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## **ROBOTIC INTRA-ROW WEED HOEING IN SUGAR BEET**

### **ABSTRACT**

Vision-based and GNSS-based row guidance systems for inter-row hoeing have been developed for maize, soybean, sugar beet and other crops with wide row spacing. Selective intra-row weeding, however, has not yet been realized for many arable crops. Weeds within crop rows and close to the crop are difficult to remove without damaging the crop. Intra-row weeding can be carried out in several different ways. We developed a prototype intra-row hoe for robotic weeding in sugar beet. A bi-spectral camera and image analysis algorithms were developed to automatically identify weed species in sugar beet based on shape features. A step-wise classifier was developed for automatic weed/crop classification.

Positions of crops and weeds were recorded in the classification results. Thresholds were set to decide when the speed of the finger weeder was increased. Electric motors were rotating the finger weeder with a fluctuating speed. At driving speed (2 km/h), the finger weeder worked selectively and did not damage the crops. At 8 km/h, the finger weeder removed all plants in the row. An encoder was mounted in the axis of a non-driven wheel running over the ground providing information concerning distance. After calibration, the distance between two images and between classified plants in the image and the finger weeder were known. A micro-controller gathered the information from the encoder, and the classification program, triggered the camera and the finger weeder.

If weeds were close to crops or if no weeds were identified, the speed of the finger weeder was not increased.

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