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RESOLVING LOOM SOCKET DAMAGE ISSUES IN INSTRUMENT PANEL USING IMAGE PROCESSING

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Abstract: - The implementation of a new strategy to evaluate the quality of multi and hyper spectral images. We define the spectral image difference as the overall perceived difference between two spectral images under a set of specified viewing conditions (illuminates).The proposed model is to track the sockets for airbag at production level quality assessment using image processing , under this domain we analyse the perfection of sockets before installation on vehicles.

Keywords: Socket, image processing, airbag, panel.

1. Introduction

Critical sockets are those that affect the critical characteristics of a car which refers to the factors that affect the safety of the customer irrespective of government rules. The purpose of an airbag is to help the passenger in the car to reduce their speed in collision without getting injured. Airbag sockets has an important role in critical characteristics of a car i.e. Safety of customers. Damage or non-functionality of airbag sockets will cause more impact during accidents at great level. Hence introducing an image processing system in the assembly plant of the sockets in instrument panel so that any fault or damage in the sockets can be recognised before it is assembled.

Digital image processing, the manipulation of images by computer, is relatively recent development in terms of man's ancient fascination with visual stimuli. In its short history, it has been applied to practically every type of images with varying degree of success. The inherent subjective appeal of pictorial displays attracts perhaps a disproportionate amount of attention from the scientists and also from the layman. Digital image processing like other glamour fields, suffers from myths, mis-connect ions, mis-understandings and mis-information. It is vast umbrella under which fall diverse aspect of optics, electronics, mathematics, photography graphics and computer technology. It is truly multidisciplinary endeavour ploughed with imprecise jargon.

Several factor combine to indicate a lively future for digital image processing. A major factor is the declining cost of computer equipment. Several new technological trends promise to further promote digital image processing. These include parallel processing mode practical by low cost microprocessors, and the use of charge coupled devices (CCDs) for digitizing, storage during processing and display and large low cost of image storage arrays.

2. Literature survey

In the existing system, survey on an image quality assessment metric has been taken based on early vision features. The abstract is to Evaluate the image perceptual quality which is a fundamental problem in image and video processing, and various methods have been proposed for image quality assessment(IQA).This letter presents IQA metrics such as state-of-the-art IQA metrics(structural similarity based image quality assessment (SSIM),multi-scale-SSIM, non-shift edge based ratio (NSER) and their limitations . In the non-shift edge based ratio (NSER) method the procedures involved include computing the response of classical receptive fields, zero-crossing detection, and non-shift edge based ratio (NSER) calculation. This IQA metric is very simple but very effective and performs much better than most state-of-the-art IQA metric. During acquisition, processing, compression, storage, transmission and reproduction, digital images are subject to a wide variety of distortions any of which may result in a degradation of visual quality. For applications in which images are ultimately to be viewed by human beings, the only "correct" method of quantifying visual image quality is through subjective evaluation. In practice, however, subjective evaluation is usually too time-consuming, expensive and inconvenient. To develop quantitative measures that can automatically predict perceived image quality is the goal of research in objective image quality assessment.

Image quality assessment (IQA) has been becoming an important issue in numerous applications such as image acquisition, transmission, compression, restoration and enhancement, etc. with the rapid proliferation of digital imaging and communication technologies. For many scenarios, e.g. real-time and automated systems the subjective IQA methods cannot be readily and routinely used, it is necessary to develop objective IQA metrics to automatically and robustly measure the image quality. It is anticipated that the evaluation results should be statistically consistent with those of the human observers. In the past decades the scientific community has developed various IQA methods. Objective IQA metrics can be classified as full reference (FR), no-reference (NR) and reduced-reference (RR) methods according to the availability of a reference image.

Objective image quality metrics can be classified according to the availability of an original (distortion-free) image, with which the distorted image is to be compared. Most of the existing approaches are known as full-reference, meaning that a complete reference image is assumed to be known. In many practical applications, however, a no-reference or "blind" quality assessment approach is desirable and the reference image is not available. In a third type of method, the reference image is only partially available, in the form of a set of extracted features made available as side information to help evaluate the quality of the distorted image, this is referred to as reduced-reference quality assessment. This paper focuses on full-reference image quality assessment. The limitations of Structural Similarity based IQA are:

1) SSIM index is a single-scale approach.
2) It achieves the best performance when applied at an appropriate scale, this is drawback of the method because the right scale depends on viewing conditions (e.g., display resolution and viewing distance), but a single scale approach lacks the flexibility to adapt to these conditions.

To overcome this drawback multi-scale SSIM is proposed that weight the relative importance between different scales. Differences of Error sensitivity approach and Structural Similarity based IQA. The limitation is this approach is still rather crude and ad-hoc, it does not work under much more broader application.

In Non-Shift Edge based Ratio a new image quality metric, NSER overcomes the drawback of MS-SSIM .This metric works robustly across different IQA databases. It achieves better performance than performance to state-of-the-art IQA metrics, such as MS-SSIM. NESR use the earliest vision features, more specifically, zero-crossing edges only, to measure the difference between reference and distortion images. The zero crossings is defined as the information carried by the edges is represented by their spatial locations in the image. When an image is distorted from the original one, the positions of edge points will change accordingly. If there is more distortion, then there will be higher the change in the degree of the edge positions. Therefore, it is a straightforward idea to compare the edge maps of the reference and distorted images to measure their difference. In this metric the reference and distorted images are well registered, which is commonly assumed in IQA research. The proposed algorithm is compared with state-of the- art IQA metrics which is based on the structural distortion,

NSER still achieves comparable performance to MS-SSIM by using only the primitive zero-crossings. This shows that zero-crossings can be efficient for IQA and very effective. The NSE detection eliminates

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much information redundancy in the image and actually selects the most significant features in the reference and distorted images. The information lost in the process of binary edge detection is not so important for IQA. The pixels belonging to a structure are related to each other with a specific intensity distribution, and the information the structure carries is hidden behind this distribution. When an image is deteriorated, the structure and the distribution vary. This is why the information fidelity criteria and the structural similarity indexes, work well for IQA. The image structure features used by the above IQA metrics are constructed from the basic primitive signals generated by ganglion and LNG neurons, and by Marr's theory, the information existed in the basic primitive signals can be represented by the zero-crossings and their spatial distribution. The structural variation caused by the image distortion will lead to the change of spatial distribution of zero-crossings. This change can be expressed and measured by using the NSE map and NSER metric.

The Conclusion presents image quality assessment (IQA) metrics namely Conventional IQA indices, state-of-the-art IQA metric, their limitations and a novel image quality assessment (IQA) metric, namely the Non-Shift Edge based Ratio (NSER),operates on the low-level early vision features, more specifically zero-crossing edges according to Marr's theory. The framework of this metric is straightforward and very simple and works robustly across different IQA databases. It achieves better performance than state-of-the-art IQA metrics, such as MS-SSIM. Early vision models may not be powerful enough to predict picture quality in highly compressed images as they fail to take into account higher level perceptual processes.

3. Proposed system

3.1 Airbag

Figure 1: Airbag

An airbag is a vehicle safety device. It is an occupant restraint system consisting of a flexible fabric envelope or cushion designed to inflate rapidly during an automobile collision. Its purpose is to cushion occupants during a crash and provide protection to their bodies when they strike interior objects such as the steering wheel or a window. Modern vehicles may contain multiple airbag modules in various side and frontal locations of the passenger seating positions. Knee airbags significantly reduce the risk for injuries to the knee, thigh and hip. The advantage of the side airbag module give optimal protection (reduces serious chest injuries) for sizes of occupants. Some vehicles are equipped with both frontal (seat belt replacement) and side air bags.

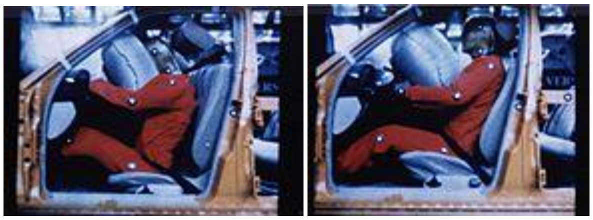

Figure 2: Frontal airbag

Figure 3: Knee airbag

Thus, the airbags are so important for passengers to avoid injuries during accidents. So it is necessary to analyze whether the socket is damaged. It can be analyzed using the image processing system in MATLAB software.

a. BLOCK DIAGRAM

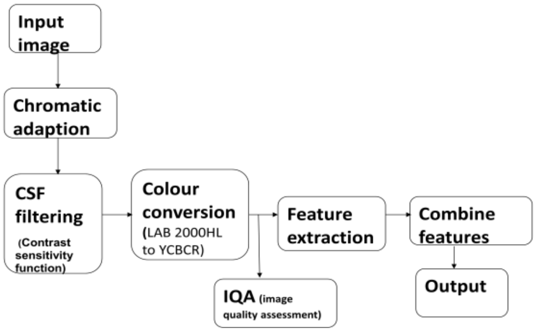

Figure 3.1: Block diagram of Proposed System

In an input image, the natural scene image for text detection we give as input image. The input image is a photograph or video frame. Chromatic adaptation is one aspect of vision that may fool someone into observing a color-based optical illusion, such as the same color illusion. An object may be viewed under various conditions. For example, it may be illuminated by sunlight, the light of a fire, or a harsh electric light. Contrast sensitivity function (CSF) is a type of filter which is a subjective measurement of a person's ability to detect a low contrast pattern stimuli, usually vertical stripes of decreasing shades of black to grey. The resulting measurement is said to give a more accurate representation of the eyes' visual performance. Colour conversion converts the RGB values in map to the YCbCr color space. Map must be an M-by-3 array. YCbCr map is an M-by-3 matrix that contains the YCbCr luminance (Y) and chrominance (Cb and Cr) color values as columns. Each row in YCbCf map represents the equivalent color to the corresponding row in the RGB color map, map. Pattern recognition and in image processing, feature extraction starts from an initial set of measured data and builds derived values (features) intended to be informative, non-redundant, facilitating the subsequent learning and generalization steps, in some cases leading to better human interpretations. Feature extraction is related to dimensionality reduction. When the input data to an algorithm is too large to be processed and it is suspected to be redundant, then it can be transformed into a reduced set of features (also named features vector). This process is called feature extraction. The extracted features from input image using color conversion methods, the most relevant features under color bands are combined together and match/comparing in order to get new image.

b. SOCKET BLOCK DIAGRAM

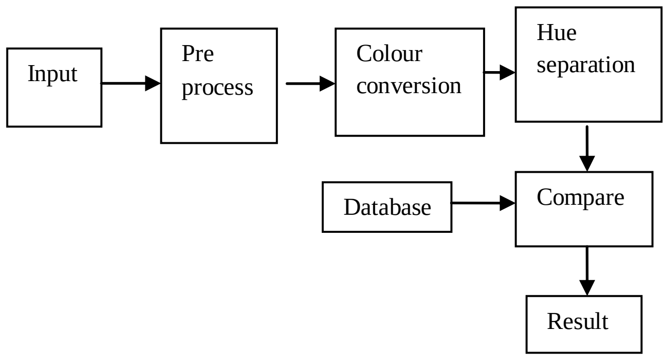

Figure 3.2: Block diagram of Socket

The image of the socket to be analysed is taken as the input. Image processing is any form of signal processing for which the input is an image, such as a photograph or video frame. Pre-processing images commonly involves removing low-frequency background noise, normalizing the intensity of the individual particles images, removing reflections, and masking portions of images. Image pre-processing is the technique of enhancing data images prior to computational processing. Various image pre-processing techniques like binarization, thresholding, resizing, normalization etc. are applied on the sampled image. After that, feature extraction techniques are applied to get features that will be useful in classifying and recognition of images. Hue is the basic component of a colour and is the dominant or average wavelength. Red, Green and Blue determines the HUE. HSL (hue-saturation-lightness) and HSV (hue-saturation-value) are the two most common cylindrical-coordinate representations of points in an RGB colour model. The Colour separation operation is used to extract different 'bands' for instance from a scanned or digital colour photo as if using colour filters when taking the picture. After colour extraction, you can perform the normal Image Processing operations like Filtering, Classification, etc. on these bands. A database is a collection of information that is organized so that it can easily be accessed, managed, and updated. Database helps to figure out how to read the images into whatever software is preferred. The differences between two perfect identical and similar photos using image processing principles is done by comparing. A Matlab code can be used to compare between two identical images. Differences between images are introduced due to different imaging conditions. Finding the differences between two similar or identical images can be noticed by eye, but sometimes those differences are embedded and takes a lot of time to be discovered, using some developed Matlab code may make such operation rapid and accurate.

4. ALGORITHM AND TECHNIQUES USED IN IMAGE PROCESSING

Earlier Fourier Transform is the algorithm which was used in image processing. Later it was analysed that Fourier Transform is not suitable for analysing non-stationary signals i.e., signals whose frequency response varies in time. To overcome this problem, Short Time Fourier Transform (STFT) was introduced. But the major drawback of STFT is low Resolution i.e. only the time intervals of certain band of frequencies can exist and one cannot know the exact time frequency representation of signals. The wavelet transform (WT) has been developed as an alternate approach to STFT to overcome the resolution problem. Multi Resolution Analysis (MRA) is used to analyse the signals at different frequencies giving different resolutions.

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a. DISCRETE WAVELET TRANSFORM

The discrete wavelet transform (DWT) was developed to apply the wavelet transform to the digital world. Filter banks are used to approximate the behaviour of the continuous wavelet transform. The signal is decomposed with a high-pass filter and a low-pass filter.

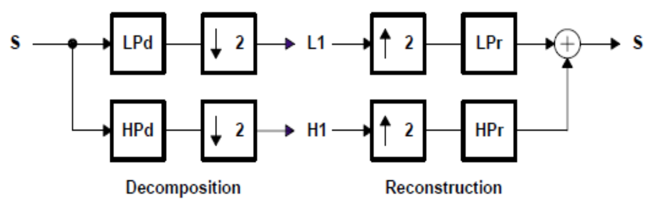

Figure 4. Discrete Wavelet Transform

Figure 4: Discrete wavelet transform

Where LPd: Low Pass Decomposition Filter, HPd: High Pass Decomposition Filter, LPr: Low Pass Reconstruction Filter , HPr: High Pass Reconstruction Filter.

b. 2-D WAVELET TRANSFORMS

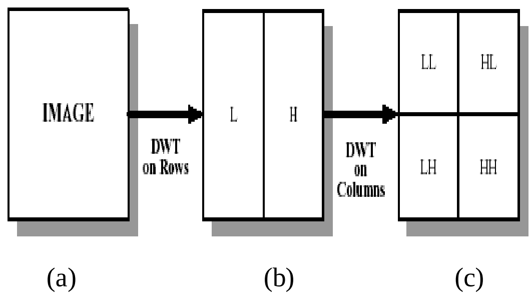

Figure 4.1. Block Diagram of DWT (a) Original Image (b) Output image after the 1-D applied on Row input (c) Output image after the second 1-D applied on row input

The 1-D DWT can be extended to 2-D transform using separable wavelet filters. With separable filters, applying a 1-D transform to all the rows of the input and then repeating on all of the columns can compute the 2-D transform. When one-level 2-D DWT is applied to an image, four transform coefficient sets are created. As depicted in Figure 4.1(c), the four sets are LL, HL, LH, and HH, where the first letter corresponds to applying either a low pass or high pass filter to the rows, and the second letter refers to the filter applied to the columns.

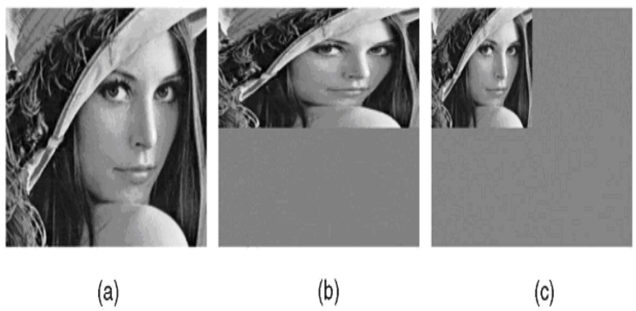

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Figure 4.2. DWT for Lena image (a) Original Image (b) Output image after the 1-D applied on column input (c) Output image after the second 1-D applied on row input

The Two-Dimensional DWT (2D-DWT) converts images from spatial domain to frequency domain. At each level of the wavelet decomposition, each column of an image is first transformed using a 1D vertical analysis filter-bank. The same filter-bank is then applied horizontally to each row of the filtered and sub sampled data. One-level of wavelet decomposition produces four filtered and sub sampled images, referred to as sub bands. The upper and lower areas of Fig. 4.2(b), respectively, represent the low pass and high pass coefficients after vertical 1D-DWT and sub sampling. The result of the horizontal 1D-DWT and sub sampling to form a 2D-DWT output image is shown in Fig.4.2(c).

We can use multiple levels of wavelet transforms to concentrate data energy in the lowest sampled bands. Specifically, the LL sub band in fig 4.1(c) can be transformed again to form LL2, HL2, LH2, and HH2 sub bands, producing a two-level wavelet transform. An (R-1) level wavelet decomposition is associated with R resolution levels numbered from 0 to (R-1), with 0 and (R-1) corresponding to the coarsest and finest resolutions.

4.3 IMAGE ENHANCEMENT

Image enhancement is the improvement of digital image quality (wanted e.g. for visual inspection or for machine analysis), without knowledge about the source of degradation. If the source of degradation is known, one calls the process image restoration**.** Both are iconical processes, viz. input and output of images. Many different, often elementary and heuristic methods are used to improve images in some sense. The problem is, of course, not well defined, as there is no objective measure for image quality. Here, we discuss a few recipes that have shown to be useful both for the human observer and/or for machine recognition. These methods are very problem-oriented a method that works fine in one case may be completely inadequate for another problem.

To grey level adjustments may be indicated, to take into account imperfections in the acquisition system. This can be done pixel by pixel, calibrating with the output of an image with constant brightness. Frequently space-invariant grey value transformations are also done for contrast stretching, range compression, etc. The critical distribution is the relative frequency of each grey value, the grey value histogram**.** Grey values can also be modified such that their histogram has any desired shape, e.g flat (every grey value has the same probability). All examples assume point processing, viz. each output pixel is the function of one input pixel; usually, the transformation is implemented.

5. RESULTS AND SIMULATION

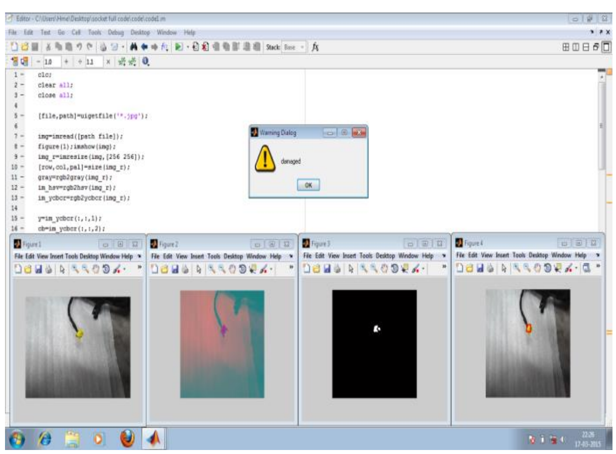

Figure 5.1: Simulation of Damaged Socket

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The two images of damaged and perfect sockets to be tested are given as input. The images can be viewed multi dimensionally in 3 ways i.e.(HSV) H-Hue, S-Saturation, V-Vector by segmenting the image and by extracting the features called as thresholding. After extracting the features, the shape of the socket is retrieved and analyzed, it is recognized that the socket is damaged or perfect with the help of a warning dialogue box.

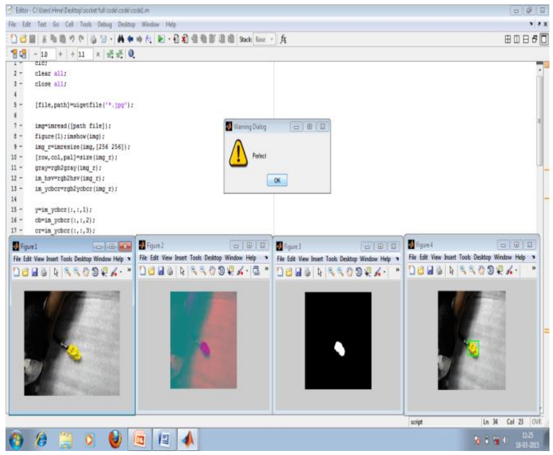

Figure 5.2: Simulation of Perfect Socket

6. CONCLUSION

Airbag socket is analyzed to avoid the replacement of entire loom in instrument panel and to analyze whether the socket is damaged or perfect before it is assembled in a car. Using discrete wavelet transform and multi resolution analysis, the approach is made in image processing. Hence, the damage of the sockets and the removal of entire loom can be reduced.

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