Weed Management in Tomato Fields through Object Detection Neural Networks

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The tomato crop (*Solanum lycopersicum L.*) is one of the most important, not only in Spain but also worldwide. Nevertheless, aggressive weeds in the field put the production at risk. That is why it is very important to identify this species to carry out a special and selective control towards them. Precision Agriculture hand in hand with computer vision is a powerful tool to solve the problem. Digital cameras and Artificial Neural Networks have been rapidly developed in the past few years, providing new methods and tools also in agriculture and weed management. The current study aims for a selective and specific real-time system using *Object Detection algorithms* based on *Convolutional Neural Network* procedures that can detect weed species in tomato fields. The input to the Neural Network are RGB images with mixtures of tomato crop and monocot (*Cyperus rotundus l., Echinochloa crus galli L., Setaria itálica L.*) and dicots (*Portulaca oeracea L., Solanum nigrum L.*) weeds. The procedure was based on the detection and classification of plant species to selective spraying. The validation process was done with a random selection of RGB images containing the aforementioned species. The prediction evaluation was done by mean average precision (mAP), the metric most accepted by the scientific community for object detection networks. The results obtained are greater than 90 %, depending on the class. This research work promises an important contribution to Site Specific Weed Management in precision agriculture..

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