

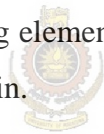
Technology Adapted

3.1 Introduction

Previous chapter critically review others work and identifies the most suitable technologies that could be used to implement Brahmi optical character recognition system. This chapter discusses about those technologies - neural network and multi agent systems and state how those technologies could be applied to this project.

3.2 Neural Networks in Pattern Recognition

Neural Networks are simplified models of the biological neuron system, which is a massively parallel distributed processing system made up of highly inter connected neural computing elements that have the ability to learn and thereby acquire the knowledge and make it available for use [17]. Artificial Neural Network is defined as a data processing system consisting of large number of simple highly interconnected processing elements in an architecture inspired by the structure of the cerebral cortex of the brain.



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There are two phases of a neural network, namely training and testing. The brain basically learns from experience. Neural networks are called machine learning algorithms, because by changing of its connection weights causes the network to learn the solution to a problem. Neural networks could learn by different methods, namely supervised learning, unsupervised learning and reinforced learning. In the supervised learning every input pattern that is used to train the network is associated with an output pattern. Based on the computer generated output and the expected output the error will be calculated. And depending on the error network parameters are adjusted in order to improve the performance. Feeding the error backward through the network is known as back propagation. In the unsupervised learning the target output is not presented to the system. The system learns of its own by discovering and adapting to the structural features in the input pattern. In the reinforced learning the expected output is not given but the supervisor indicates if the computed output is correct or incorrect. After the network is trained it is tested by giving the test patterns. The

actual results are compared with the desired results. Based on the results the accuracy level is calculated.

There are considerable amount of benefits in artificial neural networks. Since neural network is a machine learning technique it does not consume time for repetitive programming tasks. Neural networks have the powerful capability to grab the information patterns from the given data set. Even though neural network takes some time to learn for a sudden change it could rank better than the rule base systems that are limited to situation for which they were designed.

It is proven from the literature that artificial neural networks have been successfully applied for solution of variety of problems. It have shown a remarkable progress in the recognition of visual images , hand written characters, printed characters and other pattern recognition tasks. After the training phase of the neural network it is able to identify a pattern even with considerable amount of noise. Therefore it was decided to use artificial neural network in the recognition phase of this project. But when the noise level is high it is unable to guarantee the accuracy of the output, therefore it is needed to rectify this output.

3.3 Multi Agent Technology

An agent could be defined as software or an object that can perform a specific given task. The agents are base on standard template: *perceive – reason and act*. The specialties of the agents are the certain characteristic such as autonomy, adaptation and cooperation. The agents have their own agenda of goals and they act autonomously based on their goals. They do not simply reactive, but acts pro-actively and take initiatives as they deem appropriate. In this sense, agent systems can be viewed as a generalization of the client-server model in that each agent can be both a client and a server and can provide and request services to and from others. The agents are able to adapt to the environment, which consist of other agents and human users, and also they can learn from the experience in order to improve themselves in a changing environment.

Cooperation, coordination, communication and negotiation between agents are some of the most important features in a multi-agent system [15]. These features are highly

used in multi agent systems where agents collaborate with each other to achieve common goals. In order for the communication to be success among agents the agents should understand each other. This purpose is achieved by sharing the knowledge among the set of agents that resides in the multi agent system. The common knowledge of the multi agent system is stored in a shared location namely, ontology. This could be in a form of a document, set of machine interpretable specifications etc. The agents of the multi agent system access the ontology then and there when knowledge is required. The asynchronous message passing of the multi agent system is achieved by maintaining a common message space. The common message space acts as a bulletin board where agents write the required messages for the reference of other agents. Therefore even the others agents are involved with some other work they could later refer the common message space for updates. Ontology and the common message space together provide a strong support for the communication in the multi agent systems. In most of the systems problem solving is achieved by the communication feature in the multi agent systems.

By using the communication and the negotiation features of the multi agent system, the problem that emerged about the accurateness of sentence could be resolved for the system that is proposed by this thesis.

3.4 Summary

This chapter studies about the technologies - neural network and the multi agent systems. Based on the inherent features of these technologies we argue that the system should be developed by combining both the technologies: neural network and the multi agent systems. The next chapter elaborates on the approach that is followed by this system in terms of input, output, process, users and features.