

## 3D Plant Growth Measurement System Using Deep Learning Technology

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**Abstract :** The purpose of this research is to facilitate productivity advances in agriculture. To accomplish this, we developed an automatic three-dimensional (3D) recording system for growth of field crops that consists of a number of inexpensive modules: a very low-cost stereo camera, a couple of ZigBee wireless modules, a Raspberry Pi single-board computer, and a third generation (3G) wireless communication module. Our system uses an inexpensive Web stereo camera in order to keep total costs low. However, inexpensive video cameras record low-resolution images that are very noisy. Accordingly, in order to resolve these problems, we adopted a deep learning method. Based on the results of extended period of time operation test conducted without the use of an external power supply, we found that by using Super-Resolution Convolutional Neural Network method, our system could achieve a balance between the competing goals of low-cost and superior performance. Our experimental results showed the effectiveness of our system.

**Keywords :** 3D plant data, automatic recording, stereo camera, deep learning, image processing

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