InterSocialDB: An Infrastructure for Managing Social Data

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Introduction

Huge amounts of social data is generated by users of Online Social Networks (OSNs)

Social Data is not in any unified structured format

- Tweets are augmented with links, hashtags etc
- Facebook pages contain images, videos etc
- Foursquare stores check-ins of venues

In this work, we propose an infrastructure for providing:

- Storage and
- Processing functionality

to applications that target at analyzing social data

Structure

- InterSocialDB Framework
- Storing social data
- On-going work
- Conclusions

The InterSocialDB Framework

This infrastructure is composed of:

- A data acquisition component that:
  - collects,
  - preprocesses,
  - models,
  - aggregates and
  - stores social data
- A data processing component that:
  - performs various analytical tasks on social data and
  - presents the results of this analysis to the user

The InterSocialDB Framework

The data acquisition component is partitioned into three phases:

- Collection

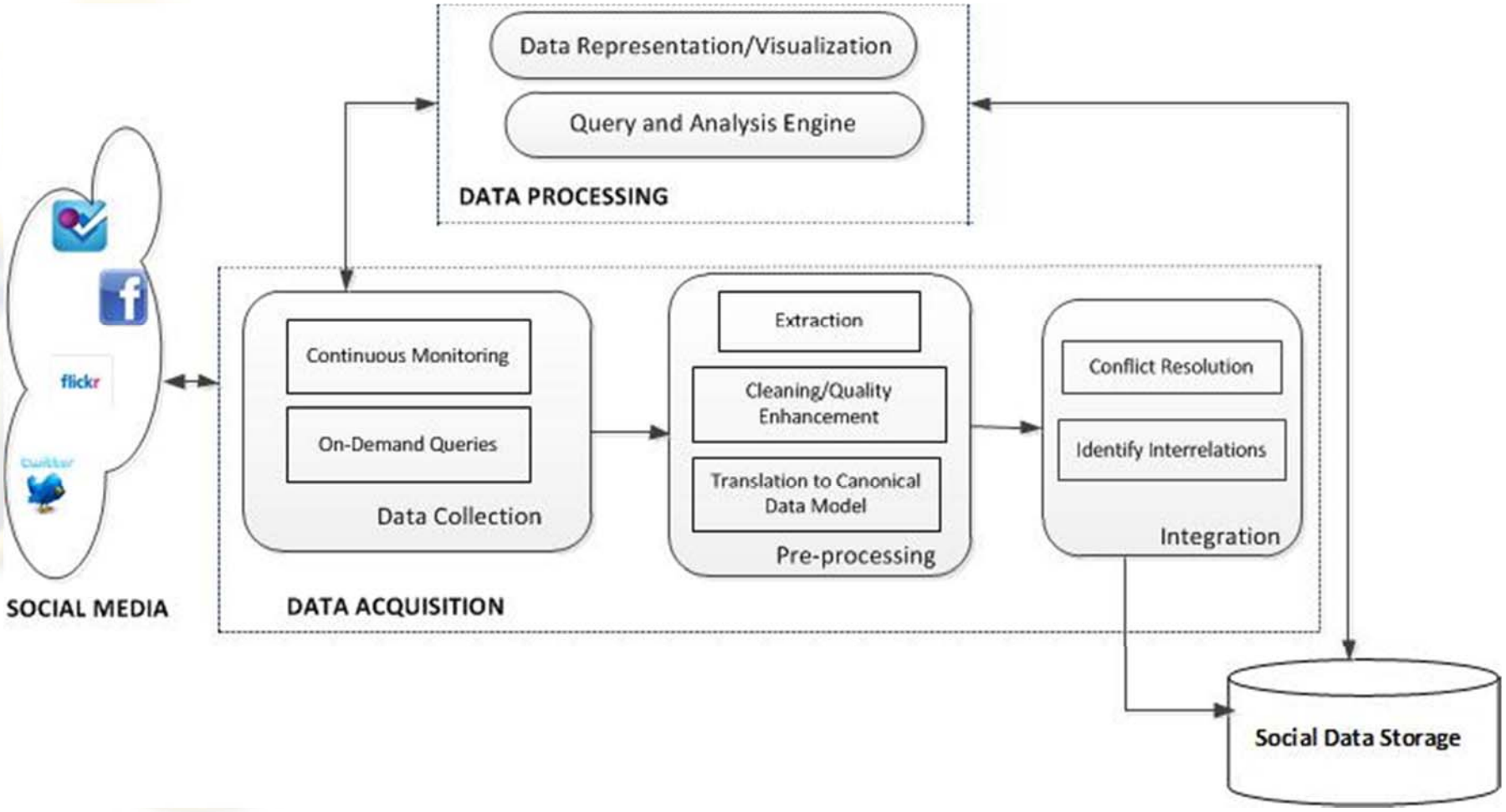
Data are gathered from social networking sites

- Preprocessing
  - extracting related information
  - data cleaning
  - translating data to a common data model

- Integration

As data are generated from more than one social networking site, we need to identify references to the same object

The InterSocialDB Framework



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Storing Social Data

We focus on storing Social Graph data

There is not a widely accepted data model for storing social data

Alternatives for storing social data:

- relational database systems
- key-value stores
- document databases
- native graph databases

Relational database systems

The Social Graph can be stored in traditional relational database systems

Pros:

- Structured Query Languages (MySQL)
- ACID properties

Cons:

- Costly JOIN operations

Examples:

- Sun MySQL
- Oracle SQL

Key-value stores

Social data is stored as key-value pairs

Pros:

- Scalability
- Performance (efficient read/write operations)

Cons:

- Limited to key-oriented queries

Examples:

- HBase
- Redis

Document databases

Social Data is stored into structured formats (e.g. JSON, BSON)

Each document is associated with a document id

Pros:

- Secondary indexes on words of each document
- Social data generated by APIs have usually JSON (or similar) format.

Cons:

- No support for ACID operations

Examples:

- CouchDB
- MongoDB

Native graph databases

They store the Social Graph as it is

Pros:

- graph-oriented storage
- good performance for graph queries (e.g. shortest path queries)

Cons

- bad performance for aggregate queries (worse than Relational DBs)
- distribution issues: How can we distribute a graph database among a number of network nodes?

Examples:

- Neo4j
- AlegroDB

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On-going work

Currently, we are working on:

- collecting data generated by popular social networking sites
- evaluating different data models for storing social data
- exploring temporal dimensions of social data

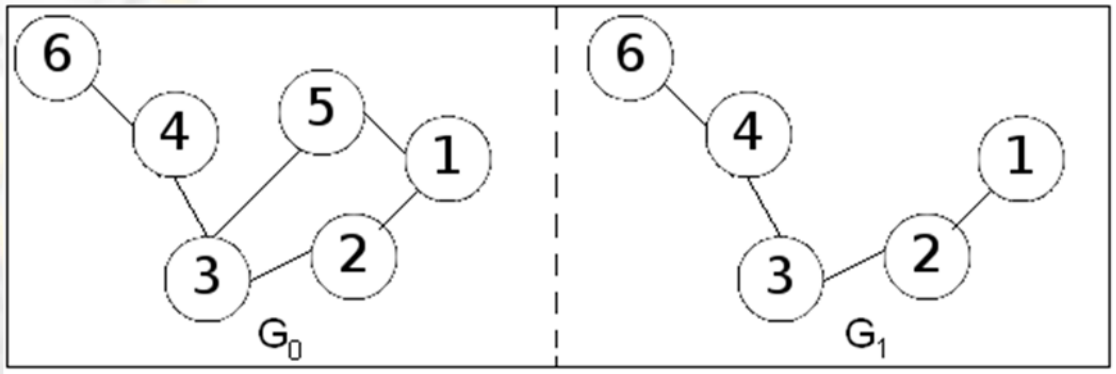
On going work

Exploring temporal aspects of social data:

- We consider live streams of social data
- Data is stored in a graph-oriented database (Neo4j)
- We propose and evaluate algorithmic methods to answer effectively and efficiently temporal queries on data of the Social Graph
  - Which is the number of Antonio Di Natale' s Facebook friends on 10th June 2012?
  - How many Foursquare users have checked-in Achaia Beach Hotel from 1st June to 1st July 2012?
  - What is the size of the diameter of the social graph of greek Twitter users on 17th June 2012?

On going work

Storing successive snapshots of the Social Graph:



2 successive snapshots of graph G, at time t_0 and at time t_1 respectively

Their difference is the set of operations:
D = { remove_node (5), remove_edge (5,1), remove_edge (5,3) }

We call this set a Delta set

On going work

Interesting questions:

- Which snapshots of the social graph to store in order to answer temporal queries efficiently?
  - storing a set of periodic snapshots and a set of deltas
  - storing only a current snapshot of the social graph and a set of deltas
- Is there an efficient way to store deltas between snapshots?
  - log file that contains a set of operations in which successive snapshots differ
  - Storing deltas as a graph?

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Conclusions

Besides the analysis of Social Data, there are also a variety of critical data management tasks:

- Data Modeling
- Data Integration
- Data Storage & Indexing

We have presented the architecture of IntersocialDB, an infrastructure for managing social data

We are in the process of implementing the related infrastructure

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Thank you!

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