i2Cloud: Indexing Imagery in the Cloud

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Introduction

- The popularity of GPS enabled devices have led to a number of emerging applications. Media content such as photos and videos can be geotagged.

- “Find images of myself captured in front of Tommy Trojan during the 2013 USC-UCLA football game day”

- The increasing amount of data and large query volume brings the scalability problem.

i2Cloud provides a scalable framework to efficiently store and query image data. In other words it is a distributed spatial index on the cloud.

Video Frame Model

- Model frames as points
- Model a video frame with W4-metadata in form of ()
  - : camera location
  - : view direction (w.r.p north)
  - : maximum viewable distance
  - : viewable angle
  - : timestamp
  - : a set of keywords tagged with
  - : people shown in

System Architecture

- A Distributed Voronoi diagram indexing frames using geo coordinates
- Utilizes
  - Multiple servers
  - Multi-core CPUs available at each server

Query Processing

- Range query with FOV
  - Find FOVs overlap with a given query circle
- k-Nearest Neighbor Query
  - Find FOVs given a query point and k value
- Presenting query results
  - To combine the FOV results into video segments
- High Query throughput
  - Can process thousands of queries within a second
- Provides Load balancing across servers
  - Query can be submitted to any servers.
  - No need to traditional top down search which overloads the servers near the root.

Conclusion and Future Work

- Index construction time remains almost constant as the data size increases
- Provides high query throughput which increases linearly as more number of nodes are used
- Adding textual and temporal dimensions to indexing and query processing