GCRI travel grant report – International Workshop on Image Analysis Methods for the Plant Sciences (IAMPS) 2015 Louvain-la-Neuve

Dr Bo Li of East malling research attended an IAMPS workshop in Louvain-la-Neuve, Belgium on 19th September 2015 and a poster about the development of automated software for the detection of stem canker symptoms was presented.

Interest in automatic image analysis has increased significantly within plant science in recent years and this community enlarged for the past a few years, so it was a good opportunity of networking with the scientists from other groups in this workshop. IAMPS was focused on the review of the progress of image analysis methods and approaches currently being used and developed in plant sciences, so most of the topics of the presentations were more or less relevant with the projects in EMR and could lead to inspirations of image analysis for other potential projects.

There were four topics in the workshop which were more relevant to the projects in EMR currently or potentially:

1. Root architecture analysis and modelling

IAMPS2014 proposed some semi-automated image analysis software for the quantification of root architecture such as RootReader2D, SmartRoot and GiA roots, but all this software was semi-automated and difficult to be applied for the complicated root architecture. This year a new fully automated software “Root System Analyzer” was developed and proposed in this workshop. The new method could detect smaller root and the output XML-based format called Root System Markup Language (RSML), which was a new standard format and enable portability of root architecture data. The input of the software is still a binary image after the segmentation of root so it may not work well directly to the colour image of root in rhizotron. But this software showed potential to analyze the root architecture in more accurate manner and will contribute to our root architecture quantification project.

2. Hyperspectral imaging in root system

Hyperspectral imaging has not been widely applied in the root system study, so this is an interesting subject to study the spectral features of plant roots. This measurement was taken in Gembloux Agro-bio Tech, University of Liege, and with the hyperspectral images taken between 1100nm and 2498nm and SVM model, the root could be separated from other species, also the roots between winter wheat and peas could discriminated.

3. Potential of high resolution thermal imaging to evaluate an index of transpiration in the field

The most interesting part of this experiment is that both the normal colour images and the thermal images were taken and image registration was applied so that the background and plants could be segmented in images of visible region. The temperature resolution was around 0.01 degree, and precision was around 0.1 degree. The leaves were grouped into four categories, which are highly exposed to sunshine, exposed to sunshine, shaded and highly shaded, and the temperature difference could be below 1 degree. The results were useful and suggested the old thermal imaging camera of which the resolution is 0.1 degree was not sensitive enough to detect the temperature change because the precision could be around 1 degree.

4. Applying limited 2D images to high throughput 3D phenotyping

3D phenotyping is becoming popular because it provides more spatial information than 2D phenotyping from different angles. This experiment from Aberystwyth university used three images taken with the same fixed camera by rotating the plant with known angles, and the Point Cloud Library (PCL) was used as the programming package to reconstruct the 3D shape. The plant biomass could then be correlated with the total number of voxels. The is simple and fast technique was applied to wheat plants but it also showed great potential for the phenotyping of other plants.

Attendance of this workshop was useful to network with other researchers who are also working on image analysis and plant sciences. Several new techniques proposed in this workshop will benefit current work also extend knowledge for other potential projects.

Dr Bo Li

Image analysis specialist

East malling research