

A computer vision-based weed control system for low-land rice precision farming

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ABSTRACT

Agricultural sector is one of the economic pillars of developing nations, because it provides means of boosting gross domestic profit. However, weeds pose a threat to food crop by competing with it for nutrients and undermining the profit to be made from it. The treatment of these weeds is necessary, but at minimal impact on the actual food crop. Herbicide usage is one major means of weed control, owing to the expensive and labour-intensive nature of hand weeding. Recently, the need for site specific spraying has been on the rise because of health concerns which have been raised on the effect of herbicides on food crops and the effect on the environment. Most research on the field focuses on accurately identifying the weeds whilst neglecting the weed control. In this research, we apply fuzzy logic-based expert system to control how herbicide is sprayed on low-land rice in order to reduce excessive herbicide usage. The system supplies the control with weed density (Box size) and confidence level. The values of both are then passed to the fuzzy logic control for spray decision. The Sugeno as well as Mamdani models were tested using generated values for detected weed box size and confidence levels of the computer vision. The mean absolute error obtained was 0.9 for both, and 0.3 and 0.2 respectively, for the mean square error. The error shows how accurate the system can be and with low error value, it shows that the system implementation is capable of providing control for spraying of herbicides which in turn will yield more returns for low-land rice farmers.

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1. INTRODUCTION

Precision farming is a cohesive production and information-based farming system with a goal to promote efficiency, boost production and lucrateness of the farm production activities while avoiding the adverse effects of excessive chemical usage on the environment or inadequate application of input [1, 2]. Precision farming has been affirmed as the solution to sustainable agriculture with focus on production boost [3]. Agricultural sector is an important sector of any economy as a mean of providing food supplies to meet the populace demand.