

"Similarity search" - plugin for searching of the resembling objects on the images

Abstract:

In process of image study with many objects the necessity of searching some resembling objects appears very often. Such tasks are very actual during cito- histo- or morphologic examinations. Especially it is very important during searching of chromosome-couple at karyotypic analysis of non-differentially stained metaphase plates.

We developed an algorithm and produced ImageJ - plugin for searching of resembling (separately situated) objects on a one image. In this plugin as a comparable criterion has been used the distribution histogram of gray values in the active selection, area and perimeter. The principal of comparison is based on a study of similar distribution histograms of the image-parts.

Firstly the marking of the study regions with the help of "threshold" - function is done. Secondly the ROI is determined and with the help of ROI-manager performed the management of the interested area. Then the objects are marked consequently and area with perimeter are measured. In results the received histogram becomes a basis for comparison.

On a histogram the interval is marked, maximal (Brtmax) and minimal (Brtmin) values of brightness are defined. The interval index that characterized the object is greater then 0. Maximal and minimal values are needful to organize the histogram intervals. All histogram from each object is divided on the intervals and received data are summarized. The quantity of intervals is 10, but it can be changed by users from 1 to 30. All received in such way data are entered to the Units and plays a main role in the objects' comparison.

Massive Units are compared by pairs and the differences (Unit_diff) between the objects revealed as ABS (Uniti - Unitj). The Index may be reflected in percentages from maximal value between Uniti and Unitj. The user primordially can establish the limitation on the criteria of the object similarity in the dialog window. By comparison Unit_diff with established criteria the algorithm is working till the difference between the values is ≥ 0 . If the difference is < 0 the algorithm stops comparison of the objects. Thus the optimization of the calculated time appears. In a same way the data normalization from each object can be done. It performs for correction of the data from different objects.

Application of the plugin on a ROI-massive the image elements can be analyzed, categorized and compared between each other.

The original plugin allows:

- markedly accelerate comparison of the objects,
- simultaneously compare big number of the objects.

In our study this plugin was successfully applied for searching of the homologous chromosomes on metaphase plates.

Keywords:

ImageJ, plugin, similarity, histogram, karyotypic analysis

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