DYNAMIC FOAF MANAGEMENT METHOD FOR SOCIAL NETWORKS IN THE SOCIAL WEB ENVIRONMENT

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Abstract

- Various researches
  - Utilization of Friend-Of-A-Friend (FOAF)
  - Automatic update and dynamic management of FOAF
- Applying FOAF and RSS to OLAP system
  - Generates OLAP cube by using the collected FOAF and RSS
  - Processes the generated OLAP cubes
- Implemented result
  - foaf:interest of users
    - Average of 19 percent increase in four weeks
  - Increased foaf:interest change
    - Number of foaf:knows of users has grown to an average of 9 percent
- By using the suggested method
  - Can provide better services
    - Rapid change of user interests with the automatic application of FOAF

Introduction

- Social network services
  - Demonstrate the relations between users
  - Interact with the creation and evaluation of content
- Volume of content generated on social network services and the number of relations between users increase
  - Number of problems have emerged
    - Only simple relations between the users are represented.
    - Meaningful relations between users cannot be represented
    - Social network requires a considerable amount of computation
      - In order to reflect changes in its connecting relations
    - Heterogeneous distributed computing environments are not adequate
      - For effective integration and processing of large volumes of metadata

Introduction

- Our aim
  - Combine FOAF with RSS files in the OLAP system
    - Dynamically manage user relationships and then to reflect it to FOAF
  - For this purpose
    - Insert each entity from FOAF and RSS into a database designed with a star schema
    - Convert it into OLAP data cubes and analyze the social network
- Proposed dynamic update technique
  - FOAF
    - Data interoperability
  - RSS
    - Reflect changes in issues based on time flow
  - OLAP cubes
    - Multidimensional analysis and processing
      - Massive amounts of data

Related Work

- FOAF
  - OWL/RDF-based user profile description technique
    - To represent information about users and their social connections
    - User profile description method
      - Essential for integrating users and the established relations among them
    - Potential solutions that facilitate the sharing of social network data
- RSS
  - Format for representing content
  - Mainly used on news and blog sites
  - Automatic collection of RSS-related programs and services
    - Users were able to get the latest information posted to a site without actually having to visit the site

Related work

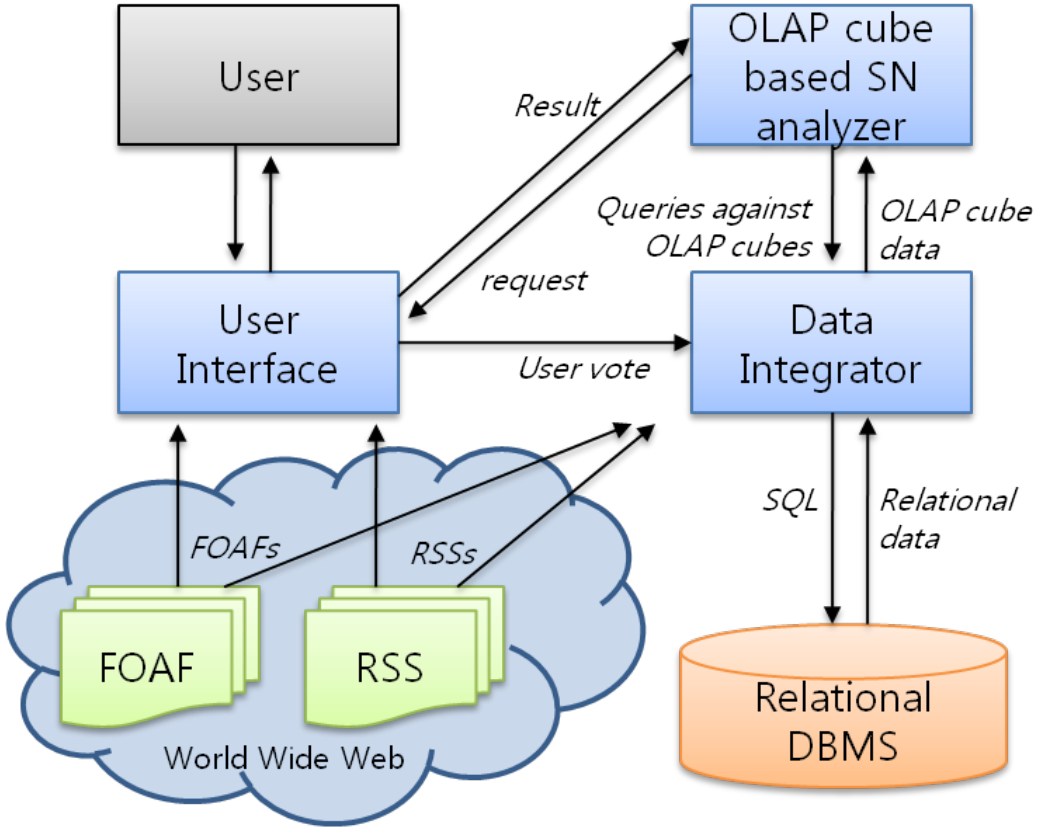
- OLAP system
  - Data warehouse
    - Storage area for massive amounts of data
    - Effectively used to offer information that is required by decision makers
    - Volume of data in data warehouses
      - Massive computational resources
  - OLAP supports multidimensional analysis
    - To run data items in diverse time frames
    - Process complicated queries

Related work

- Generation and analysis of social networks
  - Online social networks
    - To generate, integrate, and visualize
      - In the semantic web community [10, 18]
  - Culotta et al [12]
    - End-To-End user social network system
  - Aikebaier et al [23]
    - Trustworthy in distributed system
- Semantic social networks
  - Jung and Euzenat [26]
    - Three steps for using ontologies to represent user profiles, relations
  - Szomszor et al [30]
    - Models of user interests <*foaf:interest*>

System Overview

- System overview



Step 1) Design of star schema
Step 2) Data collection and insertion
Step 3) Generation of OLAP cubes
Step 4) OLAP processing operation and updating of user relationships

Design of the Star Schema

- We construct a star schema
  - 6 Dimension Tables
  - 1 Fact Table

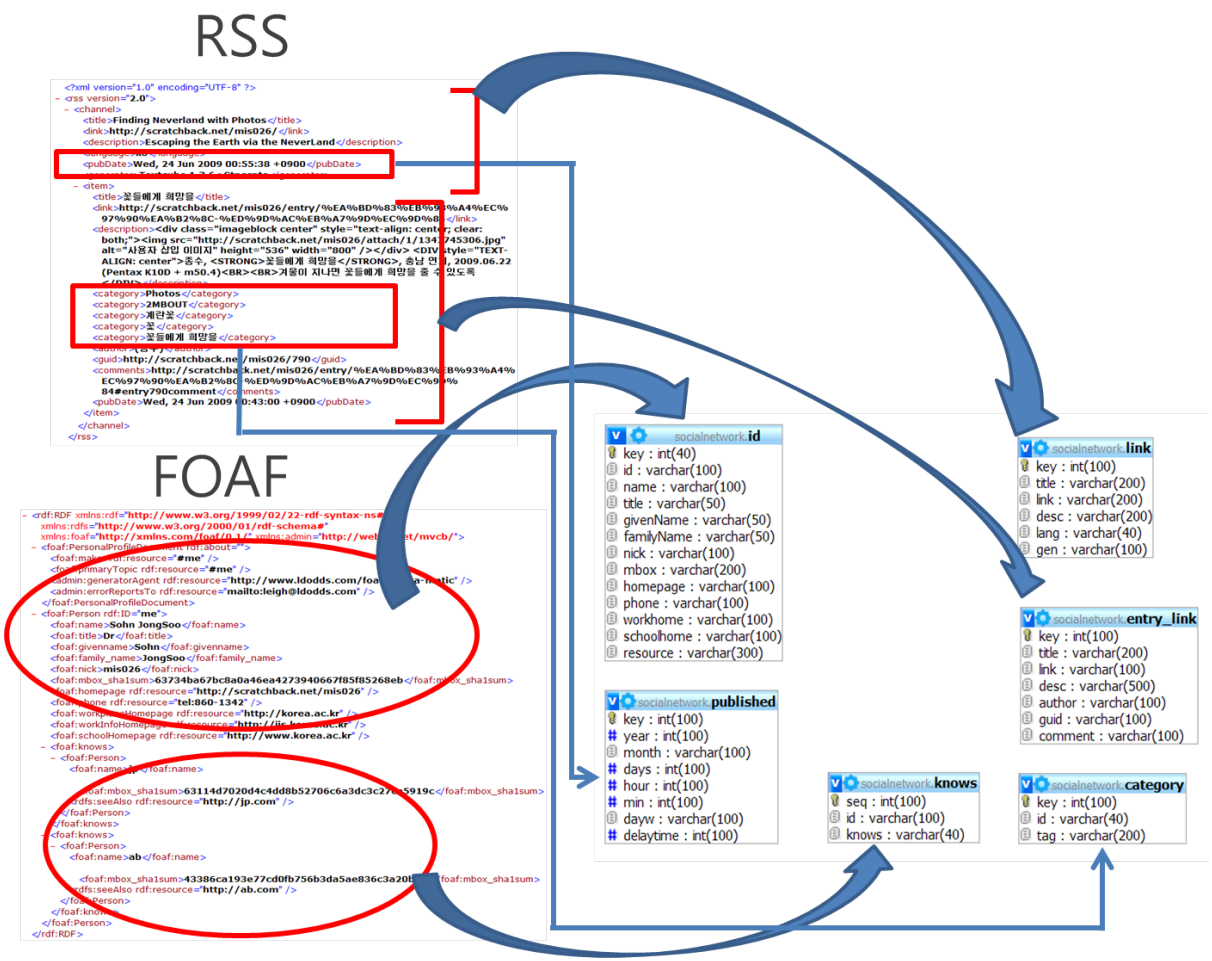
1. id dimension table: stores user profile
2. published_time dimension table: stores time information
3. knows dimension table: stores foaf:knows
4. site_link dimension table: stores website information
5. entry_link dimension table: stores contents
6. category dimension table: stores category and tags

Data Collection

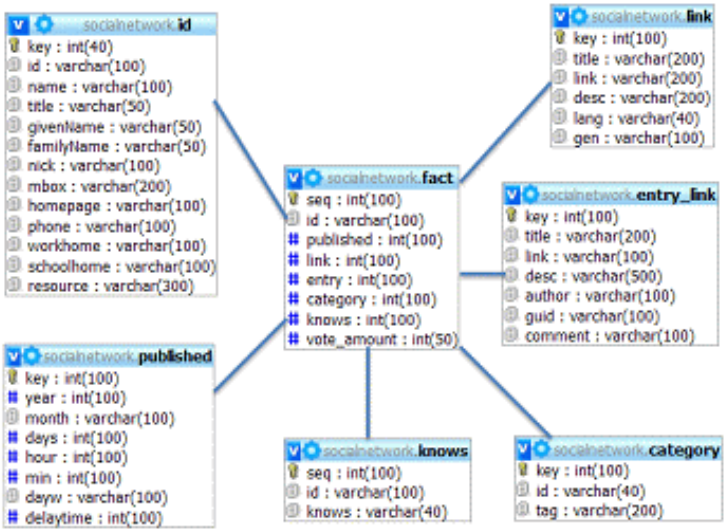
- Collect FOAF profile
  - Many SNS provides FOAF
    - We collected FOAF from livejournal.com
- Collect RSS data
  - 1) Extract the addresses of blogs or web sites of the users' FOAF
  - 2) Collect and store RSS

```
<?xml version="1.0" encoding="UTF-8" ?>
- <rss version="0.92">
  - <channel>
      <title>Law, Technology & Arts Blog</title>
      <link>http://wjlta.wordpress.com</link>
      <description>Bi-weekly comments from the Washington
        Journal of Law, Technology & Arts</description>
      <lastBuildDate>Sun, 30 Jan 2011 08:18:01
        +0000</lastBuildDate>
      <docs>http://backend.userland.com/rss092</docs>
      <language>en</language>
      <!--  generator="WordPress.com"  -->
    - <item>
        <title>The Future of Textbooks in a Digitized
          World</title>
      - <description>
          <![CDATA[ James Proctor In January 2011,
          California start-up company Kno, Inc. announced
        </description>
        <link>http://wjlta.wordpress.com/2011/01/27/the-
          future-of-textbooks-in-a-digitized-world/ </link>
      </item>
```

Generation of OLAP Cubes

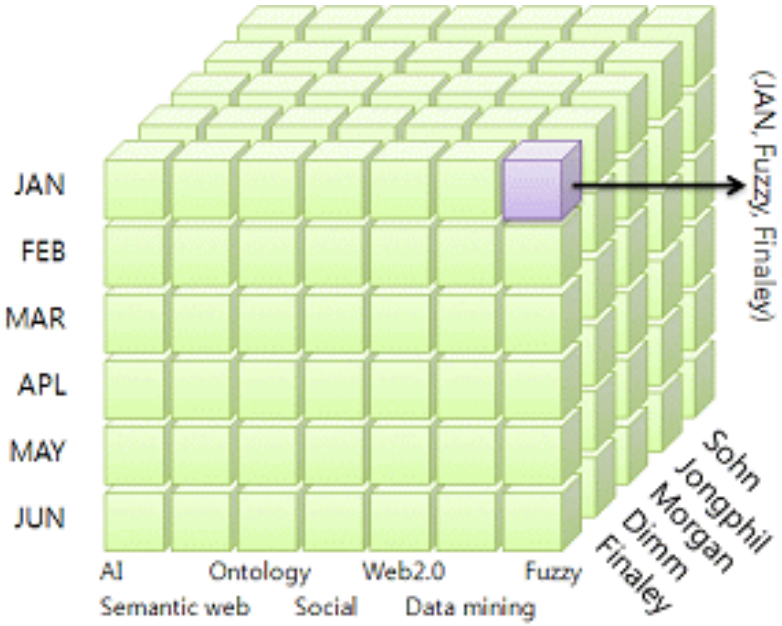


Generation of OLAP Cubes



Star schema

3D OLAP Cube

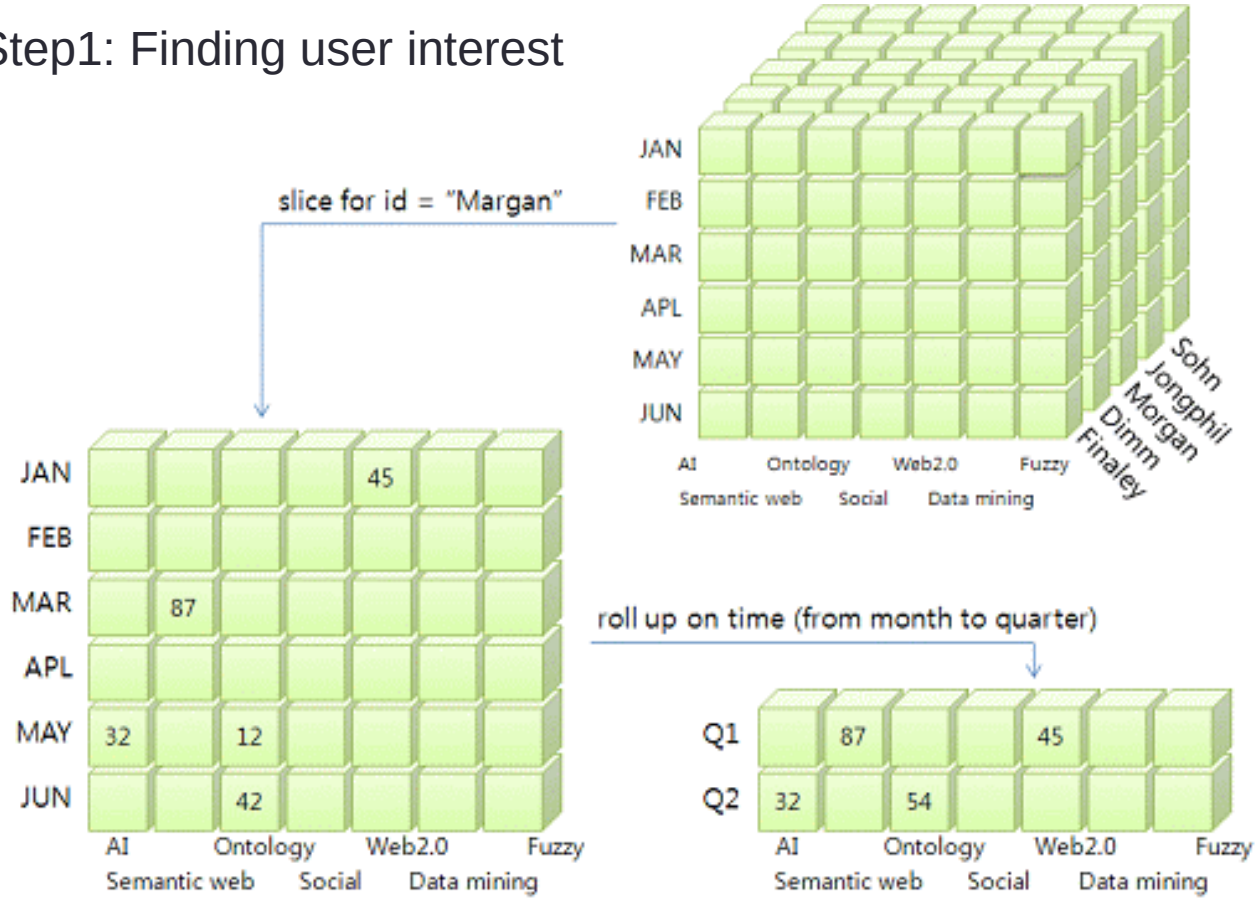


Dynamic Management of FOAF

- To make connections
  - Interests are most similar
  - Users who intend to extract relations
- First step
  - Extraction of the major interests of the corresponding users
    - Carry out several OLAP operations
- Second step
  - Extract the user
    - Most similar to the corresponding user
- By following these two steps
  - We can extract the major interests of the corresponding user

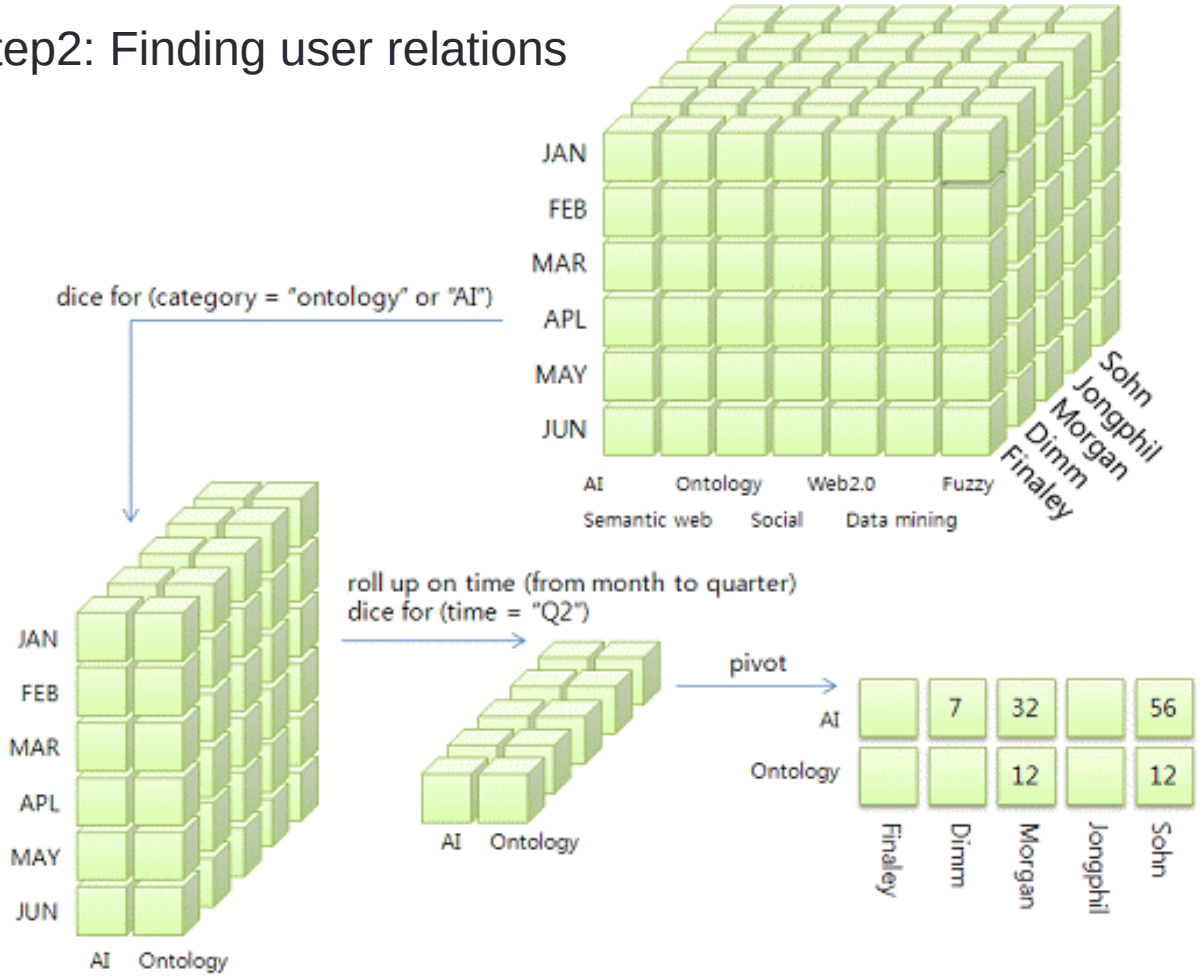
Dynamic Management of FOAF

Step1: Finding user interest



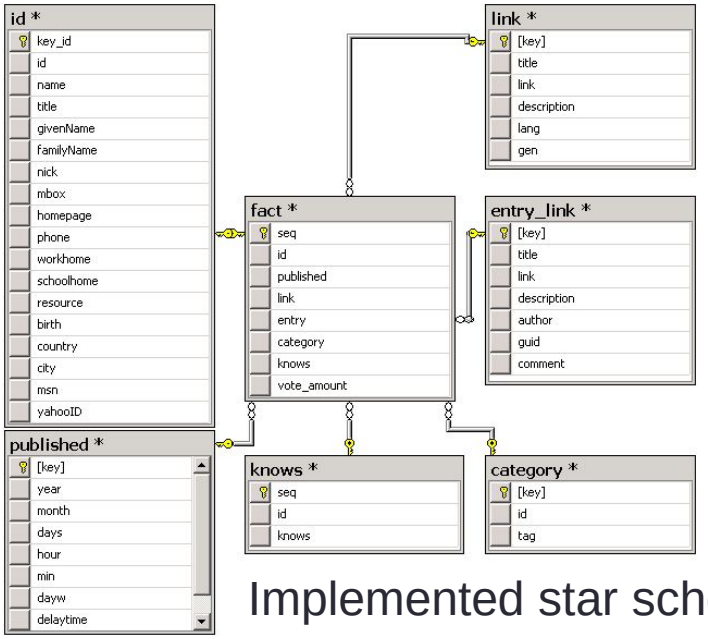
Dynamic Management of FOAF

Step2: Finding user relations



System Implementations

- Our system was constructed under the following environment:
  - Operating system: Windows XP
  - Programming language: C#
  - Database: MS SQL



Implemented star schema

id	link	entry	category	knows
yvanne	31	31	31	31
karaokedictator	32	32	32	32
hockeyvaughnfan	33	33	33	33
sotranquil	34	34	34	34
cheryl_bites	36	36	36	36
liquidhalcyon	38	38	38	38
scrittorello	40	40	40	40
razor2rozary	41	41	41	41
le_pinotnoir	42	42	42	42
angualupin	43	43	43	43
ewanism	44	44	44	44
postmodernpippo	45	45	45	45
betsyli	47	401	401	47

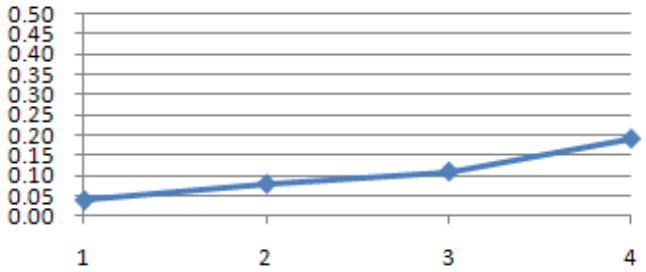
Implemented fact table

Analysis

- Number of collected data

FOAF	RSS	Number of articles
587	587	8691

- Variation in users' interest



During the fourth week
19% of variation was observed

- Change of friendship per user

ID/Week	Week 0	Week 1	Week 2	Week 3	Week 4
Criminal	29	31	38	38	39
betsyl	7	9	14	17	17
cherryboy	30	30	30	56	56
Danny_7	4	8	19	25	31
…omitted…	…	…	…	…	…

Analysis

- Functional analysis of FOAF applications

FOAF Applications	FOAF Generation	Filtering	Automatic update
Proposed	○	○	○
FOAF me	○	×	×
FOAF-o-matic	○	×	×
FOAF realm	○	○	×

- Adoption to social network services
  - Most of the web sites that support social networks
    - Choose to recommend friends based on the items
    - When there is a change in the member's interest
      - User has to directly modify his/her personal information
    - In order to solve this problem
      - System should automatically extract
        - Members' interests and reflect these interests
        - Proposed method can improve the quality of service support in social networks

Conclusion

- We proposed a method
  - To resolve the problems
    - Social network generation and management using an OLAP system
    - Based on FOAF and RSS
  - Dynamically update and manage FOAF via the OLAP system
- With the proposed method
  - We can represent the interests of users
    - As well as other relationships
  - Apply changes in the user interests to the FOAF using RSS
- Further research
  - Utilization of a query language such as SparQL
    - RDF-based metadata without conversion

THANK YOU