

## Automatic Furrow Detection for Precision Agriculture

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**Abstract :** The increasing advancement in the robotics equipped with machine vision sensors applied to precision agriculture is a demanding solution for various problems in the agricultural farms. An important issue related with the machine vision system concerns crop row and weed detection. This paper proposes an automatic furrow detection system based on real-time processing for identifying crop rows in maize fields in the presence of weed. This vision system is designed to be installed on the farming vehicles, that is, submitted to gyros, vibration and other undesired movements. The images are captured under image perspective, being affected by above undesired effects. The goal is to identify crop rows for vehicle navigation which includes weed removal, where weeds are identified as plants outside the crop rows. The images quality is affected by different lighting conditions and gaps along the crop rows due to lack of germination and wrong plantation. The proposed image processing method consists of four different processes. First, image segmentation based on HSV (Hue, Saturation, Value) decision tree. The proposed algorithm used HSV color space to discriminate crops, weeds and soil. The region of interest is defined by filtering each of the HSV channels between maximum and minimum threshold values. Then the noises in the images were eliminated by the means of hybrid median filter. Further, mathematical morphological processes, i.e., erosion to remove smaller objects followed by dilation to gradually enlarge the boundaries of regions of foreground pixels was applied. It enhances the image contrast. To accurately detect the position of crop rows, the region of interest is defined by creating a binary mask. The edge detection and Hough transform were applied to detect lines represented in polar coordinates and furrow directions as accumulations on the angle axis in the Hough space. The experimental results show that the method is effective.

**Keywords :** furrow detection, morphological, HSV, Hough transform

**Conference Title :** ICPABE 2018 : International Conference on Precision Agriculture and Biosystems Engineering

**Conference Location :** Montreal, Canada

**Conference Dates :** May 24-25, 2018