Meme Media and Knowledge Federation in the Age of Big Data

Yuzuru Tanaka
Meme Media Laboratory
Hokkaido University
Sapporo, Japan
tanaka@meme.hokudai.ac.jp
Today’s Talk

• Review of Meme Media studies since 1987
• Merging of the meme media architecture with the Web (2003-2004)
• Improvisational knowledge federation of Web resources including Web documents, Web applications, and Web services (2004-)
• Unification of the meme media architecture with the Web: Webble World (2008-)
• Meme Media and knowledge federation for exploratory visual analytics of big data (2010-)
Q1: How can we directly edit tools in a similar way like editing documents?

• They have basically similar composition structures!

→ component-based compound document architecture
Q2: How can we accelerate the Think-Try-See cycle in creative thinking?

- How to speed-up the transition from ‘think’ to ‘try’?
- Rapid prototyping of applications as if we directly edit documents
  \(\rightarrow\) component-based compound document architecture
Pads are pasted together to define a Compound Document.

Each pad wraps an object with a standard display representation and a standard logical interface.

Each pad has a set of connection jacks called slots and a single pin plug to be inserted to one of its parent’s slots.
IntelligentBox (1995)

Component Boxes and a Composition with them

Unified Treatment of Animation and Tools
Q3: How can we accelerate the evolution of knowledge resources shared by a society?

- From a Single-User Stand Alone System to a Multiple-User Networked System through which people can exchange and share their Pads
- **Proposal of Meme Media at TED4 (1993)**
- **Meme Media** as Knowledge Media that embody the characteristics of memes
  - Replication of pads (replication)
  - Recombination of composite pads (recombination)
  - Accidental replacement of some pad in a composite pad with another pad (mutation)
  - Evaluation by society (natural selection)
- **Meme Pool** as a world-wide repository of pads
  - Evolution of a whole set of composite pads shared by a society through collaborative reediting and redistribution of pads
Knowledge Media that embody the characteristics of memes

- Mark Stefik
  The Next Knowledge Medium
  *The AI Magazine*, 7(1): 34-46, 1986

- Lots of research activities on expert systems.
- He pointed out in 1986 the importance of understanding and building an interactive knowledge medium that embodies the characteristics of memes to distribute and to exchange knowledge fragments in a society.
Q4: How to migrate legacy applications?

- If users cannot use their legacy tools in the new meme media environment, they will not extensively use it.

- Legacy tools and services
  - Microsoft Office Tools (~1993)
    - Fujitsu version of IntelligentPad successfully wrapped any Active Control objects into pads, i.e., it wrapped Microsoft Word, PPT, Excell, etc.
  - Web applications (~2000)
    - K-Plex version of IntelligentPad successfully wrapped IE into a pad.
  - Web services (~2004)
    - Their migration only needs to develop their proxy objects as blank pads with appropriate sets of slots.
The Web as knowledge media

Publication infrastructure

Browse + download/upload

server

compound document with embedded tools and services

client
Meme media as knowledge media

With interoperation among functional components.
Q5: How to merge the meme media architecture with the Web?

The Web

Web applications  Web services

wrapping

Meme Media Objects

Composition

Meme Media and a Meme Pool

Legacy Applications

(1)  (2)  (3)  (4)  (5)  (6)
Extraction of some IO relation from a Web application and its wrapping to a pad
Wrapping and Linking of Web Applications
CHIP (2003) for dynamic linkage among Web Applications

Internet

NOT INTEROPERABLE

1. Wrapping through Mouse Operations

2. Functional Linkage through Drag&Drop

Web Applications

Integrated Tool

IntelligentPad Environment
Dynamic Linkage between Web clips from different navigations (C3W, 2004)

F ← extractTxtValue(B)
C ← setTxtValue(./@value, F)
Improvisational Knowledge Federation

• Once extracted and wrapped with slot definition, Web resources work as pads.
  – Each pad has a list of slots as its interface.

• It is easy to improvisationally federate pads.
  – A pad A can be functionally federated with another pad B
    • by directly specifying A to work as a child of B, and
    • by choosing one slot from each to connect the chosen slot of A to the chosen slot of B.
What is the difference between improvisational federation and mashup?

• **Mashup**
  – focuses on the *mixed visualization of different types of data* retrieved from different data sources.

• **Federation**
  – focuses on the *ad hoc way of making varieties of knowledge resources* including data, tools, and services *work together* on user’s demand.
What is the difference between improvisational federation and workflow?

- **Workflow technologies**
  - work well for planned-for interoperation scenarios, but not for improvisational interoperation scenarios.

- **Improvisational federation**
  - immediately federate and utilize both closed local resources and open public resources for improvisational interoperation scenarios.
The merging attempt has brought us two different worlds!

We need another world-wide repository for pads

→ Meme Pool
Piazza as a meme pool system
(≠ the Web)

This book cannot be compared to any other book—it opens the gates to new territories and time will tell how readers apply this information about knowledge media. ... (E-Stream Vol.7, No.4)
Q6: How can we unify the meme media architecture with the Web?

- Webble World: the 2008 version of IntelligentPad: a web-top system
  - fully exploits Microsoft Silverlight technology.
  - no need to install any IntelligentPad kernel on clients

A new HTML5-version Webble World available in next January

http://www.meme.hokudai.ac.jp/WebbleWorldPortal/
The Memetic Web

Only requires Silverlight-empowered browser!

browsing, using, reediting and redistributing envt.

reuse in local environments

proxy pads

reediting & redistribution

clipping

copy

publish

Web service A

Web service B

RIA (Silverlight) tech.
Focused applications of meme media

• **Authoring**
  – Multimedia authoring
  – Web portal authoring
  – Virtual Studio (3D)

• **Information Visualization (Reification)**
  – DB visualization
  – Web information visualization
  – Reification
    • Visualized objects = functional objects

• **Knowledge Federation**
  – Data / Tools / Services
  – Improvisational knowledge federation
3D Modeling and Simulation as 3D Authoring (IntelligentBox)
DB Visualization & Reification Environment

Gene expression during the cleavage process of an ascidian developed within a day

Component-based visualization framework

Constructed within 15 minutes
Knowledge Federation as a new Challenge

- Could one compose such a complex application as a drug design system just through ad hoc federation of available Web resources?

Components exist as Web resources.

Not possible now,

But yes in a near future.
Q7: How can we apply our technologies to Data Science?

• There is a big gap between core technology R&Ds and application R&Ds on Big Data.
  – core technology R&Ds on Big Data
    • Seeds driven to search for appropriate applications
    • Focus on each specific technology or algorithm
  – application R&Ds on Big Data
    • Mission driven
    • Focus on how to choose appropriate available analysis tools and to combine them into a complex analysis scenario to achieve the mission

• Real problems are usually complex systems consisting of many monolithic systems.
  – Mathematical modeling and analysis are only applicable to each of these monolithic system, but not to the whole complex systems.
  – Each subsystem may require different modeling and analysis
What’s missing in current Big Data Research?

• Main focuses are put on how to deal with
  – 4 Vs (Volume / Variety / Velocity / Veracity) of data

• Data Scientists focuses on
  – How to utilize existing huge varieties of statistical analysis, clustering, data mining and text mining algorithms
  – How to choose appropriate ones and combine them to compose analysis scenarios for a given problem?
    • Hypothesis making needs to determine
      – Target of analysis (Which kind of objects to focus on for analysis?)
      – Target knowledge to extract through induction and abduction
    • Hypothesis checking mainly uses
      – Deduction and Visualization
2 Types of Analysis Scenarios

• Planed-for scenarios
  – use already-established analysis methods
  – mostly for routine analyses

• Improvisational scenarios
  – are required in cutting-edge scientific research processes, and
  – in strategic and/or improvisational planning of large-scale social services
Challenging Opportunities

• EU FP projects for integrated IT support of clinical trials on cancer
    • 26 teams
  – FP7 Large-scale Integration Project p-medicine (personalized medicine) (02/2011 – 01/2015)
    • 29 teams

• MEXT initiative project on Social CPS (Cyber-Physical System) for Efficient Social Services (09/2012-03/2017)
  – Project Consortium (NII (National Institute of Informatics), Hokkaido Univ., Osaka Univ., Kyushu Univ.)
Clinical trials

Breast Cancer

Nephroblastoma

ALL

Kick-off Meeting p-medicine (270089) - February 14-15, 2011 - Homburg/Saar
Objectives

Computational resources

Modelling

Construction and/or refinement of models on different temporal and spatial scales
Integration of models
Multiscale model verification

Clinical validation

Application

Health care professionals
Hospital
Patient

Trial Outline Builder (TOB) (2010)
(Web-top integrated environment for planning trials, patient data acquisition, and exploratory data analysis)

- **Trial Plan Editing**
  - Copy-and-paste of trial event types to design both a trial flow graph and a set of some additional events outside the flow.
  - A click of each event opens its CRF editor

- **Patient Treatment View : CRF input for each patient through the TOB**
  - Possibly with the specification of some additional outside-of-flow events

- **Query & Analysis View: Querying the DB**
  - for specific cases for their statistical analysis or the visualization of correlations among specified items
Q8: How to find out patient cases in which some treatment arm may show significantly better performance than others?

Improvisational analysis scenarios

→ Exploratory Visual Analytics Environment
Why meme media?
Repetition of Hypothesis-Making and Hypothesis-Checking

Think

Hypothesis making

See

Data visualization

Try

Data Segmentation & Analysis

Hypothesis checking
Why meme media?
Repetition of Hypothesis-Making and Hypothesis-Checking

Hypothesis making

Think

Object distribution / clustering result / pattern mining result

Data visualization

See

Try

Object restriction / clustering / pattern mining

Data Segmentation & Analysis

Hypothesis checking
Why meme media?
Repetition of Hypothesis-Making and Hypothesis-Checking

Hypothesis making

Think

(1) Large library of analysis tools and data sources
(2) Improvisational federation of tools and data sources
Object restriction / clustering / pattern mining

(3) Coordinated multiple-view visualization
Object distribution / clustering result / pattern mining result

Webble World

Data visualization

See

Hypothesis checking

Try

Data Segmentation & Analysis
Social CPS: Research Focus of Hokkaido Univ. Team

• Social CPS Platform Technologies
  – Visual Analytics Environment with Improvisational Federation of Cyber-Physical Resources
    • for the Integrated Information Monitoring, Sharing, Analysis, Visualization, and Decision Making
    • to cope with both planned-for and improvisational scenarios
  – Open Large Library of
    • (open/closed) data resources
      – DB of retrospective data / real-time data streams / SNS data
    • (open/closed) application tools and services
      – for data transformation, data analysis, and data visualization
    • Analysis and visualization scenarios

• Target Applications
  – Smart Snow Plowing and Removing in Sapporo
  – Disaster management and response
Efficient Snow Plowing and Removing: Snow in Sapporo

- **Population:** 1,920,739 (The 5th largest in Japan)
- Number of house holds: 896,449
- **Annual snowfall:** 597 cm
- The largest daily snowfall: 63 cm (Jan. 31st, 1970)
- The deepest snow: 169 cm (Feb. 13th, 1939)
- **Annual budget for snow plowing and removing (2010):**
  - 14,729,000,000 yen (147,000,000 $)
    - last season
  - 22,000,000,000 yen (220,000,000 $)
Varieties of Data related to Efficient Snow Plowing and Removing

- **Probe car data** (retrospective+real-time data)
  - private cars, taxi cars
  - Real time data from snow plowing and removing vehicles
  - Real time data from buses
- **Probe person data** (retrospective data +real-time data)
- **Traffic jam sensor data** (retrospective data +real-time data)
- **Meteorological multi-sensor data** (52 locations) (retrospective data +real-time data)
- **Weather mesh data** (retrospective data)
- **Snow plowing and removing records** (retrospective data +real-time data)
- **Statistical subway passenger records** (retrospective data)
- **Complaints from residents** (retrospective data +real-time data)
- **Traffic accident records from Hokkaido Police Office** (retrospective data)
- etc.
Data Mining for Efficient Snow Plowing and Removing

• To mine specific probe-car-data patterns that correspond to specific road conditions and/or traffic conditions requiring snow plowing and/or removing,

• To apply these patterns to real-time probe car data
  → to detect specific road conditions and/or traffic conditions
  → for evidence-based strategic snow plowing and removing
  → for optimization of snow plowing and removing
Preparatory Study: Snowfall, Complaints, Snow Plowing, and Snow Removing (February 2011)
Influence of Snowfall, Snow Plowing and Removing to Average Car Speed
Jan. 31 (no snow)

January 31, 2011
Light snow fall.
Traffic situation worse than summer.
Some claims to call centers.
Influence of Snowfall, Snow Plowing and Removing to Average Car Speed: Feb. 1 (heavy snow and snow plowing)

February 1, 2011
Very heavy snow fall.
Traffic situation not good.
A lot of claims at call centers.
Influence of Snowfall, Snow Plowing and Removing to Average Car Speed: Feb. 2 (snow removing)

February 2, 2011
Almost no snow fall.
Still a lot of snow removal done.
Traffic situation slightly better.
Still many complaints.
Influence of Snowfall, Snow Plowing and Removing to Average Car Speed: Feb. 3 (snow removing)

February 3, 2011

Complaints going down.

Traffic situation still not good.

Still a lot of snow removal done.
February 4, 2011

No new snow.

Traffic situation good.

Complaints even lower.

Snow removal still continues.
Influence of Snowfall, Snow Plowing and Removing to Average Car Speed: Feb. 5 (no snow)

February 5, 2011
No new snow.
Traffic situation still good.
Complaints still few.
Influence of Snowfall, Snow Plowing and Removing to Average Car Speed: Feb. 6 (light snow)

February 6, 2011
Very light snow fall.
Traffic situation still fairly good.
Complaints still few.
Influence of Snowfall, Snow Plowing and Removing to Average Car Speed:
Feb. 7 (snow)

February 7, 2011
Fairly heavy snow fall.
Traffic situation turns bad again.
Snow plowing goes up.
Snowfall was much smaller on 7th than 1st.
Influence of Snowfall was bigger on Feb. 7 than on Feb. 1.

Counterintuitive!

February 1, 2011

Very heavy snow fall.

Traffic situation not good.

A lot of claims at call centers.
Clustering of Road Segments after the snow fall and the snow removal

The bold line running vertically is one of the main roads through the city, and right after the heavy snowfall, segments from this road end up in four different clusters.

The next day, after snow removal, all the segments in the road are clustered together again.
Real World is not so simple.

- Reality is counterintuitive!
- Macro analysis does not tell what is happening.
- Many factors are working together for the reality.
Our Assumption and Solution

• Our assumption
  – Macro analysis does not work since the real world phenomena cannot be described by a simple monolithic mathematical model.
  – If we appropriately focus our target of analysis in terms of multiple parameters including time, space, weather, etc., we may obtain some object groups each of which may follow a simple monolithic mathematical model.

• Our question
  – How to appropriately focus our target of analysis?
    • Clustering analysis to obtain groups of similarly behaving objects
    • Exploratory Visual Analytics!

• Our solution
  – Geospatial Digital Dashboard
    • For micro analysis on focused set of objects
    • Improvisational data segmentation → analysis / mining → visualization
Geospatial Digital Dashboard for Exploratory Visual Analytics
Why meme media?
Repetition of Hypothesis-Making and Hypothesis-Checking

Think

(3) Coordinated-multiple-view visualization
Object chart / clustering result / pattern mining result

See
Data visualization

Try

Hypothesis checking

Webble World

(1) Large library of analysis tools and data sources
(2) Improvisational federation of tools and data sources
Object restriction / clustering / pattern mining

Data Segmentation & Analysis
Generic Wrapping of Resources for providing a large library of tools

• Wrapping knowledge processing tools into components
  – Web services (done) and Web applications (partially done)
  – Statistical analysis / Text and data mining tools
    • mainly using R, Octave, Python and Ruby for their development.
    • Generic wrapping of tools developed in these languages
      . (done for R (with graphical output) and Octave)
      – Wizardry to be developed
  – Image processing

• Wrapping of other fundamental tools
  – GIS
    • ArcGIS (done)
  – SNSs
Coordinated Multiple Visualizations in Geospatial Digital Dashboard
Coordinated Multiple Visualizations in Geospatial Digital Dashboard

V
Database or Semantic Web

Q1(V)  Q2(V)  Q3(V)  Q4(V)

selection
Coordinated Multiple Visualizations in Geospatial Digital Dashboard

Overlay of \( Q_i(V') \) with \( Q_i(V) \) will highlight the selected objects in \( Q_i(V) \).
Each visualization view

attr(Q_i(V)):
list of (derived) attributes

cond(Q_i(v)):
conditions in the where clause of Q_i(v), which should be true.

Direct selection is defined as a condition dsC(attr(Q_i(V))) on the set of derived attributes attr(Q_i(V))

This should further quantify V as

select *
from V
where dsC(attr(Q_i(V)))
to make it V'
A single coordinate as a special case

attr(Qi(V)):
a single attribute A
dsC(attr(Qi(V)))
v1<A<v2

This should further quantify V as
select  *
from V
where v1<A<v2
to make it V’
Exploratory Object Quantification

Filtering (+ Brush & Linking)
Integrating analysis tools into coordinated multiple visualizations (1)

• **Analysis tools**
  – clustering / frequent pattern mining / statistical analysis etc.

• **Clustering**
  – A clustering result as a relation
    Cluster(OID, ClusterID)
    • in which we can apply filtering on the attributes OID (Object ID) and Cluster ID.
  – Cluster(OID, ClusterID) can be visualized in various schemes.
  – Each visualization needs to provide a direct manipulation operation to select some objects or some clusters.
Exploratory Quantification and Analysis of Objects through a Clustering Result
Integrating analysis tools into coordinated multiple visualizations (2)

• Frequent Pattern Mining
  – A mining result as two relations
    Mining(Pattern, Supp, Conf)
    Include(OID, Pattern)
    • in which we can apply filtering on the attributes Pattern, Supp (Support), Conf (Confidence) and OID (Object ID).
  – Mining(Pattern, Supp, Conf) and Include(OID, Pattern) can be visualized in various schemes to list up patterns and their occurrences in each object.
  – Each visualization needs to provide a direct manipulation operation to directly select some objects or some patterns, and to quantify those patterns with their support and/or confidence higher than directly specified values.
Exploratory Quantification and Analysis of Objects through a Mining Result

Visualization 1

Visualization 2

Visualization $i$

Visualization $n$

Frequent Patterns

support

confidence

(A, C)→(D)
(A, B, D)→(E)
(B, D, E)→(F)
(B, E, F)→(A)
(A, D)→(C)

Include(OID, Pattern)[Pattern='\{A,B,D\}→\{E\}'][OID]
Integrating analysis tools into coordinated multiple visualization (2)

• Statistical analysis
  – The statistical analysis specifies the group-by attributes and, for each group of records, some aggregate function to calculate the aggregate value.
  – The result as a relation
    Stat(GBattributes, Afunction, SetOfOIDs).
      • GBattributes : attributes specified as group-by attributes
      • Afunction : a derived attribute with the aggregate function value of each group
      • SetOfOIDs : the set of object IDs in each group as its value
  – Each visualization chart needs to provide a direct manipulation operation to quantify GBattributes value, Afunction, or each group.
Exploratory Quantification and Analysis of Objects through a Statistical Chart

Stat(month, avgSalary, SetOfOIDs)

[avgSalary < ν] [SetOfOID]
Integration of analysis tools into coordinated multiple visualizations in Geospatial Digital Dashboard
Visualizing Divergence & Flow Vector Field using Statistically processed Probe Car Data

The center corresponds to Sapporo Station, where, in the morning, people get off and take taxis at the north and south entrances respectively.
Measuring Working Road Width and Road Conditions (bumpy / icy)

• Laser Range Scanner on a patrol car
Cloud Computing

We do not care where they are in a cloud.
Meme Media for Cloud Computing

Cloud Computing

Application construction + registration + reuse
Summary

• Meme Media Architecture when unified with the Web has expanded its significance in the current state-of-the-art, especially for scientific big data analysis and social cyber-physical big data analysis based on cloud computing.

• Its wrapping and improvisational federation capabilities allow us to utilize huge varieties of Web resources as well as local knowledge resources, including tools, services, and data sources, and to immediately combine them together to interoperate with each other depending on ever-changing problem-solving demands.
Summary

• These capabilities enable exploratory visual analysis of complex systems in e-science and urban computing, where macro analysis does not work, and the repetition of hypothesis making with data segmentation and hypothesis checking with analysis and visualization plays the most important role.

• People’s creative thinking is not at all straightforward! It is a repetition of trial and error.

• Same is true with research-oriented, strategic, and/or agile analytics of big data in e-science, urban infrastructure service operation, and disaster response.
Conclusion

• Necessity of micro analysis
  – Exploratory segmentation and analysis!
  – Improvisational federation of both dedicated and open knowledge resources

• Exploratory Visual Analytics
  – Geospatial Digital Dashboard
  – Based on the Generic Framework for Coordinated Multiple Visualizations together with Analysis Result Visualizations

• Large Library of Tools and Data
  – Generic Wrapping of Tools to Meme Media Components, i.e., Webbles
It will be the age of Big Data.

• Big Data and Science infrastructure
  – requires a new generic technology for ‘improvisational knowledge federation’
    • as well as the development and extension of databases, simulators, and analysis tools in each area.
    • to meet the dynamically changing demands of creative activities.
  – c.f. Conventional e-science
    – For routine or frequently requested jobs
      » work-flow and/or resource-orchestration technologies
      » based on GRID computing.

• Big Data for Disaster Management
  – Necessity of organic and improvisational integration of disciplinary systems supporting public sectors and agile systems supporting both the participation of the public and the advanced use of open big data and information
Improvisational Federation

- Workflow technologies work well for planned-for scenarios, but not for improvisational scenarios.
- Need of improvisational federation that can improvisationally federate and utilize both authoritative resources and open resources for improvisational scenarios.
- Need of *ad hoc* federation with a new functionality.
Our Approach to these Big Challenges based on our meme media technology

- How to establish a huge library of reusable tools?
  - Generic wrapper to wrap resources to reusable components of the most recent version of meme media system Webble World

- How to improvisationally federate tools and data?
  - Improvisational federation architecture based on Webble World system architecture
    - meme media technologies (1993- )
    - knowledge federation technologies (2004- )
Generic Wrapping of Resources

• Wrapping knowledge processing tools into components
  – Web services (done) and Web applications (partially done)
  – Statistical analysis / Text and data mining tools
    • mainly using R, Octave, Python and Ruby for their development.
    • Generic wrapping of tools developed in these languages
      \[\text{(done for R (with graphical output) and Octave)}\]
      – Wizardry to be developed
  – Image processing

• Wrapping of other fundamental tools
  – GIS
    • ArcGIS (done)
  – SNSs
How can we securely federate resources?

- How to certify that the use of a composite pad will never give any harm?
- We do not like to give up the cross-site scripting since it is fundamental for meme media.
- We need to provide another service to certify the secure reuse of composite pads that are shared and composed in each community.
Conclusion

• Meme media technology inherently needs to harmonize itself with the *de fact* standard technologies and social requirements.

• **What are the next *de fact* standard technologies and social requirements?**
  
  – Cloud computing *(Both open and closed ones)*
  
  – Big data and their analysis
  
  – Crowd sourcing of resources including information, data, tools, and services
Application frameworks with meme media: a form interface framework

A form construction kit for a DBMS
CBSD: Component-Based Software Development

New Scientist
Aug. 1995
## Table 4: Key Accomplishments of CBSD Pioneers

<table>
<thead>
<tr>
<th>Organization</th>
<th>Initial Goals</th>
<th>Key Accomplishments</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Japanese Software Factories</td>
<td>Systematic reuse of software components as a key part of the development process</td>
<td>Productivity went up approximately 7% per year, and quality (in terms of the absence of residual defects) improved to the point where it was an order of magnitude better than in the United States at the same time. The factories also demonstrated the benefit of a disciplined organizational design and working culture, with a clear separation of duties, roles, and responsibilities.</td>
</tr>
<tr>
<td>GTE Data Services</td>
<td>In 1986, to make sure that reuse of components started happening within the company</td>
<td>Software reuse is now embedded as a business practice. From a top-down perspective, GTE Data Services now achieves between $8 million and $10 million a year in new cost avoidance through reuse of software components.</td>
</tr>
<tr>
<td>IBM Corporation</td>
<td>Reuse of software, designs, and experiences as a means to prevent redundant development and maintenance</td>
<td>IBM has built several reuse technology support centers, software parts foundries, a large parts library with reusable designs and abstract data types, and a multiaxel Corporates Reuse Council.</td>
</tr>
<tr>
<td>Hewlett-Packard Co. (HP)</td>
<td>Improve the corporation's software development processes and implement component-based software development and reusability</td>
<td>HP’s strategy on component-based software development is to draw an analogy to the flexible manufacturing process. If they can create the right parts for the product, akin to corporate efforts in standard parts for engineering to use in new designs, the product developers can simply assemble those parts to create new products (within a product family). HP calls the approach the “flexible software factory.”</td>
</tr>
<tr>
<td>The Eureka Software Factory (ESF)</td>
<td>To improve software production visibly, to establish a European common base of software factory engineering, and to establish software factories in practice in European industry</td>
<td>The ESF project has had a significant and profound effect on the architecture of many of today’s commercial software products, including Concerto (Sema Group—a set of integrated tools for the development of real-time systems), Prinzip (Sema Group—a set of integrated tools for the development of business software), Meseta II (Sofia—a set of integrated tools for deployment on an advanced local-area-network-based development environment), Process Weaver (Capp Games innovation—fully operational process modeling tools), and ProMod Plus (CAP tools GEI—an integrated computer-aided software engineering environment incorporating many ESF ideas and principles).</td>
</tr>
<tr>
<td>The Intelligent Pad Consortium (Japan)</td>
<td>To promote the widespread acceptance of a reusable architecture and framework for hypermedia objects that encapsulate business knowledge</td>
<td>Development of a reusable object-oriented architecture for generating software to manage various intellectual resources like documents, graphics, images, animated pictures, spoken sounds, database systems, and mail systems. The Intelligent Pad consortium intends to facilitate the exchange of information between members so that “standardization of reusable software components can be realized” nationwide (Japan) and possibly worldwide. The IntelligentPad consortium also envisions “the active commercial development of local and international objects that will support an international market for open systems development.”</td>
</tr>
</tbody>
</table>

Source: SRI International
POGS: Pads of Geographic Software

Nigel Waters is a professor with the Department of Geography, University of Guelph, Guelph, ON, Canada, N1H 61A5. E-mail: nanvater@uoguelph.ca.

POGS, small cardboard circles, are enjoying remarkable popularity as kids' collectibles. The acronym comes from their original use as bottle caps for a popular Hawaiian beverage concocted of Passion, Orange, and Guava fruit juice. Due to their recent popularity, "POGS" seems like a nice acronym to introduce the concept of intelligent software pads to GIS users.

What Are Intelligent Software Pads? Johnstone (1995) recently provided an excellent introduction to the concept of intelligent pads, the brainchild of Yuzuru Tanaka, an electrical engineering professor at Tokyo Institute of Technology, Tokyo, Japan. The Tanaka invention, the idea of pads, may surprise some people, because the 42-year-old educator is from a provincial university far removed from the mainstream of Japan's industrial heartland. He also is an academic, not an entrepreneur, and as Johnstone notes, the Japanese are not renowned for their willingness to develop software.

That tendency has nothing to do with the common stereotype that the Japanese can't write software, but results from much more subtle forces. According to Feigenbaum (1995), the epicenter of the software industry throughout the world is the Silicon Valley area, and elsewhere in the United States, it is not unusual to find a high percentage of female computer science graduates majoring in programming, a preference for custom programming rather than off-the-shelf software and a cultural attitude that views hardware as something less than real.

In contrast, the Japanese have not been as influenced by these forces. They are not as interested in programming, and they tend to be more interested in hardware. This is because they have a strong tradition of innovation and a strong commitment to education. As Johnstone notes, the Japanese are known for their ability to learn quickly and adapt to new technologies, which is why they have been so successful in the software industry.

However, there is a lack of healthy competition. Other factors include an inadequate supply of computer science students specializing in programming, a preference for custom programming rather than off-the-shelf software and a cultural attitude that views hardware as something less than real.

This is not to say that the Japanese are not interested in software, but rather that they may not have as strong an interest as their American counterparts. Johnstone notes that this lack of interest is not a reflection of the quality of the Japanese software, but rather a reflection of the cultural attitudes that exist in Japan. He notes that the Japanese have a strong tradition of innovation and a strong commitment to education, which is why they have been so successful in the software industry.

On the other hand, the Japanese have not been as influenced by the same cultural attitudes that exist in the United States. They are more interested in hardware and may not have as strong an interest in programming. This is because they have a strong tradition of innovation and a strong commitment to education.

However, there is a lack of healthy competition. Other factors include an inadequate supply of computer science students specializing in programming, a preference for custom programming rather than off-the-shelf software and a cultural attitude that views hardware as something less than real.

This is not to say that the Japanese are not interested in software, but rather that they may not have as strong an interest as their American counterparts. Johnstone notes that this lack of interest is not a reflection of the quality of the Japanese software, but rather a reflection of the cultural attitudes that exist in Japan. He notes that the Japanese have a strong tradition of innovation and a strong commitment to education, which is why they have been so successful in the software industry.

However, there is a lack of healthy competition. Other factors include an inadequate supply of computer science students specializing in programming, a preference for custom programming rather than off-the-shelf software and a cultural attitude that views hardware as something less than real.

This is not to say that the Japanese are not interested in software, but rather that they may not have as strong an interest as their American counterparts. Johnstone notes that this lack of interest is not a reflection of the quality of the Japanese software, but rather a reflection of the cultural attitudes that exist in Japan. He notes that the Japanese have a strong tradition of innovation and a strong commitment to education, which is why they have been so successful in the software industry.

However, there is a lack of healthy competition. Other factors include an inadequate supply of computer science students specializing in programming, a preference for custom programming rather than off-the-shelf software and a cultural attitude that views hardware as something less than real.

This is not to say that the Japanese are not interested in software, but rather that they may not have as strong an interest as their American counterparts. Johnstone notes that this lack of interest is not a reflection of the quality of the Japanese software, but rather a reflection of the cultural attitudes that exist in Japan. He notes that the Japanese have a strong tradition of innovation and a strong commitment to education, which is why they have been so successful in the software industry.

However, there is a lack of healthy competition. Other factors include an inadequate supply of computer science students specializing in programming, a preference for custom programming rather than off-the-shelf software and a cultural attitude that views hardware as something less than real.

This is not to say that the Japanese are not interested in software, but rather that they may not have as strong an interest as their American counterparts. Johnstone notes that this lack of interest is not a reflection of the quality of the Japanese software, but rather a reflection of the cultural attitudes that exist in Japan. He notes that the Japanese have a strong tradition of innovation and a strong commitment to education, which is why they have been so successful in the software industry.

However, there is a lack of healthy competition. Other factors include an inadequate supply of computer science students specializing in programming, a preference for custom programming rather than off-the-shelf software and a cultural attitude that views hardware as something less than real.

This is not to say that the Japanese are not interested in software, but rather that they may not have as strong an interest as their American counterparts. Johnstone notes that this lack of interest is not a reflection of the quality of the Japanese software, but rather a reflection of the cultural attitudes that exist in Japan. He notes that the Japanese have a strong tradition of innovation and a strong commitment to education, which is why they have been so successful in the software industry.

However, there is a lack of healthy competition. Other factors include an inadequate supply of computer science students specializing in programming, a preference for custom programming rather than off-the-shelf software and a cultural attitude that views hardware as something less than real.

This is not to say that the Japanese are not interested in software, but rather that they may not have as strong an interest as their American counterparts. Johnstone notes that this lack of interest is not a reflection of the quality of the Japanese software, but rather a reflection of the cultural attitudes that exist in Japan. He notes that the Japanese have a strong tradition of innovation and a strong commitment to education, which is why they have been so successful in the software industry.
Software Consortium Of U.S., Japan Firms To Develop Projects

By a WALL STREET JOURNAL Staff Reporter

TOKYO — A U.S. and a Japanese software consortium, both backed by heavyweights in their home industries, have joined hands to ensure the compatibility of their respective versions of a futuristic software architecture.

Component Integration Laboratories Inc., a U.S. association formed to push a next-generation software technology developed by Apple Computer Inc. called OpenDoc, has forged a new alliance with the IntelligentPad Consortium of Japan, which is promoting a Japan-developed software project called IntelligentPad. The two associations will exchange memberships in order to advance the development and compatibility of OpenDoc and IntelligentPad. The two groups said they will work to make OpenDoc compatible with IntelligentPad.

Both OpenDoc and IntelligentPad are “component” software systems intended to make the design and use of computer software easier, cheaper and more flexible. Both systems allow designers to build large software programs out of smaller pieces that can easily be swapped out and recombined in new ways. Both groups also face competition from Microsoft Corp., which is pushing a similar product.

The tie-up gives OpenDoc additional supporters among Japan’s big computer companies, including Fujitsu Ltd. and NEC Corp. The U.S. consortium is primarily backed by Apple, Adobe Systems Inc., International Business Machines Corp. and Novell Inc.
Integrated Visualization & Reification of DB Records and Web Contents

UNESCO Web pages on World Heritage

Local DB records (GNP of countries)

DB+Web Content
Dissemination

… This book … cannot be compared to any other book—It opens the gates to new territories and time will tell how readers apply this information about knowledge media. … (E-Stream Vol.7, No.4)

Big Challenge: How to Mine Real World Complex Big Data?

• Well-formed or ill-formed problem?
  – Efficient Snow Plowing and Removing
  – Disaster management and response
  – They are ill-formed problems.
    • The whole system cannot be modeled by a single monolithic mathematical model.
    • It should be treated as a system of systems.

• Current knowledge mining technologies
  – Only for well-formed problem
  – Formalized with clear frameworks and/or models

• How to fill in this gap?
  – Exploratory Visual Analytics
    • with improvisational federation of various data sources and analysis tools chosen from their large library.
How to fill in this big gap?

- **Library of reusable tools**
- **Database of retrospective data**
- **Physical World Sensor Network**
- **Cyber World Cloud System**
- **Exploratory Visual Analytics**
  - Do analysis/simulation
  - Check Visualization/decision making support
  - Plan plan/hypothesis
  - Act policy/control/guide
  - PDCA Cycle

- Particpation of Citizens through SNS
- Monitoring/recording
- Control/guidance
The p-medicine Consortium

Belgium
Germany
Greece
Israel
Italy
Japan
Netherlands
Poland
Spain
Switzerland
UK
TOB embedded in the ObTiMA Portal

- Webtop system
- Visual component-based system
- Some components access the underlying database.
- The configuration of each trial plan should be able to be stored in the database, and to be loaded from the database.
- Trial plans, treatment arms, treatment events, CRFs should be reusable.

Meme media technology