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Non- Parameteric Techniques for Weed Detection

Jennifer Corredor Gomez[1,2], Oliver Hensel[1], Sofrony Esmeral Jorge[2]

[1] *University of Kassel, Agricultural Engineering, Germany*
[2] *National University of Colombia, Mechanical and Mechatronics Engineering, Colombia*

Abstract

There is few research and implementation of "precision farming" in Colombia despite the fact that agriculture is one of the most important sectors in the Colombian economy. Looking forward the development of Colombia in this area and considering that in the conventional procedure to cultivate there are several steps that must be performed prior to preparing the field. Weed elimination is extremely important because they could generate poor growth of the crop; the paper presented is framed in this context, and will pursue optimal weed elimination methodologies through the development of "intelligent" burners.

The process of preparing soil for crops is usually framed in tours of indiscriminate burning routines that weaken the soil and render an inefficient use of fuel. The objective of this study is to develop a new integrated system for weed detection and removal from agriculture fields by using machine vision and thermal control. The system proposed builds on the fact that weed identification can be done using colour detection techniques via machine vision. For weed detection, an image processing methodology is developed using non-parametric techniques for pattern recognition. The aim of implementing a machine vision system that consists of a sensor that acquires images and post-processing software that is in charge of detecting weeds, is to control the process of actuation of valves for each individual burner, and thus optimising fuel use and keeping the soil's properties intact; for correct removal of weeds thermal control was used. An important activity was the development of an electronic power amplifier and a communication interface that sends a signal to activate valves, allowing the correct operation of the flame-thrower device. Through the appropriate valve selection and calculation of the desired flame intensity, the balance between amount of fuel required and temperature needed to eliminate weed is obtained.

The proposed algorithm (based on the Kn-Nearest-Neighbour Estimation) showed good results in terms of computational costs and processing times. The algorithm developed reached 0.2135 s per image in the analysis, which allows the tractor to move with a speed of 7.6 km h^{-1}. The response of the system was considered adequate for its application in actual farming operations.

Keywords: Kn-nearest-neighbour estimation, machine vision, non-parametric techniques, precision farming

Contact Address: Jennifer Corredor Gomez, University of Kassel, Agricultural Engineering, Nordbahnhofstr. 1a, 37213 Witzenhausen, Germany, e-mail: jpcorredorg@unal.edu.co