A Dissertation

on

"Feature based classification of images/sculptures and enhancement of multi-lingual inscription images"

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CERTIFICATE

This is to certify that the thesis work entitled "**FEATURE BASED CLASSIFICATION OF IMAGES/SCULPTURES AND ENHANCEMENT OF MULTI-LINGUAL INSCRIPTION IMAGES"** is bonafide work carried out by **Geetanjali Bhola, Roll No. 26/CTA/2010** in partial fulfillment of Master's Degree in **Computer Technology and Application, Delhi Technological University** during the year 2010-2013. The project report has been approved as it satisfies the academic requirements in respect of thesis work prescribed for the Master of Technology degree.

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ABSTRACT

Historical monuments and their inscriptions hold the story of the past attached to the monument. They give an idea of how the ancient people, the kings etc lived. Similarly, inscriptions found in temples or other holy places tell the inclination of ancient people towards god, religion and what they used to practice. These inscriptions are of great importance to the world's heritage and thus they need to be digitized in order to make them immortal. We see a lot of ancient temples, tombs and other monuments. They have inscriptions, sculptures and other architectural designs on them to signify the era to which they belong. We need to preserve and pass these to our upcoming generations so that they can understand and can contribute their part in maintaining the heritage. Sculptures found in these monuments are also very helpful in understanding the culture. It has been observed that the ancient people (in India, for e.g.) many times worship the same god, but with a different name. If using a classifier we can know the name of the god or sculpture in the language of our choice, and then it is much likely that we'll extract other useful information related to them too.

In our proposed work, we have worked on inscriptions and sculptures (of god/goddesses) from these monuments. Our work deals with enhancement of inscriptions and feature based classification of sculptures. The images of inscriptions and sculptures are noisy, have minimal distinction between foreground and background. These challenges create hindrance in the digitization and preservation of inscriptions. By preservation we mean that if the images of the inscriptions bearing text (of multiple languages) are passed to their respective language OCR's then they show no sign of recognition. This is due to the problems discussed above. We try to enhance the text such that it outstands from the background. It can then be easily OCR-ed.

The existing methods like variance based extraction and Fast-ICA based analysis fail to extract text from these inscription images. Natural gradient

Flexible ICA (NGFICA) is a suitable method for separating signals from a mixture of highly correlated signals, as it minimizes the dependency among the signals. We propose an NGFICA based enhancement of inscription images. The proposed method improves word and character recognition accuracies of the OCR system by 65.3% (from 10.1% to 75.4%) and 54.3% (from 32.4% to 86.7%) respectively.

Sculpture classification method proposes to built a classifier based on the features of sculptures (of god/goddesses) to classify the images of gods and goddesses. The images have been taken from various sources such as temples, forts, ancient monuments, sculptures and other images from INTERNET. The sculptures classification can prove useful as it can help us classify the god (i.e. label them as god A or god B), extract information about the god/goddess, the era or history of that particular sculpture. This is a thoughtful step towards preserving the rich history India has and make future generations learn and remember the past efficiently.

The proposed method also helps in solving a 2-class classification problem which works on the basis of training the classifier with the HOG features of the images. The proposed classifier has been tested on a small data set and gives 50-100% accuracy on four different data sets. The proposed method classifies the query image (of God/Goddesses) as belonging to either of the classes on which it has been trained. The proposed method can be extended for information retrieval after classification.

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