30. August 2021

Leibniz-Zentrum für Agrarlandschaftsforschung (ZALF) e.V.

Offer for a Master's thesis

Growth modelling of soybean plants from different land use intensities using close range RGB image time series

Growth modelling provides useful insights into the development of plants over time under different influencing factors. Based on such models, predictions for future plant growth stages can be calculated, enabling the farmer to better plan (e.g., in the form of yield estimates) and carry out early interactions. RGB images, from which valuable phenotypic traits can be derived, are suitable for analysing plant growth. These images can be collected in different ways. While regular drone aerial surveys paired with subsequent processing of orthophotos are costly and resolution is limited by time, battery, and flight altitude, manual close-range images of plants provide a flexible alternative. In this thesis, the research question is whether regular close-range images with low-cost sensors (tablet camera) of certain field sections are suitable for growth modelling of soybean. Specifically, the effects of different land use intensities on soybean growth patterns shall be investigated using current methods of image analysis and plant phenotyping. Within the scope of the work, a comprehensive image data set along growth period will be generated. The development of a suitable experimental setup for stable and repeatable image acquisition at constant height and perspective with suitable georeferencing, as well as the execution of the photo campaign are essential parts of this work.

Tasks

Acquisition of a RGB image data set of soybean, which includes

› the construction of a suitable apparatus to acquire high quality RGB images at constant height and perspective with appropriate georeferencing.
› the continuous implementation of a regular photo campaign in the patchCROP field during the growth phase starting in May 2022.
› careful preparation of the data set and provision of the images.
› protocol of influencing factors over the growth phase, such as land use intensities, special management actions, weather, etc.

Analysis of plant growth from the image time series using phenotyping and statistical data analysis and/or machine learning techniques.

Quantification of the differences in growth behaviour in relation to the different influencing factors using suitable phenotypic traits.

Qualifications:

› Interest in practical, experimental field work and willingness to conduct weekly photo campaigns near ZALF, Müncheberg, Brandenburg
› Focus on agricultural or environmental science or engineering
› Solution-oriented and open mind to image analysis and machine learning
› Interest in an interdisciplinary Master's thesis
› Experience in literature research and evaluation
› Little programming experience or knowledge of statistical software is helpful

The work will be supervised by ZALF (Working Group Resource-efficient Cropping Systems) and the Remote Sensing Group of the Geodesy Department of the University of Bonn in person of Lukas Drees and Prof. Ribana Roscher (rs.ipb.uni-bonn.de) within the PhenoRob project (phenorob.de).

For further questions please contact:

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