

3rd Project Newsletter

3D- Mosaic



On-going activities

- Experiments on site-specific analysis of irrigation effects in citrus (field trial 1, Adana, Turkey) are continued in the second vegetation period 2012
- Analyses of LiDAR data measured in field trials on citrus and plum trees has been started, targeting the estimation of canopy properties in 2 tree architectures, and model trees
- New fruit sensors have been developed based on multi spectral, multi pathlength concept
- Modelling of signal path loss in orchards is continued
- Optical properties and pigment profiles are further studied in apple and plum fruit
- Photon pathways are modelled for highly anisotropic grapefruit samples
- Imaging techniques are applied for estimating leaf area and number of fruits in plum canopy with spindle-like architecture
- Comparison of automated sensor systems for measuring canopy and fruit properties
- Databases for GIS and sDSS are developed
- Algorithms for sDSS have been validated and will be implemented
- Spatial variability of soil, topography, and plant parameters have been analyzed

CIGR-AgEng 2012

The International Conference of Agricultural Engineering CIGR-AgEng2012 (Valencia, Spain) as a world-wide congress with several parallel conferences was attended by more than 1080 participants from 63 countries. The 3D-Mosaic Project provided a session within the 5th Automation Technology for Off-road Equipment Conference (ATOE). We contributed five oral (lecturer: J. Käthner (C-0892), A. Hetzroni (C-0899), M. Zude (C-1078), A. Torricelli (C-1332), C.L. Jaeger-Hansen (C-1500)) and several poster presentations.

News:

- **More conference contributions:**
 - A. Peeters (ARO), Presentation at iEMSs 2012, Leipzig, Germany
 - J. Käthner (ATB), Presentation at Hydropedologie 2012, Leipzig, Germany
 - M. Zude (ATB), Keynote speech on automation potential in precision fruticulture, CIGR symposium, 2012, Stellenbosch, South Africa
- Final project presentations in June 2013 at the EFITA in Turin, Italy
- Final report and deliverables are due in April 2013

Advanced Monitoring of Tree Crops for Optimized Management

How to cope with variability in soil and plant properties?

Midterm meeting 2012

The midterm meeting was held at the Politecnico de Milano, Italy, 07.-08. June 2012. All project partners presented the status of their work. In smaller groups, the field trial 2 was discussed considering experimental design, equipment requirements, and reference methods. Agreed conditions were endorsed.

"The level of enthusiasm, of cross-disciplinary conversations and comprehension between the participants was infectious." according to the external project advisor.

During the meeting we were able to welcome a new partner in our project. Petrou Loukas from Aristotle University of Thessaloniki, Greece, will continue the work of Stavros G. Vougioukas.

Subsequently during the summer months, additional meetings were held within each WP – mainly to discuss data from field trial 1 and to prepare the autonomous platform and sensor systems for field trial 2. Additionally to the field trial 2, cooperative measurements were carried out within WP2 and WP3.



2nd field trial in Potsdam / Germany, 27.-31.08.12

The second field trial targeted the automated plant and soil data acquisition. A highlight was the first run of the autonomous platform from the University of Hohenheim (Hans Werner Griepentrog, Claes L. Jaeger-Hansen, Germany) in the plum orchard. On this platform three LIDAR systems were installed. 2D- and 3D-imaging systems, thermography, and laboratory hyperspectral readings were applied. New fruit sensors were tested on plum fruit, while the wireless sensor network has been installed and radio path loss was evaluated within WP3. During the growing season additional data were measured with established methods: e.g. weather and microclimate readings, geoelectric, leaf spectra and water potential, xylem sap flow, gas exchange, rating data (e.g. fruit set, fruit growth, yield). Laboratory analyses of fruit quality (e.g. SSC, fruit flesh elasticity) were carried out by the team at the Leibniz Institute for Agricultural Engineering Bornim (ATB) (Manuela Zude, Robin Gebbers, Jörn Selbeck, Michael Heisig, Rolf Adamek, Gabriele Wegner, Corinna Rolleczek, Christian Regen, Jana Käthner) and by students from the Beuth University of Applied Sciences Berlin.

Work group meetings were held to exchange on methodology, data acquisition, and data transfer.

Orchard

Location: Plum plantation of the Federal Office of Plant Varieties in the Werder fruit production area, Potsdam, Germany

Orchard: temperate climate, annual precipitation of 458 mm, average temperature of 11°C, soil ranging from sandy to loamy sand

Plant material: *Prunus domestica* 'Tophit Plus' / Wavit and pollinator 'Jojo', tree age (2012) 6-7 years, planted in a terrain of 120 m x 25 m with 6 meter elevation gradient, trees were planted in 4 m x 5 m distance

Irrigation: Drip irrigation, three times per week, 1,6 l per dripper over 80 minutes



<http://www.atb-potsdam.de/3D-MOSAIC/>



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