Complex and Semantic Computations: Can They be Simpler?

Moderator

Sigeru Omatu, Osaka Institute of Technology, Japan

Panelists

Panos Alexopoulos, iSOCO, Spain

Diletta Romana Cacciagrano, University of Camerino, Italy

Sigeru Omatu, Osaka Institute of Technology, Japan

Semantic Computation by Neural Network

Sigeru Omatu
Osaka Institute of Technology
Osaka
Japan
omatu@rsh.oit.ac.jp

Comparison of Human and Computer

- Human
  - Intuition
  - Pattern
  - Parallel
  - Distributed Memory
  - Learning
  - (Self-Organization)
- Computer
  - Logic
  - Symbol
  - Series
  - Local Memory
  - Algorithm
  - (Program)

Intuition/Logic

- Logic IF-Then rule

  Rule 1 IF A Then B

  Rule 2 If B Then C

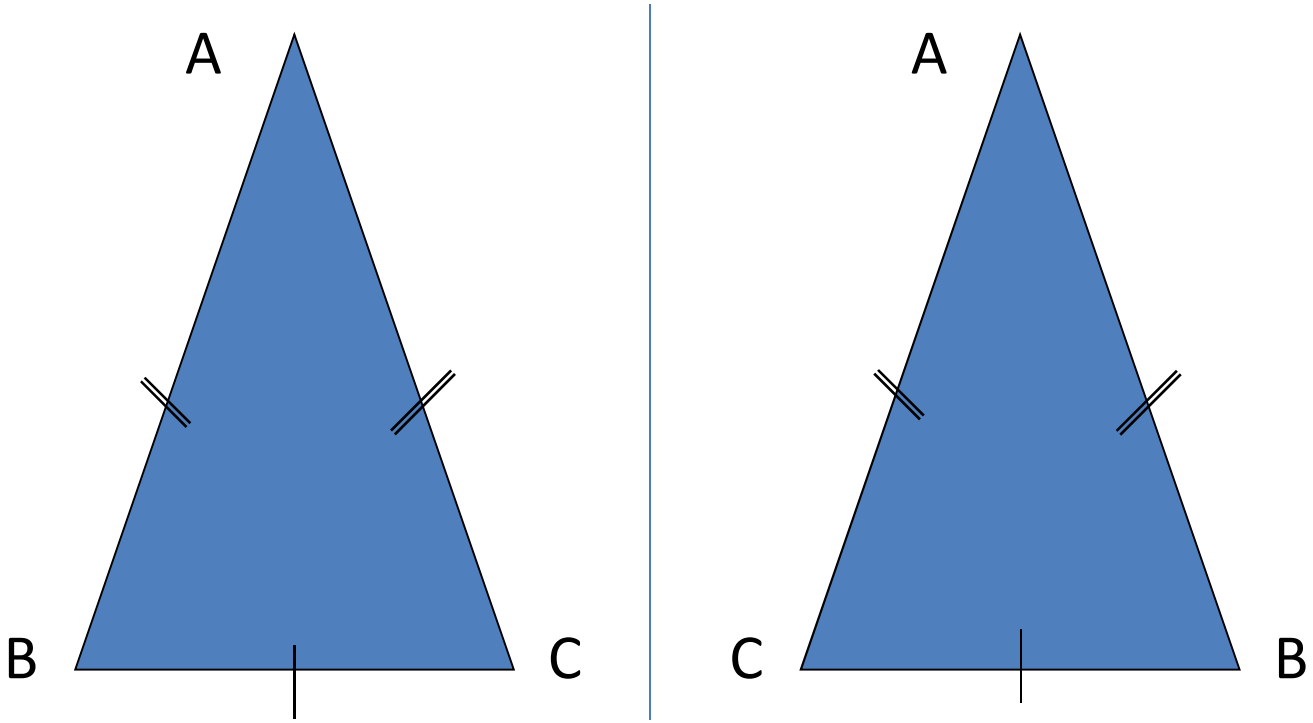
- Reasoning

  If A Then C

- Rule 1 IF touching
  Then unpleasant
- Rule 2 IF unpleasant
  Then angry
- Reasoning
- IF touching Then angry?

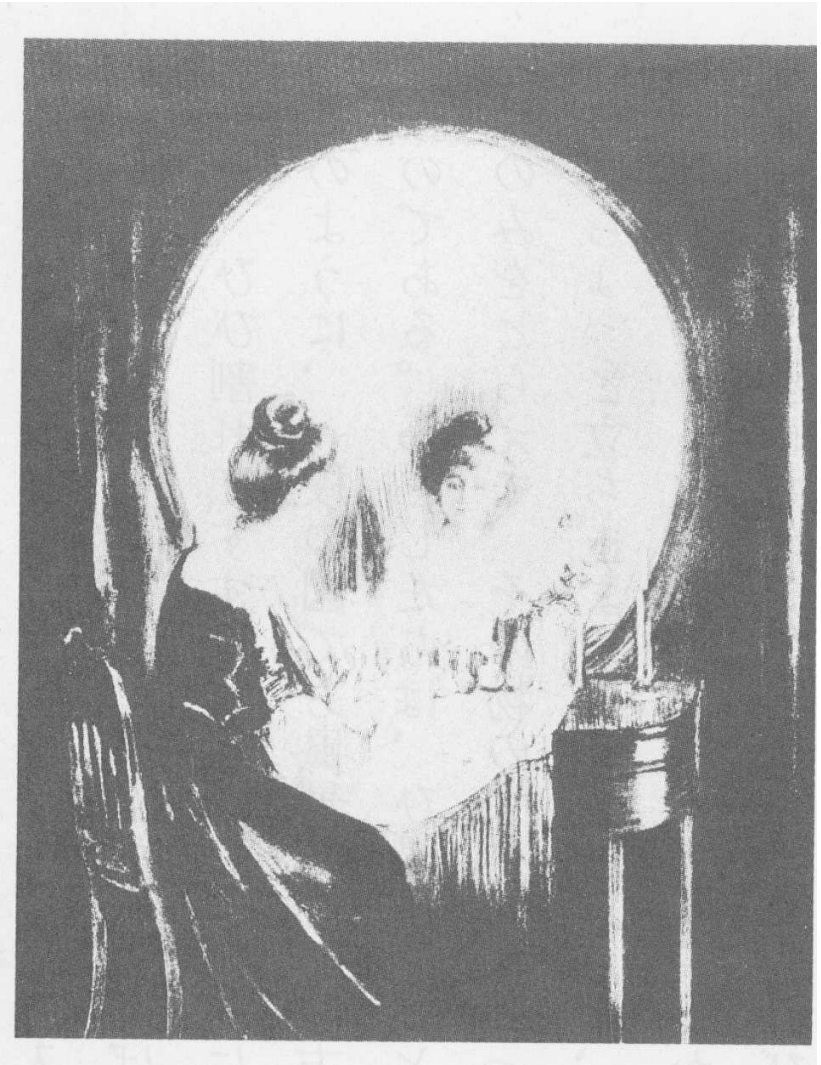
Proof by Logic Using Computer

For △ ABC, prove that if AB=AC, then ∠B= ∠C

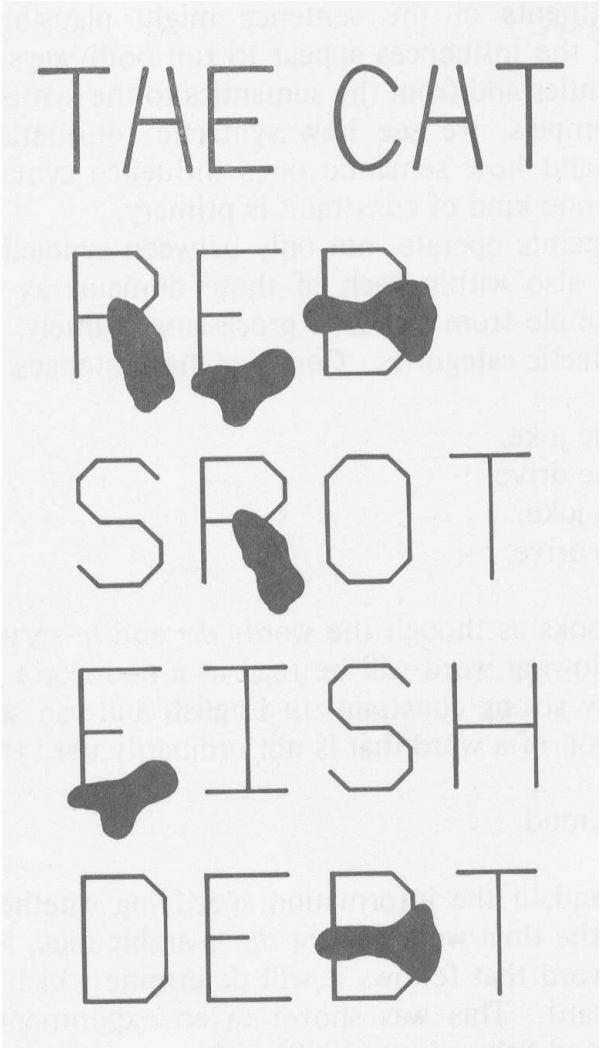


For △ ABC and △ ACB, AB=AC, BC=CB. Thus, △ABC and △ ACB are congruence. Hence, ∠B= ∠C

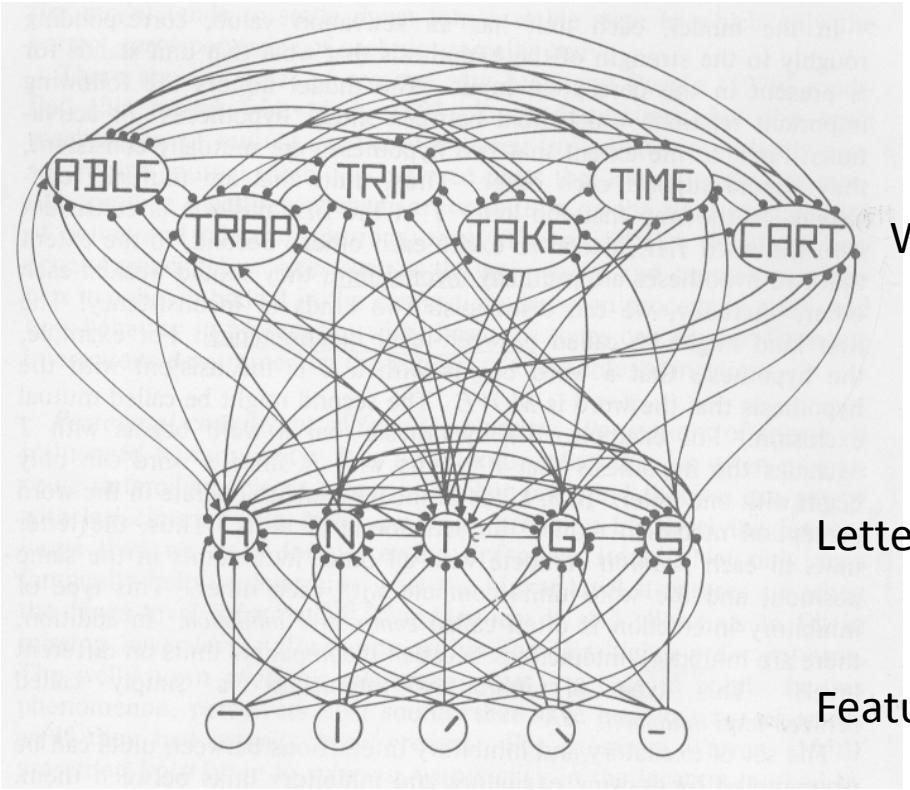
Pattern/Symbol



trompe l'oeil



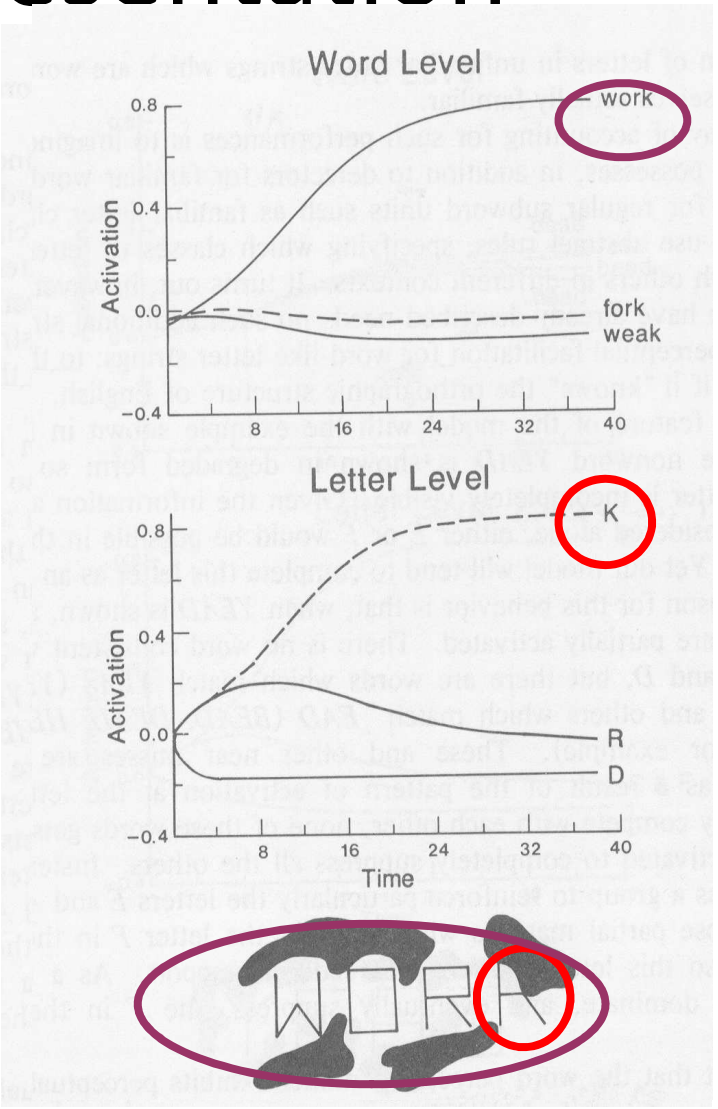
Distributed Representation



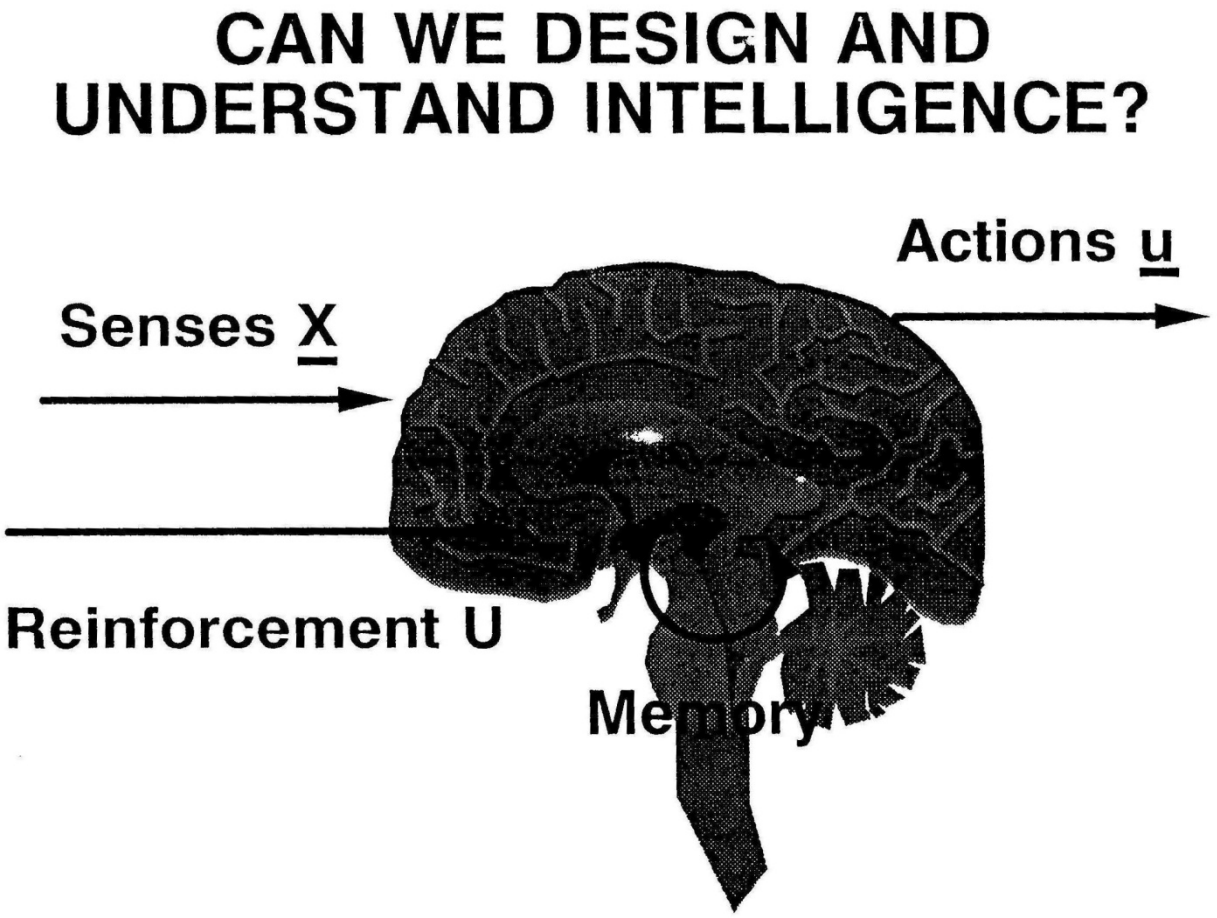
Word Leve

Letter Level

Feature Level



Learning

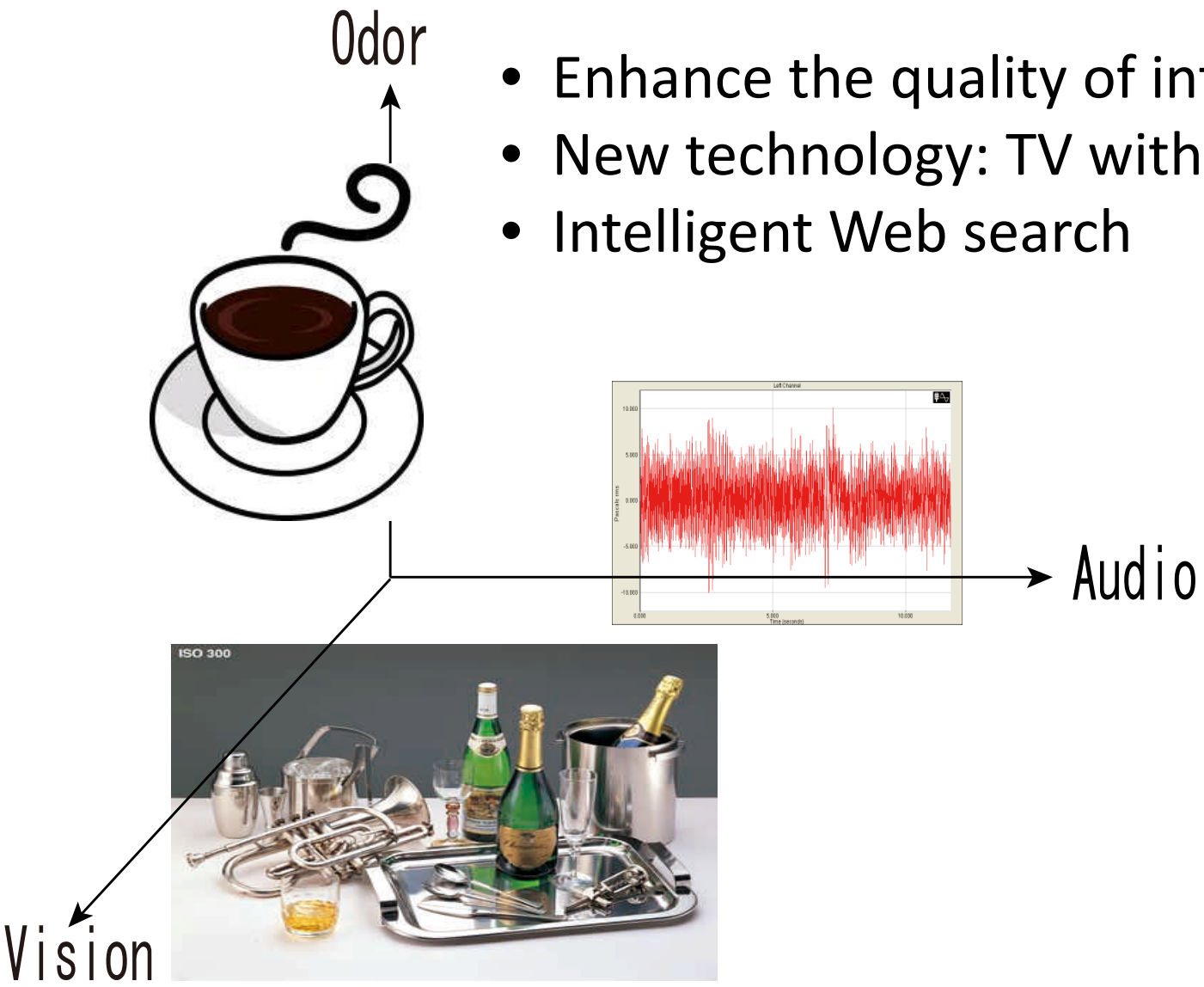

CAN WE DESIGN AND
UNDERSTAND INTELLIGENCE?
Actions u
Senses X
Reinforcement U
Memory

Exercise of Learning

Assign numerals 0,1,2,….9 to the alphabets such that

$$\begin{array}{r} \text{SEND} \\ +)\ \text{MORE} \\ \hline \text{MONEY} \end{array}$$

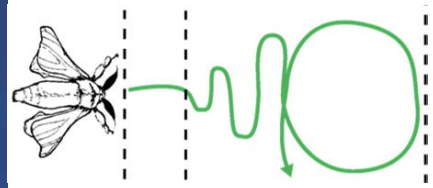
Using of Five Senses



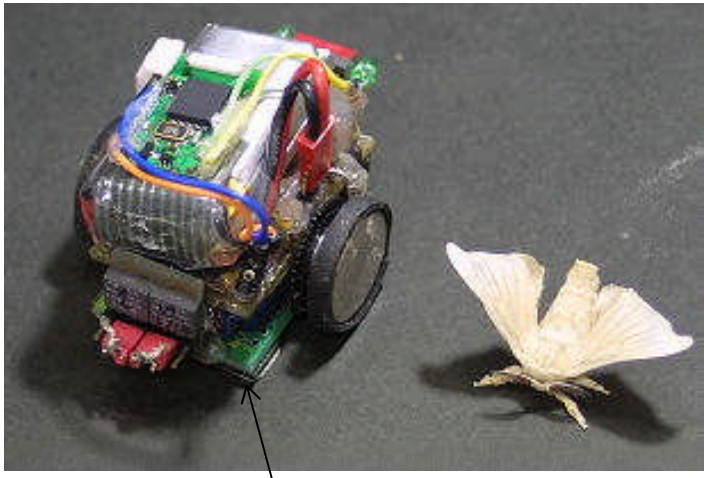
- Enhance the quality of information
- New technology: TV with odor
- Intelligent Web search

Silkworm Moth Odor Searching

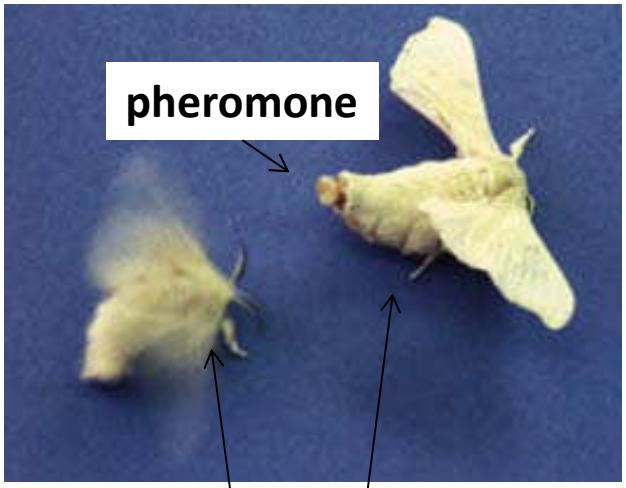
feeleran antennae



Motion pattern



Odor Source searching robot



male, female

Pheromone transmission

Prof. Kanzaki (Univ. of Tokyo)

Semantic Computation: Can be they ~~Simpler~~ Smarter?

Diletta Romana Cacciagrano
University of Camerino
Camerino, Italy

Who, Why, What & How

Who: SMARThing Lab - The UNICAM Laboratory of

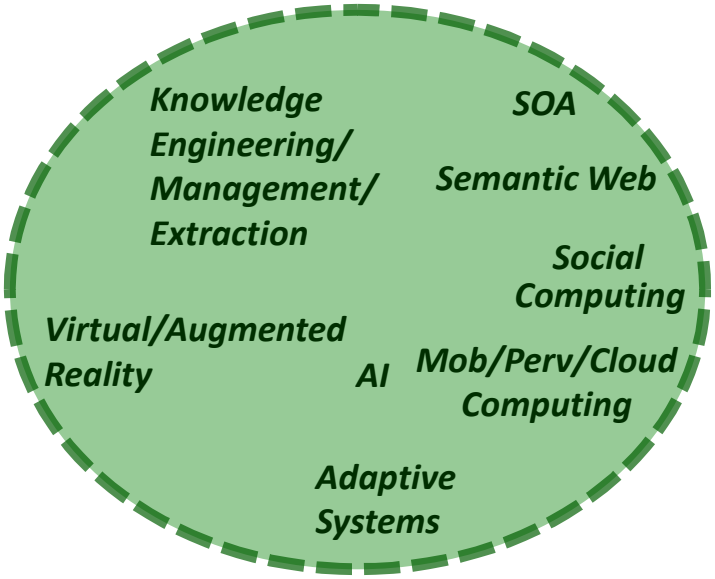
Smart Thing Computing (STC)

What: Seamless integration of computing technology into open, heterogeneous, dynamic, context-sensitive, distributed environments (i.e., our "living" environments).

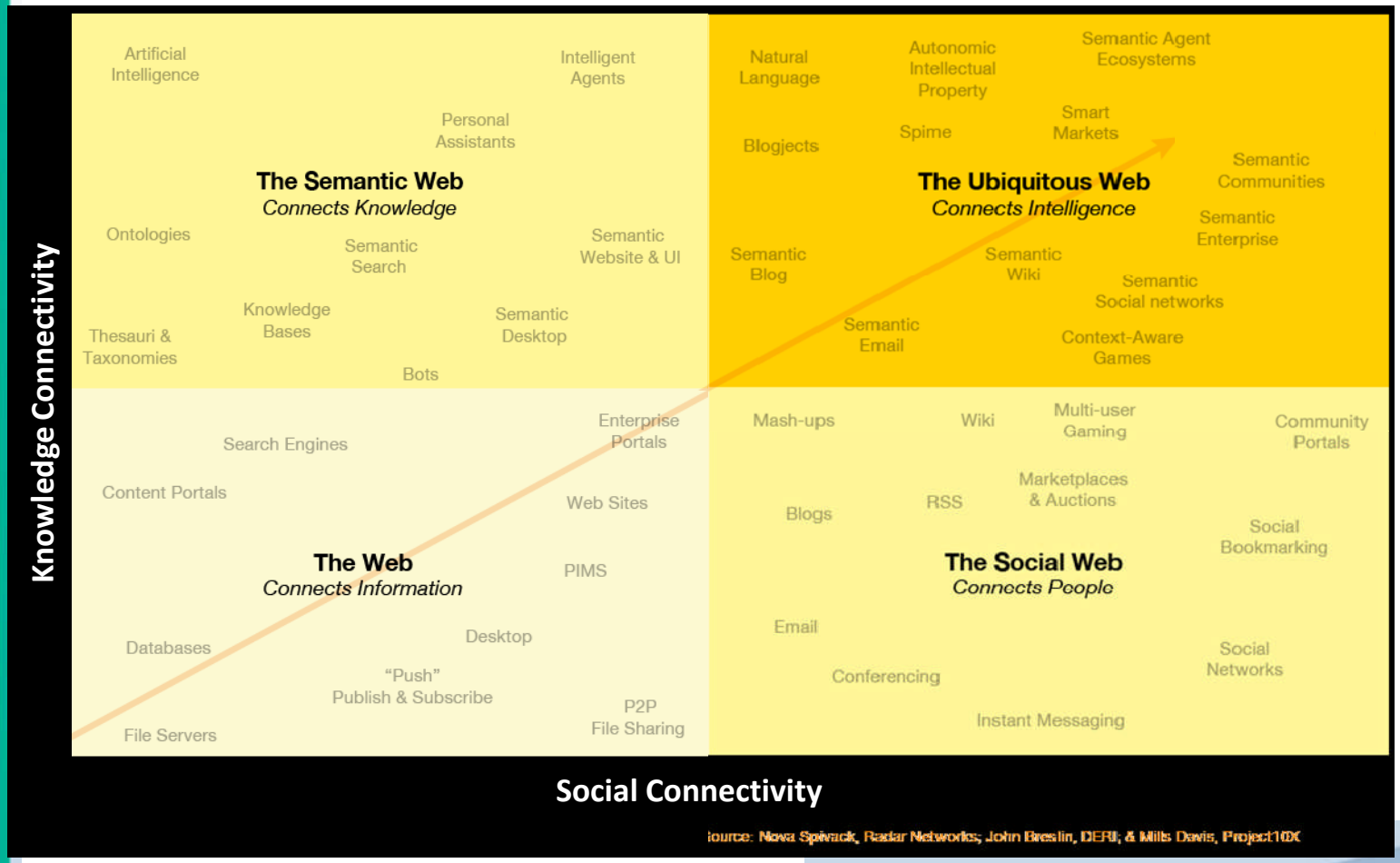
Why: The new ecosystem is digital, trans-semiotic, data and knowledge intensive, social, connected, collaborative, community-driven, mobile, multi-channel, immersive, massively networked and computational.

HOW : STC = Concept-based Networked Knowledge Computing

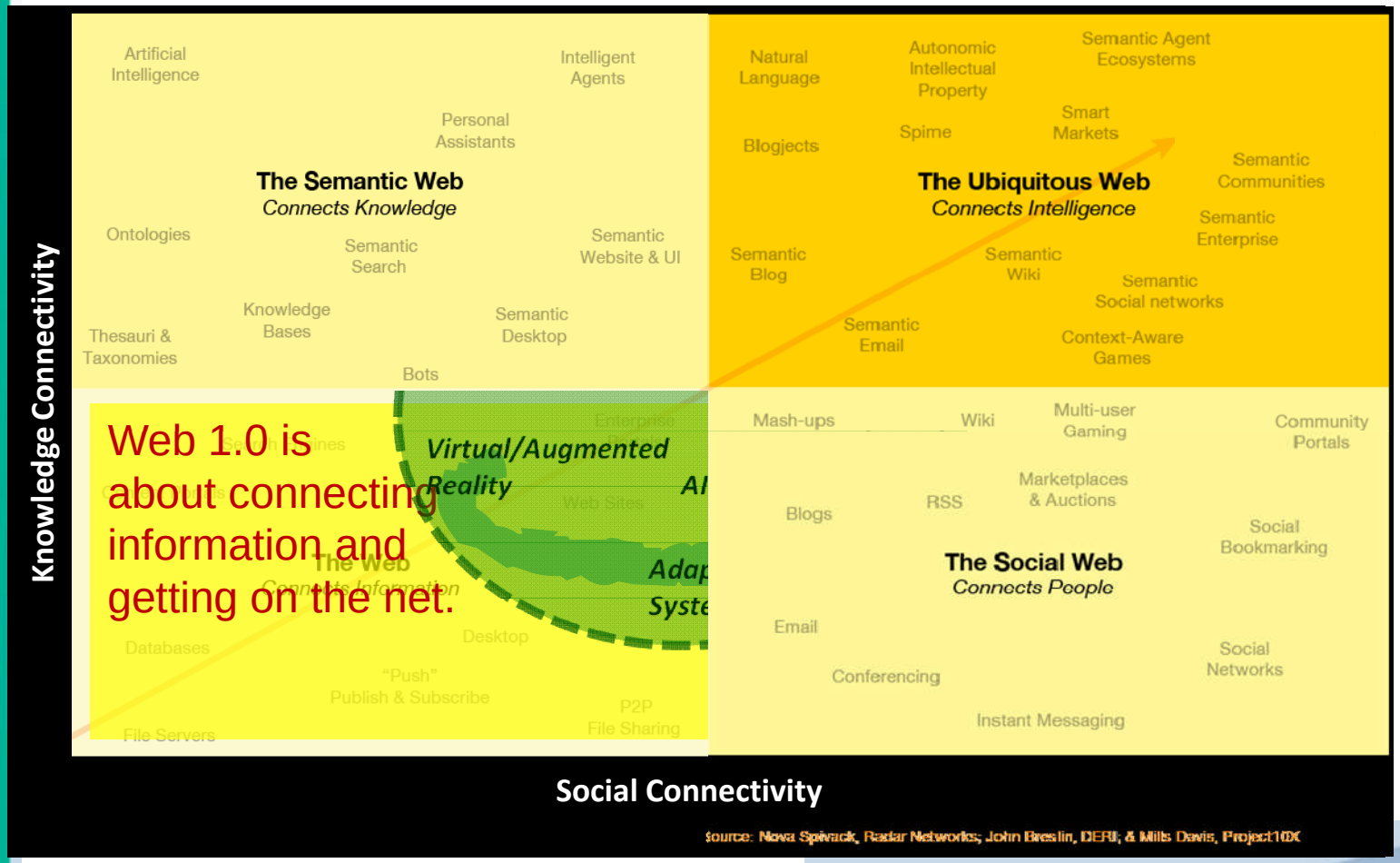
Smart Thing Computing Ingredients



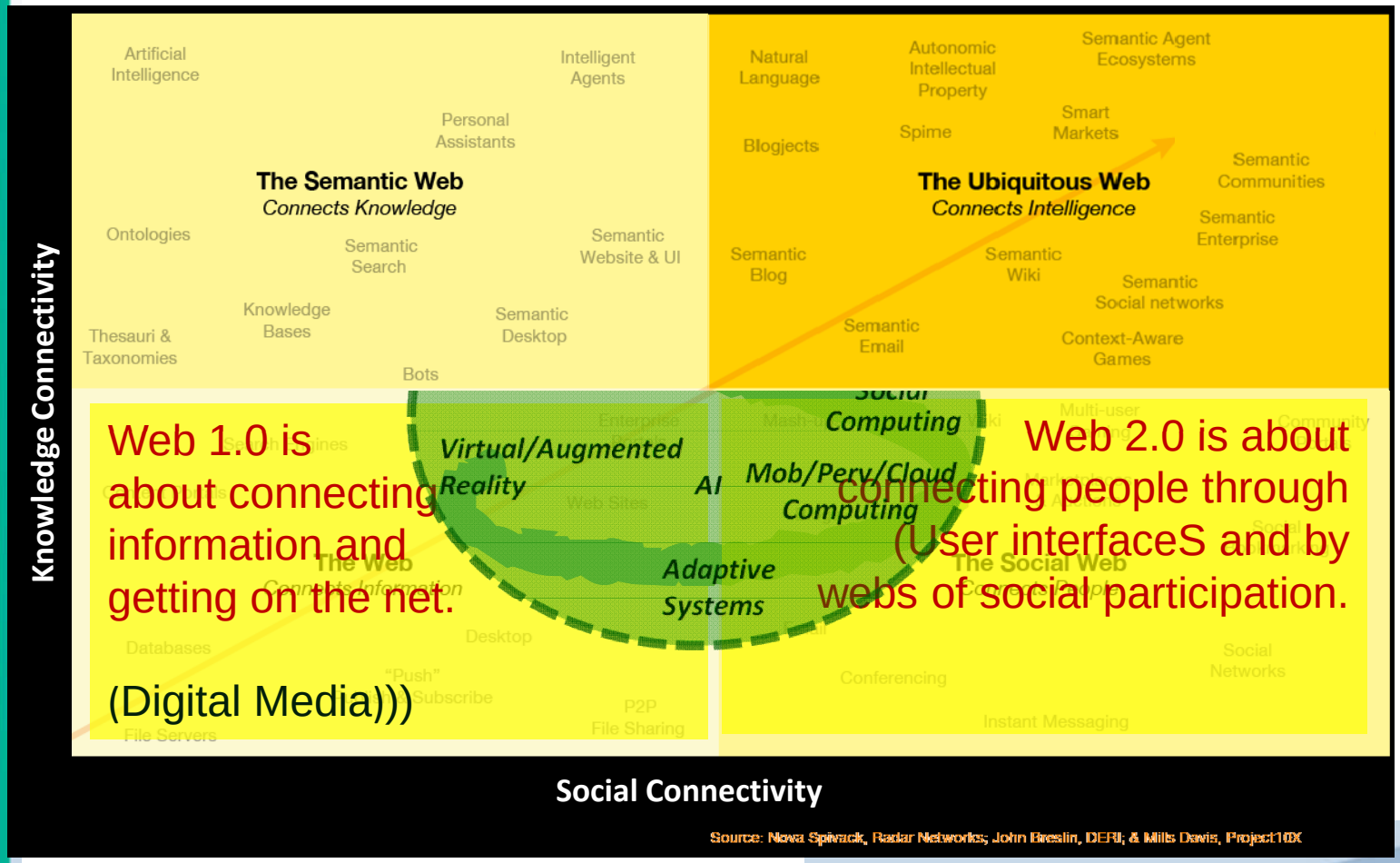
(Smart Thing) Computing in/for Web 4.0



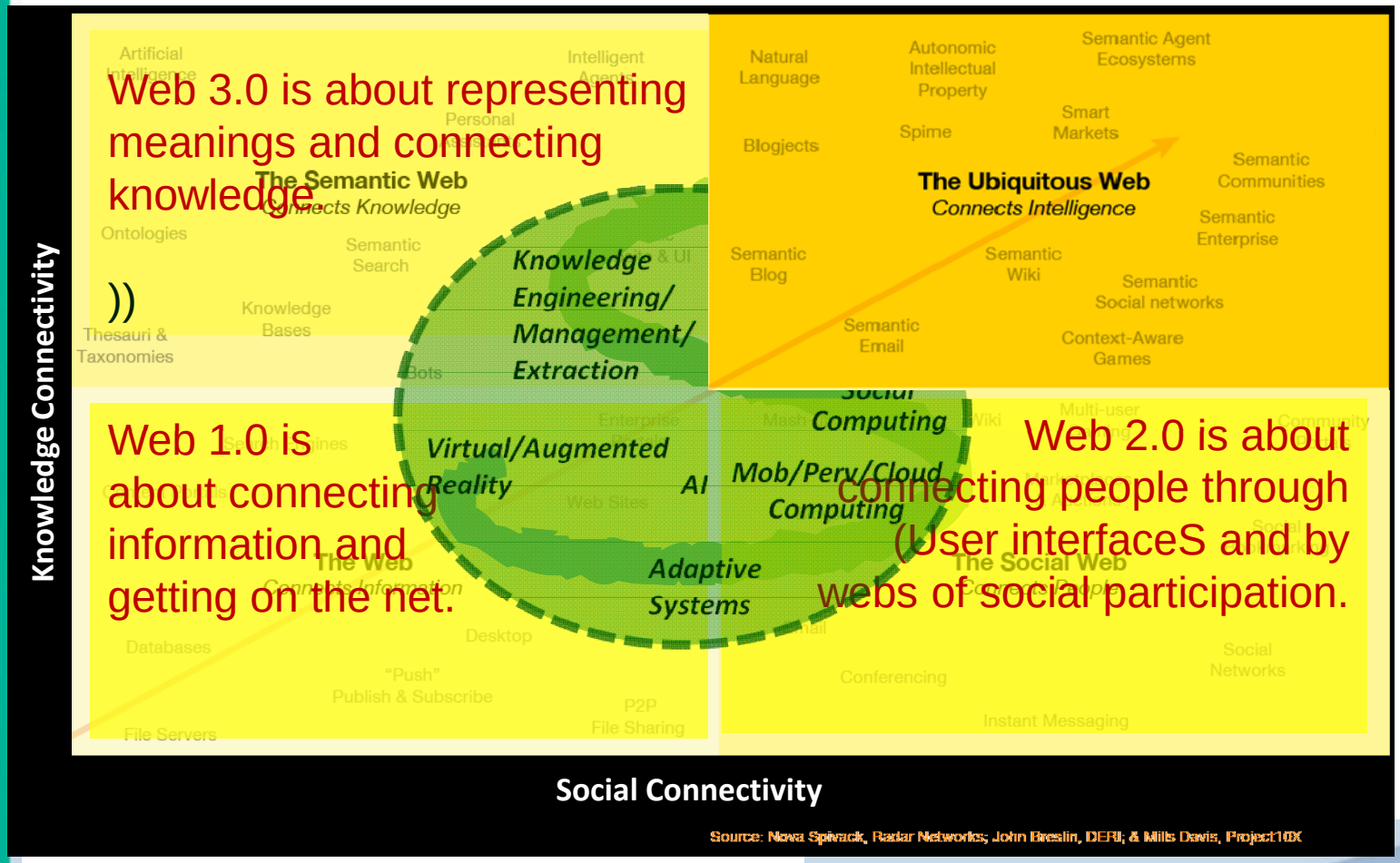
(Smart Thing) Computing in/for Web 4.0



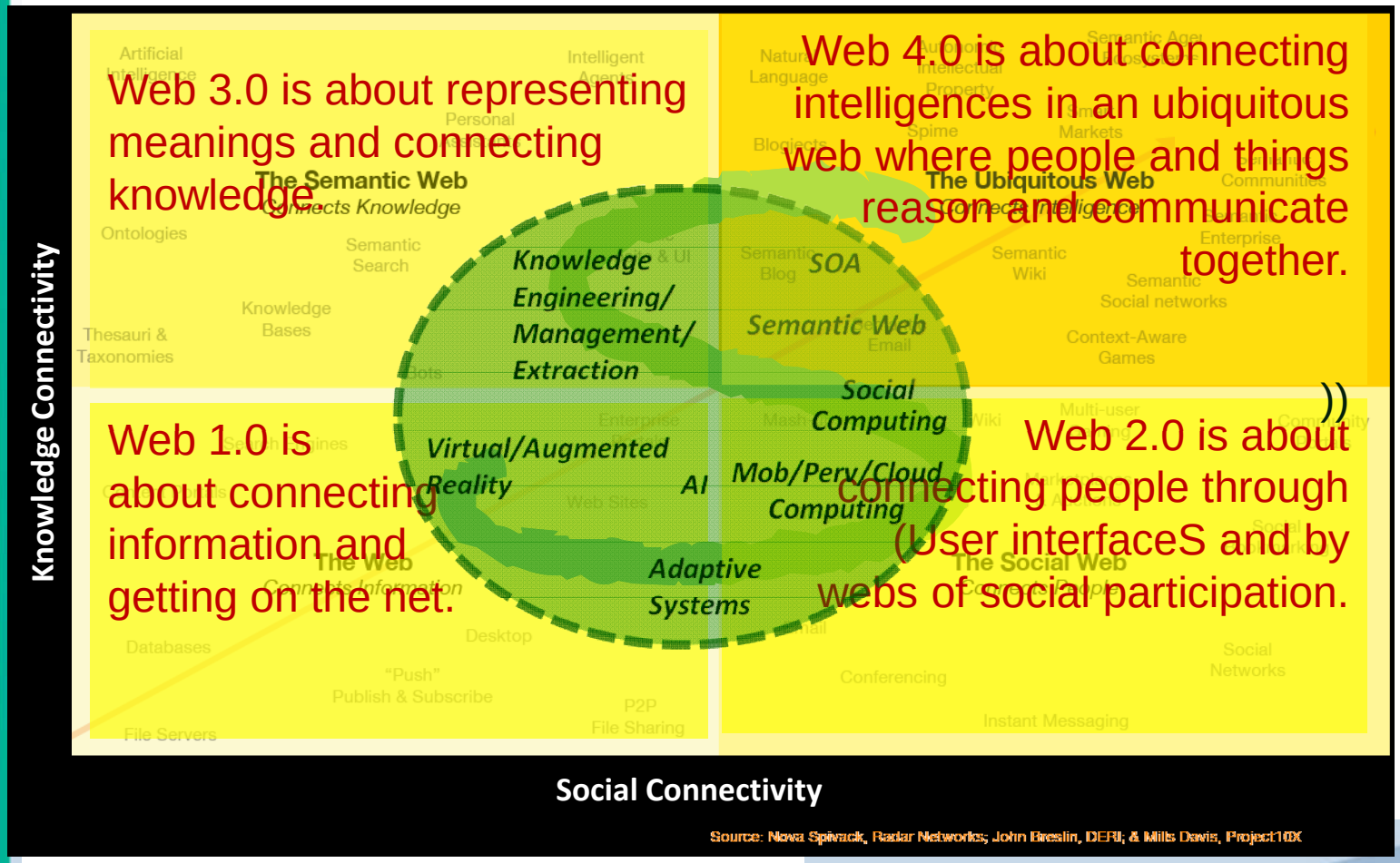
(Smart Thing) Computing in/for Web 4.0



(Smart Thing) Computing in/for Web 4.0

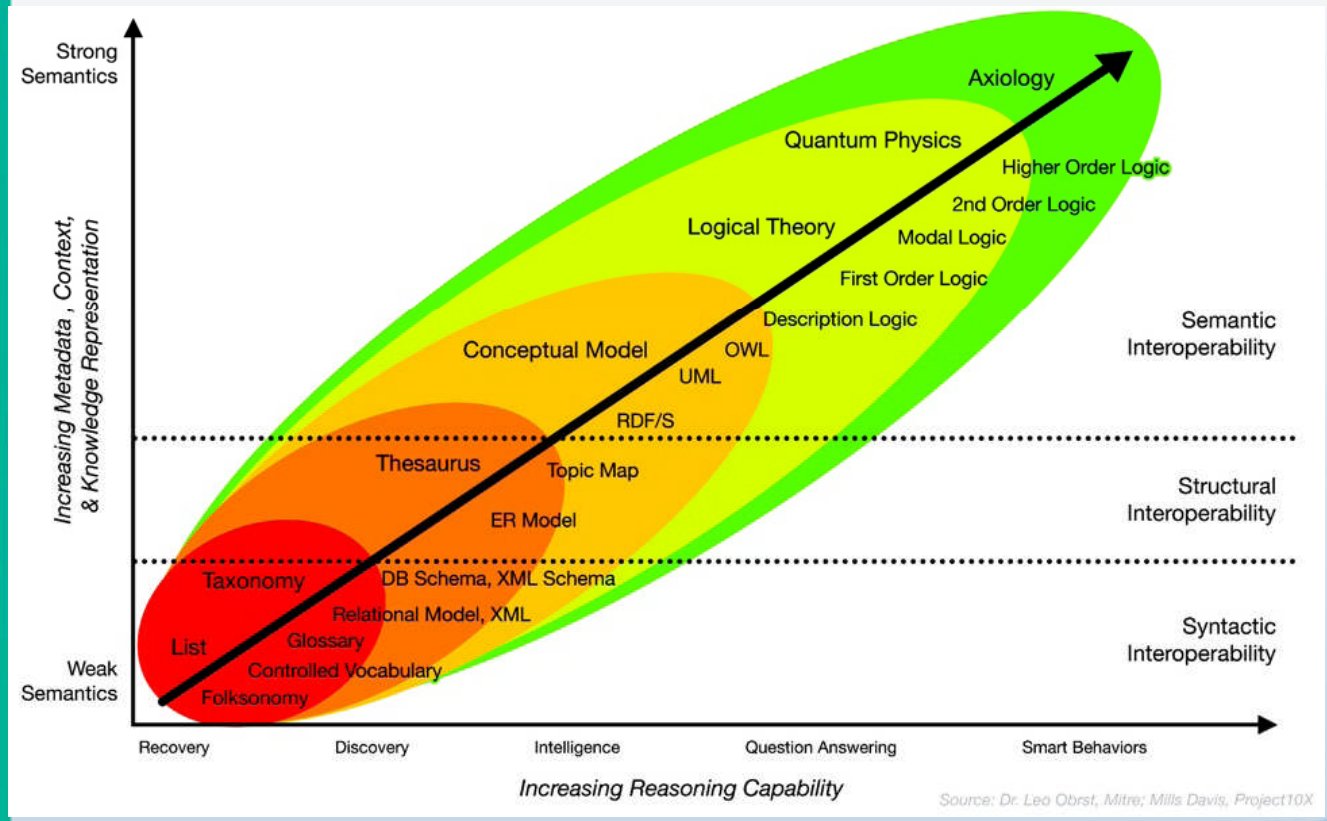


(Smart Thing) Computing in Web 4.0



What is the path?

More expressive knowledge representation enables more powerful reasoning:



Smart Behaviours

Question Answering

Discovery

Recovery

OWL-*M*$_i^{ea}$*ning*

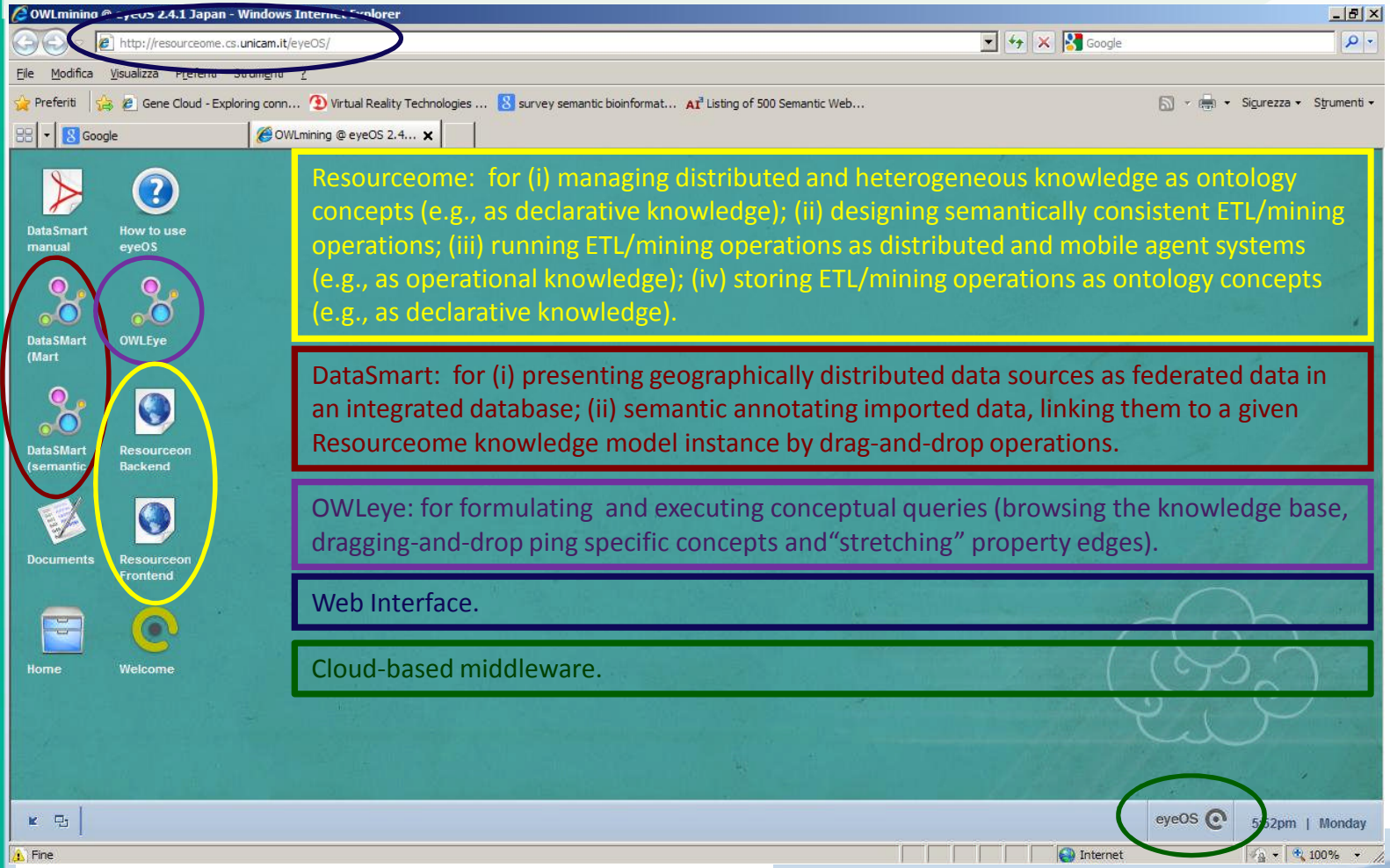
Marche Region's Request:

A platform that can be integrated with enterprise information and content management systems to open data silos, establish a layer of adaptive integrated views of the enterprise information, support and **share** decision processes.

Answer: OWL-*M*$_i^{ea}$*ning*

- Expandable 'Business Intelligence 2.0' Enterprise Resource Planning (ERP) prototype.
- ERP -> **data transformation** (e.g., Extraction, Transformation and Loading—ETL) + **analysis** (e.g., Online Analytical Processing—OLAP) and **mining** (e.g., querying and clustering);
- **Externalization** (i.e., converting tacit knowledge into explicit one) and **Combination** (i.e., creating new explicit knowledge from existing explicit one) capabilities.

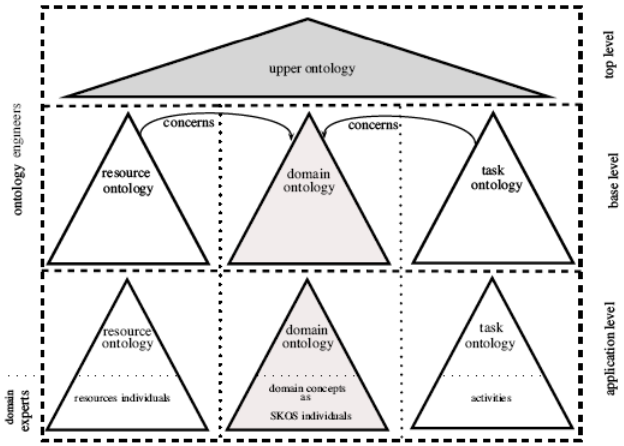
OWL-*M*$_{i}^{ea}$*ning*



http://resourceome.cs.unicam.it/eyeOS/
(User: owlmining, Passw: tryowlmining)

Towards a Concept-based Networked Knowledge

- XaaS – Everything as a Service (DWaaS, ERPaas, OLAPaaS, Data Mining as a Service, Desktop as a Service, …);
- Virtualized Infrastructure – Distributed Data, Tasks and Services can be accessed from any connected devices over the Internet;
- Web-based interface;
- Ontology-driven Apps;
- Cloud-based middleware;
- Agents.
- A flexible and powerful knowledge model
  - "Domain –independent" (it suffices to instatiate).
  - Running Business Processes as distributed MAS.
  - Storing Business Processes as concepts.

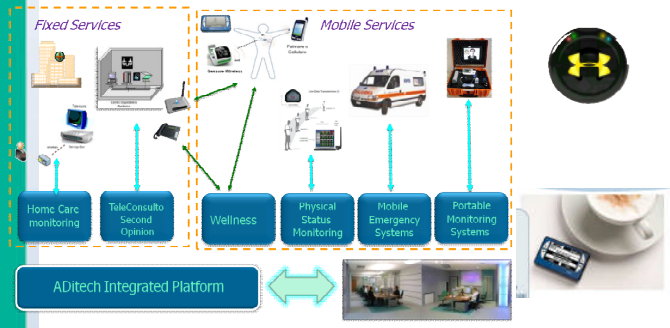


Future work: OWL-*M*$_i^{ea}$*ning* for…

Smart Health, Wellness,Nutrition, Urban-life

Data coming from…..

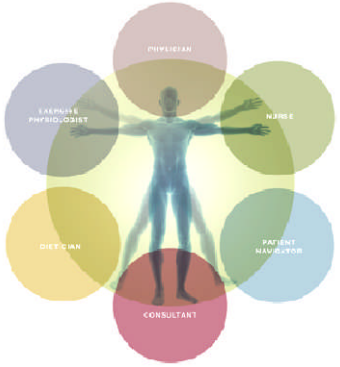
ADiTech Platform



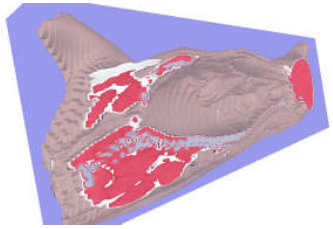
PSM Training

AiperMotion activity sensor

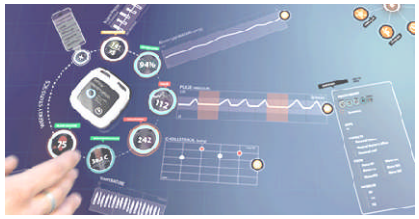
For Personalized services



Computed Tomography

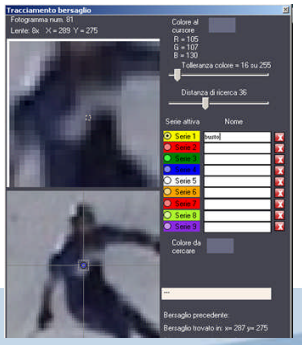


For Personalized Interfaces

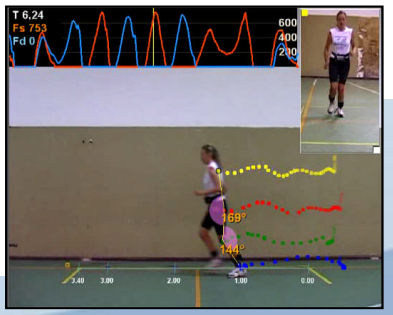


Medical Devices

Image Analisys



BioMovie



E-learning Immersive Environments

Thanks for your attention

Simpler complex and semantic computations? Just reduce the data!

Panos Alexopoulos

SEMAPRO Panel

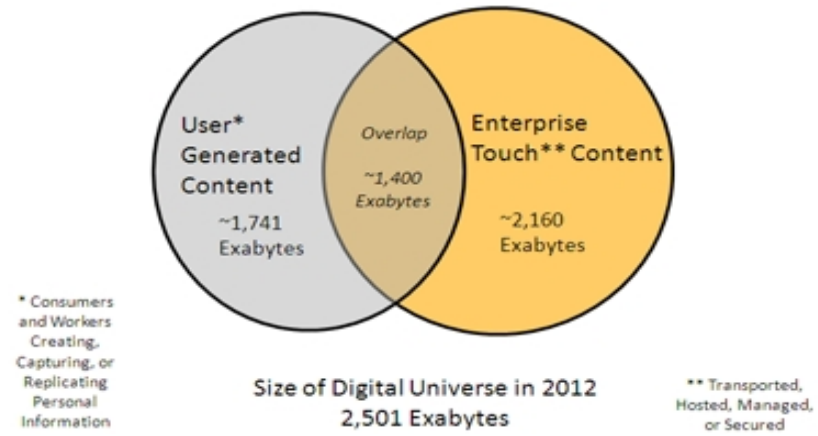
Barcelona, Spain, September 27th, 2012

Some Facts

Data is growing at a rate that we cannot catch up with

- Scale of data
- Dynamics
- Difficulty to interpret

Some Facts



- In 2010 the size of the digital universe exceeded 1 Zettabyte (=1 trillion Gb)
- 1.8 Zb in 2011
- 35 Zb expected in 2020

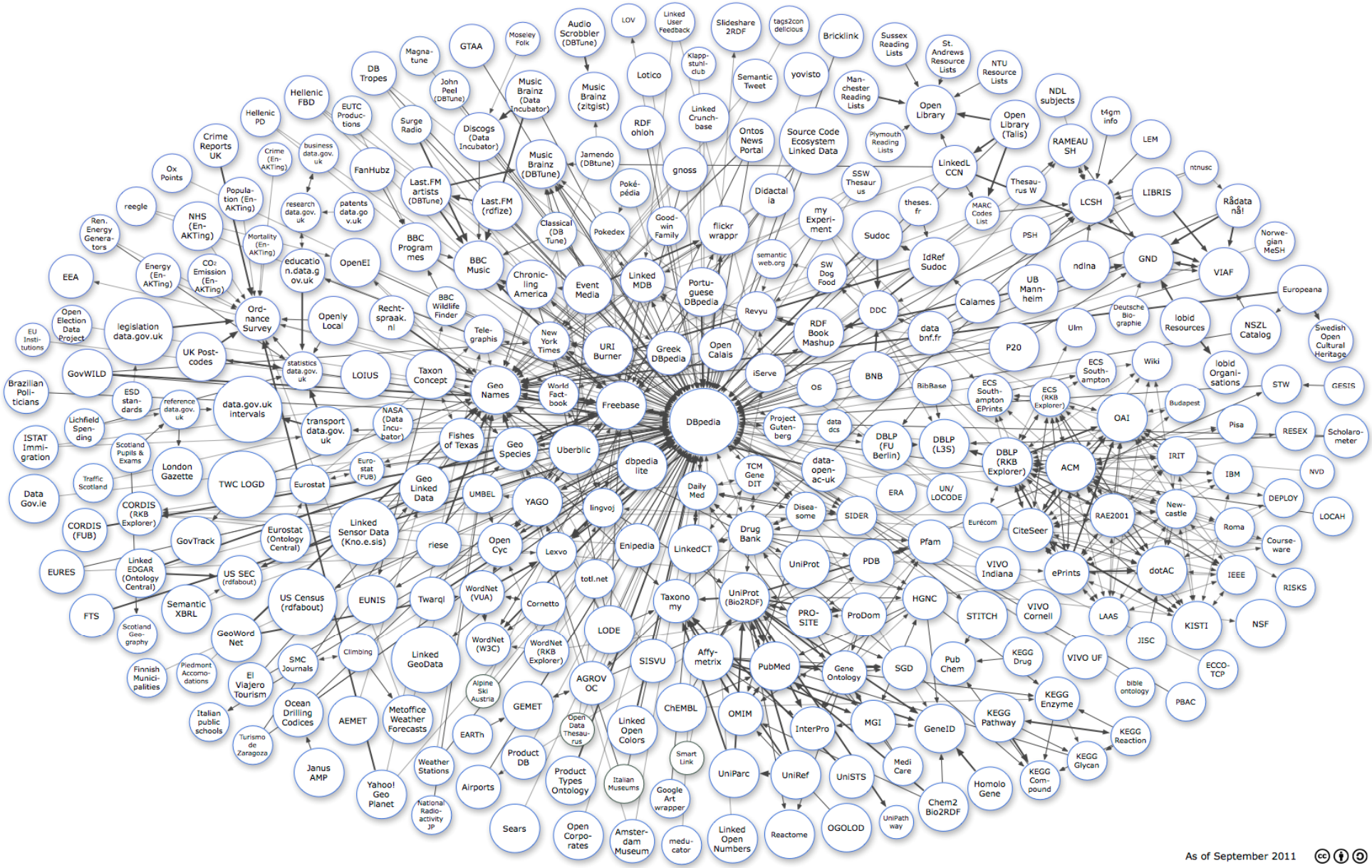
- 90% unstructured data
- 70% user-generated
- 75% resulting from data copying, merging, and transforming

- Metadata is the fastest growing data category
- Much of such data is dynamic, real-time, volatile

Source: IDC 's The 2011 Digital Universe Study – Extracting Value from Chaos

The Data Deluge

The Linked Open Data Cloud



As of September 2011

More Computing Power, More Storage, Less Requirements

LarKC
Large Knowledge Collider

SCALABILITY
IN SEMANTIC COMPUTING:
THE EUROPEAN VIEW

TrOWL
www.trowl.eu

Proposal & Challenge

Identifying and using the relevant portions of the data for the task at hand!

A way to have scalable data management is by being goal-driven!

Thank you!

Contact iSOCO

Dr. Panos Alexopoulos
Senior Researcher
palexopoulos@isoco.com

Questions?

Barcelona
Tel +34 935 677 200
Edificio Testa A
C/ Alcalde Barnils, 64-68
St. Cugat del Vallès
08174 Barcelona

Madrid
Tel +34 913 349 797
Av. del Partenón, 16-18, 1º7ª
Campo de las Naciones
28042 Madrid

Pamplona
Tel +34 948 102 408
Parque Tomás
Caballero, 2, 6º-4ª
31006 Pamplona

Valencia
Tel +34 963 467 143
Oficina 107
C/ Prof. Beltrán Báguena, 4
46009 Valencia