

# Incentive Mechanisms for Encouraging Participation in Online Communities

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## Outline

- Introduction: why is participation important?
- Comtella 2002-2007: a sharing community
- Approaches for motivating participation:
  - Social incentives: awareness  
stimulating reciprocity status
  - Rewards : money → power  
pleasing effects of actions
- Conclusions



## Online communities

- **Large interest based communities**
  - Usenet discussion groups
  - Blogs: *LifeJournal*, *MySpace*, *Blogger*, etc.
  - Game communities: e.g. *World of Warcraft*, *Second Life*, *EverQuest*
  - Sharing communities: filesharing (*BitTorrent*), digital photos (*Flickr*), bookmarks (*CiteULike*)
  - Social networking: *Orkut*, *LinkedIn*, *OpenBC*
- **Small custom-made communities for particular purpose, e.g. knowledge management**
  - Expertise finding in enterprises, or peer-help systems in education, e.g. *I-Help*
  - Sharing resources, e.g. lecture notes, papers within a research lab/group, e.g. *Comtella*
- **Network effects:**
  - more users - more diverse and interesting materials - more users...
  - less users - nothing is happening - those who come by chance leave...
  - Feedback loop!
  - After reaching a "critical mass" of participation, the community becomes self-sustained



## Reaching critical mass

- **By chance:**
  - YouTube, mySpace, Flickr, Wikipedia,
- **By purchase:**
  - *YouTube* – by Google \$1.6 billion in Oct 2006,
  - *Flickr* by Yahoo in 2005, ...
  - \$\$\$\$\$\$\$\$\$
- **By design:**
  - **build incentives in the software, e.g. Slashdot**





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## Incentive Approach

- Social awareness

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## Theories in social psychology

**Social Conformity – Asch**

- People want to fit in their peer group: e.g. have similar ideas, do similar things

**Social Comparison – Leon Festinger**

- People tend to compare with their peer group
- Knowing that their peers may align to them, they behave more responsibly, care about positive social image and status

**Real versus Online Communities – MovieLens experiment**

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## Community visualization in Comtella 2002

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## Lessons learned

Deployed in our Department, 2 months, ~20 users, fall 2003  
User Feedback:

- Visualization is "a nice feature"
- "Useful: easy to discover who has what...interesting"

### • Major problems

- Shows only users that are currently online (emphasizes loneliness)
- Size depends on who is active at the moment
- Uninteresting to compare the contributions of people interested in very different areas (peer group?)
- Random graphical location, but users tried to interpret the position
- Hard to distinguish between sizes of stars
- Hard to keep in mind what colour means
- Lacks interactivity

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## Comtella 2004: interactive vis.

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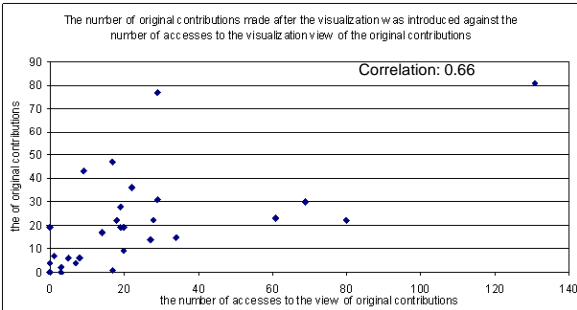


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## Evaluation: # new contributions Vs. visualization usage



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## Lessons learned

- Interactivity not used
  - Default view (original contrib.) most important
- Stars need to be more attractive
- Quality needs to be rewarded, not just quantity of contributions
  - Need to find a way to visualize "user reputation"

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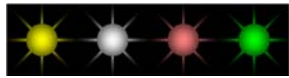


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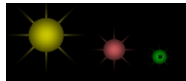
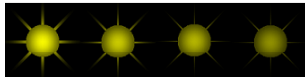
16/50

## Comtella 2005 visualization



Colour (4) – membership (status)

Brightness (4) – reputation (quality of contributions)



Size (4) – number of original contributions

State (2) – offline or online



128 images generated using OpenGL with parameters:  
- size, colour, temperature/brightness

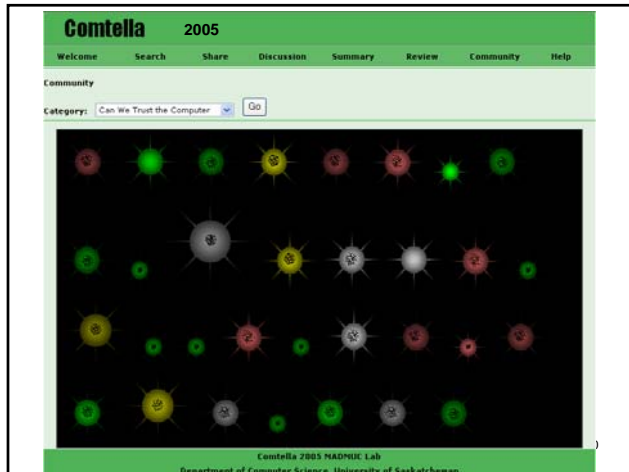
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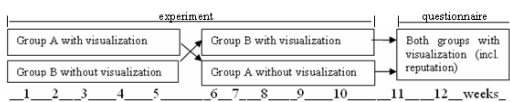
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## Comtella 2005 Vis. Evaluation



Performance of more active group: No vis (Group B) / With vis (Group B)

Performance of less active group: With vis (Group A) / No vis (Group A)

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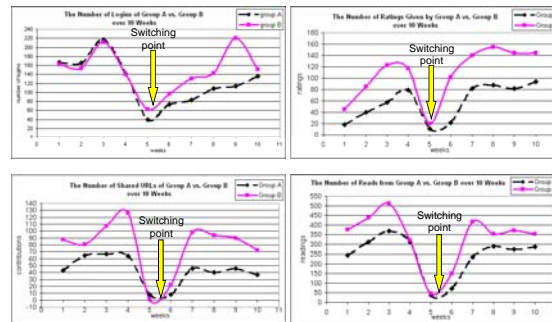


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## Data



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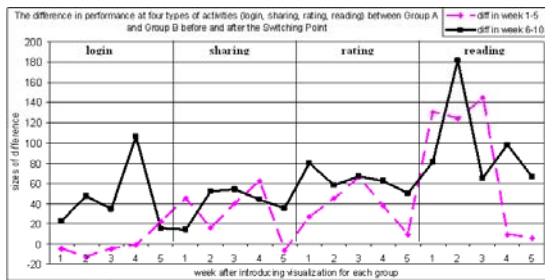


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## Data



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## Results

- Statistical tests (t-Distribution Test and Wilcoxon's Matched Pairs Signed Rank Test) show that the difference between the performances of the two groups is **significant** for all activities together,
  - Statistical significance for **logging in** (0.95 for both t-test and Wilcoxon) and **rating** activities (0.975 for t-test and 0.95 for Wilcoxon)
  - No statistical significance for *sharing* and reading activities.
- The visualization has a positive effect on increasing participation but not exactly as expected

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## Incentive approach: Status

Customer Loyalty Programs



Image from [depts.washington.edu/.../painting/4reveldt.htm](http://depts.washington.edu/.../painting/4reveldt.htm)

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## Social psychology again

- Theory of Discrete Emotions: **FEAR**
  - When people are afraid of losing something, they are very sensitive to messages about how to avoid the danger



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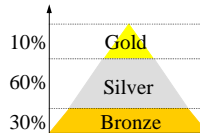
## Incentive mechanism in Comtella 2004



Ran Cheng

- Rewarding participatory acts with points and status

- The user earns points by:
  - sharing new links, rating links, etc.
- Points accumulate and result in higher status for the user



- Memberships:



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Wandong Han

Comtella File Sharing System v7.235 - MADMUC Lab, University of Saskatchewan

Search | Share | Community | Visualization | Help

Comtella Gold

Keywords (opt):

Additional Options:  Remove the duplicate papers:  Show only the new papers (after my last login)

Rating: \*\*\*\*\*

Title: Court Orders M

URL: http://www.wire.com/news/story/0204021217

Sharing Time: 2004-02-17

Relationship: Click Me

Comment: Click Me

Your level is based on your contributions

Your level in week 9 is Gold Member

Your contributions (compared to the top contributor in each category)

Your login frequency: 80 / 100

The number of new links you brought in: 74 / 100

The number of links you shared: 35 / 100

The number of your comments: 20 / 100

Your online time: 63 / 100

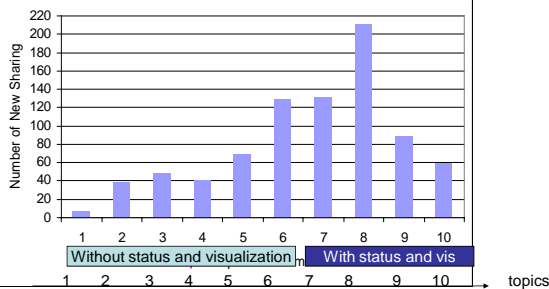
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## Results: group contributions

Distribution of the Original Contributions on Each Topic over Time



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## Lessons learned

- User Status is very effective in increasing participation in sharing new papers, **but**
  - stimulated low quality papers; excessive number of contributions, students gaming the system
  - need to stimulate contributions early in the week

Sun, L., Vassileva, J. (2006) Social Visualization Encouraging Participation in Online Communities, Proc. CRIWG'06, Springer LNCS 4154, 345-363.

Cheng, R., Vassileva J. (2005) User Motivation and Persuasion Strategy in P2P Communities, Proc. HICSS'38, Minitrack on Online Communities, IEEE Press.

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## Adaptive incentive mechanism: requirements

- To ensure sustainability, the incentive mechanism needs to:
  - Reward contribution of new resources, but
  - Encourage **timely contributions**
  - Discourage **excessive contribution**
  - Encourage **high quality contributions**
    - Ensure a way to **measure the quality of contributions** → reward ratings

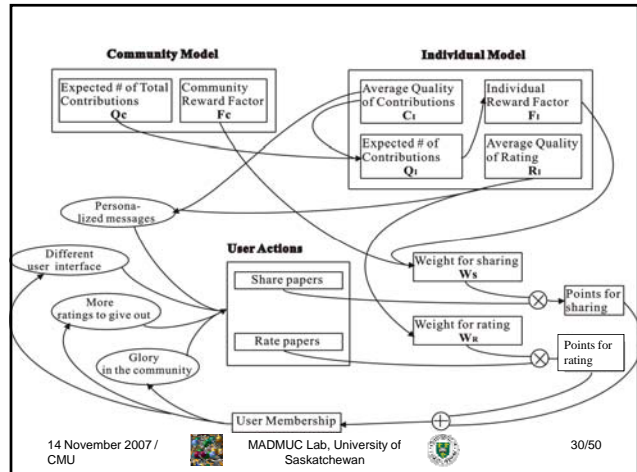
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**Comtella**

Welcome Search Share Discussion Summary Review Community Help

Welcome to Comtella 2005. Current week is Week# 11

Your contribution level in last week: Paper 0 papers, 0.0 points  
 Quantity: 0  
 avg rating: 0.0, 0.0 points  
 Quality: 0  
 Rating: 1 ratings, 3.0 points  
 Quantity: 1  
 Rating: 0.0 points  
 Quality: 0  
 Overall: 0.0 points

In current week: Paper 5 papers, 2.3 points  
 Quantity: 5  
 avg rating: 0.2  
 Quality: 1  
 Rating: 0 ratings, 0.0 points  
 Quantity: 0  
 Rating: Not available until next week.  
 Quality: N/A  
 Overall: Not available until next week.

Points\* 0.13

Community News:  
 Comtella User Survey (03/30/2005)  
 From Ran:  
 It is time to run the survey. Please fill out the [questionnaire](#). We appreciate your effort and time!  
 Pay attention to the "Comtella Messages", (02/28/2005 From Ran)  
 Please pay attention to your "Comtella Messages" part. It provides different suggestions for different persons. Following these suggestions is a shortcut to upgrade your memberships.  
 Cpoint has expiry date (2 weeks), (01/24/2005 From Ran)  
 Please use your cpoints as soon as possible, it can be used to increase the visibility of your articles. For more info, click "help".  
 Submit a news item

Top users of last week:  
 Terrell JamesRond07 Mingtial

Best papers of last week:

Rank	Title	Provider
1	Roundtable looks at issue of learning software engineers	Atadul
1	When is A Software Engineer Not A Software Engineer?	Michael
1	Don't learn too heavily on the code of ethics	Laurance
1	Ethical Problems with Modern Technology	Just a house member

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## Extrinsic incentive for rating

- Currency as payment for rating - C-points
  - Earned with each act of rating
  - Can be invested to "sponsor" own links (like Google's sponsored links)
  - Decay over time

Result: <<Previous Next>> Total: 5 Page

Cpoint	Paper Title	Earned Ratings	My Rating	View Times	Fake?	Fak Estm
404	SOBNO-CAPADIVY SOCIAL EXPRESSION OR SOCIAL SITUATION	1	Rate	7	Fake	0
304	Is Google "the only archive we'll ever need"?	2	Rate	8	Fake	0
204	Technology & Happiness	4	Rate	12	Fake	0
204	Video Games Not TV Linked to Obesity in Kids	4	Rate	13	Fake	0
104	Alzheimer's patients to trial MS-like life-long treatment	3	Rate	4	Fake	0
104	Sexual Issues for Teens	2	Rate	8	Fake	0

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## Comtella 2005 Evaluation

- Comtella used in the “Ethics and IT” class  
– 32 students, divided into:

**Test Group:** with status, adaptive rewards, c-points, personalized messages

**Control Group:** with status

1 2 3 4 5 6 7 8 9 10 → topics

- Compared the numbers of contributions in each group (links, ratings)
- Post-study online questionnaire

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## Comtella 2005 - Results

- Did the users in the test group (Comtella 1) give more ratings?
  - **Yes:** nearly twice as much as Comtella 2: **1065** vs. **613** ratings (significant)
- Did the summative ratings in Comtella 1 reflect better the quality of the contributed links?
  - **Yes:** in Comtella 1, **56%** (9 users) felt that the final summative ratings that their links received reflect fairly their quality, while in Comtella 2, only **25%** (4 users) thought so.
- Did the users in Comtella 1 tend to share links earlier in the week?
  - **Yes:** users in Comtella 1 shared **71.3%** of their contributions in the first 3 days after introducing the topic; users in Comtella 2 shared **60.6%** of their contributions in the first 3 days. The difference was significant for all topics and ranged between 7-14%.

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## Comtella 2005 - Results (2)

- Did the users in Comtella 1 participate more actively in general?
  - **Yes:** they **read more papers** (**3419** vs. **2416**) and **logged in the system** more frequently (**1714** vs. **982**).
- Is there a significant difference in the total number of contributed links between the test and the control group?
  - **No:** **613** in Comtella 1 versus **587** in Comtella 2
  - There was no excessive paper contribution in either case.

Cheng R., Vassileva J. (2006) Design and evaluation of an adaptive incentive mechanism for sustained educational online communities, User Modeling and User Adapted Interaction, 16 (2/3), 321-348.

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## Lessons learned

- Incorporating an incentive mechanism can stimulate a desired behaviour in an online community
  - the **c-points** stimulated ratings
    - can be useful for collaborative filtering systems
- An adaptive rewards mechanism can orchestrate a desired pattern of collective behaviour
  - the **time-adaptation** of the rewards stimulated users to make contributions earlier
- It is important to make the user aware of the rewards for different actions at any given time

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## Incentive approach: entangle lurkers in social relationships

- Encouraging Social Reciprocation
  - “Who reads my postings?”
  - “What did they post?”
- Through social visualization
  - Modeling and visualizing the asymmetry of interpersonal relations
  - Expectation – that users will try to correct the asymmetry



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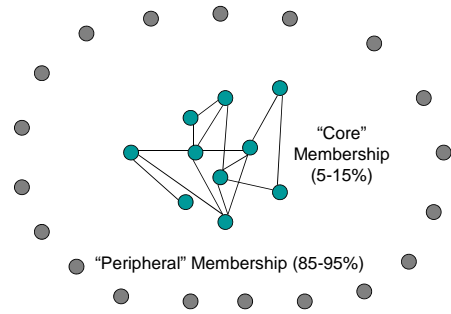


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37/50

## Online community composition



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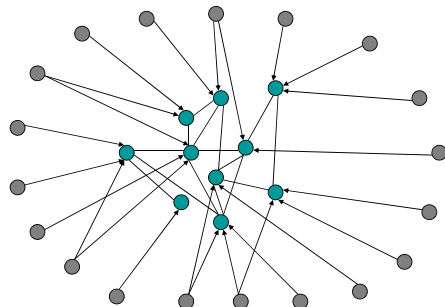


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38/50

## We want to “connect the dots”



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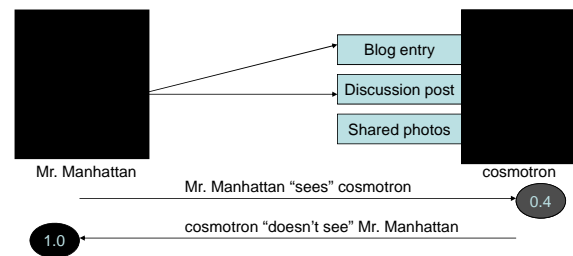


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39/50

## Modeling relations: mutual visibility



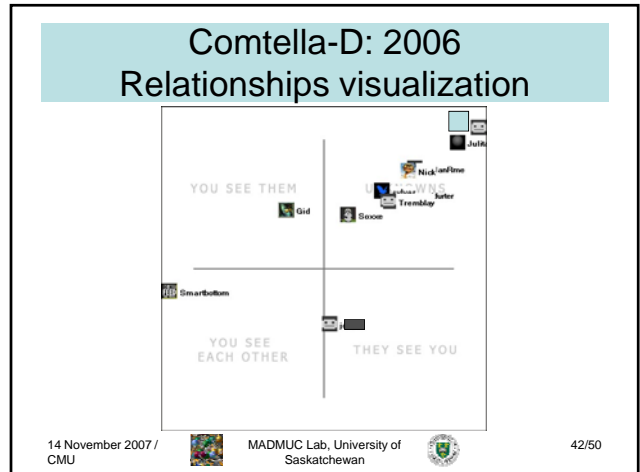
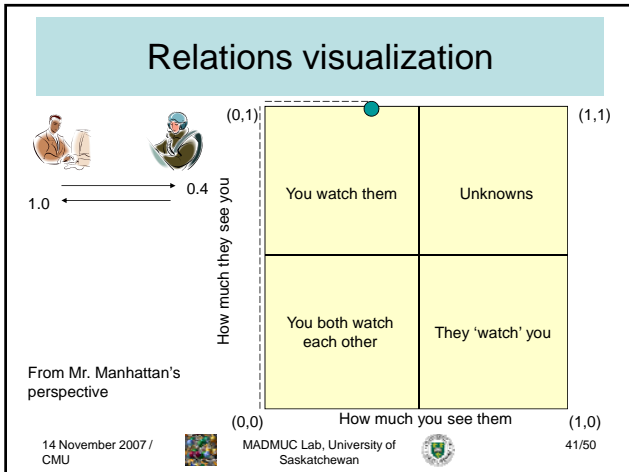
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## Incentive Approach



- Immediately reward desirable actions
  - Rating is important
  - Reward it with esthetically pleasing effect (something "fun" to watch)
  - The user sees immediately the effect of her rating
- Emphasize what is valued in the community
  - Highly rated content is valued – emphasize it visually → generates "recommendation" in the interface (something useful, value added)
  - Gentle social comparison - based on contributions, not ego

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## Community energy

@work Energy

The quick red fox jumped over the lazy brown dog.  
By Andrew

○○○○

All generalizations are false, including this one.  
By Mark Twain

○○○○

Stored Energy

○○○○

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Forum	Description	# of Posts	Created on
Privacy	Big Brother, databases, risks, protection, awareness, philosophical views	82	1/4/2006
Freedom of Speech	Censorship, anonymity, laws, offensive/dangerous	93	1/4/2006
Intellectual Property	Fair-use, copying music/movies/software, solutions	78	1/4/2006
Wiretapping and Encryption	Role of secrecy, trust in government, cryptography	70	1/4/2006
Computer Security and Crime	Hacking, hoaxes, law, identity theft, privacy and	79	1/4/2006
Computers and Work	Changing nature of work, impact on employment, employee monitoring, teleworking	79	1/4/2006
Broader social issues	Computers and community, digital divide, bad technologies, who benefits the most	73	1/4/2006
Can we trust the computer?	What can go wrong, Therac-25 case study, reliability and safety, computer models	70	1/4/2006
Ethics and Professionalism	Professional codes and guidelines, cases, aspects of professional ethics	53	1/4/2006

## Study: Comtella-D

- Online discussion forum for 2 courses:
  - CS 408 (required use) (N=19; simulated core)
  - Phil 236 (recommended use) (N=32; peripheral members)

Test interface

Control interface (typical discussion forum)

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## Listing forums control interface

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Forum	Description	# of Posts	Created on
Privacy	Big Brother, databases, risks, protection, awareness, philosophical views	82	1/4/2006
Freedom of Speech	Censorship, anonymity, laws, offensive/dangerous speech	93	1/4/2006
Intellectual Property	Fair-use, copying music/movies/software, solutions, copyrights vs patents	78	1/4/2006
Wiretapping and Encryption	Role of secrecy, trust in government, cryptography	70	1/4/2006
Computer Security and Crime	Hacking, hoaxes, law, identity theft, privacy and civil liberties, crime fighting	79	1/4/2006
Computers and Work	Changing nature of work, impact on employment, employee monitoring, teleworking	79	1/4/2006
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## Listing forums test interface

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Can we trust the computer?	What can go wrong, Therac-25 case study, reliability and safety, computer models	70	1/4/2006
Ethics and Professionalism	Professional codes and guidelines, cases, aspects of professional ethics	53	1/4/2006

## Post header

### Control Interface



### Test Interface



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49/50

## Results

Group	Contribution Counts				Average Access / Views		
	Threads	Posts	Comments	Ratings	Logins	Reads	Relavis
CS test	72	326	17	55	66.3	233.6	4
CS ctrl	60	299	5	11	48.6	180.2	n/a
Phil test	6	10	0	6	15.9	28.1	1.1
Phil ctrl	1	6	1	4	7.9	19.2	n/a

Significant,  $p < 0.02$

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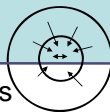


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## More results



- Counted the number of interactions between members of the groups: core (test), core (control), periphery (test), periphery (control).
  - Periphery test users interacted more often with the core group than periphery control users ( $p < 0.01$ )
  - Within the core group, members of the test group engaged in more symmetrical relations

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51/50

## Claims and questions

- The users' behavior can be dynamically "orchestrated" by
  - Providing social awareness through visualization
  - Providing explicit rewards (status, power, esthetic pleasure, social binding) for desired user activities
  - Adapting the rewards according to what activities are currently needed most by the community.
- What should be the "score"?



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## Summary

- Motivating participation is an interesting and under-explored area in social computing
- On the cross-roads of:
  - Economics (mechanism design)
  - Game theory
  - Social Psychology
  - HCI
  - Distributed AI
  - Applications – in education, online communities and game design, web 2.0, enterprise 2.0 etc...
- In this talk I presented a spectrum of approaches
  - All were successful (encouraged participation)
  - Choosing one is a matter of beliefs and knowledge of the community

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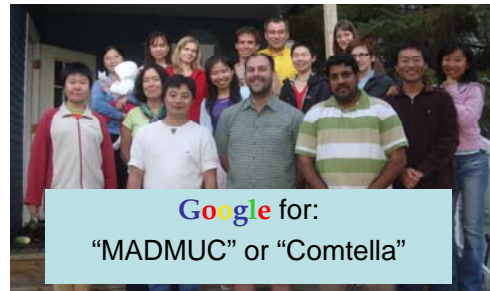
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## More Info?

<http://bistrica.usask.ca/madmuc>



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## Evaluation

- The hypothesis is confirmed by the results:
  - The inactive group becomes more active when it has access to the visualization, while the active group remains the same without the visualization
    - → The difference between the performance of the two groups shrinks
  - The inactive group becomes less active when it did not have access to the visualization, and the active group becomes more active when it had the visualization →
    - The difference between the performance of the two groups increases
- Statistical tests (t-Distribution Test and Wilcoxon's Matched Pairs Signed Rank Test) show that the difference between the performances of the two groups is **significant** for all activities, i.e. it is not due to chance or randomness -> **it is a result of applying the visualization.**
  - Statistical significance for logging in (0.95 for both t-test and Wilcoxon) and rating activities (0.975 for t-test and 0.95 for Wilcoxon)
  - No statistical significance for sharing and reading activities.
- The visualization has a positive effect on increasing participation

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