ABSTRACT

In recent years, with the perception of a wide range of applications of image matching and mining, the researchers working in the areas of Geoscience, Health Care, Environment and Climate, Astronomy, Life Sciences and drugs, Discoveries, Digital libraries, Scientific publications, and Social media like Facebook, You Tube, Flicker, Skype, etc. have turned their attention to object recognition and visual mining. As a result, a number of techniques have been developed for visual mining. Content-based image retrieval system, though many image mining techniques are available, evolves and plays a significant role in image mining and retrieval for the past two decades especially from the last decade. In this system, the contents of the images are analyzed, and the features at low-level such as colour, structure of the texture and orientation are extracted; and they are utilized to retrieve an appropriate image.

To achieve tasks mentioned above, this research work proposes a navel technique based on a probabilistic model, i.e. Full Range Gaussian Markov Random Field (FRGMRF) model. The parameters of the model are estimated based on the Bayesian approach. Based on the parameters, the model coefficients are computed, which extract the features such as colour, texture, spatial orientation of the textures, and the autocorrelation coefficients are computed using the
model coefficients. Since the \textit{sine} and \textit{cosine} functions are involved in the estimate of the model coefficients, it extracts features in good manner both the periodic patterned and stochastic patterned texture images, and also in untexture or structure images.

In order to experiment the proposed FRGMRF model, the colour image is segmented into various regions according to its structure and nature. The segmented image is modelled to HSV colour space, where V attributes to pixel values, and it ranges from 0 to 1. On HSV colour space, the texture information and spatial orientation of the pixels are extracted. On each region, the model parameters, ACCs, and unique texture numbers are computed using the FRGMRF model. The model parameters and ACCs are formed as feature vectors (FVs) of the image. The \textit{Mahalanobis} distance is applied to measure the distance between the query and target images.

Moreover, associated probabilities are computed on the texture numbers, and are used to compute the divergence between the query and target images using \textit{cosine} function. Based on the associative probabilities, positional vectors are computed, and also that are incorporated in the feature vectors. The obtained results are compared to those of the existing systems. The comparative study evidence the efficiency of the proposed system.
**Keywords:** Full Range Gaussian Markov Random Field model; autocorrelation; Micro-textures; Content based image retrieval system; Bayesian approach, texture number, feature vector, spatial features.