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MOSAICING IN VARIOUS IMAGES: A SURVEY

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ABSTRACT

K-means clustering and watershed are the key techniques used as a combination, Edge detection procedure and region, merging are also used. Merging method based on mean gray values and edge strengths (T1, T2) are used to avoid over segmentation. To merge different regions of same object different gray levels are used. Fuzzy enhancement is used to realize the image detection; this also solves the problem of clearance. A comparative study of various edge detection techniques is also proposed in this paper. To present the face mosaic, a statistical model containing mean images and Eigen images are used instead of only one image template. The integration of digital image processing and laser light projection for the synthesis of geo referenced 3D optical maps of underwater scenes are developed through these techniques.

KEYWORDS: Difference in Strength (DIS), AUV (Autonomous Underwater Vehicle), vertical character stroke (VSB).

INTRODUCTION

An edge is a boundary or contour of a digital image at which a significant change occurs in some physical aspect of an image, namely surface reflectance, illumination or the distances of the visible surfaces from the point of view of a viewer. The major problem in image processing and computer vision is image deblurring. There exist many robust algorithms and successful commercial products that operate in wild, where quality evaluation of image stitching generally involves qualitative evaluation and quantitative evaluation with statistical indicators which are also known as subjective evaluation methods, the subjective quantitative image eventually lack lack of accurate quantitative measurements and are susceptible to objective factors. Image registration is a crucial step in image mosaicing. Also the issue that has several drawbacks is image registration using multiple images, which are eliminated by various overcoming methods described in the paper. The first step towards overcoming such issues is to first register an image as a reference image. Such images are used as target images and the remaining images are used as estimate of the floating reference and are also termed as source images. For creating virtual environments the conventional method used is a cylindrical panorama which also helps in covering horizontal views. However this method has its limitation, which forces the user to employ a tripod and to limit the camera motion to only horizontal rotation.

PRESENT THEORY AND PRACTICES

Nassir Salman proposed 'Image Segmentation Based on Watershed and Edge Detection Techniques', a combination of K-means, watershed segmentation method, and Difference in Strength (DIS) map was used to perform image segmentation and edge detection tasks. We obtained an initial segmentation based on K-means clustering technique. Starting from this, we used two techniques; the first is watershed technique with new merging procedures based on mean intensity value to segment the image regions and to detect their boundaries. The second is edge strength technique to obtain an accurate edge map of our images without using watershed method. In this paper: We solved the problem of undesirable over segmentation results produced by the watershed algorithm, when used directly with raw data images. Also, the edge maps we obtained have no broken lines on entire image and the final edge detection result is one closed boundary per actual region in the image.

Byeong-Ho KANG proposed 'A Review on Image and video processing'; Image and Video Processing are hot topics in the field of research and development. Image processing is any form of signal processing for which the input is an image, such as photographs or frames of video; the output of image processing can be either an image or a set of characteristics or parameters related to the image. Most image-processing techniques involve treating the image as a two-dimensional signal and applying standard signal-processing techniques to it. Video processing is a particular case of signal processing, where the input and output signals are video files or video streams. Video processing techniques are used in television sets, VCRs, DVDs, video codecs, video players and other devices. In This paper, we present Image and Video processing elements. We also present the current technologies related to Image and Video Processing.

Er. Snigdha Mohanty proposed 'Edge Detection: A Comparison', Edge detection is one of the most frequently used techniques in digital image processing. Its application area reaches from astronomy to medicine where isolation of objects focused on from the unwanted background is of great interest. Edge detection has also found application for photogrammetric purposes. In this study, edge detection has first been practiced on stratigraphic structures, which are crucial to geologic time scaling, using digitized images from an analog no camera. The raw images have been low pass filtered in order to suppress the huge amount of unnecessary details. Four types of methods have been used and inter-compared with each other. One of the problems encountered is long processing times to gradient operations in both directions on the images. Natural layering of structure has been exploited in order to reduce computing time. Edge detection followed then from single direction. Taking over close grey values of linear edges with the non-required background leads to unclear detection of edges. Another practice of this study is to extract the faults in the western part of the north Anatolian Fault Zone on a digitized image taken by TK350 camera. A comparison of extracted details with geological maps has been undertaken. Here, the biggest problem is that the faults can be misidentified as geomorphologic formations. Hydrological attributes such as streams, water lines etc. exhibit same characteristics as with the faults. The joint problem of both applications is the quantization of linear details via dilatation. Automation is the last step of the entire edge detection process and has been still a difficult task.

Uvika proposed 'A Comprehensive Review On Different Edge Detection Techniques', Edge detection is one of the most commonly used operations in image analysis and is also an essential pre-processing step in image segmentation. An edge is the boundary between an object and the background, and indicates the boundary between adjacent parts of image and overlapping objects. Here we are reviewing several techniques for edge detection like Sobel operator technique, Prewitt technique, Fuzzy Edge Detection technique, Canny technique, Roberts technique and Morphology based multi structure elements edge detection technique.

Mohamed A. El-Sayed proposed 'New Edge Detection Technique based on the Shannon Entropy in Gray Level Images', Edge detection is an important field in image processing. Edges characterize object boundaries and are therefore useful for segmentation, registration, feature extraction, and identification of objects in a scene. In this paper, an approach utilizing an improvement of Baljit and Amar method which uses Shannon entropy other than the evaluation of derivatives of the image in detecting edges in gray level images has been proposed. The proposed method can reduce the CPU time required for the edge detection process and the quality of the edge detector of the output images is robust. A standard test images, the real-world and synthetic images are used to compare the results of the proposed edge detector with the Baljit and Amar edge detector method. In order to validate the results, the run time of the proposed method and the previous method are presented. It has been observed that the proposed edge detector works effectively for different gray scale digital images. The performance evaluation of the proposed technique in terms of the measured CPU time and the quality of edge detector method are presented. Experimental results demonstrate that the proposed method achieve better result than the relevant classic method.

Firas A. Jassim proposed 'Semi-Optimal Edge Detector based on Simple Standard Deviation with Adjusted Thresholding', This paper proposes a novel method which combines both median filter and simple standard deviation to accomplish an excellent edge detector for image processing. First of all, a denoising process must be applied on the grey scale image using median filter to identify pixels which are likely to be contaminated by noise. The benefit of this step is to smooth the image and get rid of the noisy pixels. After that, the simple statistical standard deviation could be computed for each 2*2 window size. If the value of the standard deviation inside the 2*2 window size is greater than a predefined threshold, then the upper left pixel in the 2*2 window represents an edge. The visual differences between the proposed edge detector and the standard known edge detectors have been shown to support the contribution in this paper.

Li Yinghua proposed 'The Application of image edge detection by using fuzzy technique', A new method to deal with images by computer is put forward, which is more convenient for the eyes to identify and much easier to understand. As the edge is a basic feature of image, checking it is one of the most important parts in processing image. The traditional technique is to use the edge detection partial operator, which is to detect the gray level changes of neighbors of every pixel, and to detect the edge by using the changing regular of one-order or two-order directional differential coefficient. But sometimes there is uncertainty of the edge, and man can't distinguish whether it is the edge or not. In order to turn the fuzzy edge to be clear and solve the problem above, this paper mentions fuzzy enhancement to realize image edge detection. Fuzzy technology is a newly rising technology used in many fields, especially in the image processing, and fuzzy enhancement is one important part of the fuzzy technology. Based on this technology, this paper firstly sets the image fuzzy feature plane of the original image, secondly precedes the fuzzy enhancement, and then detects the edge by Sobel differential arithmetic. At the end of the paper, it realizes the histogram algorithm and the fuzzy enhancing algorithm by Visual C++. Results of the experiment show that fuzzy enhancement is superior in image processing.

Meghana D. More proposed 'Edge detection techniques: a comparative approach', the outer shape of the object plays a vital role in human visual system for its recognition. Edges characterized boundaries in image and hence problem of fundamental importance image processing. There are various areas in image analysis and pattern recognition where most of the input images are edge detected images. We know that the image is composed of object and its background. So for the recognition of object from its background, the process which is very important is known as edge detection. This paper presents a comparative study of different edge detection techniques. There are different edge detection techniques such as sobel, Roberts operator, prewitt's cross operator and canny's edge detector, laplacian, Laplacian of Guassian. Xiaoming Liu proposed 'Geometry-Assisted Statistical Modeling For Face Mosaicing'; The modelling of facial appearance has many applications. This paper proposes an approach to generating a statistical face model based on video mosaicing. Unlike traditional video mosaicing, we use the geometry of a face to improve the mosaicing result. Given a face sequence, each frame is unwrapped onto certain portion of the surface of a sphere, as determined by spherical projection and the minimization procedure using the Levenberg-Marquardt algorithm A statistical model containing a mean image and a number of eigen images, instead of only one image template, are used to represent the face mosaic. Good experimental results have been observed.

L. Brignone proposed 'First sea trials of a laser aided three dimensional underwater image mosaicing technique', Geo-referenced optical surveys of the seabed are obtained by composing mosaics of underwater images to allow scientists to study marine habitats, classify their features, quantify the population and measure the evolution over time. These are sought after tools but extremely complex to produce given the extent of the surfaces to map and the limited swath and range obtainable with standard diver or ROV operated image surveys. In this article we describe the development of an original technique based on the integration of laser light projection and digital image processing for the synthesis of geo-referenced 3D optical maps of underwater scenes. For testing purposes a full scale payload prototype has been designed and integrated to IFREMER's experimental AUV (Autonomous Underwater Vehicle) Vortex. Promising results are shown using data collected during dedicated sea trials performed in the Mediterranean Sea.

Miao Ligang proposed 'Automatic Document Image Mosaicing Algorithm with Hand-held Camera', This paper presents an image mosaicing method for camera-captured document images, and it can be used to stitch multiple overlapping document images into a large high resolution image. First, we use the nearest-neighbor (NN) clustering technique in document skew rectification to locate the horizontal vanishing point of the text plane. Secondly we partition the image into multiple overlapping blocks centered with the centroid of each connected component (CC), and propose a run-length opening algorithm (RLOA) to compute the local orientation of vertical character stroke (VSB), which is used to locate the document's vertical vanishing point. Thirdly, a three-step hierarchical rectification method is proposed to rectify document images. Finally, it uses local alignment constraints of all the overlapping image pairs to construct global alignment model, thus, to eliminate the error accumulation effectively. This method is unique in not calibrating the internal and external camera parameters in advance and not restricting the camera position and it can produce a high resolution and accurate full page mosaic from small image patches of a document.

Yair Poleg proposed 'Alignment and Mosaicing of Non-Over lapping Images', Image alignment and mosaicing are usually performed on a set of overlapping images, using features in the area of overlap for alignment and for seamless stitching. With- out image overlap current methods are helpless, and this is the case we address in this paper. So if a traveler wants to create a panoramic mosaic of a scene from pictures he has taken, but realizes back home that his

pictures do not overlap, there is still hope. The proposed process has three stages: (i) Images are extrapolated beyond their original boundaries, hoping that the extrapolated areas will cover the gaps between them. This extrapolation becomes more blurred as we move away from the original image. (ii) The extrapolated images are lined and their relative positions recovered. (iii) The gaps between the images are inpainted to create a seamless mosaic image.

Yi Ding proposed 'Reducing Misregistration Based on Feature Image Mosaicing', Image mosaicing has been collecting widespread attention because it can automatically construct a panoramic image from multiple images. Among previous methods, homograph-based methods are the most accurate in the geometric sense. This is because these methods use planar projective transformation, which consider perspective effects as a geometric transformation model between images. We propose an automatic image mosaicing method which can construct a panoramic image from a collection of digital still images. These methods, however, have a problem of misregistration in the case of general scenes with arbitrary camera motion. Our method can reduce this misregistration by using geometric constraints called trilinearity. Experiments using real images confirm the effectiveness of our method.

H.W. Mulder proposed 'Simultaneous Pairwise Registration For Image Mosaicing Of TEE Data', Due to the limited field-of-view of transesophageal echocardiography (TEE) images, mosaicing is required to visualize the entire left atrium in a single image. However, the small overlap between the images and the lack of a single reference image challenges the registration. Our approach is to exploit overlap of an image with multiple other images by simultaneous pairwise registration. Three images were registered to a floating common reference using a rigid transformation. The images iteratively serve as floating reference for the other images. Averaging the resulting transformations for each image will make the simultaneous registration converge to a common reference space. It was shown on randomly transformed MR brain and TEE images that the simultaneous method achieved higher success rates than regular pairwise registration. Initial results on TEE images of the left atrium demonstrated the ability of our method to register the images to a common space.

Zhang Weibo proposed 'Performance Evaluation Approach for Image Mosaicing Algorithm', In order to evaluate performance of any image mosaic algorithm objectively, a complete evaluation indicators system is constructed in this paper based on reference panoramas or non-reference panoramas. The involved indicators reflect human visual effect, image registration accuracy and image fusion effect. Then the formula of registration error (RE) is improved from TRE. Meanwhile, a blind evaluation approach related on the indicators system is proposed to avoid any manual interventions and to keep the computational simplicity. Exhaustive tests show that the proposed approach can reflect performance of image mosaic algorithm comprehensively and the result of experiment is consistent with subjective evaluation.

ASWIN C. SANKARANARAYANAN proposed 'BlurBurst: Removing Blur Due to Camera Shake using Multiple Images', Image de-blurring has matured over the last decade; today, there are a wide range of de-blurring algorithms that operate successfully in the wild. Yet, there are many applications — including telephoto and low-light photography — where camera shake produces a blur kernel that is large enough to cripple state-of-the-art de-blurring algorithms. This failure can be attributed to the decreasing SNR at the higher-frequencies of the latent image with increasing blur kernel size. As a consequence, resolving the finest details in the image is often impossible without undesirable artifacts due to noise amplification. In this paper, we demonstrate that these challenges can be overcome by obtaining multiple blurred images. We make the following observations. First, the burst mode in most digital camera supports the ability to take a sequence of shots in rapid succession. Second, blur due to camera shake is largely one-dimensional; hence, just obtaining a few blurry images opportunistically produces blur orientations that are not aligned with each other; this produces dramatic improvements in de-blurring. Third, an alternating sequence of convex programs can be used to recover both the latent image and blur kernels effectively. We refer to this multi-image de-blurring algorithm as BlurBurst. We demonstrate applications of BlurBurst in telephoto and low-light photography and highlight broader uses in hand-held high dynamic-range (HDR) imaging.

M. Kalpana proposed 'Extraction of Edge Detection Using Digital Image Processing Techniques', Digital image Processing is one of the basic and important tool in the image processing and computer vision. In this paper we discuss about the extraction of a digital image edge using different digital image processing techniques. Edge detection is the most common technique for detecting discontinuities in intensity values. The input image or actual an image have some noise that may cause the off quality of the digital image. Firstly, wavelet transform is used to remove noises from the image collected. Secondly, some edge detection operators such as Differential edge detection, Log edge

detection, canny edge detection and Binary morphology are analyzed. And then according to the simulation results, the advantages and disadvantages of these edge detection operators are compared. It is shown that the Binary morphology operator can obtain better edge feature. Finally, in order to gain clear and integral image profile, the method of ordering closed is given. After experimentation, edge detection method proposed in this paper is feasible.

OBSERVATIONAL TABLE OF DIFFERENT OBJECT TRACKING TECHNIQUES AND VARIOUS ASPECTS

Sr. No.	Authors Name	Year	Proposed method	Dataset Used	Parameter Used For Evaluation	Results
1	Nassir Salman	2006	Any gray tone image can be considered as a topographic surface. If we flood this surface from its minima and, if we prevent the merging of the waters coming from different sources, we partition the image into two different sets: The catchment basins and the watershed lines.	Image	Watershed, Difference In Strength Map, K-Means, Edge Detection, Image Segmentation.	The segmentation regions and their boundaries were defined well and all of the boundaries are accurately located at the true edge as shown clearly
2	Byeong-Ho Kang	2007	Image processing is any form of signal processing for which the input is an image, such as photographs or frames of video; the output of image processing can be either an image or a set of characteristics or parameters related to the image. Video processing is a particular case of signal processing, where the input and output signals are video files or video streams	Image And Video	Image Processing, Video Processing, Digital Image, Multimedia	Image Processing is the act of examining images for the purpose of identifying objects and judging their significance" Image analyst study the remotely sensed data and attempt through logical process in detecting, identifying, classifying, measuring and evaluating the significance of physical and cultural objects, their patterns and spatial relationship
3	Uvika, Sumeet Kaur	2012	An edge is the boundary between an object and the background, and indicates the boundary between adjacent parts of image and overlapping objects. Here we are reviewing several techniques for edge detection like Sobel operator technique, Prewitt technique, Fuzzy Edge Detection technique, Roberts's technique and Morphology based multi structure elements edge detection technique.	Image	Boundary, Edge Detection Techniques, Image Segmentation, Objects.	Various edge detection techniques for image segmentation like Sobel operator technique, Prewitt technique, Fuzzy Edge Detection technique, Canny technique, Roberts's technique and Morphology based multi structure elements edge detection technique.
4	Mohamed A. El-Sayed & Tarek Abd-El Hafeez	2011	An approach utilizing an improvement of Baljit and Amar method which uses Shannon entropy other than the evaluation of derivatives of the image in detecting edges in gray level images has been	Image	Edge Detection, Shannon Entropy, Threshold Value	The run time of the proposed and the pervious method are presented. It has been observed that the proposed edge detector works effectively for

			proposed. The proposed method can reduce the CPU time required for the edge detection process and the quality of the edge detector of the output images is robust.			different gray scale digital images.
5	Firas A. Jassim	2013	A denoising process must be applied on the grey scale image using median filter to identify pixels which are likely to be contaminated by noise. The benefit of this step is to smooth the image and get rid of the noisy pixels. After that, the simple statistical standard deviation could be computed for each 2X2 window size.	Image	Computer Vision, Edge Detection, Median Filter, Standard Deviation.	A good recommendation is that the proposed edge detector is suitable for text images that contain any kind of text. Another benefit for the proposed edge detector is the easy implementation.
6	Li Yinghua, Liu Bingqi, Zhou Bin,		The edge is a basic feature of image, checking it is one of the most important parts in processing image. The traditional technique is to use the edge detection partial operator, which is to detect the gray Level changes of neighbors of every pixel, and to detect the edge by using the changing regular of one-order or two-order Directional differential coefficient.	Image	Fuzzy Enhancing, Histogram Enhancing, Image Edge Detection	We use the image of the radial distinguishable target to experiment. Fig. Is the original image, fig. Is the image that screened by the low-light device, fig. Is the image enhanced by histogram, fig. Is the image enhanced by Pal Algorithm
7	Meghana D. More & G.K.Andurkar	2012	The image is composed of object and its background. So for the recognition of object from its background, the process which is very important is known as edge detection. This paper presents a comparative study of different edge detection techniques. There are different edge detection techniques such as sobel, Roberts operator, prewitt's cross operator and canny's edge detector, laplacian, laplacian of gaussian.	Image	Edge Detection, Pattern Recognition, Sobel , Canny	The edge detection techniques we can say that canny edge detector is able to detect maximum number of edges. Canny's edge detector gives very good results for detecting horizontal and vertical edges.
8	Xiaoming Liu & Tsuhan Chen	2003	A face sequence, each frame is unwrapped onto certain portion of the surface of a sphere, as determined by spherical projection and the minimization procedure using the Levenberg-Marquardt algorithm A statistical model containing a mean image and a	Image	Face Mosaic, Illumination, Linear Discriminant.	Generating a Statistical face model based on video mosaicing. Unlike traditional video mosaicing, we use the geometry of a face to improve the mosaicing result.

			number of eigen images, instead of only one image template, is used to represent the face mosaic.			
9	Er. Snigdha Mohanty & Er. Mahesh Prasad Sahoo	-----	Natural layering of structure has been exploited in order to reduce computing time. Edge detection followed then from single direction. Taking over close grey values of linear edges with the non-required background leads to unclear detection of edges. Another practice of this study is to extract the faults in the western part of the north Anatolian Fault Zone on a digitized image taken by TK350 camera.	Digitized Image	Gaussian, Uniform, Optimal	The result of Sobel, Prewitt, Robert operators from derivative methods and log filter are practiced to the original image; when they obtained images are compared and the whole image is considered, Sobel operator was proved to be more effective in defining the lines
10	L. Brignone, M. Munaro, AG. Allais, J. Opederbecke IFREMER	2011	Laser-camera systems used as inexpensive tools for metrology and surface reconstruction.	Georeferenced optical surveys of the seabed.	the integration of laser light projection, Autonomous Underwater Vehicle)	Provides original method to perform accurate reconstruction 3D underwater scenes from collected images.
11	Miao Ligang, Yue Yongjuan	2011	Method to stitch multiple overlapping document images into a large high resolution image.	camera-captured document images	run-length opening algorithm(RLOA), a three-step hierarchical rectification	produces a high resolution and accurate full page mosaic from small image
12	Yi Ding, Tianjiang Wang, and Xian Fu	2012	Construction of panoramic image from a collection of digital still images.	Digital still images.	Trilinearity, planar calibration pattern.	panoramic image of a nonplanar scene with unrestricted camera motion is obtained.
13	Yair Poleg, Shmuel Peleg		Mosaicing the images that do not overlap.	Panoramic input images	inpainting	Automatic alignment and mosaicing of non-overlapping images has been introduced.
14	H.W. Mulder, M. van Stralen, B. Ren, F.F. Berends, J.G. Bosch, J.P.W. Pluim	2013	Simultaneous pair wise registration	TEE image	Simultaneous registration, TEE, image mosaicing, groupwise registration	simultaneous registration method aligns more data sets correctly compared with pair wise registration
15	Zhang Weibo, Li Jianxun, Zhang Zhi	2013	Complete evaluation Indicators system with and without reference panorama. The involved indicators reflect human visual effect, image registration accuracy and image fusion effect.	Mosaic image	Image mosaicing, indicators system, registration error, mutual information, reference panorama 3786978	System can evaluate any type of image stitching algorithm

16	Aswin C. Sankaranarayanan, Ashok Veeraraghavan, Richard G. Baraniuk		multi-image deblurring algorithm namely BlurBurst	Multiple images	Deblurring, Multiple images, Tele-photo imaging, Low-light photography, HDR imaging	Blur burst handles deblurring in the telephoto and low-light imaging and also overcome the limitation of single-image deblurring.
17	M. Kalpana, G. Kishorebabu, K.Sujatha	2012	Edge detection methods and denoising methods	Digital image	Image, Digital image, Edge, boundary, Edge detection, wavelet denoising, differential operators, and binary morphology.	sobel operator after wavelet de-noising and with Binary morphology directly is better.

CONCLUSIONS

A system that has complete quantitative indicators are able to evaluate any type of image stitching, such algorithm is proposed. Firstly a morphology based technique is presented to rectify a document which is captured through a digital camera, which is basically distorted. To locate the horizontal and vertical vanishing point independently, two local adaptive structured elements are used. With unrestricted camera motion we make a panoramic image of a non-planar scene, this turned out to be the greatest advantage of this method. A simultaneous pair wise registration method is used where the images were registered to a common floating reference frame; this avoids registration bias towards a single reference image.

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