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The Intersection/Union Region Computation for Drosophila Brain Images Using Encoding Schemes Based on Multi-Core CPUs

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Abstract : With more and more Drosophila Driver and Neuron images, it is an important work to find the similarity relationships among them as the functional inference. There is a general problem that how to find a Drosophila Driver image, which can cover a set of Drosophila Driver/Neuron images. In order to solve this problem, the intersection/union region for a set of images should be computed at first, then a comparison work is used to calculate the similarities between the region and other images. In this paper, three encoding schemes, namely Integer, Boolean, Decimal, are proposed to encode each image as a one-dimensional structure. Then, the intersection/union region from these images can be computed by using the compare operations, Boolean operators and lookup table method. Finally, the comparison work is done as the union region computation, and the similarity score can be calculated by the definition of Tanimoto coefficient. The above methods for the region computation are also implemented in the multi-core CPUs environment with the OpenMP. From the experimental results, in the encoding phase, the performance by the Boolean scheme is the best than that by others; in the region computation phase, the performance by Decimal is the best when the number of images is large. The speedup ratio can achieve 12 based on 16 CPUs.
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