

Information & Data Visualization

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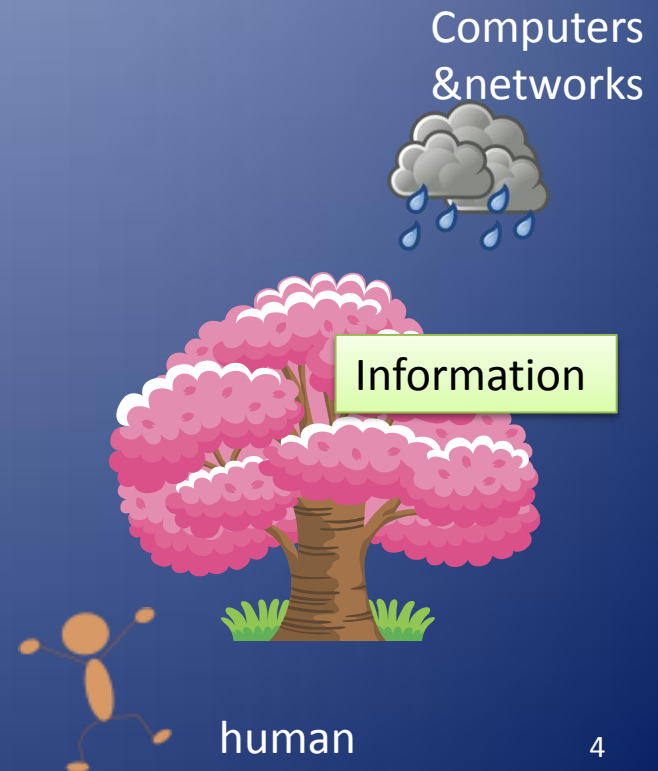
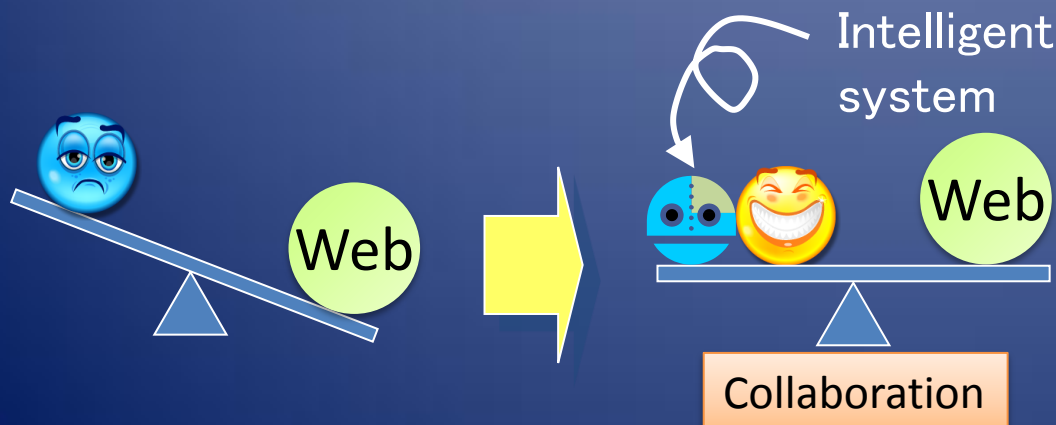
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 - Interaction model
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Self Introduction

- Yasufumi Takama, Dr. Eng.
 - Associate Professor,
Graduate School of System Design, Tokyo Metropolitan University, JAPAN
- Biography
 - 1994.3: B. S. Degree, Univ. of Tokyo , JAPAN
 - 1996.3: M. S. Degree, Univ. of Tokyo , JAPAN
 - 1999.3: Dr. Eng. Degree, Univ. of Tokyo , JAPAN
 - 1999.4-2002.3: Assistant Prof.,
Tokyo Institute of Technology , JAPAN
 - 2002.4-2005.3: Associate Prof.,
Tokyo Metropolitan Institute of Technology , JAPAN
 - 2005.3-: Associate Prof., Tokyo Metropolitan Univ., JAPAN

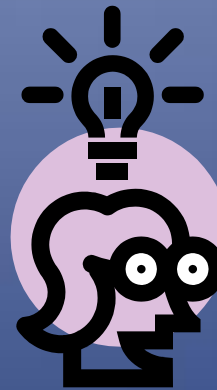
Motivation

- Growth of Computers & Networks
 - IT resource used for fast & large-scale processing
 - Available information beyond human capacity
- Collaboration between human & computer systems
 - Intelligent system/interface
 - **Information visualization**



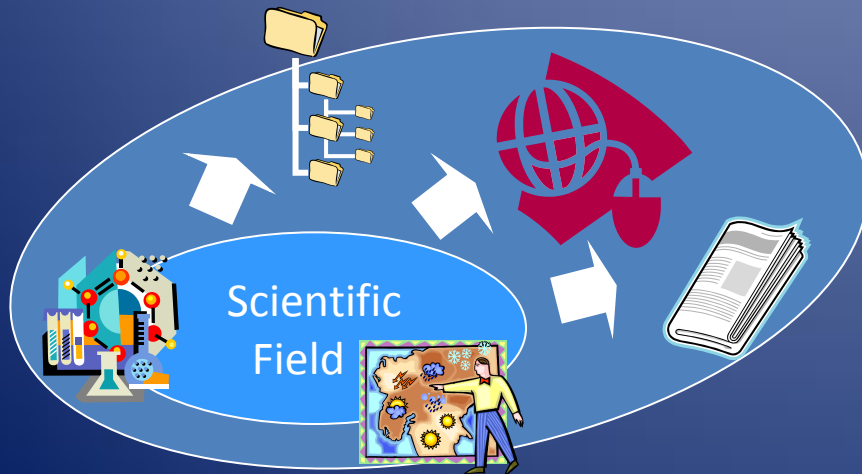
Goal of Information Visualization

- To provide users with data / information in understandable manner
 - Utilizing human's visual perception capability
 - Possible to grasp perspective of large-scale data



From Scientific Visualization to Information Visualization

- Data in scientific Field
 - Having physical / spatial structure
 - Geographic data, medical images, etc.
- Data in other field
 - *Abstract, nonphysical data*
 - Business application, data mining, information retrieval, social network, etc.



Improvement of computational power
Spread of computer systems



Expansion of visualization target

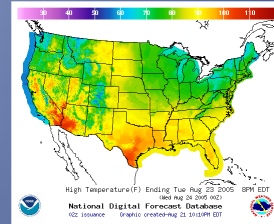
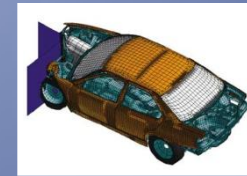
Importance of Data Organization



Data with
structure



How to
visualize



Scientific
visualization

Data processing

Data
Analysis



What to
visualize



How to
visualize



Information
visualization



Abstract
Data



Social Data Analysis

Social Data Analysis

- Recent trend: Data Sharing on Web
 - Flickr, Google Maps
 - View sharing: Many Eyes[Viegas07], Sense.US[Heer07], NameVoyager[Wattenberg06], Swivel
- Data analysis as collaborative work
 - Difficulty in exploring huge data space by individual
 - Deeper understanding & exploration of data space
- Collaborative information visualization[Heer07]
 - Support of sensemaking process with visualization
 - View as context of discussion & exploration
- Example:
 - NameVoyager [Wattenberg06]
 - Emergence of collaboration



NameVoyager [Wattenberg06]

<http://www.babynamewizard.com/voyager>

- Trend of Baby's name in USA
 - 500,000 visits within 1st 2weeks
 - Stacked graph:
X=year, Y=frequency
 - Dynamic query:
filtering by
keystrokes

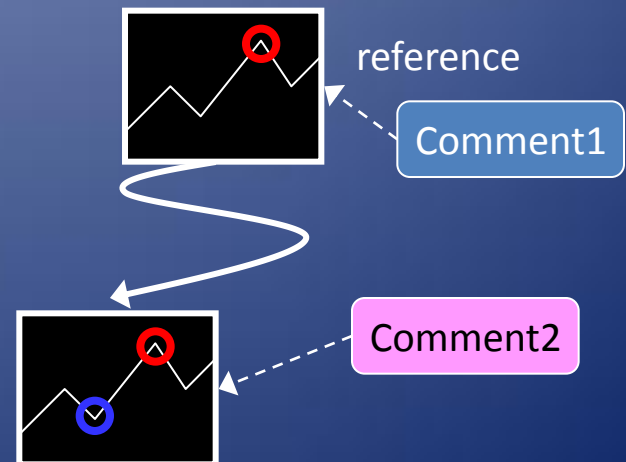
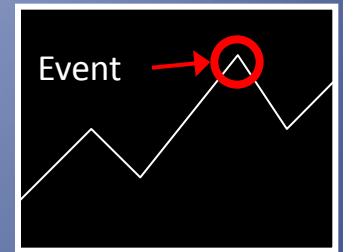
Collaboration with Sharing View

- Collaboration in NameVoyager (NV)
 - Discussion in Blogs & discussion forums (other sites than NV!)
 - Referring to view by keystrokes
- Type of collaboration
 - Sharing of discovery ... telling findings to others, sometimes with question
 - Reply from others ... answer to question, exchange of opinions
- Problems
 - Difficulty in sharing context (particular view)
 - Repeating similar questions / discussions
 - Grasp & control of discussion (convergence/divergence)

*Visualization as
common ground
for communication*

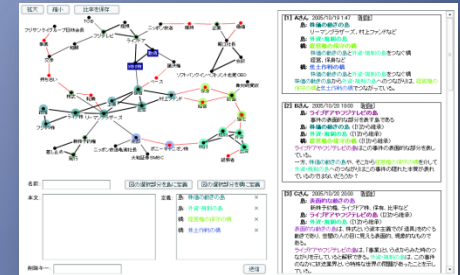
Basic Functionalities for Supporting Social Data Analysis

- Graphical Annotation
 - Adding comments / marks on view
 - Complemental comment (e.g. cause of trend)
 - Point of focus (reference point in comment)
- Visualization bookmark [Heer07][Viegas07]
 - Assign URL to *state* of view (state = basic view + annotations)
 - Link comment to state of view when it is written
- Comment listings



BBS Equipped with Views

- Focusing on Task-oriented discussion
- Employment of BBS
 - Suitable for long discussion
 - Each thread has a view as context
- Graphical annotation
 - Used as reference point in comment
 - *Similarity between annotation*
- Finding similar comments
 - Annotation-based Similarity
- Two applications
 - KGBBS: KeyGraph-based BBS
 - BBS with GoogleMaps: Community anticrime action support



BBS with View for Community Anticrime Action Support

- Creation of Community Safety Map by Children
- Online discussion by community residents
- View = Community Safety Map
 - Implemented as GoogleMaps™
 - Annotation = Spot





Providing 2 interfaces for

- Supporting map creation *by children*
- Supporting discussion *by adults*



Supporting Creation of Community Safety Map

- Available from Web browser
- Input spot information on map area
 - Icons showing criteria for judging dangerousness & safety of spots
 - Photos
 - Comments

Danger		Easy to enter
		 Difficult to see
Safe		Difficult to enter
		 Easy to see

Back gate of Fukushi-en

Dangerous when it is dark



Support Discussion about Anticrime Actions

- Spots are referred to in comments

Referred spots

危険な場所

[1] 瀬尾 - 2008/01/08 09:12:34

スポット: 中小田野公園

スポット: 小さい神社

このあたりは周りから見えにくく、改善する必要があります。

[\[ここに書き込む\]](#)

Comment

The screenshot shows a web interface for a BBS. On the left is a '引用ボックス' (Quote Box) with a list of spots: '小田野中央公園に続く道', 'みつみ公園', and '駐車場脇', each with a '削除' (Delete) button. The main area is a map with various icons. A callout box is open over a spot, showing a photo of a path and the text '小田野中央公園に続く道' and '見通しが悪い。' (Poor visibility). Below the photo is a 'BBSで引用する' (Quote on BBS) button. On the right is a 'スレッド一覧' (Thread List) with three threads under the title '新しいスレッドを作成' (Create new thread). The threads are: '校庭' (Schoolyard) by Aさん, '夕方' (Evening) by Aさん and Bさん, and '豊田駅周辺について' (About the area around Toyohashi Station) by Aさん and Bさん. Each thread has a 'ここに書き込む' (Write here) link.

Click

Reference
Box

Map Area

Thread Area

Experimental Results

Group	Item	1st trial	2nd trial
A	Support functions	ON	OFF
	# of spots	23	36
	# of comments	15	14
	# of referred spots	25	12
B	Support functions	OFF	ON
	# of spots	23	36
	# of comments	14	11
	# of referred spots	1	14

Using functions makes it easy to have concrete discussion by referring to particular spots

KGBBS: Online Discussion Support for Chance Discovery [Takama07]

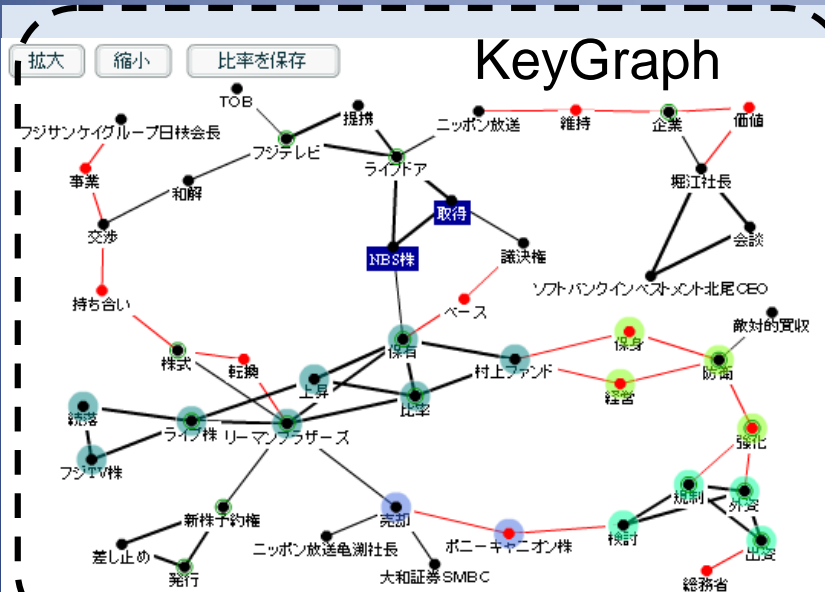
- KeyGraph as *common ground*
- Annotation = making islands & bridges
- Annotation inheritance
- Comment retrieval based on referred annotation

KeyGraph: Typical visualization
method for chance discovery

- Islands: node cluster,
common ground
- Bridge: path between islands,
clue for chance

The screenshot displays the KGBBS interface. On the left, a 'KeyGraph' visualization shows a network of nodes and edges. Nodes are labeled with names like 'フジサンケイグループ日経会長', 'フジテレビ', 'ライブドア', 'NBB', '村上天郎', '大和証券SMB', and 'ニッポン放送電通社長'. Edges connect these nodes, representing relationships. A green box labeled 'KeyGraph' is overlaid on the graph. On the right, a 'Thread' of discussions is visible. The first post is from 'Aさん' dated 2005/10/19 147, discussing '株値の動きの島' (Island of stock price movement) and '経営権の保守' (Conservation of management rights). The second post is from 'Bさん' dated 2005/10/20 1800, discussing 'ライブドアやフジテレビの島' (Island of LiveDoor or Fuji TV) and '株の動きの島' (Island of stock price movement). The third post is from 'Cさん' dated 2005/10/20 2000, discussing '表面的な動きの島' (Island of superficial movement) and '株の動きの島' (Island of stock price movement). The interface includes a search bar, a list of nodes, and a list of threads.

Screenshot of KGBBS



名前:

図の選択部分を島に定義

本文:

定義:

島:	株価の動きの島	×
島:	外資・規制の島	×
橋:	経営権の保守の橋	×
橋:	焦土作戦の橋	×

削除キー:

- Scenario

[1] Aさん 2005/10/19 1:47 **[削除]**
島:株価の動きの島
 リーマンブラザーズ、村上ファンドなど
島:外資・規制の島
橋:経営権の保守の橋
 株価の動きの島と外資・規制の島をつなぐ橋
 経営、保身など
橋:焦土作戦の橋
 株価の動きの島と外資・規制の島をつなぐ橋
 株価の動きの島から外資・規制の島へのつながりとは、経営権の
 保守の橋と焦土作戦の橋でつながっている。

[2] Bさん 2005/10/20 18:00 [閉除]

島: **ライブドアやフジテレビの島**
事件の表面的な部分を表す島である

島: **株価の動きの島** ([1]から継承)

島: **外資・規制の島** ([1]から継承)

橋: **経営権の保守の橋** ([1]から継承)

ライブドアやフジテレビの島はこの事件の表面的な部分を表している。

一方、株価の動きの島や、そこから**経営権の保守の橋**を介して**外資・規制の島**へのつながりはこの事件の隠れた本質が表れているので、**おたけ**だろうか？

[3] Gさん 2005/10/20 20:00 [削除]

鳥: 表面的な動きの鳥
新株子約権、ライブドア株、保有、比率など

鳥: ライブドアやフジテレビの鳥 (2から継承)

鳥: 外資・規制の鳥 (1から継承)

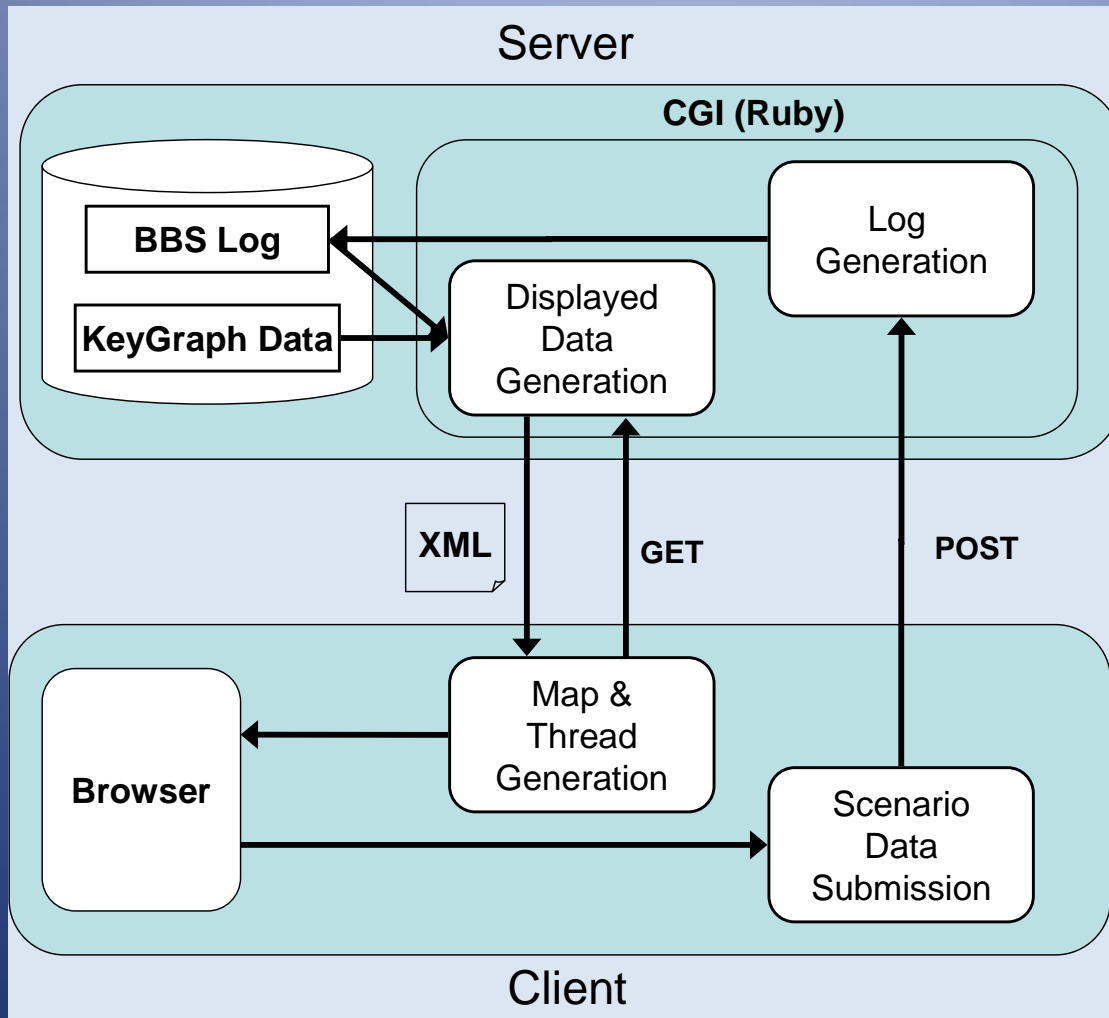
表面的な動きの鳥は、株式という資本主義での「道具」をめぐる動きであり、世間の人の目に見える表面的、現象的なものである。

ライブドアやフジテレビの鳥は、「事業」という点からみた時のつながりを示しているかと解釈できる。外資・規制の鳥は、この事件のなかり放送業界という特殊な世界の問題があったことを示している。

Posting form

Thread

KGBBS: System Architecture



Referring to View in Scenario

The diagram illustrates a scenario view interface. At the top, a 'Delete Scenario Button' points to a table header. The table has two columns: 'Name' and 'Date'. The first row contains the text '[2] Bさん 2005/10/20 18:00 [削除]'. Below this, there are four entries, each preceded by a label: '島: ライブドアやフジテレビの島', '島: 株価の動きの島 ([1]から継承)', '島: 外資・規制の島 ([1]から継承)', and '橋: 経営権の保守の橋 ([1]から継承)'. A bracket labeled 'Referred Islands' groups the first three entries. A bracket labeled 'Referred Bridges' points to the fourth entry. Below these entries are two paragraphs of text. A bracket labeled 'Sentences' groups these two paragraphs. The first paragraph states that 'ライブドアやフジテレビの島' represents the surface part of the event. The second paragraph discusses the connection between '株価の動きの島' and '経営権の保守の橋' leading to '外資・規制の島', suggesting a hidden essence. At the bottom, a 'Scenario Search Button' points to a search query: '[このシナリオをクエリーとしてシナリオ検索]'.

Delete Scenario Button

Name	Date
[2] Bさん	2005/10/20 18:00 [削除]
島: ライブドアやフジテレビの島	
島: 株価の動きの島 ([1]から継承)	
島: 外資・規制の島 ([1]から継承)	
橋: 経営権の保守の橋 ([1]から継承)	

Referred Islands

Referred Bridges

Sentences

Scenario Search Button

[このシナリオをクエリーとしてシナリオ検索]

Visualizing Trend Information

Trend Information

- Trend information: Summarization of temporal / spatial data, obtained through synthesis rather than simple enumeration [Kato05]
 - Temporal trend information ... movements of gasoline price, approval rating for cabinet, hot topics in blogs, etc.
 - Spatial trend information ... distribution of earthquake intensity, interregional comparison of statistical data
 - Spatiotemporal trend information ... Swarm earthquakes



Importance of Trend Information

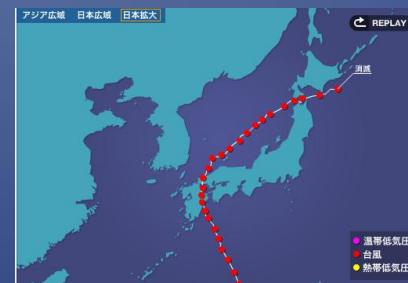
- Useful for situation understanding, prediction, decision making, etc.
- Important information on Web
 - Recent growth of data resources accumulating data continuously
 - Further utilization of Web
- MuST: NTCIR workshop
 - Workshop on Multimodal Summarization for Trend Information
 - Test collection (News articles)
 - Joint field of NLP & IV researchers



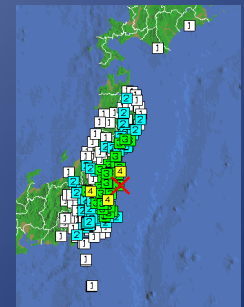
<http://must.c.u-tokyo.ac.jp/>
<http://research.nii.ac.jp/ntcir/index-en.html>

Visualization of trend information

- Trend info. essentially represented with graph & chart
- Importance of interaction
 - Exploratory data analysis: goal is not defined in advance
 - View data space from various viewpoints
- Problem
 - User interaction become complicated
cf. interaction model
 - Abstract trend data



<http://weathernews.jp/typhoon/>



<http://www.seisvol.kishou.go.jp/>

Target Data for Trend Visualization

- Statistical data: cabinet approval rating, stock market, national census, etc.
 - Easy to visualize: i.e., statistical map, line chart
 - Simple data processing
- Abstract data: trend analysis in Blogs/SNS, topic transition in BBS
 - How to visualize? ... Various methods proposed
 - What to visualize? ... Need processing for information organization

Visual Summary [Koinuma09]

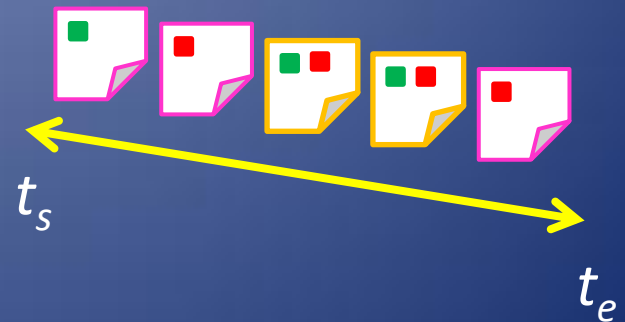
- Visualization of topic transition in BBS thread
- Help users to grasp topic transition *without reading* BBS posts
 - Identifying thread's main topic
 - Discriminating topic transition patterns
 - Discussion ... exchanging opinion about subject
 - Topic-oriented chatting ... freely talking about subject
 - Open-ended chatting ... freely talking without subject

Summary of Visualization Method

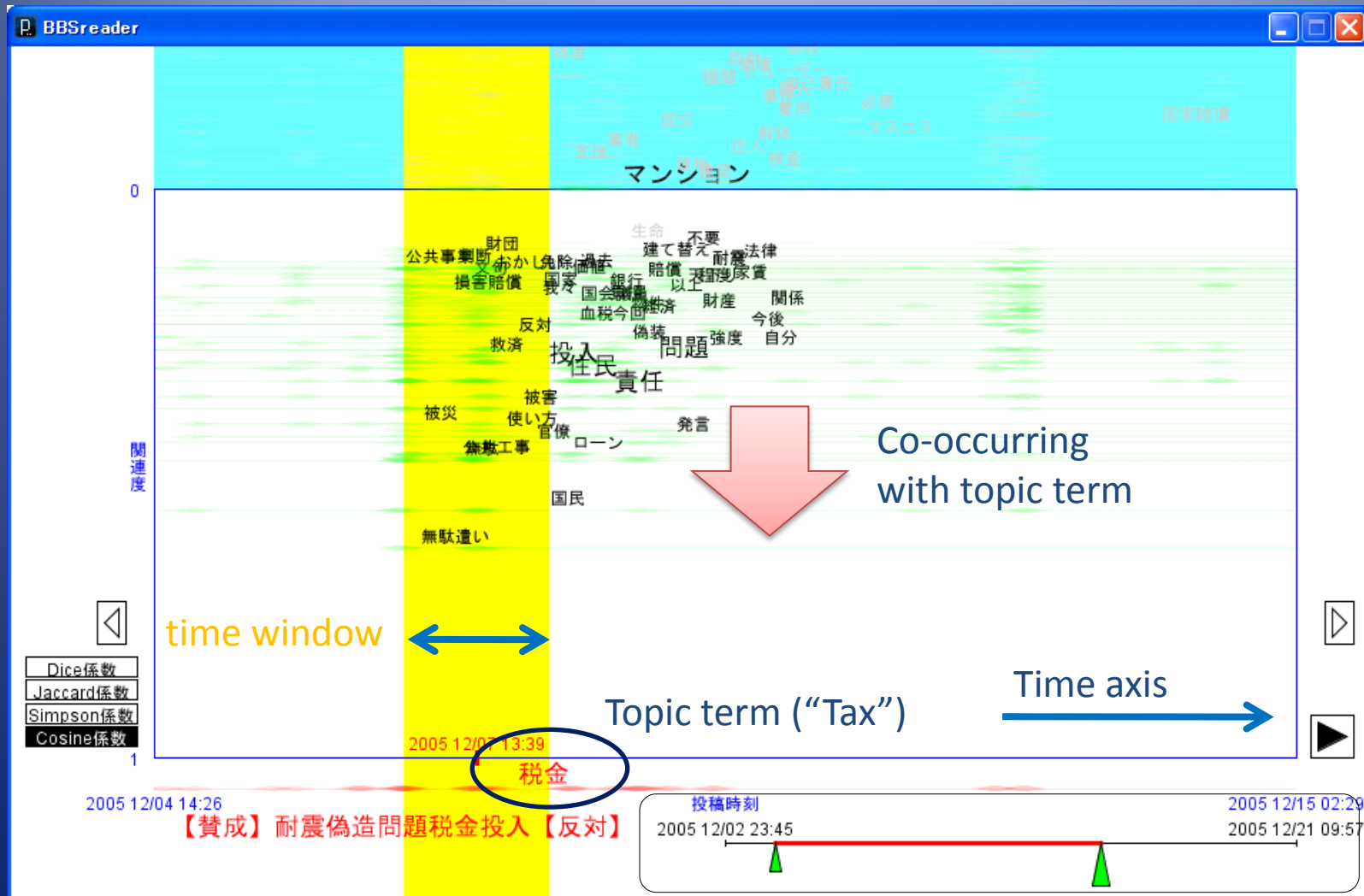
- Organization of trend information
 - Co-occurrence of keywords within time window

$$R_{Simpson}(k_i, k_j, t_s, t_e) = \frac{|K_i(t_s, t_e) \cap K_j(t_s, t_e)|}{\min\{|K_i(t_s, t_e)|, |K_j(t_s, t_e)|\}}$$

- 2 Visualization mode
 - Frequency mode
 - Topic term model:
Co-occurrence with topic term
- Interactive visualization
 - Controlling time window
 - Specifying topic term

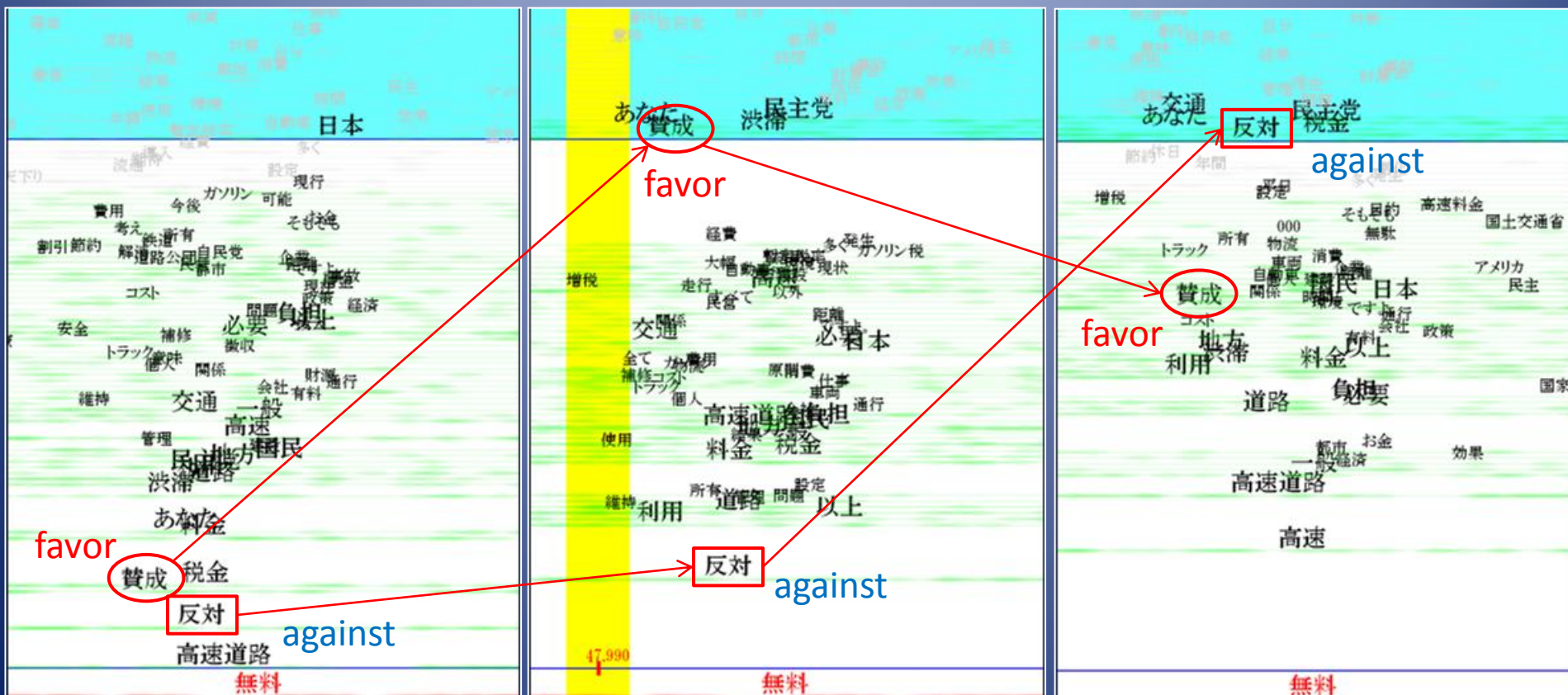


Screen shot of Visual Summary



Example of Visualizing Topic Transition

Thread title: Expressway should be toll-free?
Topic term (“expressway”)



Conclusion (Future Works)

- Introduction of our 3 research topics
- Social data analysis
 - BBS with sharing view
- Trend information visualization
 - Visual summary: BBS monitoring system
 - Future work: Real-time monitoring of multiple threads
- Interactive visualization
 - Visualization cube
 - Future work: Dual View system with 2 visualization cubes