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A Review on Image synthesis in Digital Image Processing

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ABSTRACT

Image processing is a growing filed where great progress made recently. Some developments that have been identified are soft computing in image processing. Image synthesis is the process of creating an image from non-image data and bringing together information from more than one image. There are two ways of creating a digital image. One is to scan the image or capture it through a camera in the traditional manner. Another is to create an image through programs by switching a pixel on or off or by planning an image as a set of primitives and rendering it. Image synthesis crates new images that often combine two important concepts in image restoration and visualization.

Key words: Digital Image, Restoration, Synthesis,

I.INTRODUCTION

In this image synthesis analysis there are different types of techniques are there. The techniques are image Registration, image fusion, image composting, image mosaicking, image visualization, image understanding, and finally we have stereo imaging. In image Registration, the main purpose is to modify the spatial alignment of the images in such a way that they can be fused together. In the Image fusion takes spatially and temporarily aligned, semantically equivalent image that is of better quality than the original image. The image composting is an operation that takes two or more images as input and produces an integrated result of all images as output. Image Mosaicking is an extension operation of image composting. Image mosaicking is an operation where every group of pixels is approximated by a given image. The image visualization for better treatment planning. The image understanding which uses the fusion , modelling and matching to gain understanding of the object , and finally stereo imaging will gives the image object depth. In the next section we will discuss more deeply about each technique for understanding of various image synthesis in digital image processing.

II.RELATED WORK

1. **IMAGE REGISTRATION:** In this technique once the images are registered, visualization allows us to visualize the information from the fused images. In this we have to consider the two images that have different orientations, so there is a need to align all the images in the same spatial orientation so that change detection can be performed.so, in two images, one is original image and other one is reference image. The second image is called the sensed image.in this image registration under which this kind of spatial orientation is required, They are i) Images taken from multiple viewpoints ii) Images taken of a scene at multiple times iii) Images of a scene taken using different sensors iv) Scene to model Registration.

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Generally, all imaging applications involving image fusion require image registration as a prerequisite. Some of the image registration applications in biomedical engineering are the fusion of CT (Computed Tomography) and MRI (Magnetic Resonance Imaging) images, in remote sensing domain are environmental monitoring, weather forecasting, change detection, and in machine vision domain are shape recovery, motion tracking, target template matching, and geospatial information systems (GIS).

A. **IMAGE ANALYSIS AND FEATURE SELECTION:** To register two images, one requires the features of both the reference and the sensed images. The first stage involves extraction of image features such as boundary, edges, contours, lines, and corners. The process of feature selection is manual or automatic. The features can be chosen manually by placing permanent markers in the image called fiducials or fuducial points or automatically using image processing algorithms such as point detection, line detection. And corner detection.

B. **FEATURE MATCHING AND PAIRING:** This stage is also known as the feature correspondence stage. Establishing the correspondence between the feature points of the reference image and the sensed image is called feature correspondence and involves finding the relevant features of the reference image and searching for them in the sensed image.

   The feature can also be selected independently and the correspondence obtained. There are two types of feature correspondence algorithms available, namely area-based methods and feature based methods. When both the images are very similar, then the correspondence between he features identified is established using feature descriptors or similarity metrics.

2. IMAGE FUSION

Image fusion takes specially and temporally aligned semantically equivalent images created in the image registration process to produce a resultant image that is of better quality than the original image. The objective of the image fusion is to produce a resultant image with more information that will be helpful in better human perception and hence improve image analysis.

Human beings inherently perform fusion we sense the world using sensory information such as vision, audio, touch, smell, and taste .We combine all these information to get more inputs about the environment similar to this situation in image processing. the information from multiple sources is combined to gain more details about the environment. The main advantages of image fusion are increased reliability and improved quality of information.

Modern vision systems are Active vision systems that use multiple sensors to gain information from different sources and combine the information at various abstraction levels that is pixel feature & levels this method replaces the earlier expert system approach of image understanding.

Redundant information: although the information is from different sources there still exists some information that conveys the same details about the seen this increase the reliability of the information is the information is confirmed by more sources but also causes redundancy.

Complementary information these are pieces of information that are complementary in nature and come from different sources.

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The figure shows the image fusion process for three images A, B, and C.

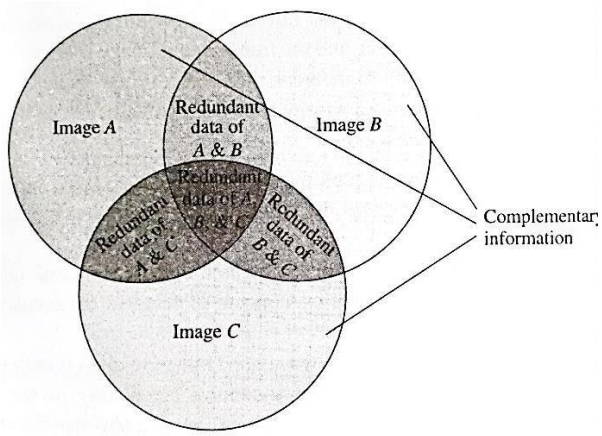

Figure 1: Image Fusion Process of three Images

Corporation information this is information that can be obtained when required to facilities this every piece of information has to its corresponding timing details .It can be observed that there is retain and information among the three images shown in figure such as A and B, B and C, A and C, and A, B, and C.

However, the complementary information can be fused together to give more information in the resultant image. Increasing the redundant information improves the reliability and complementary information provides improved information. Some of the medical imaging applications used image fusion effectively. For example, City images provide a better view of bone information and MRI provides a better view of the software tissues. Therefore when image fusion is carried out to get a resultant image, it is better than the original image in perception as well as content. Image fusion is useful in many areas such as medical imaging, biometrics, computer vision, remote sensing, and Robotics. however, the earlier applications of image fusion work in the field of military, where multiple sensors were used in applications such as detection, tracking, identification of target, and monitoring applications where fusion was utilised to improve the reliability and capability.

Image fusion can be grouped under the following categories:

Different viewpoints these kinds of applications are called multi-view analysis applications. The images taken at different viewpoints can be combined to get a larger 2D or 3D view for improved visualisation.

Different times these are called multi-temporal analysis applications images are acquired at regular intervals and the changes on the scene are evaluated.

Different sensors these are called multi modal analysis applications, where the aim is to integrate the image obtained from the different modes.

Image fusion procedure involves the following three steps:

1. In the first step the images that need to be fused are preprocesses.Pre-processing is required, as the image may often come from different modalities such as CT and MRI, have different sizes, resolutions, colours, and dynamic ranges.
2. The second step is image registration. it has been discussed about how the image registration needs to be performed. this is the essential requirement of the image fusion process

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3. The third and final step is to perform image fusion. image fusion can be done at three levels pixel, feature, and decision.

3. IMAGE COMPOSITING

Image compositing is an operation that takes two or more images as input and produces an integrated result of all images as output. The origin of digital compositing dates back to 1857, when a photographer named Oscar.G combined 32 photo negatives to produce a single output image which was called „the two ways of life". Digital imaging makes composting easier and it is useful in creating photographs that can be used in web pages and imaging applications. Image composting is achieved by dividing the image into too many pieces full stop the pieces may be combined in different combinations to create a single output image called an element.

The operations used to produce integrated results are called image composting operators. Two images are combined in digital compositing in a manner such that the image does not obscure anything that it covers; this can be visualised as masking operation.

A colour image is viewed as a 4 channel image where an additional channel is called a matte channel or Alpha channels. The Alpha channel is used to control the process of image integration.

(a)

(b)

(c)

Figure 2: Image Compositing (a) Original Image (b) Sample flower image (c) Image Composite (a) and (b)

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4. IMAGE MOSAICKING

This is an extension of the image compositing operation .Image mosaic is an operation where every group of pixels is approximated by a given image. A collection of small images gives an Illusion of a larger image when viewed from a distance. The small images called tile images can be placed other manually automatically.

A panoramic image is a special type of image mosaic where multiple views of a scene are switched to give a single image. The effectiveness of these operations is judged based on the fact that the result appears almost identical to the original image.

Image mosaic operation involves the following four steps:

1. The first step is the collection of tile images. the selection of images is based on the need and is often considered artistic activity.

2. The second step involves choosing a grid or pattern. The grids can be rectangular or hexagonal.

3. The third step involves the placement of tiles. this is done automatically or manually. The tiles can be placed in the target image using the same tiles, randomly or by using some matching algorithms. that colour, texture, war shape off the target image and the tiles are determined before The tile is placed.

4. The fourth and last step is the colour correction stage where the colours of the tiles are manipulated so that the target looks effective. This involves calculation of the average colour of The tile and designing a suitable function to map the colour of The tile to the target colour.

(a) (b)

Figure 3: (a) Example for Image Mosaic (b) Mosaic Image Zooming

6. IMAGE UNDERSTANDING

The issues of image processing can be grouped into three parts image processing, image analysis, and image understanding. Image processing, refers to low-level operations such as image acquisition, noise removal, and image enhancement. Image analysis refers to the extraction of information from the image

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often in the image often in the form of numbers. image understanding on the other hand refers to the higher level of processing. This refers to the representation of extracted information into meaningful descriptions so that interpretations of the image can be made.

The idea of image understanding is from Active vision systems which use the idea of fusion, Modelling, and matching to gain understanding of the object. The basis of image understanding is mass computational theory of vision, which attempts to develop an informational model for human vision. The Mar‟s paradigm involves the following three stages one is Primal sketch and two and half sketch and last one is 3D sketch.

III.CONCLUSION

Soft computing is suitable for problems in which modelling is difficult. The inspiration for soft computing is derived from biology. The full stop hybrid computing domain is a combination of both conventional hard computing and soft computing where certain subsets of the problems are solved by hard computing, while soft computing is used to solve the remaining part of the problems whenever applicable. There are many sources for Impression in images. Some examples in image processing are the ambiguity in the grey levels, special ambiguity, and the ambiguity in knowledge.

Image synthesis is a process of creating an image from non-image data. it also uses information from multiple sources to create a resultant image full form. The purpose of image Registration is to modify the special element of two images so that image can be used to give a better resultant image. Pairing is a process of determining the relevant features of the images for which the special element is sought. Image fusion produces a single image using many specially registered images. The main advantages of image fusion are increased reliability and improved quality of information. Image fusion can be done at the pixel level, feature level, or at the decision level. Visualisation is the process of graphically viewing an image at multiple viewpoints to perform better image analysis.

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