IoT and Deep Learning approach for Growth Stage Segregation and Harvest Time Prediction of Aquaponic and Vermiponic Swiss Chards

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Abstract : Aquaponics offers a simple conclusive solution to the food and environmental crisis of the world. This approach combines the idea of Aquaculture (growing fish) to Hydroponics (growing vegetables and plants in a soilless method). Smart Aquaponics explores the use of smart technology including artificial intelligence and IoT, to assist farmers with better decision making and online monitoring and control of the system. Identification of different growth stages of Swiss Chard plants and predicting its harvest time is found to be important in Aquaponic yield management. This paper brings out the comparative analysis of a standard Aquaponics with a Vermiponics (Aquaponics with worms), which was grown in the controlled environment, by implementing IoT and deep learning-based growth stage segregation and harvest time prediction of Swiss Chards before and after applying an optimal freshwater replenishment. Data collection, Growth stage classification and Harvest Time prediction has been performed with and without water replenishment. The paper discusses the experimental design, IoT and sensor communication with architecture, data collection process, image segmentation, various regression and classification models and error estimation used in the project. The paper concludes with the results comparison, including best models that performs growth stage segregation and harvest time prediction of the Aquaponic and Vermiponic testbed with and without freshwater replenishment.

Keywords : aquaponics, deep learning, internet of things, vermiponics