Automatic Aphid Counting Based on The Yellow Water Pan Trap Imagery and Deep Learning

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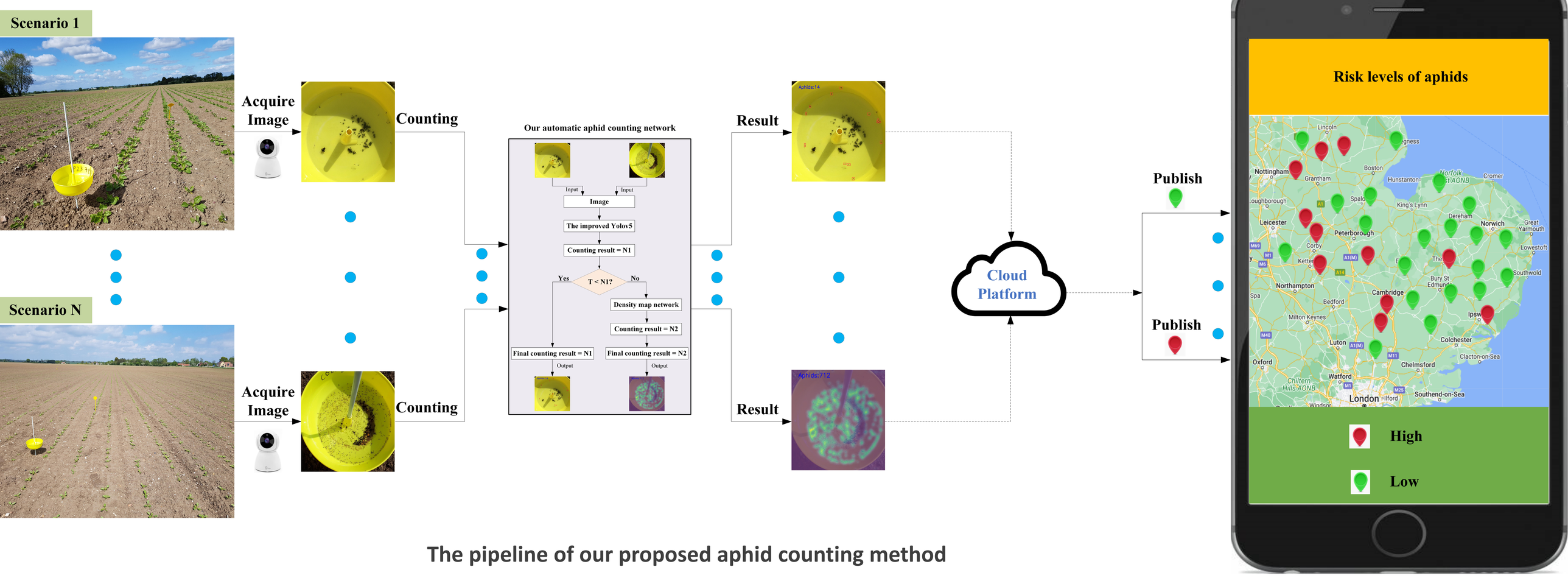
Introduction

Beets infected with virus yellows

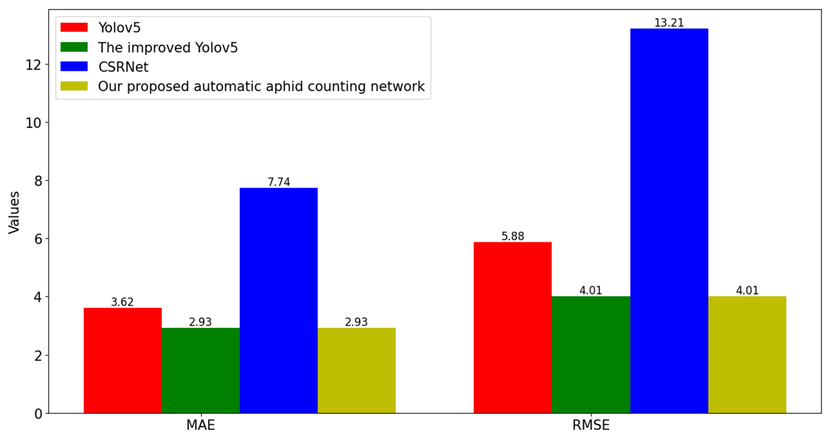
Aphids are efficient vectors to transmit virus yellows in fields. Timely monitoring and control of aphid populations are thus critical to prevent the large-scale outbreak of virus yellows. The main challenges in aphid counting include: 1) Aphids are small objects; 2) The density distributions of aphids are varied in different areas of the field. In this project, we proposed a hybrid automatic aphid counting network to replace manual counting, which is labor-intensive and time-consuming.

Methodology

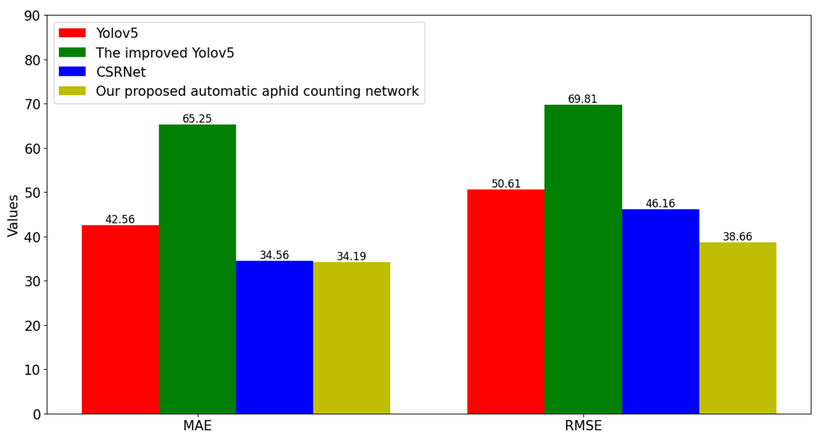


The pipeline of our proposed aphid counting method

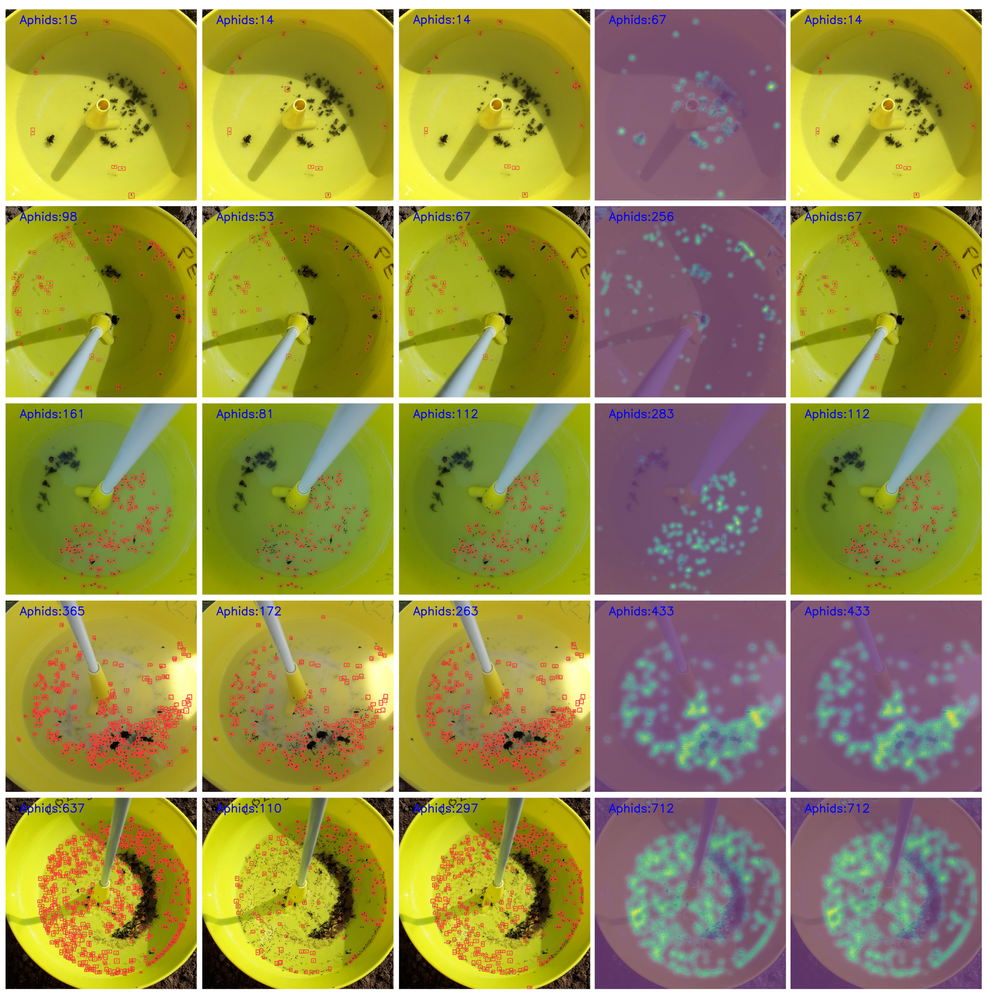
Experimental results and conclusions



The counting results using different networks on the test set of normal-density aphid dataset



The counting results using different networks on the test set of high-density aphid dataset



True label **Yolov5** **Improved Yolov5** **CSRNet** **Ours**

1) The detection results of the improved Yolov5 are obviously better than the original Yolov5.

2) The counting effect based on the detection network is better in aphids with sparse and scattered distribution. While the counting effect based on the density map estimation network is better in the case of dense distribution of aphids.

3) Our proposed network combining the strengths of the detection network and the density map estimate network achieves the best counting effect compared with other methods.