

Approach to Recognition of Ancient Sri Lankan Inscriptions

4.1 Introduction

The technologies that are suitable to solve the problem stated in this thesis are presented in the previous chapter. This chapter explains about the approach that has been followed for this project. The approach is presented in terms of inputs, outputs, process, technology, users and features.

4.2 Artificial Neural Network and Multi-Agent System based Approach

The hypothesis of this project is defined as the noise removal in a textual document could be resolved through communication and negotiation among the experts who are knowledgeable in morphology, sentence structure and semantics of a particular context. With the above hypothesis this project attempts to build an optical character recognition system for the ancient Sri Lankan inscriptions.

The input for this system is the digital images of ancient Sri Lankan inscriptions. Most of these digital images are occupied with high volume of noise. In order to extract the significant features for the input of the neural network the digital inscription image need some pre processing. Therefore the users are advised to perform pre defined set of image processing procedures in order to reduce the noise in the original image. It makes the subsequent phases of project easier.

As the first step, the image is blurred and converted into grey scale mode. Then the threshold technique is applied. During this processes the colored inscription photographs are converted into a binary image and the pixels that were identified as noise were reduced. This pre processed image is used as the input for the Brahmi optical character recognition system.

The inscription image that was processed using the image processing procedures is used as the input for the Brahmi optical character recognition system. The system generates horizontal and vertical projection graphs by analyzing the black pixel intensity of the threshold inscription image. Then the system segments the characters

into individual images using the projection graphs and the horizontal and vertical threshold values. The user has provided the facility to define the horizontal and vertical threshold values via the front-end. Base on the selected threshold values the character strings are segmented into isolated characters. These isolated characters are digitize and converted into 1s and 0s. In addition to the digitize values, the pre-defined features of the isolated individual character images are extracted and send to the neural network to recognize the character.

The neural network is designed as multi layer perceptron which consist of one hidden layer. By concatenating all the recognized characters given by the neural network one particular string is constructed. However there is a very high probability to have incorrect characters in this string due to the high noise availability. Therefore a post processing phase is introduced to rectify the output given by the neural network.

The input for the post processing phase is the string that was constructed by combining the outputs of the neural network. The functions in this module is performed by three agents namely, lexical agent, structure analyst agent and the semantic agent. Firstly in this phase the input string is analyzed and provides suggestions for the words that contain incorrect characters. The suggestions that exist for a particular word is considered one at a time and sentences are created. The structure analyst agent tests the validity of these sentences using the statistic information which comprises of the availability percentages of words in certain locations. Semantic agent evaluates the sentence base on the context. Base on the response given by the structure analyst agent and the semantic agent the sentence could be accepted as the inscription string or reject the sentence and consider the next sentence provided by the lexical agent.

The final output of the system is string of Sinhala Unicode characters which are mapped with the characters that resides on the original ancient Sri Lankan inscription.

GNU Image Manipulation Program (GIMP) was use to perform the image processing procedures. The entire system was developed using java technology in the NetBeans Integrated Development Environments along with the MS – Access database management system. In order to increase the performance of the system some

information such as Sinhala dictionary are stored in files for fast accessing. Neuro Solutions software was used for to design the neural network.

This application is designed to run on a standalone machine. The users of this system are identified as the archaeologist and students in the archaeological field.

4.3 Summary

The approach towards developing the Brahmi optical recognition system is depicted throughout this chapter. It also provide a clear overview of the intended users that is interacting with the system, inputs and outputs of the system, the process that has been carried out, the technology been adopted in order to develop the system and the overall functionality and features of the system.

The next chapter discuss about the design of the system by elaborating each and every module in the system.



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