APPLICATION METHODS ON THE FLUORESCENCE IMAGES

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Characterizing the 3D geometry of plants is nowadays a challenging problem in the functional-structural modeling of plants. Plant geometry represents the exchange interface between internal physiological processes and the environment. This interaction may concern e.g. capture of resources, disease propagation... The majority of these effects affect processes involved in photosynthesis.

The chlorophyll fluorescence imaging provides a powerful, non-invasive tool for investigating photosynthesis and its spatial and temporal heterogeneity. Here, we introduce a new experimental instrument - Arch System witch was developed by PSI, Brno (www.psi.cz) for acquiring fluorescence images of the whole plants.

The Arch System consists of a CCD camera equipped by high pass interference filter (680nm) and 2 light sources, LED panels (620nm). The key part of the system is a arch shaped supporting construction that allow precise movement of both, camera and light sources with minimal step 2°. The system is fully automated.

For the 3D reconstruction, we need images of the plant, captured under different (known) angles and we need to detect interesting elements (image features) in images. Multitude of algorithms for searching of image features that are local, meaningful, detectable parts of the image exists. Here, we tested four detection algorithms:

1. The *Canny's edge detector* is searching for edges, for pixels at or around which the image values undergo a sharp variation.
2. The *Harri's corner detector* is searching for the pixel which neighborhood has a spatial image gradient.
3. Another one is *searching for contours* in the image. It means that it is using the edge detector with different levels (values).
4. The *skeletization* is method for constructing skeleton of the object in the image.

We correlated features of two images acquired from different angles and we were searching for corresponding points. The correlation method was based on comparing of neighborhoods of features from first and second image.

The best result were achieved by searching contours algorithm while the evaluation criterion was a number of found corresponding points.

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