

Kaspersen, K.¹; Berge, Therese W.²; Goldberg, S.³; Netland, J.²; Overskeid, Ø.³; Stølan, T.⁴

¹SINTEF Information and Communication Technology, Oslo, Norway, ²Bioforsk – Norwegian Institute for Agricultural and Environmental Research, Plant Health and Plant Protection Division, Ås, Norway, ³Adigo Ltd., Oppedgård, Norway, ⁴DAT Ltd., Rena, Norway, e-mail Kristin.Kaspersen@sintef.no

Estimation of weed pressure in cereals using digital image analysis

Poster presentation

Lack of automatic weed monitoring is a bottleneck for operational site-specific weed control. *Weedcer* is an algorithm developed for automatic estimation of weed pressure in cereals based on red-green-blue images. It was developed and tested with images acquired in Norwegian cereals seeded at the normal row spacing of the region, 0.125 m.

Images were acquired in spring for spring cereals and autumn for winter wheat. Images were acquired about 0.5 m above the soil surface with a camera mounted vertically on a mobile platform. To ensure even illumination, external flash was used. Each image covered approximately 0.06 m² (0.2 m × 0.3 m) and the image resolution was ca 0.25 mm pixel⁻¹. The algorithm uses adaptive thresholding for optimal separation of soil and plants regardless of soil conditions and crop colour. Weed leaf candidates are identified based on shape, size, colour and texture. The shape descriptors include roundness, elongation and a set of Fourier features. The candidates are then classified by a support vector machine (SVM) which has been trained on a manually classified, independent data set based on images from 2007 and 2008.

The classifier was tested on two datasets. Test set A consists of randomly selected images from 2007 and 2008. Test set B consists of manually selected images from 2007, 2008 and 2009. Test set B covered a large span of soil conditions, weed and crop densities. We built separate classifiers for spring and winter cereals. Results are given for ground cover. Test set A had 84.0% correct classification of weed vs. spring cereal with 10.9% false positives (cereal classified as weed) and 5.1% false negatives (weed classified as cereal). Test set B had 79.2% correct classification, 6.7% false positives, 14.0% false negatives.

The results for winter wheat were better. Test set A had 91.0% correct classification, 4.5% false positives, 4.4% false negatives. Test set B had 91.7% correct classification, 1.1% false positives, 7.1% false negatives.