WOODY ROOT PROCESSES
REVEALING THE HIDDEN HALF

Sede Boqer, Israel
4-8 February 2006

COST E38: Woody root processes
AUTOMATIC DETECTION OF ROOTS IN MINIRHIZOTRON IMAGES

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Manual analysis of minirhizotron images is very time consuming. An improved approach for automatic root detection combines region and contour based techniques were developed. The first step is aimed at detecting easily recognizable parts of the root (optimally at least one part of each root), which will be called a R-SEED subsequently in this paper. In a second phase each R-SEED is expanded with a more sophisticated algorithm to find the boundaries of the complete root. Images of fine roots were digitised, processed and used to validate the approach. As the R-SEED detection influences the overall performance strongly the approach benefits from the improved algorithm. In four out of five images from one time series examined in detail the root area detected is nearly correct with a relative error between -8.8% and +7.3%. In one image the detection fails substantially due to decomposed roots. In general, the root area detected is systematically lower than the area marked manually. The in this paper presented improved approach to detect roots in minirhizotron images was successfully used and validated with independend images. The new seed detection step considerably improves the contour based approach, which was developed in the first stage. Both techniques allow already a better detection of roots with complex backgrounds as other approaches or colour based approaches. Future development will include a toleration of elaborate root models and enhanced image acquisition. Another aim will be to connect expanded R-SEEDS when situated on a single root and to control expansion termination exactly. Additional information in the form of colour and information derived in the time dimension may prove valuable.

Keywords: Fine Roots, Dynamics, Growth, Image Analysis, Endoscope