Workshop on Digital Bioeconomy: Convergence towards a bio-based society



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Seed-to-plant-tracking: Automated phenotyping and tracking of individual seeds and corresponding plants

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Seeds play a critical role in keeping continuity between successive generations of plants. However, it is still not fully understood whether, or to what extent, the variability of seed traits within plant species or genotypes in interaction with a changing environment has an impact on seed emergence (i.e. germination), early development and further performance of a plant. Here, we present the technology developed by IBG-2 to tackle these questions: our seed-to-plant-tracking approach includes 1) automated identification, measurement and sowing of individual seeds, 2) automated trait characterization of resulting seedlings and further plant growth, 3) harvest and storage of seeds for subsequent measurements in the next generation, 4) integration of data from distributed sources into a common database. The pipeline consists of the robotic system "phenoSeeder" (Jahnke et al. 2016), amended by an acoustic volumeter (Sydoruk et al. 2020), and the imaging platform "Growscreen" (Walter et al. 2007, Scharr et al. 2020). The main goal is to find correlations between seed traits and plant performance in all development feed back on the variability of seed traits and early vigour of plants in the next generation. The identification of relevant plant traits and genotypes with promising properties under unfavourable environmental conditions will contribute to the sustainable intensification of plant production.

References:

Jahnke S, Roussel J, Hombach T, et al. (2016). Phenoseeder - a robot system for automated handling and phenotyping of individual seeds. Plant Physiology, 172:1358–1370.

Walter A, Scharr H, Gilmer F, et al. (2007). Dynamics of seedling growth acclimation towards altered light conditions can be quantified via GROWSCREEN: a setup and procedure designed for rapid optical phenotyping of different plant species. New Phytologist, 174:447–455.

Scharr H, Bruns B, Fischbach A, et al. (2020). Germination Detection of Seedlings in Soil: A System, Dataset and Challenge. In: Bartoli, A, Fusiello, A (eds) Computer Vision –ECCV 2020 Workshops. ECCV 2020. Lecture Notes in Computer Science, vol 12540. Springer, Cham.

Sydoruk V, Kochs J, van Dusschoten D, Huber G, Jahnke S (2020). Precise volumetric measurements of any shaped objects with a novel acoustic volumeter. Sensors 20:760.

Consent

Yes

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