Search Techniques for Atmospheric Data Sets

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The ability to perform real-time conditional queries Is increasingly relevant as data diversity and volume increase. Pairing traditional database techniques with statistical algorithms that exploit the data characteristics is critical for a solution.

I. Objective

- Search datasets based on arbitrary conditions
- Reduce the development time for finding datasets of interest and focus more on the scientific pursuits
- Enable queries as :
  - **SELECT DAYS between 2008-01 to 2008-06 AT sgp-C1 WHERE clear sky samples > K (constant) AND zenith angle was between 0-20 deg.**
  - **SELECT DAYS between 2008-01 to 2008-12 AT twp-C1 WHERE rain rate was between 1-10mm/hr.**

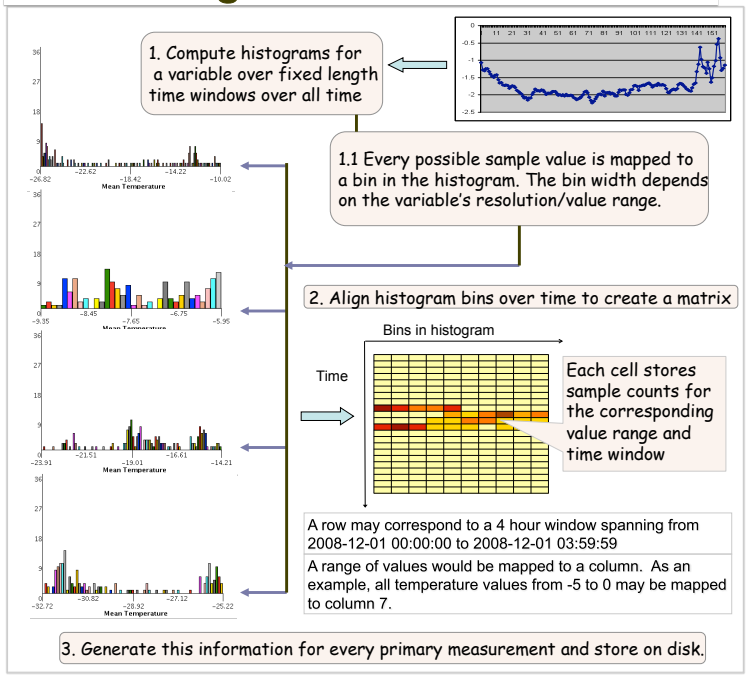
II. Motivation

- Using a database-driven architecture for data storage and query may not be feasible in short-term, thus motivating exploration of alternative solutions.
- Combining knowledge about statistical characteristics of ARM datasets with traditional database techniques can provide powerful capabilities
- Precompute statistics about data characteristics and "index" to avoid scanning the data at query time

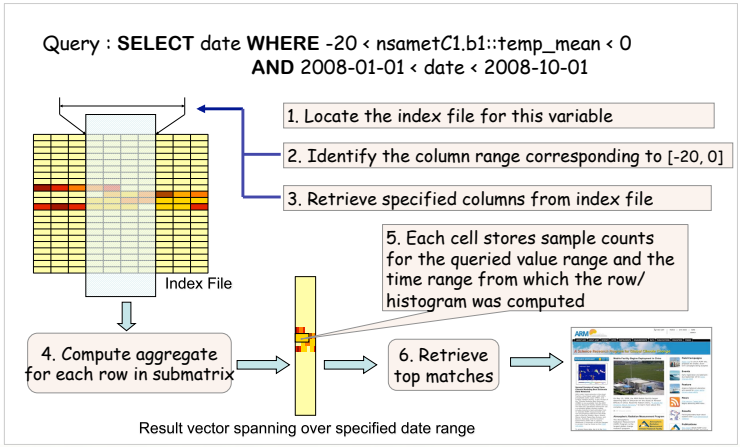
III. Histogram based Index Generation

- The goal is to compute a signature of data using small time windows (3/4 hours) over the history of an entire datastream, for every variable of interest.
- Factors favoring histograms
  - When the goal is to find "time ranges" of interest, a summarization technique helps to avoid storing information about every record
  - Inherent information available from a statistical distribution can help improving the quality of search results

IV. Indexing the Data



V. Query Processing



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