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LC-Elliptical Fourier Analysis for quantitative Pavement Cell shape analysis

Although considerable progress has been made in identifying genes that control cell polarity, it is still unclear how they work together to generate cells with particular shapes. Indeed, we have limited understanding on how multicellular dynamics and patterning is linked to cell shape and how cell shape in turn influences intracellular dynamics.

The complex pattern of lobes and indentations of Pavement Cells in the epidermis of the leaf of Arabidopsis thaliana offers an ideal system to address this problem. To quantify cell shape changes in a growing leaf is extremely important to gain insight on the time scale involved in cell morphogenesis and cell polarity coordination. Moreover, how the dynamics of cell morphogenesis is regulated and influenced by the position of the leaf and leaf developmental stage has remained elusive.

Quantitative methods for shape analysis are essential to assess the influence of cell shape on cell intracellular dynamics and to analyse the polarity effects of a given mutation or treatment. We propose a new method to quantify cell shape changes based on Elliptical Fourier Analysis(EFA). Our new method called Lobe-Contribution EFA provide a measurement that directly relates to morphological periodicities and provide a good separation of cells according with their degree of lobbing in analysis of populations of cell after a Principal Component Analysis.