Domain: MATLAB
Technology: Image Processing

Algorithm of Weed Detection in Crops by Computational Vision

Abstract:

This research has been based on the use of precision agriculture tools for the management of weeds in crops. It has focused on the creation of an image-processing algorithm to detect the existence of weeds in a specific site of crops. The main objective has been to obtain a formula so that a weed detection system can be developed through binary classifications. The initial step of image processing is the detection of green plants in order to eliminate all the soil in the image, reducing information that is not necessary. Then, it has focused on the vegetation by segmentation and eliminating unwanted information through medium and morphological filters. Finally, a labeling of objects has been made in the image so that weed detection can be done using a threshold based on the area of detection. This algorithm establishes an accurate monitoring of weeds and can be implemented in automated systems for the eradication of weeds in crops, either through the use of automated sprayers for specific site or a weedcutting mechanism. In addition, it increases the performance of operational processes in crop management, reducing the time spent searching for weeds throughout a plot of land and focusing weed removal tasks on specific sites for effective control.

Keywords: Image processing, weed detection, crop monitoring, morphological filters, precision agriculture

Existing System:

The control of weeds is of vital importance in agriculture, these are unwanted by the farmer since they are causing several problems in the crop. Among its negative effects is the contamination of production, shelter of insects and diseases, facilitates the growth of other pests and increases irrigation costs. Most people who practice agricultural activity for export, are people who use conventional methods for land treatment, irrigation and crop management, maintaining the quality of the product at an outstanding level. Despite the high quality of the national product, the outstanding quality standards developed countries have not yet achieved. The disparity lies in the use of new technologies to improve and optimize the processes of soil study and crop management

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Disadvantages:

- Limited accuracy
- High computational requirements
- Difficulty in detecting small weeds
- Limited scalability

Proposed System:

The idea of making an algorithm that by means of image processing detects the weeds that are located in a specific area of plantation then arises. This methodology is advantageous because it offers a technological tool for farmers throughout the process of sowing, growing and harvesting crops. In addition, it increases the performance of operational processes in crop management, reducing the time spent searching for weeds throughout a plot of land and focusing weed removal tasks on specific sites for effective control. weed detection in crops using computational vision can accurately identify and differentiate weeds from crops, which can be used to target specific areas for weed control, reducing the use of herbicides and improving crop yields

Below is the block diagram of the proposed method

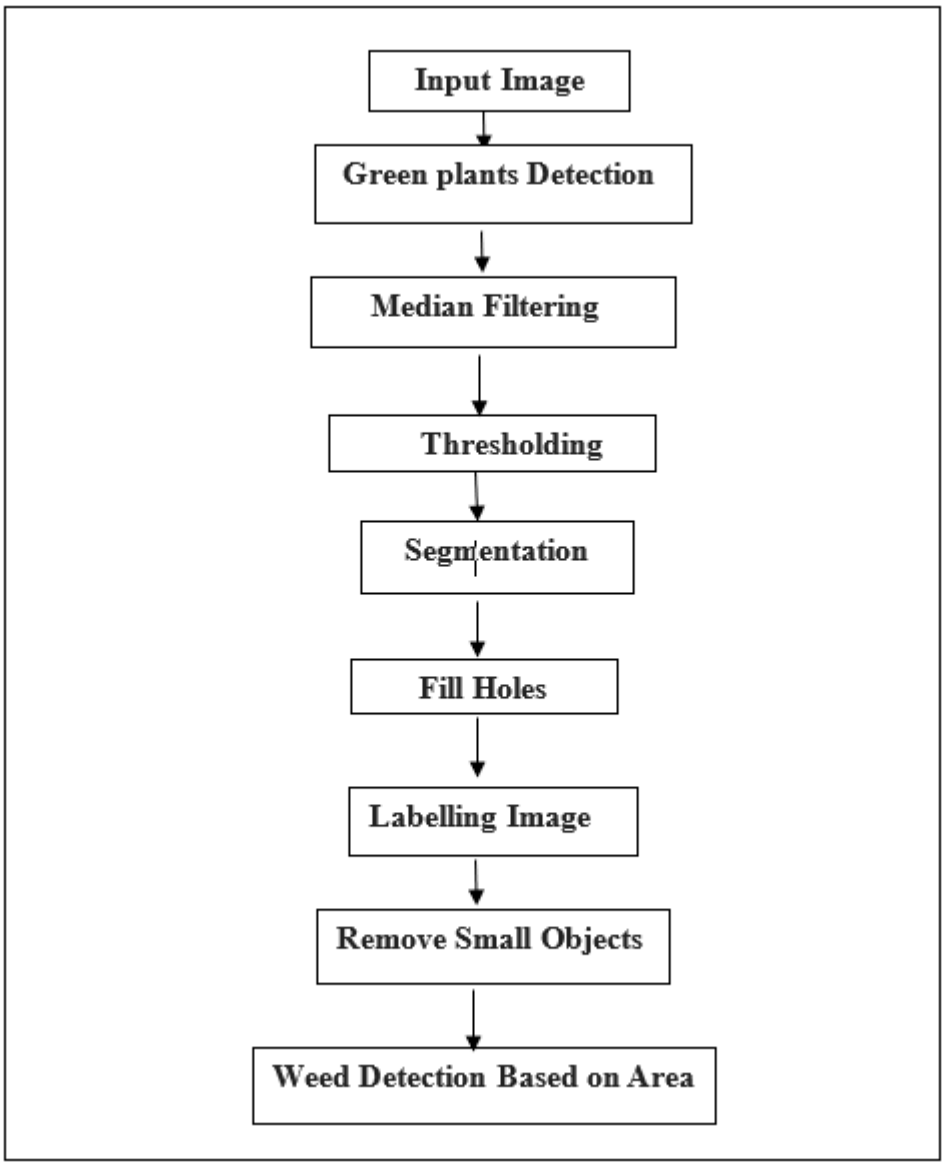

Figure 1: Block Diagram of Proposed System

The Precision Agriculture (PA) has opened the doors so that technology can be incorporated into the farming processes and improve the effectiveness of production in the crops. This new concept has led to developed countries highly productive in agriculture, opting for the use of new tools to improve their technological management in the agricultural enterprise. In this way, agricultural practices are determined to replace the usual inputs based on average values, as in traditional agriculture, for a more precise agriculture, with localized management, which studies the changes in yield in an entire area. Consequently, greater benefits are obtained such as the optimization of

the use of inputs, determination of the availability of nutrients, organic matter, water, etc. on the land, reducing production costs and improving the quality of crops.

Advantages:

- Increased efficiency
- Flexibility.
- detect weeds in real-time.
- Sustainability

Applications:

- Precision agriculture
- Crop monitoring
- Research

Software & Hardware Requirements:
Software: Matlab 2020a or above

Hardware:

Operating Systems:

- Windows 10
- Windows 7 Service Pack 1
- Windows Server 2019
- Windows Server 2016

Processors:

Minimum: Dell Latitude E5450 computer with Intel Core i5-5200 processor

Recommended: Any Intel or AMD x86-64 processor with four logical cores and AVX2 instruction set support

Disk:

Minimum: 2.9 GB of HDD space for MATLAB only, 5-8 GB for a typical installation

Recommended: An SSD is recommended A full installation of all MathWorks products may take up to 29 GB of disk space

RAM:

Minimum: 4 GB

Recommended: 8 GB

Learning outcomes:

- Introduction to Matlab
- What is EISPACK & LINPACK
- How to start with MATLAB
- About Matlab language
- Matlab coding skills
- About tools & libraries
- Application Program Interface in Matlab
- About Matlab desktop
- How to use Matlab editor to create M-Files
- Features of Matlab
- Basics on Matlab
- What is an Image/pixel?
- About image formats
- Introduction to Image Processing
- How digital image is formed
- Importing the image via image acquisition tools
- Analyzing and manipulation of image.
- Phases of image processing:
- Acquisition
- Image enhancement
- Image restoration
- Color image processing
- Image compression

- Morphological processing
- Segmentation etc.,
- How to extend our work to another real time applications
- Project development Skills
    - Problem analyzing skills
    - Problem solving skills
    - Creativity and imaginary skills
    - Programming skills
    - Deployment
    - Testing skills
    - Debugging skills
    - Project presentation skills
    - Thesis writing skills