CLASSIFICATION OF DROSOPHILA EMBRYONIC DEVELOPMENTAL STAGE RANGE BASED ON GENE EXPRESSION PATTERN IMAGES

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The genetic analysis of spatial patterns of gene expression relies on the direct visualization of the presence or absence of gene products (mRNA or protein) at a given developmental stage (time) of a developing animal. The raw data produced by these experiments include images of the *Drosophila* embryos showing a particular gene expression pattern revealed by a gene-specific probe. The identification of genes showing spatial and temporal overlaps in their expression patterns is fundamentally important to formulating and testing gene interaction hypotheses. Comparison of expression patterns is most biologically meaningful when images from a similar time point (developmental stage range) are compared. In this paper, we propose a computational system for automatic developmental stage classification by images analysis. This classification system uses image textural properties at a sub-block level across developmental stages as distinguishing features. Gabor filters are applied to extract features of image sub-blocks. Robust implementations of Linear Discriminant Analysis (LDA) are employed to extract the most discriminant features for the classification. Experiments on a collection of 2705 expression pattern images from early stages show tha the proposed system significantly outperforms previously reported results in terms of classification accuracy, which shows high promise of the proposed system in reducing the time taken by biologists to assign the embryo stage range.