# Enhanced Computer Based Counting System for Coconut Mites in Microscopic Images

A PROJECT REPORT PRESENTED BY

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The researchers in the filed of pests and diseases of coconut are constantly struggling to find methods to control the spread of the coconut mite, one of the most damaging pests of coconut in the world. In their studies the estimation of mite population in a nut sample is one of the key factors used to judge the effect of the control methods applied. This invariably involves counting the presence of mites in a sample of wash water carrying dead mites, by observing it through a microscope. Manual counting is a very tedious and a time consuming task where many human errors may occur. Besides, it requires the constant attention of a trained person whose eyes may get tired frequently due to the strain required to observe through a microscope and count. With the advancement of the digital image processing techniques, this tedious task can be made much more convenient, consistent and partially automated, which may definitely help the researchers to accelerate the control actions on the spread of this pest.

In the development of this automated mite counting system, digital images were acquired through a commercially available digital camera. The image was processed with several image processing algorithms in order to improve the appearance for accurate identification of mites. The system was developed with MATLAB (MATrix LABoratory ) as a standalone application that runs on any Windows platform.

The objective of the project was to improve and automate the mite counting process using advanced digital image processing algorithms. The variability in the images, their magnification through the microscope, and during acquisition by the digital camera, and different orientations were taken into account in developing the techniques for counting them. In order to handle a wider range of images with above attributes, the system was designed and developed to function with the operator's feedback also, instead of being fully autonomous in processing images. In places where the system finds it difficult to segment the mites clearly due to the quality of the image or the obscure orientation of the mites, the operator was given an opportunity through the user interface, to improve the accuracy of classification by adjusting the processing parameters based on operator's judgment. It could be considered as one of the advantages over the previous development (Gamage, 2001). The system keeps track of the clearly identifiable regions and modifies the count based on operator's judgment in difficult to identify situations. It also provides a visible cue of the identified mites, reducing the work load of the human observer where he / she has to keep a mental record in manual counting. All these could be considered as added improvements to the previous attempt to develop analysis software for this purpose.