

(54) Title of the invention : P-MONITOR FOR LARGE-SCALE MULTI-CLASS PEST DETECTION AND CLASSIFICATION BASED ON DEEP LEARNING

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(57) Abstract :

Multi-class pest detection is one of the crucial components in pest management involving localization in addition to classification which is much more difficult than generic object detection because of the apparent differences among pest species. This project proposes a region-based end-to-end approach named P-Monitor for large-scale multi-class pest detection and classification based on deep learning. P-Monitor consists of three major parts. First, a novel module Channel Spatial Attention (CSA) is proposed to be fused into the Convolutional Neural Network (CNN) backbone for feature extraction and enhancement. The second one is called Region Proposal Network (RPN) that is adopted for providing region proposals as potential pest positions based on extracted feature maps from images. Position-Sensitive Score Map (PSSM), the third component, is used to replace fully connected (FC) layers for pest classification and bounding box regression. Furthermore, we apply contextual Regions of Interest (RoIs) as contextual information of pest features to improve detection accuracy. We evaluate P-Monitor on our newly collected large-scale pests' image dataset, Multi-class Pests Dataset 2018 (MPD2018) captured by our designed task-specific image acquisition application, covering more than 80k images with over 580k pests labeled by agricultural experts and categorized in 16 classes. The experimental results show that the proposed P-Monitor performs well on multi-class pest detection with 75.46% mean average precision (mAP), which outperforms the state-of-the-art methods.

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