New platforms for social computation and web-gaming

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Techno-social systems

Social dynamics

ICT-based social-communities
New ICT-driven opportunities

Understand and control information dynamics

- social annotations, social bookmarking
- search engines
- recommendation systems
- collaborative editing (wiki, blogs, forum, ...)
- collaborative filtering
- ... 

Web as a laboratory for social sciences

- opinions formation
- consumers behaviors, marketing strategies
- cultural trends, globalization
- birth and evolution of communication systems
- language evolution
- ... 

Raise awareness and participation

- Monitoring of common resources and environment
- Monitoring of societies
- Feedback to policy makers
- Sustainable development
- ...
Understand and control information dynamics

- social annotations, social bookmarking
- search engines
- recommendation systems
- collaborative editing (wiki, blogs, forum, ...)
- collaborative filtering
- ...

...
a short history of the web

1989-1991
WWW is created at CERN

1991-2000
mass adoption, users are consumers,
taxonomic approach

1998
Google is born

2000
the Semantic Web vision by T. Berners-Lee

2000-2004
users become content providers,
rise of online communities

2005
“bottom-up” information architecture
“bottom-up architecture”

"I hate intellectuals. They are from the top down. I am from the bottom up." F. Lloyd Wright
“bottom-up architecture”

"I hate intellectuals. They are from the top down. I am from the bottom up." F. Lloyd Wright
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« earlier | later »

» showing 10, 25, 50, 100 items per page

http://del.icio.us
resource

user

{ tags }

http://del.icio.us
RadRails - A Ruby on Rails IDE

URL: http://del.icio.us

Tags:
- resource
- user
- { tags }
- post
folksonomy structure

basic unit of information: (user, resource, tag)

\[ Y \subseteq U \times T \times R \]
folksonomy structure

basic unit of information: \((\text{user}, \text{resource}, \text{tag})\)

hypergraph with 3-edges:

\[ Y \subseteq U \times T \times R \]
aspects of tagging

OH, HI; I'M HERE FROM THE INTERNET.
\WHAT ARE YOU DOING!?
GLUING CAPTIONS TO YOUR CATS.
aspects of tagging

- tagging is a **distributed process**
- users bookmark and tag resources, with no explicit coordination
- tagging has a small cognitive overhead
- system contents can be browsed by tag
- the system evolves in time: new resources, new users, new tags
- there may be an underlying social network, explicitly exposed or not
aspects of tagging

- Tagging is a **distributed process**
- Users bookmark and tag resources, with no explicit coordination
- Tagging has a small cognitive overhead
- System contents can be browsed by tag
- The system evolves in time: new resources, new users, new tags
- There may be an underlying social network, explicitly exposed or not
- The behavior of users is "selfish", but they are exposed to each other’s activity
- They share implicit knowledge (language, cultural background)
aspects of tagging

eposure to resource

categorization

tagging

tagging

exposure to tags

user 1
user 2
user 3
user 4
user 5

tag "A"
tag "B"
tag "C"
tag "D"

resource
aspects of tagging

exposure to resource

categorization

tagging

exposure to tags
the complexity
the complexity

http://www.flickr.com/photos/gustavog/9708628/

community level
the complexity

http://www.flickr.com/photos/gustavog/9708628/

http://dml.riken.go.jp/~ciro/blog/2005/Feb/14

community level  user level
the complexity

community level

user level

FOLKSONOMY

http://www.flickr.com/photos/gustavog/9708628/

http://dml.riken.go.jp/~ciro/blog/2005/Feb/14
research fields

- statistical physics
- self-organization
- pattern formation
- growth processes
- complex networks
- stochastic processes
- agent-based models

complex systems

- semantic networks
- symbol grounding
- emergence of conventions

computer science

- information retrieval
- ontology learning
- artificial intelligence
- distributed systems
- algorithms

linguistics
temporal dynamics and evolution
• “rich get richer” dynamics results in a robust categorization
social adoption of a tag

article first introducing the term “ajax” gets published

http://blog.pietrosperoni.it/2005/05/28/tagclouds-and-cultural-changes/
global vocabulary growth

\[ N(\tau) \approx 650,000 \text{ users} \]
\[ \approx 2 \cdot 10^7 \text{ resources} \]
\[ \approx 5 \cdot 10^7 \text{ posts} \]
\[ \approx 2.5 \cdot 10^6 \text{ tags} \]

Heaps’ law

\[ \gamma \approx 0.8 \]
global vocabulary growth
≈ natural language

\[ N(\tau) \approx 10^{6.2} \]

- \( \approx 650.000 \) users
- \( \approx 2 \cdot 10^7 \) resources
- \( \approx 5 \cdot 10^7 \) posts
- \( \approx 2.5 \cdot 10^6 \) tags

Heaps' law

\( \gamma \approx 0.8 \)
tag popularity: frequency-rank plot

$P(R) \sim R^{-\alpha}$

$\alpha > 1$

levelling off

high rank

low rank
a Yule-Simon model with memory

- Start with $n_0$ words
- At time $t$: with probability $p$, a new word is appended
- With probability $1-p$, a word is copied from position $t-x$
- $x$ is distributed according to a fat-tailed memory kernel $Q(x)$

$$Q_t(x) \sim \frac{1}{x + \tau}$$
copying + skewed memory kernel + invention

C. Cattuto, VL and L. Pietronero
"Semiotic dynamics and collaborative tagging" PNAS 104, 1461 (2007)
structural properties
social linking

structural unit: (user, content, metadata)

networks of users

explicit social network

structural unit: (user, {friends})
network of tag co-occurrence
network of tag co-occurrence
network of tag co-occurrence
network of tag co-occurrence

\[ s_i = \sum_{j \in V(i)} w_{ij} \]
networks of tag co-occurrence
networks of tag co-occurrence

\[ T_{tur} \rightarrow C_{tt'} = \sum_{u,r} T_{tur} T_{t'ur} \]

weighted
networks of tag co-occurrence

\[ T_{tur} \rightarrow C_{tt'} = \sum_{u,r} T_{tur} T_{t'ur} \]

(weighted)

( u1, r1, \{t1, t2, t3\} )
networks of tag co-occurrence

\[ T_{tur} \rightarrow C_{tt'} = \sum_{u, r} T_{tur} T_{t'ur} \]

( u1, r1, \{t1, t2, t3\} )

( u2, r2, \{t1, t2\} )
networks of tag co-occurrence

\[ T_{tur} \rightarrow C_{tt'} = \sum_{u,r} T_{tur} T_{t'ur} \]

( u1, r1, \{t1, t2, t3\} )

( u2, r2, \{t1, t2\} )

( u3, r3, \{t2, t4\} )

Diagram:

- Node t1 connected to t2 with weight 2
- Node t2 connected to t3 and t4
- Node t3 connected to t4

The network of tag co-occurrence involves the calculation of weighted connections between tags based on user interactions and relationships.
networks of tag co-occurrence

\[ T_{tur} \rightarrow C_{tt'} = \sum_{u,r} T_{tur} T_{t'ur} \]

\[(u_1, r_1, \{t_1, t_2, t_3\})\]
\[(u_2, r_2, \{t_1, t_2\})\]
\[(u_3, r_3, \{t_2, t_4\})\]
\[(u_4, r_4, \{t_5\})\]
networks of tag co-occurrence: nearest-neighbor average strength
networks of tag co-occurrence: nearest-neighbor average strength

s = 4
networks of tag co-occurrence: nearest-neighbor average strength

\[ s = 3 \]

\[ s = 2 \]

\[ s = 1 \]

\[ s = 4 \]
networks of tag co-occurrence: nearest-neighbor average strength

$s = 3$

$s = 4$

$s_{NN} = 2$

$s = 2$

$s = 1$
networks of tag co-occurrence

\[ S_{nn}(t) = \frac{1}{k_i} \sum_{j=1}^{k_i} s_t \]
modelling structural properties

C. Cattuto, A. Barrat, A. Baldassarri, G. Schehr and VL
“Collective dynamics of social annotation”
PNAS 106, 10511 (2009)
red edible fruit
red
yellow
edible
fruit
Peach is a red and yellow edible fruit that I like.
Basic idea

shared semantic graph (latent)  
tag co-occurrence network
Semantic space

Co-occurrence network

Basic idea

shared semantic graph (latent)

tag co-occurrence network

{1,2,3,4}
Basic idea

shared semantic graph (latent)  
tag co-occurrence network

{1,2,3,4}  
{1,5,6}
Main ingredients
Main ingredients

semantic graph topology
Main ingredients

semantic graph topology

networks considered:

Watts and Strogatz (small world)
Random scale free (configuration model)
Erdos Renyi

...
Main ingredients

- semantic graph topology
- length of random walks

networks considered:

- Watts and Strogatz (small world)
- Random scale free (configuration model)
- Erdos Renyi

...
Main ingredients

semantic graph topology

length of random walks

networks considered:

Watts and Strogatz (small world)
Random scale free (configuration model)
Erdos Renyi

...
Comparison with real systems

**Heaps’ law**

- Real
- Synthetic

**Frequency-rank**

- Real
- Synthetic
Comparison with real systems

**strength vs. degree**

**real**

![Graph](image)

**knn**

**Clustering coefficient**

**synthetic**

**knn**

**Clustering coefficient**

**distributions**
Social bookmarking systems are interesting because they encode, in an unpredictable way, traces of the cognitive abilities of human beings: emergent semantics

(just a few) open questions
Social bookmarking systems are interesting because they encode, in an unpredictable way, traces of the cognitive abilities of human beings: emergent semantics

(Just a few) open questions

- Understanding users’ behaviour
- Individual vs. collective (cooperative) features
- Modeling tag invention rate
- Structure/evolution of the co-occurrence networks
- Latent hierarchies & semantics
- Measures of node relatedness and similarity
Web as a laboratory for social sciences

- opinions formation
- consumers behaviors, marketing strategies
- cultural trends, globalization
- birth and evolution of communication systems
- language evolution
- ...
Social computation

Populations of users facing collectively difficult problems using a small cognitive overhead
Social computation

Populations of users facing collectively difficult problems using a small cognitive overhead

- collaborative tagging and folksonomies
- online collaborative games
- collaborative filtering
- recommendation/trust networks
- crowdsourcing

http://www.espgame.org/
The ESP Game

The images shown during the game may be subject to copyright.

The ESP Game

Click to start the game
The human computer

“Before the computers were machines they were persons”

D.A. Grier
David Rand posted on Crowdflower about a great AMT study he recently conducted along with John Horton on altruism (as measured by cooperative behavior on a Prisoner’s Dilemma), that also used religious priming. The authors found that (carrnoped from the original post):

"Mechanical Turk is a marketplace for work. We give businesses and developers access to an on-demand, scalable workforce. Workers select from thousands of tasks and work whenever it’s convenient."

174,064 HITs available. View them now.

About
- About
- How to collaborate
- People
- Resources and Links
- What is AMT

Categories
- Games
- Heuristics and Biases
- Information Processing

Recent Posts
- Altruism
- Intertemporal Choice
- Sunk-cost Fallacy
- Framing
- Anchoring
- Base Rate Fallacy
- P-Beauty Contest
- Outcome Bias

Leave a Comment
p-beauty contest

**Task**: select a number in [0:100]

**Winner**: player closest to $p \times AVERAGE$

$p = 1/2$
A new platform for web-based experiments
A new platform for web-based experiments

http://www.xtribe.eu/

X-Tribe launch at the 2nd London Citizen Cyberscience Summit
Submitted by admin on Mon, 2012-02-13 17:49

Finally, the beginning. The X-Tribe platform will be presented at the 2nd London Citizen Cyberscience Summit by the Citizen Cyberscience Center.

After the success of the first edition, the summit will take again place in London from 16 to 18 February 2012, with a very rich programme that will touch many different aspects of the citizen science: people engagement, pollution monitoring, case studies and many others.

And we will be there too, for the first official presentation of the X-Tribe project.

Read more

http://www.xtribe.eu/
Experimental Tribe (ET) is general purpose platform for social computation and web-based experiments
Experimental Tribe (ET) is a general-purpose platform for social computation and web-based experiments. It will allow virtually any researcher to realize his own experiment with minimal effort, paving the way of the use of the web as a standard "laboratory" for social sciences.
Experimental Tribe (ET) is a general-purpose platform for social computation and web-based experiments.

- It will allow virtually any researcher to realize his own experiment with minimal effort, paving the way of the use of the web as a standard "laboratory" for social sciences.

- It can be a strong "basin of attraction" for people willing to participate in experiments, making in this way recruitment much easier than for single-experiment platforms.
Experimental Tribe (ET) is a general-purpose platform for social computation and web-based experiments.

- It will allow virtually any researcher to realize his own experiment with minimal effort, paving the way of the use of the web as a standard "laboratory" for social sciences.

- It can be a strong "basin of attraction" for people willing to participate in experiments, making recruitment much easier than for single-experiment platforms.

- Research areas: opinion and language dynamics, decision making, game-theory, human mobility, economics, psychology, etc...
Click inside the green circle to meet your friend.
Please wait for the other player to finish
Distance is 413 meters and score is 23
How would you label your choice?

misunderstanding

Save
Distance is 413 meters and score is 23
Do you want to play again? Yes  No
Which place is this?
Which place is this?
Which place is this? paris
Which place is this?

paris Yes

Great you recognized the place!


Great, play again!  Nope, stop it!
City Race

Drawing a route from A to B...

Select, by clicking on the map (green area), the next point to move to.

To finish, click on B.

Tips

* The colours on the street express how busy that street is (red - very busy - to blue - very low traffic).

* Make sure you pay attention to one-way streets and the lane you start from.

* Take small steps in order to control exactly the route, otherwise the shortest path by Google Maps will be used.

* You can revert only one move per game.

* You can finish, by clicking on B, only after B is within the green area.
City Race

Score: good!

Exact score is 1.00

Distance (m)  You Google
1 min 1 min
15 s 15 s
Speed (km/h)  You Google
27.35 27.40

Without traffic information:
1.00.
You Google
2 min 2 min
6 s 6 s
Speed (km/h) 16.29 16.31
TIME

keep writing things related to this word until you guess what the other player wrote

clock, date

FAST

type a word and hit Enter key
bus

instructions:
Look at the word. **Type the first word or phrase that comes to mind.**
This will gradually help build a giant network of associated words you can
**view.**

- To [skip](#) a word, just press "enter".
- Flag this word as [junk](#) or [not a word](#)
- Flag this word as [misspelling](#)

updates:

- note: occasionally the site gets very busy and goes down for a few
  minutes. (If you are playing the game and you start getting strange
  message boxes, that's why..) I'm trying to fix it, but until then, just
  wait a couple minutes, and refresh. Sorry about that!

- some [interesting stats](#)
Raise awareness and participation

- Monitoring of common resources and environment
- Monitoring of societies
- Feedback to policy makers
- Sustainable development
- ...


Enhance environmental awareness through social information technologies

http://www.everyaware.eu/
EveryAware concept

- Objective/subjective monitoring
- Pressure on policy making
- Enhanced awareness
- Change of individual behaviours
- Development of new ICT tools

"Tell me, I forget. Show me, I remember. Involve me, I understand."

Chinese proverb
Citizen Science

...individual volunteers or networks of volunteers, many of whom may have no specific scientific training, perform or manage research-related tasks such as observation, measurement or computation.
GPS helps Pygmies defend forest

J. Lewis (UCL)

Turn users into sensors

- Temperature/humidity
- Temperature
- Movement
- Chemical
  NO2, NO, ozone, CO, CO2
- Magnetic
Objective vs. Subjective monitoring

Measured Quantities

Opinions
Perceptions
Impressions
Personal Experiences

participatory sensing
Main themes

- Social computation
- Participatory sensing
- Geolocation and geographic mapping
- Opinion dynamics / Decision making
- Data management
- Complex systems modeling
The EveryAware platform
Sensor box
Objective data

Sensor box

GPS, accelerometers
Temperature, humidity
Noise
Air quality (NOx, Ozone, CO, ...)
e.m sensors, geiger
Objective data

Subjective data

Sensor box

GPS, accelerometers

Temperature, humidity

Noise

Air quality (NOx, Ozone, CO, ...)

e.m sensors, geiger

Tags

Annotation

Votes

Comments
Objective data

GPS, accelerometers
Temperature, humidity
Noise
Air quality (NOx, Ozone, CO, ...)
e.m sensors, geiger

Subjective data

Tags
Annotation
Votes
Comments
Objective data
- GPS, accelerometers
- Temperature, humidity
- Noise
- Air quality (NOx, Ozone, CO, ...)
- e.m sensors, geiger

Subjective data
- Tags
- Annotation
- Votes
- Comments

Sensor box

Server
Objective data

- GPS, accelerometers
- Temperature, humidity
- Noise
- Air quality (NOx, Ozone, CO, ...)
- E.m sensors, geiger

Subjective data

- Server

Tags
Annotation
Votes
Comments

Sensor box
Different scales

Users with sensor box (air quality) ~200-300

Users with smartphones (noise pollution) ~1000-10000

Web users
Web games
Opinions
WideNoise, the iPhone & Android app that helps you understand the soundscape around you.

There are various kinds of pollution that get often on the first page of newspapers. Noise pollution instead is rarely cited, but it’s something that constantly surrounds us even if we are not aware of. WideNoise will help you to better understand the soundscape around you & live a healthier life.

http://cs.everyaware.eu/event/widenoise
Each sound level is represented as a symbolic noise emitter:

Nobody knows how much noise is “65db”, but everyone knows the noise level of a TV!
Objective monitoring
Objective monitoring
Objective monitoring

Prediction
Objective monitoring

Actual measure

Prediction
Objective monitoring

Actual measure

Prediction
Subjective monitoring
Subjective monitoring
Subjective monitoring

Sliders
Subjective monitoring

Sliders
Subjective monitoring

Sliders

Tags

[Phone screen with sliders and tags]

[Phone screen with tags list: Lorem, Ipsum, Gaium, Sit, Amet, Isciquitur, Elit, Lacustre]
Statistics

These values are an average of several recordings:

- Average dB Value: 62.17
- Recordings: 10
- Begin: Thu Dec 22 2011 21:00:08
- End: Thu Dec 22 2011 21:13:18

Perception:
- Artificial: 0.63
- Disturbance: 0.51
- Feeling: 0.52
- Isolation: 0.52
case study on

Air quality monitoring
SensorBox

- Li-po battery of 4500 mAh
- Measurement rate of 1 Hz
- Power consumption of 2.5 W
- Battery duration of 6-7 hours
$\text{NO}_2$ measurement
Main objectives

* monitor personal exposure
* extract relevant and reliable environmental information
* investigate and stimulate fundamental shifts in public opinion
* stimulate an efficient usage of shared resources
Thanks to:
Thanks to:

Stefano Ingarra (CSP)
Andrea Molino (CSP)
Bart Elen (VITO)
Jan Theunis (VITO)
Thanks to:

Stefano Ingarra (CSP)
Andrea Molino (CSP)
Bart Elen (VITO)
Jan Theunis (VITO)
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Saverio Caminiti
Claudio Cicali
Pietro Gravino
Gabriele Paolacci
Vito D.P. Servedio
Francesca Tria
Massimo Warglien