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Development of a Smart Trap Structure for Pest Identification and Counting

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[Introduction]

Currently, it is relies on manpower and visual inspection that the system for inspecting pests and diseases in field. However, the proportion of experts is decreasing every year due to the replacement of personnel. If the timing of pest control is missed, it can lead to a large outbreak in crops. Therefore, this study conducted to develop trap that combine pests identification and counting technology.

[Materials and Methods]

We explored the structure of the existing trap and devised a moth lure trap for the major pests of crops, the *Spodoptera exigua* and *Spodoptera litura*. The trap was designed to enable unmanned inspections with features such as power supply and automatic discharge. Additionally, we modified the height and angle of the camera under the suction fan to solve problems such as out-of-focus images and interference of view. We collected about 2,000 images to obtain a classification key for identifying *Spodoptera exigua*, and obtained model improvement data through box labeling.

[Results and Discussion]

We developed a classification key for recognizing the *Spodoptera exigua*, focusing on the lower wing patterns similar to symmetric pairs. A image was labeled with boxes to facilitate use in deep learning. In addition, we obtained images of overlapping insects in groups of ten to enhance the sophistication of the deep learning model.

When deep learning was performed using this image, a mAP of 96% was achieved. We will also conduct additional research to address issues such as reduced attractiveness due to pheromone diffusion caused by fan operation for descent.

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