

**MEDICAL IMAGE ANALYSIS WITH AN
INNOVATIVE INTELLIGENT COMPUTER
PROGRAM**

A dissertation submitted to the
Computer Science and Technology Degree Program,
Uva Wellassa University
in partial fulfillment of the requirements for the award of the
Degree of Bachelor of Science

by

**KOSGODA PATHIRANAGE PRABUDDHA SUNETH
PATHIRANA**

Registration Number: UWU/CST/06/0024

**Computer Science and Technology Degree Program
Uva Wellassa University, Sri Lanka
July 2010**

Abstract

The pre-defined major research objective was uniquely identifying an image captured from a medical instrument such as electronic microscope (microscopic view). It was proposed that, the technique optical patterns recognition, one of the key applications of artificial neural networks (ANN) will be used. Furthermore, also mentioned that the researcher will study the feasibility of using genetic algorithms (GA) to enhance the efficiency of ANN. In brief, the research is developing a computer program (software) with its ultimate objective, analyze a digital image and recognize it. (Optionally – Interpret it.)

Many experiments were carried-out to achieve these objectives, started with implementing an algorithm (a neural network) to recognize optical patterns. Succeeded with the selected software to implement and simulate basic algorithms - 'Wolfram Mathematica Version 6.0'.

The prototype-level NN architecture comprised of 3 layers, successfully trained with 'Back-propagation algorithm' and was able to recognize some pre-trained images of Sinhala characters (for algorithms testing purposes only). This program was then interfaced with a GUI created from VB.net and worked fine. (A Sinhala OCR-Optical Character Recognizer – a by-product)

In the next step, the training algorithm was optimized with an innovated Genetic Algorithm (GA), tested and obtained reports verifying that the GA works as expected and it significantly reduces the errors of outputs.

Then, after an in-depth study, the type of medical image (from which instrument they are being captured from) was selected. That was color images from TEM (Transmission Electron Microscopy) (http://en.wikipedia.org/wiki/Transmission_electron_microscopy). The images analyzed by the program are - more specifically, human blood viruses those can be recognized by its specific optical patterns.

The same algorithms developed in previous steps (NN+GA), were used with modifications to adapt the system to recognize medical images. Later, extended the program by interfacing with a user-friendly GUI developed by VB.net, enabling

analysis of color images (by analyzing each color channel (RGB) separately) and automated report generation feature.

The software developed - the final outcome was tested with more than 60 images and has obtained expected results. Therefore, without any hesitation, this research can be categorized as an extremely successful research, because the researcher has satisfied all the pre-defined objectives and absolutely an innovation.