A NOVEL APPROACH ON RANSAC ALGORITHM

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ABSTRACT

The proposed paper presents the new and automatic technique to estimate the anaglyph stereo image from the depth image. We introduce the new algorithm Random Sample Consensus (RSANSAC) to generate the 3d anaglyph image. This technique is based on new image registration based on the point matching feature extraction from the input image using matching points technique. Corresponding between points image extraction from the different images is establish using RANSAC method. The initial corresponding is establish using enumerative search with rotation invariant cross-correlation measure, based on the estimated corresponding set of inliers points to overlapping image area. Ransac method down-projects the plane filtered points on to 2D, and assigns correspondences for each point to lines on the 2D map. The full sampled point cloud is processed for obstacle avoidance for autonomous navigation. Hence, a natural choice is to extract geometric features from the point cloud, and process these features instead of the raw point clouds. The task of geometric feature extraction itself is challenging due to noisy sensing, geometric outliers and real-time constraints. Random Sample Consensus (RANSAC) as belonging to planes in 3D. The plane filtered points are then converted to a set of convex polygons in 3D which represent the planes detected in the scene. The detected convex polygons are then merged across successive depth images to generate a set of scene polygons and construct the depth image to stereo image.

Keywords: Depth Map, Feature Extraction and Detection, Ransac Method, Anaglyph 3D Image

1. Introduction

The availability of low cost depth cameras has provide the 3D sensing capability of the 3D cloud points, which was mostly used only the possible in the most expensive sensor like time of flight cameras. The application like 3d mapping and reconstruction, object recognition can be benefit from the sensors [18]. Indoor mobile robots have limited onboard computational power it is infeasible to process the complete 3D point clouds in real time and at full frame rates. Feature extraction and geometric extraction is the natural choice of the sensor data [15]. We introduce the 2d to 3d conversion technique to estimate the depth from original image and find out the 3d points from that image and reconstruct the 3d image from the depth image. After construct the depth we are using Ransac algorithm to find the set of 3d filtering points from the depth images and the convex polygons in 3d to fit these plane filtering points [7]. 3d image become a more and more in every life like medical images, 3d gaming etc. several technique are used to convert the existing 2d image to 3d images, in many cases these techniques are semi-automatic in suitable operations are used to estimate the depth map from the original image to generate the depth image from the machine learning algorithm. And other methods based on the motion of the objects relative to the cameras to find the depth map from the analyzing the optical flow [8]. We are using another algorithm to use the focus to the depth map by using sift flow to estimate the inferred depth image from the original image[10]. In this paper we used the novel image classification to able to digital image processing to converting 2d image to 3d image by using the following steps:

1. Convert the original image to depth image.
2. Extract the feature from the depth image using Ransac method.
3. Generate anaglyph 3D stereo image.

The method is well suitable for the real time application.

2. Related Work

The availability of low cost depth cameras has provided the 3D sensing capability of the 3D cloud points. Depth map can be constructing using the image segmentation, color based segmentation and region based segmentation then we recover from depth image from the original images proper way. For construct the depth image we are using two types of technique are vanishing line detection and gradient planes generation [10]. Depth map generation by using fusion. Vanishing line mostly used outdoor without geometric elements. This algorithm can be used edge detection and noise removal and detect the straight lines. Gradient planes are used to find the slope of vanishing line detection and depth map generation by fusion is depending on two images. This is mostly used in the indoor images. After getting the depth images using the 3d cloud points. 3d image contain many advantages over 2d image [3]. 2d image give only the limited information of the physical shape of a object and 3d image express the geometric in terms of the three dimensional coordinates. Image registration is the process overlying two or more images has same images taken from different time and different viewpoints and/or by different sensors [5]. Ransac algorithm handles this problem by introducing a classification of the data into inliers and outliers while estimating the optimal transformation of the inliers [10]. A threshold value is used, it insure that none of the inliers deviates from the model by more than threshold value

3. Depth Map Generation

To estimate the depth using the defocused image from multiple cameras is much research topic. But single defocused images have so far not been successfully used for the same [18]. Some attempts have been made on different approaches, specifically using low level cues in order to obtain information about relative depth. Such depth maps are referred to as 2.5 D maps because they are not completely successful in providing information [16] about the 3rd dimension. Estimation of depth from single image involved in geometry based techniques [1]. The proposed method estimates the relative depth in the image directly by estimating the blur in various parts of the pictures. A poor assumption made in this method is that the focused part of the image is closer to the imaging system and the defocused (or blurred) part is farther away. Under this assumption, objects closer by are identified by their fine resolution and details and those farther away are characterized by their blurry nature. The reverse heat equation is used to measure the amount of blur at different regions of the image [6]. A good amount of literature is available on the use of stabilized reverse heat equation for restoration purposes [3]. Using the reverse heat equation, the image is restored in a spatially variant manner. The regions which are restored sooner will be finer resolution regions, assumer to be closer to the imaging system, whereas those regions which take longer time to be restored will be the blurred regions [11]. The assumption made regarding the correlation between the blur of a region in the image and the depth of that particular region is certainly flawed [4]. In many cases it may be possible for nearby objects to be blurred and objects farther away to be focused. Yet, in cases where accuracy may not be the prime goal, this Method may yield invaluable information to computer vision scientists as supplementary information to be used to identify, classify and understand the interaction of various objects in a scene[14]. The Following concepts were identified as crucial to understanding and appreciating the topic in its fullness:

1. Formulation of partial differential equations (PDE) of the continuous image intensity field based on Identified criterion

2. Discretization of the partial differential equation for implementation on a coding platform

3. Understanding of the heat equation and its implication on blurring and de-blurring of an image.

The depth estimation approach used here is indirectly a blur measurement technique. The measure of blur in a particular region directly corresponds to the relative depth of that region[12]. In order to measure the blur, the reverse heat equation to be used,

$$\frac{\partial u}{\partial t} = -c + \left(\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}\right)$$

The reverse heat equation performs an operation opposite to blurring. Hence, it is used to restore blurred images to their original condition. If the reverse heat equation is applied to individual regions of an image, each blurred to a different extent, it would take different amount of time to restore each region[14]. Hence, the time taken to restore any region can be considered to be proportional to the blur of that region In order to detect that the region has been restored, the unstable nature of the reverse heat equation has been used. A stopping criterion has been defined, which detects when each pixel neighborhood begins to become unstable while applying the reverse heat equation to the image [5]. That particular pixel neighborhood which becomes unstable is assumed to be restored and so the reverse heat equation is no longer applied to it in the next iteration. Using the stopping criterion the PDF depth image construct the following equation [8]

$$\frac{\partial u}{\partial t} = -\beta(x,y)\,C\left(\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}\right)$$

$$\beta(x,y) = 1 \quad if \ |\nabla u - \overline{\nabla u}| < \theta$$

$$0 \quad else$$

Here ∇u represents the gradient at the point (x, y) and $\overline{\nabla u}$ represent the average gradient at the Surrounding points. The value of θ can be intuitively chosen to be some fraction of the maximum pixel intensity. Image defined the fraction from the range of 0.2 to 0.4. Greater and lesser values of θ than that have also been considered during testing of the algorithm.

Figure1: Original Image

Figure2: Depth Image

4.RANSAC ALGORITHM

The Ransac algorithm is used to extract features between the pair of depth images [9]. Image registration is the process overlying two or more images of the same scene taken from the different time, from different viewpoints, and/or by different sensors. It geometrically aligns two images that is reference and sensed images. Feature detection and initially correspondence estimate the same objects independently two images [5]. Here we are using the feature extraction that corner detection that is matching points. Corner detection and matching point are used somewhat interchangeably and refer to point like feature in a image. Edge detection is points where there is boundary between the two images. Edge is almost arbitrary shape and may include the junctions [1, 6]. Edge is defining the set points in an image which is strong gradient magnitude. The GeometricTransformEstimator object estimates geometric transformation from matching point pairs and returns the transform in a matrix. Use this object to compute projective, affine, or no reflective similarity transformations with robust statistical methods, such as, RANSAC and Least Median of Squares. The success of estimating the correct geometric transformation depends heavily on the quality of the input point pairs. If you chose the RANSAC or LMS algorithm [14], the block will randomly select point pairs to compute the transformation matrix and will use the transformation that best fits the input points. There is a chance that all of the randomly selected point pairs may contain outliers despite repeated sampling. Ransac image matching is done the following steps:

1. Detect the feature in an image.
2. Select as small data subset as possible. Basically, the number of data points necessary to solve the least-squares approximation is used. The subset must be selected randomly among the correspondence points.
3. Calculate the transformation model using the selected subset. Use the least-squares approximation here.
4. Transform all the other correspondence points with the calculated transformation and classify them into inliers and outliers using a threshold *t*.

5. Remember the transformation if the number of inliers is big enough.
6. Repeat this process a specified number of times.
7. When the iterations are finished, re-estimate the model using the inliers. This step provides the optimal model w.r.t the inliers found previously.
8. Re-classify the inliers as in step 4 with threshold *t*. Indeed, after step 7, additional points may be classified as inliers.
9. Repeat step 8 and 7 until the number of inliers converges.

Figure3: Original image

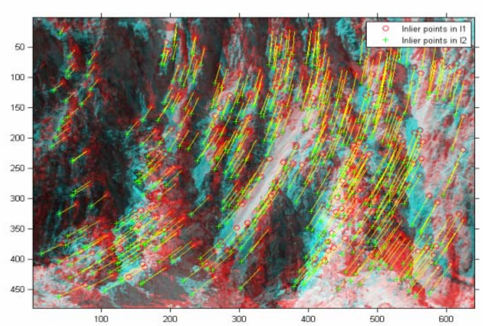

Figure4: RANSAC Image

5. Stereo Image Construction

An area of increasing interest in computer vision is the fusion of 2D images with depth maps from 3D sensing devices to obtain more sensor 3D information about the scene. Before this can be achieved, one must have an accurate method for the calibration of the 3D sensing devices and the pinhole cameras[11]. A robust method for registering depth maps from 3D sensing devices into point clouds reconstructed from 2D images. Our new calibration method explores RANSAC registration to take into account the high-noise nature of current 3D sensing technologies. We solve this by using a novel application of the RANSAC algorithm to robustly register two point clouds obtained from the 3D sensing device and the pinhole camera [10]. The primary challenge for solving a problem of nature lies in the image registration of depth map with high noise content to point cloud reconstruct from images. The registration of point cloud of 3D points with pairs of stereo cameras [9]. The root of this method relies on the ransac method to obtain the respective transformation between each of the two cameras and 3D sensing device. The set of 3D points obtained from 3D sensing device into points obtained 3D construction from the depth image.

There are several steps to construct the depth image into 3D image:

1. Find the corresponding points between two images.

2. Calculate the real world coordinates in the composite image.

3. Calculate the real world coordinates in the 3D device image frame using the depth data.

4. Perform the registration between the point clouds using the RANSAC.

5. Construct the anaglyph 3D effect image.

Figure5: Stereo Image

Stereo image rectification projects images onto a common image plane in such a way that the corresponding points have the same row coordinates. This process is useful for stereo vision, because the 2-D stereo correspondence problem is reduced to a 1-D problem. Stereo image rectification is often used as a pre-processing step for computing disparity or creating anaglyph images.

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7. Conclusion and Future Work

These papers propose the depth map generation from a single image for 2D to 3D conversion with user interaction. The proposed method combine the depth hypothesis with salient segmentation image and refine the depth image using defocused color segmentation of pixel based depth image. The proposed depth map maintains the salient depth values and local transition of depth. Ransac method to find the point cloud matching between images and reconstruct the image into stereo image that is anaglyph 3D effect image. A single solution converting the 2d image into 3d image does not exist that is convert the image into depth map and apply the ransac method find the feature point clouds of that depth image to convert the anaglyph 3D image. Now a days this technique using in 3D TV's and 3D movies.

8. References

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