CHAPTER 7

CONCLUSIONS AND FURTHER SCOPE

7.1 CONCLUSIONS

The research work described in the thesis has shown concern for combining the statistical and structural principles for the representation of textures. By utilizing the advantages of both the principles, an effective texture representation scheme has been suggested for monochrome texture images.

An image region has been represented by a set of orthogonal polynomials. The computed orthogonal polynomial effects have been separated into two responses. One set of responses is due to the presence of texture and the other set is due to the noise. The corresponding variances are analyzed using the Statistical design of experiments based approach. There is a hypothesis that the set of variances due to the interaction is responsible for the presence of texture and hence, the divergence among them must be significant. And the divergence among the other variances is due to the responses of the noise and hence they estimate the same noise variance. The Nair test has been applied for detecting the presence of texture.

A complete set of texture primitives is presented. These primitives are of the size 3 x 3. The primitives, on their own, have inscribed all the existing popular paradigms such as co-occurrence, run-length and edge-strength principles in it. That is, the previous approaches have been included

in this representation in a much more simplified way. The frequency of occurrences of the primitives over an image is represented as a spectrum called the texture primitive spectrum. This is used as the global descriptor. The occurrences of primitives are perceived at different tolerance levels. The primitive spectrums are presented for standard texture images. The effects of noise on the spectrum have been studied. As the noise levels are introduced, the primitive presence started decreasing. The variation of window size on the primitive spectrums has been studied and the primitive presence is found directly proportional. Similarly the characteristics of the primitive spectrum have been studied in the case of rotation and the tolerance variation. Next, the usage of the primitives has been shown in the case of texture image generation. By defining a set of placement rules and by filling the region defined with a texture primitive, different texture images have been generated. The above texture representation scheme is effective because the same has been employed successfully for supervised and un-supervised texture classification of various textured regions. The proposed method of texture classification is based on computing the feature vector, namely, the primitive spectrums. An average correct classification of 96 % has been achieved. For the experimental works, texture images collected from both the Brodatz and VisTex album have been used.

The usage of conventional edge detection schemes may not be directly applicable to textured images. Edge detection in textured images by using the proposed texture representation scheme has been suggested. The edge detection has been carried out for both deterministic and non-deterministic texture images.

The experiments have been extended for analyzing skin images which were caused by a variety of burns. When the simple mean and standard deviation could not be used for revealing any information about the extent of

burn, the weighted mean computed from the primitive spectrum has been very useful in determining the severity and approximate time for getting cured. The statistical parameter computed from the primitive spectrum, namely, the weighted mean is related to the severity of burn and the time to get cured is inversely related. As the weighted mean becomes lesser and lesser, the time to get cured becomes more and more. The conclusions with reference to the skin images have been confirmed by medical experts. The results presented agree with the medical experts' opinion. Hence, the usage of the texture primitive spectrum is effectively shown for the analysis of textured skin images which are affected by different degrees of burn. This provides an estimate to know the time to get cured from the diseased skin image.

Hence the combined statistical and structural approach-based texture representation scheme is presented and has been effectively used in texture analysis.

7.2 FURTHER SCOPE OF THE WORK

The proposed work has been explained and carried out for an image size of 3 x 3. The work can be extended for higher window sizes, namely, 5X5, 7X7,… as local descriptors for defining the texture primitives. Using different kinds of primitives defined in the 3 x 3 size, the classification of textures like fine (micro), coarse (macro), deterministic, random, stochastic could be approached. The set of primitives can be still grouped as more responsive to different objectives.

The work can be extended to in multi-spectral image analysis or color or remotely sensed satellite images wherein different bands of images are used in analysis. Accordingly, an N dimensional primitive spectrum can be employed for texture analysis. The work can be extended by proposing a

different set of placement rules with different sized primitives and many composite irregular shaped texture images can be generated. These generated images can be used for the analysis of the application of various algorithms. A few more applications in the area of fabric analysis, and brain image analysis, pattern generation can be thought of.