Chapter 48
A Study of Different Color Segmentation Techniques for Crop Bunch in Arecanut

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ABSTRACT

Arecanut is an important cash crop of India and ranks first in the production. Arecanut crop bunch segmentation plays very vital role in the process of harvesting. Work on arecanut crop bunch segmentation is of first kind in the literature and this chapter mainly focuses on exploring different color segmentation techniques such as Thresholding, K-means clustering, Fuzzy C Means (FCM), Fast Fuzzy C Means clustering (FFCM), Watershed and Maximum Similarity based Region Merging (MSRM). The effectiveness of the segmentation methods are evaluated on our own collection of Arecanut image dataset of size 200.

INTRODUCTION

Agriculture plays a major role in any nation's economy and it is the primary livelihood of the mankind. Indian economy is based on agriculture as it is a traditional occupation. A stable agricultural industry ensures a country with food security, source of income and source of employment. This could be achieved by improving agriculture production and its quality by practicing precision agriculture. Precision agriculture, as a crop management concept, could meet much of the increasing environmental, economic, market and public pressures (Stafford 2000). The impact of precision agriculture technologies on agricultural production is expected in two areas: profitability for the producers and ecological and environmental benefits to the public (Zhang et al. 2002). The objectives of precision agriculture

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are profit maximization, its input rationalization and environmental damage reduction, by adjusting the agriculture practices to the site demands.

In the field of precision agriculture considerably quite a large effort on research has been focused. This leads the agricultural and engineering companies for manufacturing advanced machine vision devices to facilitate the practice of precision agriculture (Scarlet 2001). The spatial and temporal soil variability and crop management within a farm has been admired for centuries. In the past, the fields are small in size and their demarcations are defined by natural boundaries, like soil type and water courses. This made farmers to change their soil and crop treatments manually. With the enhancement in the area of field, the crop production was substantially increased and to cope up with the large scale of crop production automation coined more importance in the later part of the previous century (Godwin and Miller 2003). Without incorporating and developing the new technology for filed spatial variability and crop management (Goense et al. 1996), it was impossible automate the precision agriculture. With the advancement in technology which vitally made the impact for the development of the precision agriculture concept, in the late 1970s, the Global Positioning System (GPS) using satellites placed in orbit by the Department of Defense in the US. This system helped in locating any position on earth using latitude, longitude and altitude, 24 hours a day, up to the perfect accuracy of a few centimeters. With this information available to machines in the field, the treatment for the crops can be applied locally at the time of field operations within the field for the required amount of area (Stafford 1994). Precision agriculture is the future way ahead for formers to produce quality crop for the millennium. This is because the production of crop become more and more precise, the technologies are highly optimized which results in cost reduction and impact over the environment (Stafford et al. 1996).

Three main obstructions which needed to overcome during the implementation of precision agriculture (Matthews 1983; Stafford 2000)

1. Precision agriculture deals with intensive information related to mapping of different types of soil, crop and factors related to environment of the field. This produces huge data quantities which would be processed by the user. Along with the field data some more data is added based on the experience like weather and market information data. This overload of data has to be maintained and managed properly by suitable data integration, expert and decision support systems (Stafford 1994). To achieve this development some standardization of data formats and transfer protocols need to be followed.
2. There is an absence of balanced systems and methods for deciding application necessities on a restricted premise and a parallel absence of experimentally approved evidences for the benefits guaranteed for the concept. Both of these must be addressed by researching in the area of soil, crop science and agronomic exploration and experimentation.
3. Although information needed on soil, yield and ecological elements can be obtained, most strategies are expensive and intense labor-oriented, (like laboratory set up and subject expert for the analysis of soil). The information can be created through programmed sensor frameworks sensing particular components or suitable substitutes.

Accordingly, improvement of quick sensing frameworks must be needed before practicing precision agriculture. With the improvement of frameworks that can give information at fine spatial determination, the advancement of more exact application innovations and exact and dependable position reckoning has ended up important. Agricultural engineers must take a lead in overcoming the first and third hindrances