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Paper ID 11 : Automatic detection of phenotypic traits in legume roots

-- Paper Summary --

Paper ID : 11

Title : Automatic detection of phenotypic traits in legume roots

Abstract : Under conditions of low nitrogen in soil, legumes have the ability to fix nitrogen in nodules. Understanding these mechanisms is currently a major focus in the field of agronomy.
In this context, we need to characterize the interactions between plants and environment by "pheno-methods".
Our study consists in developing a morphological data processing tool to characterize the growth of organ using non-destructive and automated innovative techniques. The research is incorporated through the High-Throughput Phenotyping Platform (PPHD) of the INRA Centre of Dijon.
The patented system installed on the PPHD platform, the Rhizocab, is able to monitor the development of plant root system without destruction. The rhizotron images acquired from this system are the input data for our research.
Although there are several commercial tools on the market to treat rhizotron images, none is suitable with our problem. However, there is currently no automatic method for the detection of phenotypic traits in image processing. We present here a set of methods and a program for the quantitative analysis of root image.
Once the rhizotron image was acquired, the program allows us to extract the root from the noisy background. For the first period of our research, we work on plants with a taproot system, so the next step is to extract the primary root. Step by step, we can finally calculate several parameters which biologists need such as: the lengths of the primary root, the local diameter of the primary root, the number of nodules and their locations, the number of lateral roots on the primary root etc.
Spatial analysis of nodulated roots provides the possibility of comparative analysis between phenotypes and genotypes of legume species, also the possibility to study the dynamic interaction between genetic background and the physical world. This approach could also be used to analyze non taproots system and even other species than legume species.

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