Aalto University
School of Engineering

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Spatial data is uncertain in precision farming

Title of the dissertation	Role of spatial data uncertainty in executions of precision farming operations Paikkatiedon epävarmuuden vaikutus täsmäviljelytyötehtävien onnistumiseen
Contents of the dissertation	The core idea of precision farming is to spatially and timely optimize the farming inputs to maximize the farming outcomes while reducing the environmental stress. Often the potential benefit of the precision farming disappears due to the uncertainty of the application tasks. This dissertation approaches the problem of uncertainty by applying geographical information quality evaluation and measurement methods to the evaluation of farm work execution. The overall accuracy was estimated to be 61 % in relation to optimal treatments in the studied cases. The machinery driving lines were overlapping by 10 % on average. Accurate steering assistance can cut that in half. The biggest difficulty is the optimization of the variable rate application levels. Different tasks conducted for the same purpose varied 22 % on average. The temporal accuracy was completely case dependent containing a response to the immediate rain forecasts or applicability of one month old satellite image. A single precision farming operation was estimated to benefit about 31 €/ha which was estimated to be only 23 % of the total precision farming benefit potential according to the variables in this work. These numbers indicate the quality of spatial data inputs to farm machinery. This uncertainty is large in contrast to typical attempted precision farming adjustments and defined machinery performance requirements. These results suggest that there is a need for better uncertainty management, before different precision farming applications can truly be developed and evaluated.
Field of the dissertation	Geoinformatics
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