Weed species phenotyping into a culture of maize for the precision application of herbicides

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The weed management in agriculture plays an important role, since the yield of a crop can vary depending on the species of invasive plants involved, and due to its percentage of occupation by area. Since one function of the phenotyping process is the morphological characterization of plants [1], such concept can be used to discriminate between monocot and dicots weed species, i.e., those having narrow-leaves and broad-leaved weeds, groups that can be appropriately controlled by specific herbicides. In fact, efficiency is higher if selective treatment is performed for each type of infestation instead of using a general application of herbicide on the whole agricultural surface. This paper presents a method for weed recognition based on phenotyping processes, i.e., to improve precision spraying based on the control of weed species into a maize culture. The method was developed considering the use of shape modelling techniques, which uses concepts of multi-resolution analysis in both radial and circular directions. Results obtained were compared with a solution presented in the literature, which used the Hu moments [2]. The performances of the classifiers were compared based on the class of error, risk assessment, accuracy and algorithm quality. Besides, for validation both the Moments-Invariant and the Centroid-Radii models were used. The proposed approach has shown robustness characteristics for the recognition of those analyzed weeds. The data set for experimentations consisted of 100 images collected form an agricultural field of maize, considering specific set of data for training and testing, as well as for analyses and comparison purpose. In this context, the results have shown that the consideration of the species and its occupancy rate in the area of culture associated with the herbicide application at variable rates based on zones and precision application can be useful to minimize the economic and environmental impacts, and competitiveness.

References:
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