Leaf Recognition and Classification Algorithm to be used by Indigenous Medicine

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In Sri Lanka there is a lot of emphasis on herbal and indigenous medicine. Majority prefer Ayurvedic medicine to Western medicine due to various factors such as less or rather no side effects. The fact that Ayurvedic medical system stood the test of time sums up to its worth as an alternative course of treatment for various ailments. However, a major drawback in the practice of indigenous medicine is the difficulty in finding ingredients. The literature cites efforts that have been made to come up with techniques to help this situation. Eg: Prof. H.M.D.R. Herath Social Science Department Head, University of Peradeniya had created an alphabetically ordered list of all trees and plants of Sri Lanka.

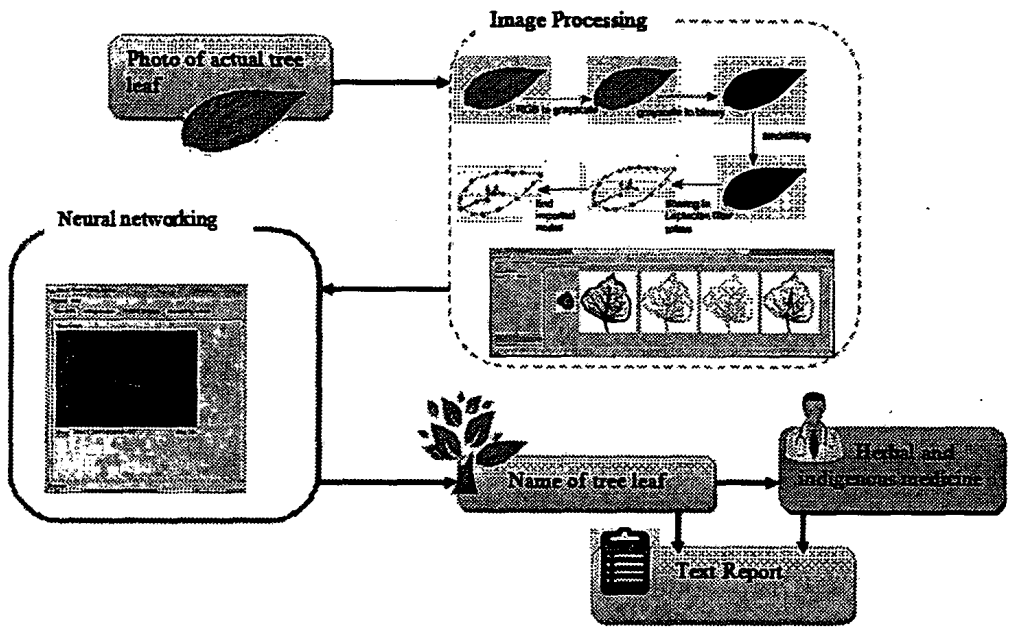
We believe our solution will fill the gap between the body of knowledge possessed by Ayurvedic medical practitioners and the technological requirements in the field. We developed a system that recognises the leaves of the herbs used for Ayrvedic treatment. The system takes the leaves of the trees as inputs and outputs the name of the tree or plant. Practical usages of our tool are:

- To identify unknown plants and their medicinal usage.
- To identify plants and herbs that provide certain ingredients for Ayurvedic prescriptions (e.g., leaf)

We used a combination of image processing techniques and neural networking to train a model and perform pattern matching to recognise the leaf with a pre-set level of confidence for its accuracy. As a supplementary feature, the system is also capable of providing a description of the identified herb's medicinal usage in reference to illnesses b going through feed data. In our solution we use Dynamic Training since we need to use new leaves while the program is functioning and train the new set of leaves. We also use a customisable image reading process depending on image quality. We use some rectifying algorithms to bring all images of leaves to one platform or image quality level for a better solution. Training can be improved with customising learning cycles and hidden layers. We also use a graphical user interface with charting as shown in Figure 1. Other existing shape modelling techniques used are Moment Invariant (M-I) Model and Centroid Radii (C-R) Model. The method we use is the Prewitt's Edge Detection Algorithm to detect the shape of the leaf and the veins of the leaf. The output is a 2D Structure. Training can be improved with customizing learning cycles and hidden layers. We also use a graphical user interface with charting as shown in Figure 1.

Our solution will have below components and inter-connectivity on each component is as shown in Figure 1. In the Image Processing module we used Prewitt's edge detection algorithm. In an image, we looked at discontinuities in depth, surface orientation and colour properties and photo illumination. We have also integrated a feed-forward back-propagation neural network. We train the network, test and compare and display the results. Database gives the list of illnesses the plant of the leaf is used with a report with confidence level.

FIGURE I
DESIGN ARCHITECTURE OF THE SOLUTION



The neural network based java application consists of three main phases. They are Image processing and edge detection, Neural network training and Recognition.

We can get a resultant of an average accuracy of about 90%-98% accuracy level with a 20 x 20 training set.

The application will be exposed as a service so mobile app can use it and give the real time name of the plant or tree.

Future Work for this application will include,

1. Given the Illness which plants/trees are suitable.
2. Localization.
3. Geographical Distribution of medical plants/trees in Sri Lanka.