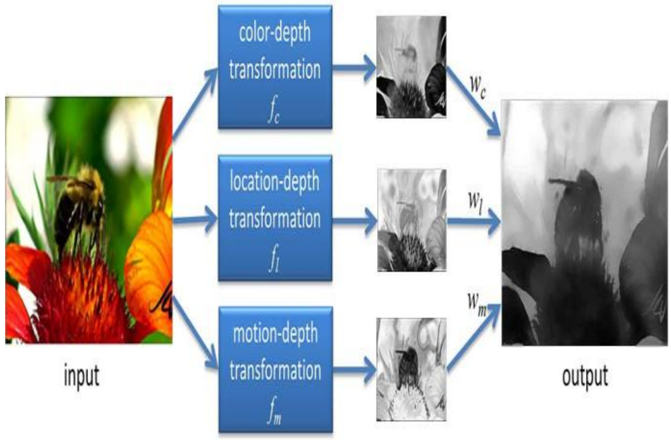

FIG 4.1: Design of depth estimation based on color, location and motion.

3. NOISE REDUCTION

Noise reduction is the process of reducing the noise which is present in the image. There are 2 steps in the noise reduction one is noise detection, by which we can identify the location of the noise in an image and another method is noise replacement which is done by some image de-noising technique which is clearly discussed below

5.1 Noise Detection

Noise in image is any degradation in a picture signal, caused by external disturbance whereas a picture is being sent from one place to a different place via satellite, wireless and network cable. Noise represents unwanted data that deteriorates image quality[17][28]. Noise reduction is that the method of removing noise from a picture. By that the standard of a picture is additionally scale back. There are different kinds of noise in image process, few noise are listed below.

Types

- Salt and pepper noise
- Gaussian noise
- Shot noise
- Quantization noise (uniform noise)
- Anisotropic noise
- Speckle noise
- Periodic noise

- In Salt and pepper noise (sparse lightweight and dark disturbances), components within the image area unit terribly totally different in color or intensity from their encompassing pixels; the shaping characteristic is that the worth of a loud pixel bears no relevancy the color of encompassing pixels. Typically this kind of noise can solely have an effect on a little range of image pixels. Once viewed, the image contains dark and white dots, thus the term salt and pepper noise. Typical sources embody flecks of dirt within the camera.

- In mathematician noise, every component within the image are modified from its original worth by a (usually) bit. A bar graph, a plot of the number of distortion of a component worth against the frequency with that it happens, shows a traditional distribution of noise. whereas alternative distributions area unit potential, the mathematician (normal) distribution is sometimes an honest model, attributable to the central limit theorem that claims that the add of various noises tends to approach a normal distribution. In either case, the noise at totally different pixels will be either correlative or uncorrelated; in several cases, noise values at different pixels are totally being freelance and identically distributed, and thus unrelated.

- In Shot noise, The dominant noise within the lighter components of a picture from a picture sensing element is usually that caused by applied mathematics quantum fluctuations, that is, variation within the range of photons perceived at a given exposure level. This noise is thought as gauge boson shot noise. Shot noise features a root-mean-square worth proportional to the root of the image intensity, and also the noises at totally different pixels area unit freelance of 1 another. Shot noise follows a distribution, that is sometimes not terribly totally different from mathematician.

- In division noise, the noise caused by quantizing the pixels of a perceived image to variety of distinct levels is thought as division noise. It's associate close to uniform distribution. It will be signal dependent, it'll be signal freelance if alternative noise sources area unit large enough to cause video digitizing, or if video digitizing is expressly applied

- In anisotropic noise, noise sources show up with a big orientation in pictures. as an example, image sensors area unit typically subject to row noise or column noise.
- In Speckle noise, it will be designed by random values increased by the component values of a picture.
- In Periodic noise, it's the looks once signal is subject to a periodic, instead of a random disturbance.

These are the few forms of noise gift in a picture, that reduces the standard of a picture in addition because it can corrupt the knowledge that is sent by the image. By understanding the on top of mentioned noise, we will simply determine the kind noise that is gift within the image. Within the noise detection step, location of noise is known. Thus we tend to filter those noise by mistreatment some filtering technique as mentioned below.

SOURCE OF IMAGE NOISE:

- Error occur in image signal
- Sensor heat
- Size of sensing element

5.2 Image De-Noising

Image de-noising is additionally referred to as filter, it's the method of removing the assorted forms of noise or unwanted data gift in a picture primarily based upon their properties whereas keeping the main points of the image preserved. Image filtering isn't solely accustomed improve the image quality however additionally used as a preprocessing stage in several applications as well as image encryption, pattern recognition. General purpose image filter lack the flexibleness and adaptableness of un-modeled noise sorts. Pictures area unit typically corrupted by random variations in intensity, illumination, or have poor distinction and can't be used directly. The term Filtering is outlined as rework component intensity values to reveal sure image characteristics

- Enhancement: improves distinction
- Smoothing: take away noises
- Template matching: detects better-known patterns.

Noise reduction involves 2 steps one is noise detection and another one is noise replacement. The noise detection is that the opening move, location of noise is known. The noise replacement is that the second step, within which the detected reedy pixels area unit replaced by the calculable values.

NOISE REMOVAL TECHNIQUE

- Minimum Filtering
- Maximum Filtering
- Mean Filtering
- Median Filtering
- Guassian Filtering
- Rank Order Filtering

- In Minimum filtering technique, this component is replaced by the minimum component worth of its neighboring pixels.
- In most filtering technique, this component is replaced by the most component worth of its neighboring pixels.
- In Mean filtering technique, current component is replaced by the {arithmetic mean, first moment, expectation, expected worth, mean, mean value} value of its neighboring pixels.
- In Median filtering technique, current picture {element, component, constituent, element} is replaced by the middle element of its neighboring pixels.
- In ordering filter, current component is replaced by the user outline order its neighboring pixels. For Example: (order=20)
- In Guassian filtering technique, the reedy component is replaced by the resulted worth of multiplication of kernel matrix and designated region from the image. it's accustomed take away the noise and blur from a picture

ISSN: 2278-0181
Vol. 3 Issue 4, April - 2014

5.3 Noise Replacement

There are unit several ways used for reducing noise. However the normal median filter and mean filter area unit accustomed scale back the salt and pepper noise and Guassian noise severally. The noise replacement is that the method of exchange the calculable values within the place of detected reedy pixels. During this approach a picture with the salt associated pepper noise is taken as an input and it's removed by mistreatment the median filter so as to realize the great quality of the image compared to all or any the filters.

SALT AND PEPPER NOISE REMOVAL

It is additionally referred to as impulse noise or spike noise. This noise will be caused by sharp and sudden disturbance within the image signal. It look is arbitrarily scattered as white and black dot (or both) pixels on the image. a picture containing salt and pepper noise can have dark pixels in bright regions and bright pixels in dark regions. This kind of noise is caused by the dead pixels, analog to digital device error and bit error whereas transmission. If the intensity worth of the component is a smaller amount than or adequate zero then there's pepper noise and if the intensity worth of component is bigger than or adequate 255 then there's salt noise. There are solely 2 risk values exists that's, a and b. and also the likelihood of every is a smaller amount than 0.2

$$\text{Intensity value of pixel at position}(x, y) = \begin{cases} \leq 0, & \text{pepper noise} \\ \geq 255, & \text{salt noise} \end{cases}$$

MEDIAN FILTER

Median filter is that the easy and powerful filter. It's used for reducing the number of intensity variation between one component and also the alternative component. During this filter, we tend to replace component worth with the average. The median is calculated by initial sorting all the component worth's into ascending order so replaces the component being calculated with the center component value.

$$L(u,v) \rightarrow \text{mid}\{|(u+i,v+j)|(i,j) \in R\}$$

Step 1: Put the pixel values of the surrounding (of noisy pixel) pixels in a single dimensional array

Step 2: Sort this array in ascending order

Step 3: The noisy pixel value is replaced by middle element of the sorted array.

Syntax to remove the salt and pepper noise using median filter:

- Read the image from the file system to matrix I
- Creates a new figure to show the image.
- Show the loaded image as a figure1.
- Apply median filter using the function medfilt2 .
- Show image after applying the filter as a figure2.
- Write the new image to the file system.

figure 5.3(a) Original image

figure 5.3(b) Image with salt and pepper noise

figure 5.3(c) Filtered image by using median filter

BENEFITS

- The importance of the image sequence process is consistently growing with the ever increasing use of the digital television and video systems in shopper, commercial, medical, communication applications.
- It has several advantage over analog image process, it permits a far wider vary of algorithmic rule to be applied to the computer file will avoid issues like build-up of noise and signal distortion throughout the process. So the noise filtering or image de-noising is a very important task within the image process.
- By de-noising a picture it conjointly improves and quality of a picture and also the data sent within the image is evident.

4. CONCLUSION

Digital image process is apace evolving field with growing application in science and engineering and 3D content has become the fashionable trend in today's world. During this paper, we tend to planned a replacement category of ways geared toward 2D-to-3D image conversion that area unit supported the radically completely different approach of learning that involves 2 steps:
One technique that's primarily based upon a degree mapping from native image attributes to scene-depth. The opposite technique is predicated on globally estimating the whole depth of a picture. For the depth estimation primarily based upon purpose mapping from the native image attributes like color, spacial location and motion, the ways and also the method to estimate the depth mechanically is clearly mentioned. Each the depth estimation of a picture and depth primarily based rendering area unit tired the longer term. The planned algorithmic rule is achieved in terms of each assessable depth quality and procedure quality. Enhancement of a picture is critical before getting in the training primarily based conversion of 2nd image into 3D. Therefore, we tend to specialize in the image de-noising, the planned ways area unit utilized in order to scale back the unwanted data or distortion that is termed as noise which will be caused by the external force whereas a picture is being transmitted, where as transmittal a picture knowledge over Associate in Nursing unsecure channel, a noise also can be other by effort. This paper highlights the noise removal ways for the grey scale image likewise because the color image and conjointly to extend the bar graph of a picture that is corrupted by the salt and pepper noise. For removing the salt and pepper noise, noise filtering techniques area unit used like minimum, maximum, mean, median and guassian. However the median filter produces the proper image compared to all or any alternative filtering techniques. With the unceasingly increasing quantity of 3D knowledge on-line and with the apace growing computing power within the cloud, the planned algorithmic rule looks a promising various to operator-assisted 2D-to-3D conversion and removal of noise in a picture.

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