## Community as a New Communication Layer in the Internet

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This work is done with Masaharu Hamasaki, Ohmukai Ikki, and Toru Takahashi. Hideaki Takeda / National Institute of Informatics

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#### **The Information Flood on the Internet**

- The information flood on the Internet
  - The amount of information on the Internet has been increasing
  - How to ensure the quality of information within the enormous amount of information
- The key to escape from the information flood is human relationship

## Human relationship for the information flood

- People can act intelligent agents for each other to collect, filter and associate necessary information.
- They can help not only themselves but also other people
  - Four eyes see more than two.(三人寄れば文殊の知恵)
  - Scratch me and I'll scratch you (魚心あれば水心)
- But, it can work only via reliable human network

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#### Human relationship for the information flood

- Only reliable human network can help us to keep quality of information
  - Which do you believe recommendation of TV programs by your friends or TV guide books?
    - The degree of reliability
    - The degree of closeness
    - The degree of shared interests
    - •...
- Community or human network is the key to enable information sharing and exchange with quality

## **Roles of communities** for information sharing/exchanging

- Communities or human network can serve as a layer of communication via computer network
- The distinction
  - Personal human network:
    - the graph where a person as a node and a relation between persons as a link
  - Community:
    - the structure upon personal human network

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# **Roles of communities** for information sharing/exchanging

- Roles of communities
  - provide channels for information exchange on specific topics
    - Becoming a member of a community is obtaining a channel to send and receive information related on the community
    - E.g., Mailing list
  - work as filtering information
    - Members of communities collect and distribute information specific to some topics either explicitly or implicitly. Once a consensus can be formed in a community, information specific to the topics can be easily collected or selected by members of the community.
  - offer a field for collaboration to produce new information
    - Communication in communities can yield new information
    - E.g., discussion group on BBS

## Tasks to realize "better" online communities

- Two directions
  - Make online communities natural like real-world communities
    - Online communities are still by far un-mature in comparison with real-world communities.
  - Exploit characteristics of online communities
    - Reduce real-world constraints
      - Time, Space, etc
    - Add new communication ways
      - Agents, asynchronous communication, etc
  - Both directions are needed

Balance is important

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# Tasks

- Forming communities
  - How to know relationship among people?
    - Relating people to each other *Re-configuration of personal human network*

• How to form communities from relationship among people?

• Finding common needs, interests, topics, etc.

Finding relationship via WWW bookmarks

Collaborative Scheduling Support System for Conferences

- Facilitating activities in communities
  - How to make communities better?
    - Exploit merits of online communities and compensate their demerits *Expressive Media for Online Communities*

e-kyoshitsu: Application to Distance Learning for Children

- How to utilize information in communities?
  - Filtering, extraction, summarization, etc.
  - (...)

Red: Research Themes Blue: Applications to communities

# Re-configuration of personal networks by the neighborhood matchmaker method

M. Hamasaki, H. Takeda

#### **Purpose**

- Personal network is usually "ad hoc"
  - We may miss better friends nearby
- We need better network
- One Solution:
  - Collect data for all people, then generate the "best" network
    - Disadvantage:
      - Scalability
      - Privacy
- Our approach:
  - Neighborhood Matchmaker Method (NMM)

#### Neighborhood Matchmaker Method (NMM)

- A iterative approach to optimize the network
- Every node works as a matchmaker for neighborhood nodes to improve the network
- The basic idea
  - In our real life, introducing new friends by the current friends is a practical way to optimize personal networks
    - We can know persons who you have not known before
    - Your friend can filter people for you
- Advantages
  - No need for central servers
  - Applicable to any size of community
  - Less computational cost



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### Algorithm

- 1. A node calculates connection values between its neighbor nodes
  - We call that node "matchmaker"
- 2. If the matchmaker finds a pair of nodes which has a good enough connection value, it selects this pair for recommendation. The matchmaker introduces both nodes of recommended pair to each other
- 3. The node that receives recommendation decides whether it accepts or not. If it accepts, it adds a path to the recommended node



Calculating connection values

Introducing each nodes

Adding a new path

#### **Sample Networks**





#### **Results: Cover-Rate w.r.t. Nodes**

- The path size is fixed as three times as the node size
- All cases were converged
- The average of cover-rate and the turn of convergence vary with the node size



#### **Results: Average of Convergence Turn**

- The number of convergence turn is linearly increased with the node size
- Computational cost
  - NMM: O(N)
    - Central Server Model: O(N<sup>2</sup>)



#### Conclusion

- Proposal of optimization of "ad hoc" network
- Good news for the Internet communities
  - No need for central servers
  - Applicable to any size of community
  - Anytime Algorithm

#### Discovery of Shared Topics Networks among People A Simple Approach to Find Community Knowledge from WWW Bookmarks

H. Takeda, M. Hamasaki, T. Matsuzuka, Y. Taniguchi

#### **Purpose**

- Generation of human network guiding individual information activities
  - An example
    - I want to watch sports programs on TV. What your recommendation?
  - Who and What
- Shared Topics Network among Users (STN)

## **Our approach**

- Combination of manual and automatic methods
  - Identification of topic
    - Use of bookmark files as users' knowledge
      To overcome knowledge acquisition problem
  - Discovery of inter-topic relations
    - Text analysis to calculate inter-topic relations

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#### Procedure to discovery shared topics

Calculation of Similarity among WWW pages ↓ Estimation of Similarity among folders for different users

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#### Calculation of Similarity among WWW pages



# **Discovery of common topics**



## kMedia Interface



#### **Bookmark with recommendation**



#### **Discovered Shared Topics Network**



## **Discovery of topic relations**

- Common relations
  - (search, IR), (academia, research-related)
  - similar but words themselves are different
- Un-common relations
  - ...(Unix, academia)
    - Speciality of the community



#### **Discovery of relationship among people**

- What are common topics with others?
- Who is good at this topic?



## **Experimental Evaluation (1)** Subjects of Experiment

- 12 subjects
- 3 persons from 4 communities (lab. = community)
- Two tasks for subjects
  - Submit their bookmark files
  - Evaluate recommendations generated by STN
- Two types of groups to generate STN
  - In-community: Belongs to the same laboratory
  - Cross-community: Comes from different laboratories

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# **Experimental Evaluation (2)** Items for User Evaluations

• The evaluation ranges from 1 to 5 (5 is the best)



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#### Analysis of Effects of Community (1)

the Relation Between Page and Folder Relevance

• High correlation between folder relevance and page relevance for in-community case



#### Category Resemblance (1) Categorization Is Human Relation?

• Human relation can be measured by resemblance of folder structure





#### **Effects of Category Resemblance (2)** Correlation Coefficient of the Parameters to Evaluations of Person

• The category resemblance is the highest of all parameters in this experiment

	To contact	To meet
Category Resemblance		
Num. of recommended pages	0.42	0.30
Ave. of page relevance	-0.13	-0.19
Num. of recommended folders	0.45	0.30
Ave. of folder relevance	0.38	0.30



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Avg. of Evaluation of page	0.29	0.40
Avg. of Evaluation 1 of folder	0.28	0.32
Avg. of Evaluation 2 of folder	0.09	0.20

# Effects of Category Resemblance (4) for Page Recommendation

• Better page recommendation results for new group made from category resemblance (CR)



### **Summary**

- Proposal of shared topic network to enhance user's communication
- Proposal of algorithm of discovery of shared topic networks with WWW bookmark files
- Validity of our approach by an experiment
- Proposal of category resemblance as measurement for community effects

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#### Collaborative Scheduling Support System for Conferences (on-going project)

H. Takeda, M. Hamasaki In cooperation with Yutaka Matsuo and Takuichi Nishimura

## Purpose

- System Aim: Support people to find their friends in a specific group
- Research Theme: Investigate different human networks in the same group
- Three human networks
  - Human network in the activity: *I worked with him*
  - Human network by communication: *I know him*
  - Human network by behavior: *I meet him*
- Scheduling on conferences



# **System Functions**

- Easy-to-use scheduling system for the conference
  - Just add presentations what you want to watch
- Can refer schedules of other people
  - Manually collaborative scheduling
  - Can only see schedules of *who know you*
- Can recommend schedules (not yet)
  - Automatically collaborative scheduling
- On-site support of schedules (not yet)
  - Small communication device with sensors



#### Cobit

Takuichi Nishimura, Hideo Itoh, Yoshinobu Yamamoto and Hideyuki Nakashima. ``A compact battery-less information terminal (CoBIT) for location-based support systems," In Proceeding of SPIE, number 48638-12 2002

#### The current status of the system



## TelMeA Show Me What You Mean -Expressive Media for Online Communities

Toru Takahashi, Yasuhiro Katagiri, H. Takeda

## **Introduction of TelMeA2002**

- What is TelMeA2002?
  - TelMeA2002 is an asynchronous community system like bulletin board system (not internet chat system).
  - TelMeA2002 employs character agents as personal conversational media among users.
  - We call such personal agents as *personified media*
  - In TelMeA2002 community, users can make messages in combination of full body expressions and pointing to web contents with personified media

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## TelMeA2002



## **Conversation Process in TelMeA2002**



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## **Our Goal**

- Is to find pragmatic rules of social and nonverbal interactions
  - Supporting social and nonverbal interactions
  - Archiving the logs of long-term community activities
  - Analyzing usages and effects of nonverbal expressivity



- Calculate social evaluations for involved information
- Summarize or make reutilize the involved information

#### **Challenges 1 - Identification**



- Unique embodiment is necessary for quick identification.
  - Because users are represented by their personified media.
- For analysis, however, each personified medium needs to have same set of expressions.
- Making same animations for various personified media puts a heavy load on the development.



We first focus on an analysis of usage of various type of animation before expanding the grade of identification.
 (56 kinds of animations for all 8 types of personified media)

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#### **Challenges 2 - Communication Features**

- Personified media should cover all 4 features of human communication
  - *Facts* enable through the spoken content
  - *Relationship* expressed through the relative spatial distance and position
  - Appeal expressed through the selection of various performative verbs
  - Self-revelation communicated through the emotional expression

#### **Challenges 3 - Expressive Repertoire**

- Personified media need to cover the entire scale of expression for the believability.
  - 35 performative verbs (*explains*, *agrees*, *complains*, etc.)
  - 48 affective expressions (*likes, sadly, worries*, etc.)
  - 13 interpersonal attitudes (yes, I know, forgotten, etc.)
  - Direct attention
    - Pointing, interpersonal distances
- Some essential conversational expressions such as statice and nods are less of importance because of nature of asynchronous conversation.

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## Trial Use: e-教室(e-classroom) Project

- e-教室(e-classroom) Project:
  - Run by NPO
  - Distance learning for children (mainly junior-high school, 12-15yrs)
  - Several classrooms (math, economics, CG, etc)
- TelMeA for e-教室
  - Experimental use of TelMeA
  - Classroom for
    - Leaning "agent" as new technologies by using
    - Communicating to each other ("BBS" for participants)
  - (demo)

# TelMeA for e-教室



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### The current status of "TelMeA for e-教室"

- Period: c.a. 4 month (2003.1.16-)
- Login users: 64
- Posted users: 24
- Post No.: 297, Post thread No.: 22

### **Summary**

- Information technologies, in particular AI can offer new opportunities for communities
  - Reducing constraints of the real world
    - Time, space, etc
  - new communication ways
    - Knowing new related people, communication via agents etc
- They will change meaning or roles of communities
  - e.g,
    - Very weak communities
    - Quick life cycle of communities
    - Belonging so many communities

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#### **Summary**

- Challenges
  - Support of life cycle of communities
    - Create, maintain, diverse, merge, disappear
  - Trust
    - Trust is very difficult
    - Trust may be more complicated than the real world...