Generalized 2D Correlation Analysis Applied to Horizontal Change of Signal

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For about these 30 years, widely spread, generalized two-dimensional correlation spectroscopy,[1,2] has formed an active research area. One of the most attractive properties of the method is that one can determine the sequential order of signal changes using global phase angles. But this method has been weak for the band shift and broadening phenomena (that is, horizontal change of signal), causing distortion of the correlation values. This research realized correlation analysis on the horizontal change of signal, in which we introduced the first moment (that is, center of mass) of a local region of spectral channels in the spectrum at a time, *t*. For possible application, cell movements marked by green fluorescent protein (GFP) are supposed. Please note that spectral channels in the conventional method are replaced by horizontal axes of positions, *x* and *y*, of images, in a more generalized manner.

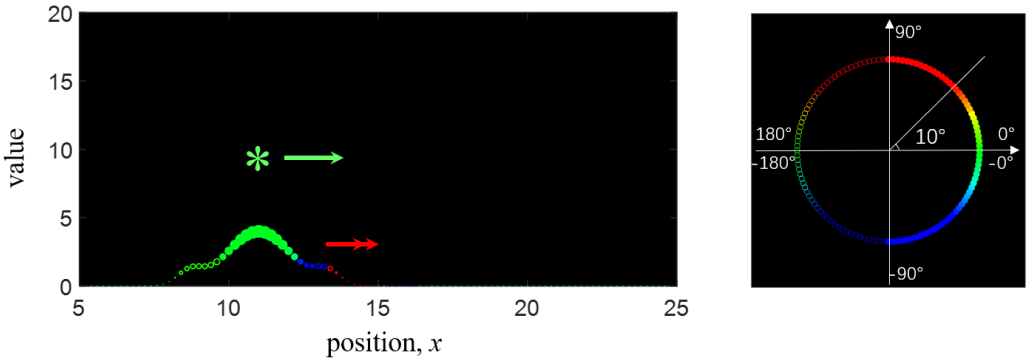

Fig. A simulation of the ameba-like cell movement for the one-dimensional axis, *x* The symbol * represents the global position of the cell; the green arrow shows the movement; the red shows a locally different movement of the cell.

Figure shows a simulation of the ameba-like cell movement for the one-dimensional axis, *x*, in which the corresponding global phase angles are indicated by color changes. The reference signal is the first moment of the all the positions of horizontal axis, *x*. While the green color indicates that the local movement of the cell is synchronized, the red indicates earlier; the blue indicates later. In future, this method will be applied to study a relationship between cell movements and retaining of three-dimensional structure of a tissue.

Reference: 1. I. Noda, *Appl. Spectrosc.*, **1993**, *47*, 1329.

2. D. Miyata, T. Nakabayashi, S. Morita, *J. Chem. Inf. Model.*, **2020**, *60*, 5070.