Chapter 1

A Survey of Potatoes
Image Segmentation Based on Machine Vision

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ABSTRACT

The quality control of the agricultural products, which in many cases is through intuitive observation of the visible features of the product, plays a key role in the survival of the agricultural industry. For a long time, the qualitative categorization of these products has been performed by trained people who search products for the specific characteristics. On the other hand, hard and repetitive working can cause people to make some mistakes in computing the quality control errors. Hence, by entering the machine vision systems into this subject, they turned into a reliable, low-cost and real-time technology. Despite the existence of machine vision systems in this process, there are still major challenges in categorizing agricultural products in terms of quality, size, shape, and examination of defects. Potato is one of the most important agricultural products that is produced and has a high application. Unfortunately, it suffers from various types of diseases and defects. Hence, its quality control has a particular importance.

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INTRODUCTION

Potato with the scientific name of Solanum tuberosum is one year plant from the Solanaceae family. Over thousands of species of potatoes are exist in the worldwide. The original name of the potato is batata that the Spaniards changed its name into potato it in the 16th century.

This product is one of the big challenges in agriculture; because it can be used as a meal and competes with the plant for resources. As a result of this competition for resources, its skin yields suffer from the blemishes (defects). Defects have a significant effect on the potato products qualification (Ahmadvand, Mondani, & Golzardi, 2009).

Several types of research have been introduced to detect the potato defects for qualifying and grading them (Ahmadvand et al., 2009; Moallem & Razmjooy, 2012; Moallem, Razmjooy, & Ashourian, 2013; Qi et al., 2018; Salaman, 2014).

The first step in quality inspection of potatoes in computer vision is to correct segmentation of the potato from the background.

In other words, image segmentation is the process of separating a digital image into some classes. The number of these classes can be changed based on the subject purpose. Indeed, the main purpose of image segmentation is to simplify and change the representation of an image into something that is more meaningful and easier to analyze (Hau, 2015).

Recently, the application of the image segmentation in agricultural applications is increasing. The quality inspection of the agricultural products is getting to be smarter with the automatic computer vision based robots. Hence, designing a profitable algorithm for solving the segmentation problem for these robots is a challenging subject for the researchers and scientists.

In this study, a review of different methods for potato tuber segmentation to separate the potato tuber image from the background image has been presented.

There are different methods for segmentation of potato images; in the following, the methods and their characteristics are discussed.

BI-LEVEL IMAGE SEGMENTATION

In order to obtain a simple and fast system, monochrome (grayscale) images are the best choice (Russ, 2016). Using grayscale images reduces the complexity and speeds up the system. There are different works of using this kind of system. The general algorithm of this approach is as follows:
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