The Image Stack Stream Model, Querying, and Architecture

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Abstract

Rising volumes of multimedia are being gathered with the increasing deployment of sensors. We present the Image Stack stream model/view of data for querying and visualizing the streaming data. This view is independent of the presence of a DBMS, since more sensors will capture data on a real-time basis. We outline requirements for modeling and visualizing streaming multimedia data with motivating queries. We present the Image Stack data model, a high-level query language for the model, and a system architecture and design to support these requirements. We provide highlights of a prototype implementation in Java and Java Data Objects, bypassing the use of a DBMS as permanent storage.

1. Introduction

Growing types and volumes of multimedia data (alphanumeric, image, sound, and video) are being captured by increasing deployment of sensors (environmental, geophysical, medical, etc). We address the challenge of querying and visualizing of information from multiple streams of different but related types of data, focusing on the access and presentation of data through time. Recent work by others has been reported on video indexing and accessing by content and visual languages [1]-[2]. However, it has generally focused on viewing individual video streams and not on the multiple heterogeneous streams that we are addressing. Furthermore, because much of the expected data streams are multidimensional, using existing streaming data management technology to answer spatio-temporal queries over multidimensional real-time and archived data is difficult. An example of such a query is:

> *"Display the locations of intersections of the UCLA boundaries with Westwood Blvd and Sunset Blvd where the poison fume level exceeds value Y now."*

A stream is an ordered sequence of frames or values. A frame could be an image, a photograph, a frame in a video stream, a text report, or an alphanumeric record changing through time. Current DBMS's (relational or object DBMS's) deal well with alphanumeric record type structures once they are stored and loaded into a database. Unfortunately, it is impractical to store in a DBMS the voluminous data that is arriving rapidly from many sensors.
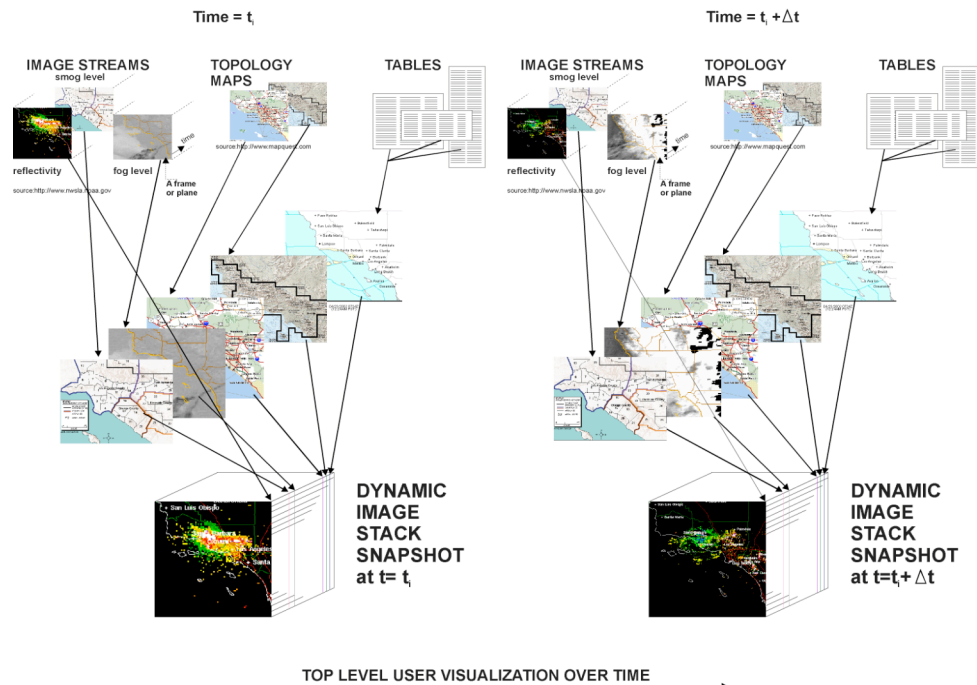
There has been research regarding alphanumeric data

Figure 1: Stream of two Image Stacks.