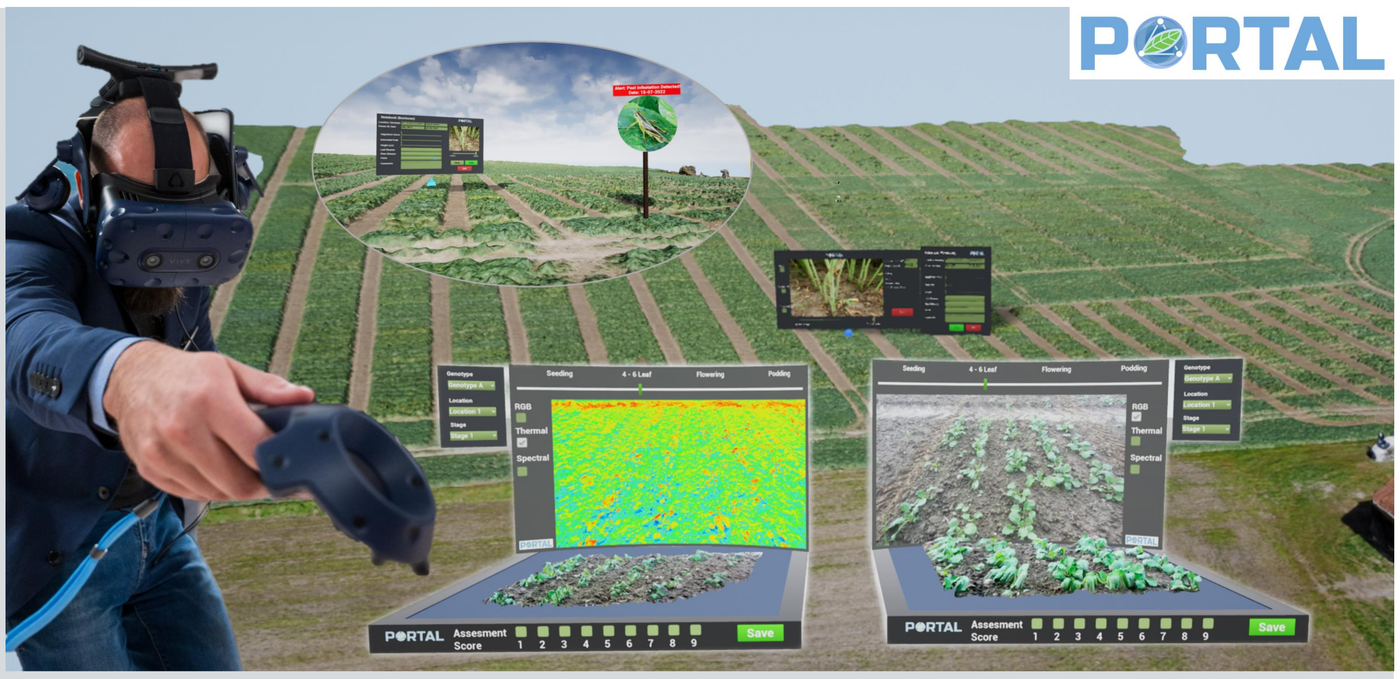
dfki ai
Deutsches Forschungszentrum
für Künstliche Intelligenz
German Research Center for
Artificial Intelligence

Plan-Based
Robot Control &
Cognitive Assistants

PORTAL

Plant breeding using robotics and AI for advanced data analysis and decision-making in virtual space



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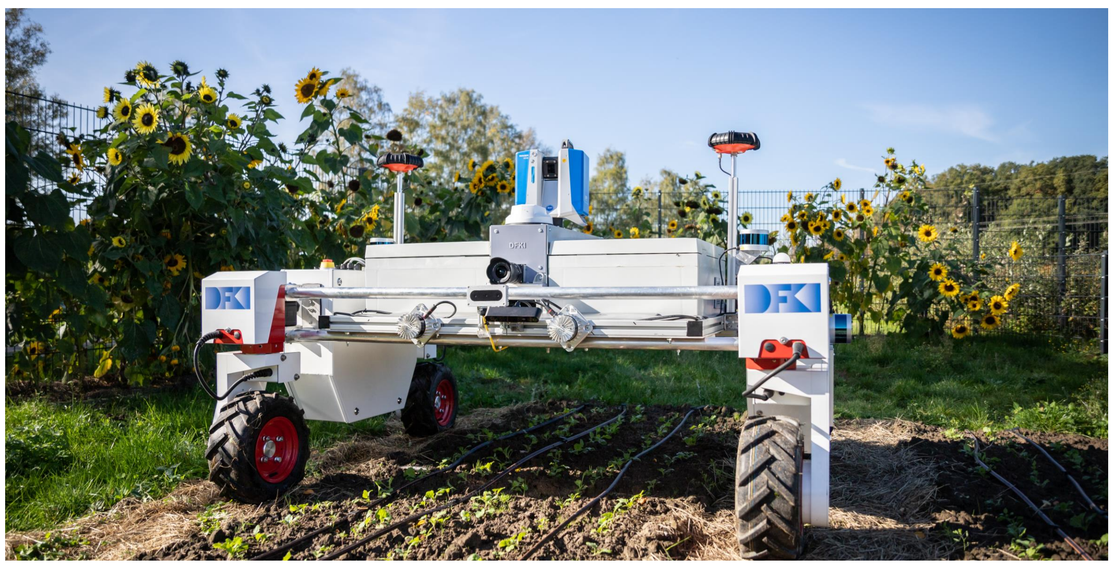
Plant Breeding ...

In the process of plant breeding for developing robust and high-performing field crops, it is unavoidable to regularly evaluate a variety of candidates in plot trials. A large number of parameters and characteristics are accessed at the various stages of plant development. Data collection and evaluation can only be carried out by appropriately trained experts and must take place in special stages at a high frequency in different locations.

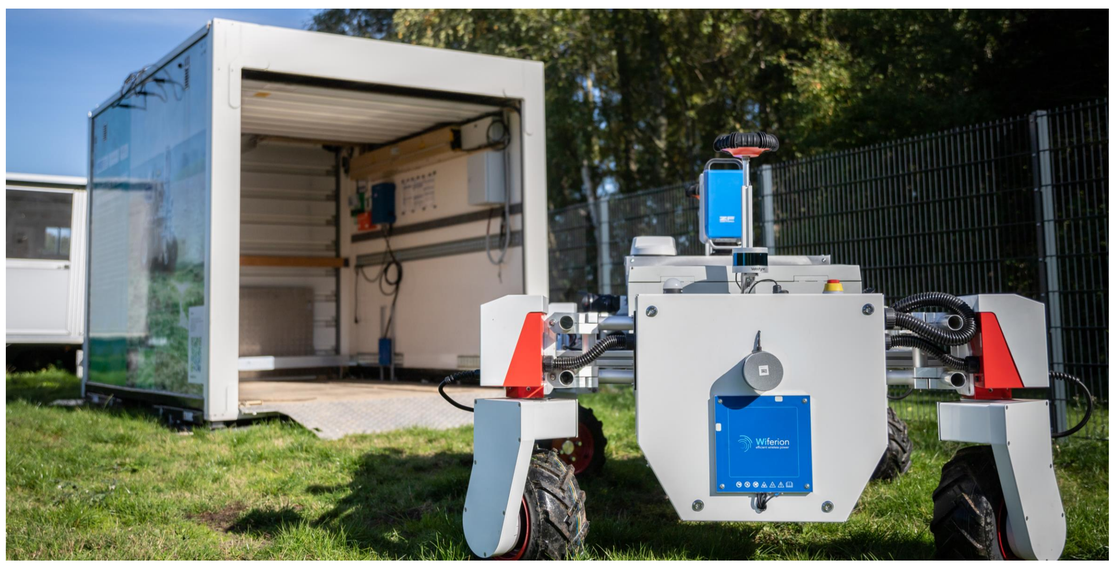


The Valdemar robot

... with Robots, AI and VR

An autonomous robotic approach can significantly reduce the effort of breeding and open up new possibilities. Continuous monitoring of the individual plots through regular, highly accurate, acquisition of multi-modal data provides the basis for creating a detailed, three-dimensional model of the breeding plots. This model will be displayed for the breeders within a virtual reality (VR) environment. This will enable them to assess a virtual breeding nursery. In this virtual nursery, not only data in the range of the light spectrum visible to humans will be presented, but also false-color views of data in the UV, NIR, and IR range will be available.

The process of trait recording can thus be supported by additional information. Data from previous breeding periods can be directly compared with current data. This provides a completely new basis for decision-making in plant breeding. The collected data can also be used to train classification models to identify potential diseases or particularly desirable traits at an early stage. In combination with the close-meshed data collection by an autonomously acting robot, new possibilities will arise for the targeted selection of future varieties.



The mobile robot base station

- (Long-term) Autonomous Robot
  - Multi-modal sensor setup
  - Monitoring a complete season
  - Mobile robot base station
    - Self-sufficient by solar and wind energy
    - 5G Uplink and data pre-processing
- Virtual Breeding Nursery
  - User-centric Design
  - Assessments in VR
  - AI Assistance

Project Partners:

[1] dfki ai
[2] NPZ INNOVATION *Wir forschen für Qualität.*

Duration:

02/2021
-
04/2024

Founded by:

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Bundesanstalt für Landwirtschaft und Ernährung

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Execution Monitoring for Long-Term Autonomous Mobile Robots in Outdoor Scenarios
Tim Bohne; Benjamin Kisliuk
In: Workshop on Robot Execution Failures and Failure Management Strategies at ICRA 2023. IEEE International Conference on Robotics and Automation (ICRA-2023), Embracing the future: Making robots for humans, located at ICRA 2023, May 29 - June 2, London, United Kingdom, 6/2023.

Erste Schritte zu einem virtuellen Zuchtgarten mittels eines autonomen Roboters
Christoph Tieben; Benjamin Kisliuk; Matthias Enders; Mareike Léon; Dr.Florian Daiber; Felix Kosmalla; Prof. Dr. Stefan Stiene; Prof. Dr. Joachim Hertzberg
In: Markus Gandorfer; Christa Hoffmann; Nadja El Benni; Marianne Cockburn; Thomas Anken; Helga Floto (Hrsg.). 42. GIL-Jahrestagung, Künstliche Intelligenz in der Agrar- und Ernährungswirtschaft. Gesellschaft für Informatik in der Land-, Forst- und Ernährungswirtschaft (GIL-2022), February 21-22, Switzerland, Pages 295-300, ISBN 978-3-88579-711-1, Gesellschaft für Informatik e.V. Bonn, 2/2022.

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