RESEARCH ARTICLE

DETECTING PLANT LEAF DISEASES USING IMAGE PROCESSING TECHNIQUES: A SURVEY

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Received-07.07.2021, Revised-26.07.2021, Accepted-15.08.2021

Abstract: Most developing countries that rely on agricultural resources, such as India and Malaysia, still employ traditional techniques which are visual inspection to detect plant leaf diseases. Image processing is relatively new, cutting-edge technology in agriculture field to detect plant leaf diseases and the most important approach is through image segmentation. It works by segmenting meaningful information from diseased plant leaf image to be analysed and it is much simpler than traditional techniques. This article covers a survey on various image segmentation techniques such as K-Means, Otsu's, Edge-based, Watershed and Region Growing. It also includes the discussion of advantages and disadvantages of each technique. Aside from that, the accuracy of segmentation achieved by each technique is also reviewed to describe their performance in detecting plant leaf diseases.

Keywords: Plant leaf diseases, Agricultural resources, Image processing, Image segmentation

INTRODUCTION

Because India is an agricultural country, agriculture is very important sector of the Indian economy and it accounts for more than 80% of people's income (Patel & Joshi, 2017). In Malaysia, agriculture continues to be a major part of economy, producing 12% of the country's GDP and employing 16% of the population (Adnan & Nordin, 2021). Therefore, detection of leaf diseases in these countries is essential because diverse types of diseases in the crop relatively lower yields. It also is challenging for farmers to distinguish a specific disease.

Farmers adopted visual inspection methods to detect plant leaf diseases in the past. Visual inspection of plant leaf diseases, on the other hand, is inefficient since it necessitates the expertise of professional botanists as well as prepared disease specimens, which takes a long time. In contemporary times, farmers begin to embrace technology to help them accomplish their jobs more efficiently.

Hence, we looked at several different types of plant leaf diseases, as well as various modern techniques for detecting them through image processing.

Three most common plant leaf diseases are leaf blight, gray spot and rust. This paper covers a variety of techniques to detect plant leaf diseases. At the end, the accuracy of detection of each technique is reviewed to determine their performance.

MATERIALS AND METHODS

Detection of plant leaf diseases through image processing fundamental steps are image acquisition, image pre-processing, image segmentation, feature extraction and lastly image classification of the diseases. Image segmentation is highlighted in this survey, with the technique being centered on segmenting the infected from the uninfected parts in order to determine disease types.

There are five image segmentation techniques reviewed in this survey which are:

- K-Means
- Otsu's
- Edge-based
- Watershed
- Region Growing

RESULTS AND DISCUSSION

Table 1 summary the overview of image segmentation techniques utilised in various papers. The source of diseased plant leaf and detection accuracy of the techniques is also listed.

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