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Possibilities and challenges of modelling the agricultural tracks at field scale

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The application “FiTraM” (Field Traffic Model) models the spatially explicit wheel tracks and the field traffic intensity of agricultural vehicles from recorded GPS points. The spatial location of traffic intensities are required to analyse the effect of field traffic on the soil structure, e.g. with regard to mitigate soil compaction. The modelling is based on geometrical and geodetical calculations. The application is written in python and uses PostgreSQL and PostGIS for data storing and calculation of statistics.

The results of FiTraM are the spatially mapped wheel tracks, wheel pass frequency, wheel load and the soil pressure induced by machines (optionally). With continuous route recording various operations (sowing, harvesting, soil tillage) can be analysed in terms of the intensity of travel and the complete process chain during single crops can be mapped. These results (e.g. amount of wheel passages, summed wheel load) can be related to further soil measurements to link field traffic intensities with loss of soil functionality or reduced yield.

This contribution intends to illustrate the process of modelling the field traffic intensity by means of different agricultural working processes - from data acquisition to the statistical evaluation of the spatial modelling results. Examples of different traffic operations are used to explain how driving behaviour needs to be taken into account for modelling, such as reversing and lifting equipment (e.g. during soil tillage). The difficulties, such as the evaluation of the positional accuracy in the field and the processing of the large data sets, will be addressed.