

Personalization Mobile P2P Network using FCA Based Multidimensional Aggregation

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Outline

- 1 Introduction
- 2 Related works
- 3 Proposed User Model
- 4 User model exploitation
- 5 Conclusion and Future Work

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Introduction: Key Notions

Context

"Context is any information that can be used to characterize the situation of an entity. An entity is a person, place, or object that is considered relevant to the interaction between a user and an application, including the user and applications themselves"
[Abowd et al, 1999]

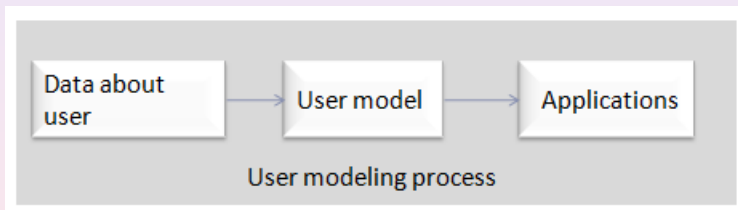
Context dimension

location, companion, time, environment, device, etc.

Context dimension feature

Social context dimension: Friend, Parents, Girlfriend, Boyfriend, Alone, Spouse, etc.

Introduction: User Modeling



Introduction: User Modeling

User Model

- 1 How to build the model?
- 2 What model of representation?
- 3 What is the role of the model?

How to build the models ?

User model in distributed case

- Resources-Based model [Vassileva 2002; Dennis 2007; Ye 2007]
- Content-Based Models [Lu 2006 ; Mghirbi 2012 ; Yeferny 2012]
- Multidimensional-Based Model [Yeung 2012]

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Exigences

- Expressiveness, Generality, Rapid adaptation, Flexibility and extensibility, Dynamicity, etc. [Carmagnola et al., 2011]
- *Autonomy, Scale Transit, Heterogeneity*

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Drawbacks

- Content-Based, Resources-Based: expressiveness prolem
- Multidimensional-Based Model: scale Transit prolem

Introduction: User Modeling

User modeling in p2p systems

- (-) Small number of works which address the problem of context modeling.
- (-) Existing works don't take into account user's contextual information.
- (-) Existing works don't take into account the specificity of P2P Systems.

Solution

User model taking into account the specificity of P2P Systems and user's contextual information.

Proposed User Model

- DIM = Location, Interest Centers, Query Profile
- User model: set of profiles
- Profile: Semantic correlations between:
 - Past requests and positive peers.
 - Past requests and positive document.
 - Past requests and location context.

Correlation extraction technique

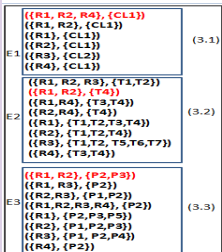
FCA

- 1 Log File Projection Formal context
- 2 Formal concepts creation
- 3 Search of similar concepts
- 4 Join of similar concepts
- 5 Exploitation: Selection and Similarity

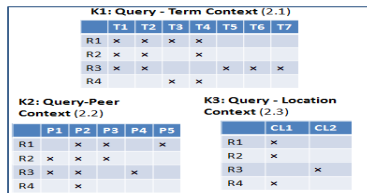
User model example

Log File

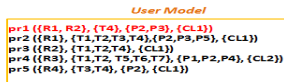
- (1)
- ```
(R1, T1-T2-T3-T4, P2-P3-P5, I1)
(R2, T1-T2-T4, P1-P2-P3, I2)
(R3, T1-T2-T5-T6-T7, P1-P2-P4, I3)
(R4, T3-T4, P2, I4)
```



## (2) Projection and Formal contexts generation



## (4) Generation



Legend

- pr<sub>i</sub> (i=1..5): user profiles
- T<sub>i</sub> (i=1..7): terms
- R<sub>i</sub> (i=1..5): user queries
- P<sub>i</sub> (i=1..5): peers
- CL (i=1..3): location concept

## Distributed Information Retrieval Process

- 1 Resources selection
- 2 Queries resolution
- 3 Results aggregation

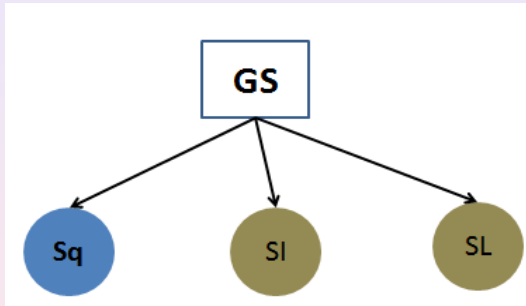
## Heterogeneity

- Indexing methods
- IR methods

- Find an aggregation

$$\psi(\{L_1, \langle d_{11}, \dots, d_{1n} \rangle, \dots, L_m, \langle d_{m1}, \dots, d_{mk} \rangle\}) \rightarrow L_f \langle D \rangle$$

- **Compute the global score of each document**

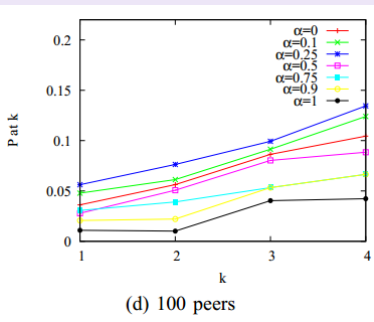
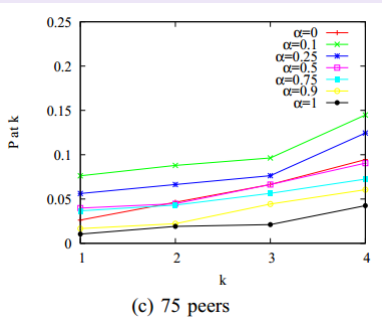


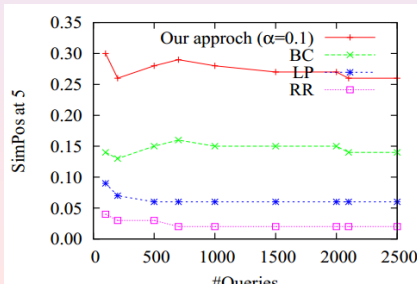
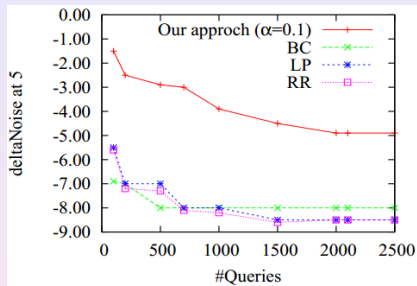
Linear combination:  $SG(d) = \alpha * Sq + (1 - \alpha) * (SI + SL)$

## Evaluation

### Environment

- NS2 Simulator
- Contextual Testbed: CAT-P2P [AROUR 2014] Testbed
- Evaluation metrics:  $P@k$ ,  $SimPos@k$ ,  $\delta Noise@k$
- Baseline: Round Robin (RR), Borda Count (BC), Light Profile (LP)





## Conclusion

- Proposition of a contextual user model.
- User model can be used as to model users in P2P systems.
- User model supports a variety of context-aware applications (filtering, expansion, aggregation, recommendation, . . . ) in P2PIR systems.
- We illustrate the use of the model in the context of query results aggregation.

## Future work

- Evaluate, using the contextual model, rating prediction in P2P systems.
- Exploit the model in existing recommender systems and evaluate the impact in recommendations and the final user satisfaction.
- Study the impact of interactions and dependency between context dimensions (Choquet integral).



Any Questions ?