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Precise agriculture

Precision agriculture, or information-based management of agricultural production systems, emerged in the mid-1980s as a way to apply the right treatment in the right place at the right time (GEBBERS, ADAMCHUK, 2010). It means that with very detailed information of the field, farmers can target specific issues with much more efficiency than with traditional ways of agriculture. Main difference between traditional and precise agriculture attitude is, that the traditional watering or fertilization methods are derived from experience, having less scientific basis, and cause waste of water or soil deterioration. Humanity depends on agriculture and water for survival, so optimal, profitable, and sustainable use of our land and water resources is critical (LI et al., 2011).

My dissertation thesis will be focused on different kind of processes within precise agriculture. More specifically, my job will be finding solutions to increase effectivity and efficiency of precise agriculture. The general goal for farmers is to maximize the output (yield) while minimizing the input (cost) (BEERI, PELED, 2009). In case of my work, even ecological impact will be considered. Therefore, optimization of economic and ecological effectivity on the fields will be my long term goal.

At this moment I focus on filtration of yield data. Within the range of technologies nowadays, it is impossible to avoid errors in yield datasets. These errors might be caused by various reasons – for example unexpected events during the harvesting process leading to unusual behavior of the machine, trajectory of the harvester, errors caused by wrong calibration of yield monitor and many more. Errors in datasets are creating misleading information about yield in that part of the field, leading to wrong conclusions for the farmer.

Cleaning of the data is made on several levels, both statistically and empirically. Both global and local filtering is taken in account. After cleaning of the data I am comparing cleaned and raw data to detect the impact of those errors. Different methods, interpolations and grids are used during comparison.

In the future I plan to look closely on correlations between yield zones and satellite images, especially images with EVI and NDVI indexes. Nowadays, detailed precise agriculture is possible only on fields where the data were collected. With usage of satellite images and cleaned datasets as practice fields for correlation, information can be extrapolated also to other fields without measured data.

This attitude has several obstacles at the moment. Firstly, I can work with relatively small sample from collaborative farm Rostěnice. Only a few of practice fields can be used, because of errors in attributes of the datasets (for example some fields with barley attribute had actually wheat on them at the particular year). Correlated satellite and vegetation images have to be specific for every plant because of different behaviour between species. In this case, wrong attribute of plant would lead to miscorrelations and not representative results. Those data have to be corrected by employees of collaborative farm Rostěnice first. Secondly, suitable and complex algorithm for filtration must be found first.

In the future work there are several directions in which I could work with the datasets. Yield datasets are robust and detailed enough for finding ways to economic and ecological improvement of the fields. Usage of machine learning is also considered.

Results of my work should help farmers with decision making. After application to agriculture technology it would be possible to work on fields with much better precision and detail than nowadays.

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