

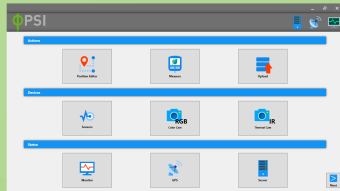
Lukáš Kaleta¹, Klára Panzarová¹, Petr Polach¹ and Martin Trtílek¹

¹ PSI (Photon Systems Instruments), spol. s r.o., Drasov, Czech Republic

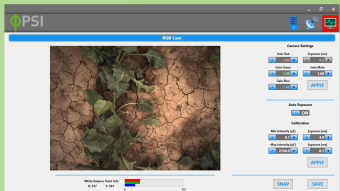
^{*}for more information please contact kaleta@psi.cz

FieldScreen Client Software

FieldScreen Client software is developed for navigation in the field, system control, data transfer and sensor calibration. Client applications runs on rugged outdoor PC tablet and controls the system remotely. All measured morphometric, biochemical and physiological measurements are collated with environmental measurements at each screening location together with precise RTK-GPS position. After the plant observation is done the data transfers to database operated by PlantScreen software package including protocol editor, map editor, experiment management and data analysis.



The field systems are designed and configured to meet the users' specific requirements with respect to the size and morphology of plants screened. Every component of the field systems is designed to withstand the severest weather conditions, and to operate flawlessly.



Plant Phenotyping Research Center

PSI Research Center provides state-of-art infrastructure for plant cultivation and automated high-throughput phenotyping.

We offer access to cutting edge instruments and provide professional support of highly skilled technical and scientific personnel. PPRC infrastructure is available for use by visiting scientists and on fee-for-service basis for a wide range of phenotyping experiments.

Total area for field plant cultivation and phenotyping is 3.000 m².



In the search for beneficial traits that may allow crops to resist abiotic and biotic stresses, fast and accurate methods are required for efficient and effective plant phenotyping in the field. Such methods must involve automated measurements of plant morphology, biochemistry and physiology to determine potential and actual yield under a variety of monitored environmental conditions. Over the past 20 years, Photon Systems Instruments (PSI) has pioneered numerous techniques for non-invasive measurements of plant processes which have been integrated into our unique line of plant phenotyping systems for the field and greenhouse.



Handheld Devices

Lightweight battery-powered devices for non-destructive measurements of various parameters in the field.

Rover FluorCam

Smaller-scale motorized mobile unit for fast and accurate crop phenotyping in the field. Rover FluorCam is customized fluorescence imaging system for physiological screening in the greenhouse and in the field. Its wheels provide exceptional stability and easy movement among plants in the field. Large plants up to 1 m may be studied in situ without physical disturbance.



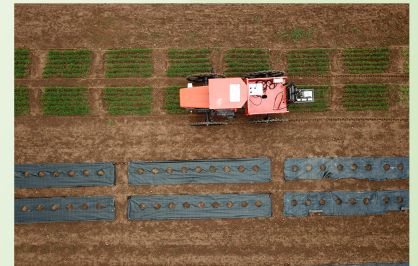
FieldScreen Systems

Tractor

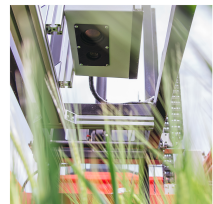
High-clearance field vehicle with adjustable arm for phenotyping crop canopies. Module-based system consists of sensors unit, control unit, navigation and user interface application. It can be mounted on various ground-based vehicles. System navigates the driver with RTK-GPS precision to measuring points and automatically runs the predefined measuring protocols. Auto-shutter function makes sure that images are well exposed. After measurement the data are synchronized database for further data analysis.

Sensors available for the FieldScreen Systems:

- Stereoscopic RGB visible light imaging – for growth related traits evaluation
- Kinetic chlorophyll fluorescence imaging – for rapid non-invasive measurement of photosystem II activity
- Hyperspectral imaging in VNIR and SWIR region – for analysis of plant reflective indices across the entire surface of the imaged sample in spectral range from 400 to 2500 nm
- Thermal Imaging – for image based analysis of plant's responses to heat load and water deprivation
- Laser distance sensor – for plant height and optionally for 3D reconstruction
- LiDAR - 3D plant model reconstruction
- Environmental monitoring sensors (light intensity and spectra, air pressure, temperature...)



Adjustable arm with sensors module



Thermal and RGB Imaging sensors



RTK GPS antenna



System navigates the driver to next measuring point

Gate



Gate is an drive pivot tower with multiple sensor modules mounted on XZ-robotic arm. System is automatically moving over field plots at speed that ensures high throughput. Active sensors are used for accurate monitoring of numerous physiological and morphological plant parameters that are time- and location- referenced.

Spider

