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Indexing the Neural Structure

Keywords: Spatial Indexing, Blue Brain Project, Neural Model, Scientific Data Management

Problem: A simulation of the human brain on a microcircuit has always been a dream for a Neuro Scientist; today we see such system emerging in the Blue Brain Laboratory which can simulate a fraction of a brain tissue with high precision. Such a system is exposed to a large number of computational problems; one of them is to store the spatial 3D brain model on disk and to query it efficiently. The queries can be spatial range queries for retrieving model primitives from disk and to perform occupancy and volumetric queries quickly without looking at the entire search space.

Project: The project would involve implementation and evaluation of state of the art algorithm for spatial indexing, A thorough investigation of the strength and weaknesses of such a system would then be researched, The goal of the project would be to understand the underlying data and to exploit the hidden properties of the data and to redesign a new indexing structure. If time permits we would like to extend such an index structure for generic spatial datasets and compare its performance.

Plan:

1. To gather and clean neural data for indexing
2. To test the existing state of the algorithms on the Neural data.
3. To identify shortcomings of the existing algorithm and develop an intuition to remove those bottlenecks
4. Evaluate and compare the current as well as future techniques

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References:

1. S. Papadomanolakis, A. Ailamaki, G. Herber, Efficient Query Processing on Unstructured Tetrahedral Meshes, SIGMOD 2006.

2. N. Beckermann, H. Knegel, R.Schneider, B. Seeger, The R*-tree: An Efficient and Robust Access Method for Points and Rectangles, ACM 1990