2nd Project Newsletter
3D- Mosaic

3D MOSAIC

ICT AGRI era-net

SEVENTH FRAMEWORK PROGRAMME

Advanced Monitoring of Tree Crops for Optimized Management

**How to cope with variability in soil and plant properties?**

On-going activities

3D-Mosaic partners addressed the non-destructive analysis of optical properties of fruits, estimating the leave area index of high and low dense canopies, and the wireless transmission of sensor data aiming the automated data acquisition in orchards. Main conclusions:

I. The scattering coefficients of botanically different fruits were analyzed by Alessandro Torricelli and Lorenzo Spinelli (Politecnico di Milano, Italy). Stone fruit and berries show high variability, while minor changes were found in pip fruit during the course of fruit development. Such data will be helpful in the ongoing development of robust calibrations of the fruit sensors.

RioRed

ATB (J. Selbeck)
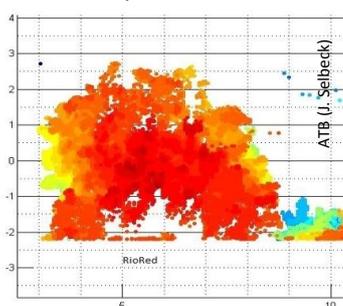
II. Florian Pforte (University of Kassel, Germany) and Jörn Selbeck (ATB, Germany) compared near infrared imaging and the number of laser-scanner (LiDAR) hits per tree for automated estimation of the leaf area on the tree level.
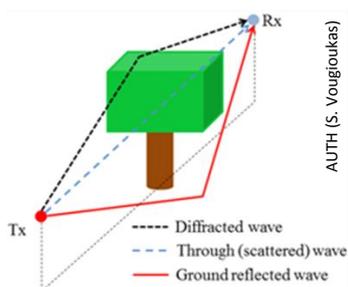
III. Comparison of radio path loss at different heights - with and without leaves – revealed that when the antennas are close to the ground or to the tree tops, the path loss is not affected significantly by the presence of tree leaves. Comparison among measurements and predictions revealed that the most accurate model for the particular orchard layout was the parametric exponential decay model using parameters best fitted to the data.

AUTH (S. Vougioukas)

- - - - Diffracted wave
- - - - Through (scattered) wave
——— Ground reflected wave

Agritechnica 2011

The Agritechnica (Hanover, Germany) is the world's largest exhibition for agricultural machinery and equipment. More than 2.100 exhibitors presented innovations, including information on the *3D-Mosaic* project. Furthermore, at the booth of the University of Hohenheim the autonomous platform was presented.

ATB (R. Gebbers)

News:

- **Midterm meeting June 2012**
- **Contributions at CIGR AgEng 2012**

Peeters, A. Hetzroni, A. Bengal, "Developing a GIS-based spatial decision support system for automated tree crop management to optimize irrigation inputs

Torricelli, L. Spinelli, P. Rossi, J. Kaethner, J. Selbeck, A. Franceschini, M. Zude, „Non-destructive optical assessment of photon path length in fruit during ripening: Implication on design of continuous-wave sensors"

Vougioukass S. G., H. Anastasiu, C.Regen, M. Zude, „Comparison of radio path loss models for wireless sensor networks in orchard environments"

Richter U., J. Selbeck, F. Pforte, O. Hensel, „Comparison of leave area estimations via laserscanner and image analysis"

Kaethner J., P. Rozzi, M. Zude, „Correlation analyses of high resolution 3D soil electrical conductivity and time series of fruit quality features"

Jaeger-Hansen C. L., H.-W. Griepentrog, J. C. Andersen, „Navigation and tree mapping in orchards"

Ünlü M., R. Kanber, S. Tekïn, D. L. Koç, B. Kapur, F. Ünlü, T. Yeşïloğ, İ. Ortaç, „Advanced Monitoring of Citrus Trees for Optimized Irrigation Management

1st field trial in Adana / Turkey, 07.11-15.11.2011

3D-Mosaic partners attended the first field trial in a citrus orchard located in a Mediterranean climate and desiccated riverbed with overlaying sand. The Çukurova University in Adana served as generous host providing facilities and logistics for scientific exchange, social networking as well as data acquisition. Particularly, in the interdisciplinary project the exchange on methodology and data acquisition on the same orchard was highly valuable.

During the study, the soil, crop, and climate data have been observed. In addition, the physical and chemical properties of soil profile were determined throughout the root zone of trees. Evapotranspiration of trees were determined using water balance, Eddy methods, Bowen-Ratio-Energy-Balance. During the growing season additional data, for example weather data, CO_2 concentration, and leave water potential, net photosynthesis, fruit growth, and yield were measured by the team from University of Çukurova (Riza Kanber, Mustafa Ünlü, Turgut Yeşiloğlu, Ibrahim Ortaç, Servet Tekin, Buçak Kapur, D. Levent Koç, Filiz Ünlü, Berken Çimen).

All data were geo-referenced using GNSS-system (Claes L. Jaeger-Hansen, University Hohenheim, Germany). The fruit counting and LAI estimation were performed using onboard LiDAR scanner system extended with a side looking vertical scanner for tree localization and canopy measurements additionally to 2D photogrammetry with different viewing angle and radiometric configurations from Florian Pforte (University Kassel, Germany).

Orchard

Location:	**Citrus gardens of Çukurova University, Faculty of Agriculture, established in 1993-1994 as an experimental orchard**
Cultivar:	**Citrus paradisii 'RioRed', grafted on sour orange, tree age (2012) 26 years**
Irrigation:	**every 14 days, 100%, 75%, and 50 %**
Area:	**184 m x 72 m, spaced 8 m x 8 m**

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

Spectral-optical properties of the crop were studied by means of developed device (Paolo Rozzi, Sintéleia, Italy) and laboratory equipment of Politecnico di Milano, Italy. Reference analyses were carried out by young scientists of host and ATB.

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