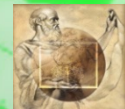




Big Data based Technological Innovations on Intelligent Health Service in the Clouds



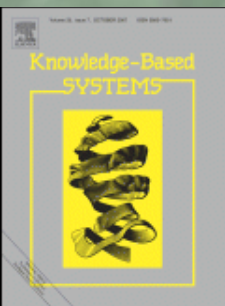
Hamido FUJITA

Doctor Honoris Causa (Óbuda University)

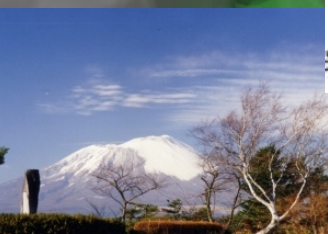
-Editor in Chief Knowledge-Based Systems

-Director of Intelligent Software Systems

Iwate Prefectural University, Iwate, Japan



<http://www.fujita.soft.iwate-pu.ac.jp>



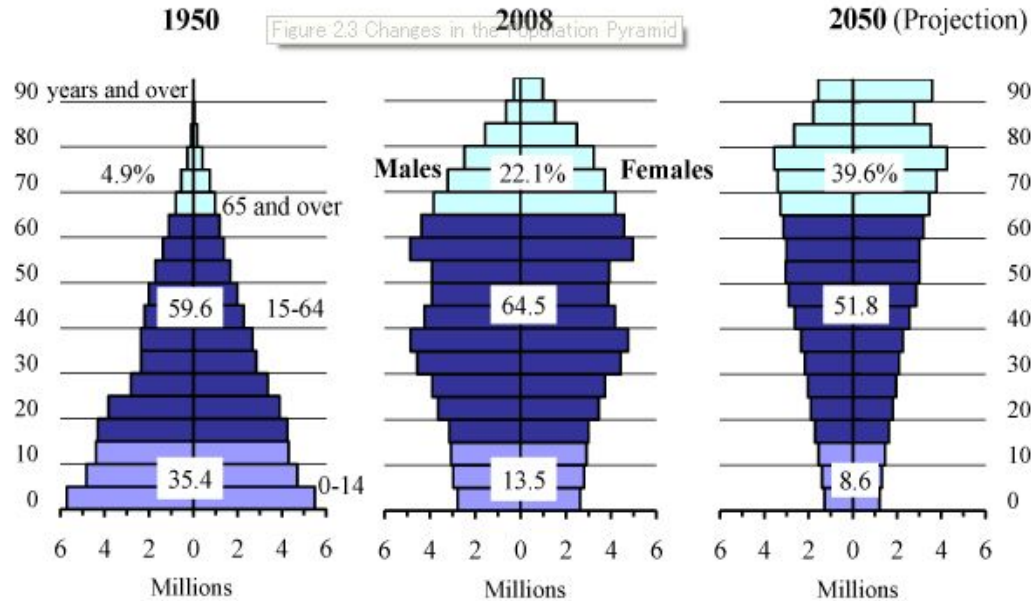
CLOUD ROBOTICS

- Use something without knowing what is going on inside.
- Users are shielded from the details how something actually works.

- ✓ Key
- ✓ Steering wheel
- ✓ Gearshift
- ✓ Gas pedal
- ✓ Brakes



Changes in the Population Pyramid



Source: Statistics Bureau, MIC; Ministry of Health, Labour and Welfare.



The proportion of the population 65 and over has doubled from 10% in 1985 to 20% in 2005, and is projected to be 30% in 2023 [2006, NIPSSR].

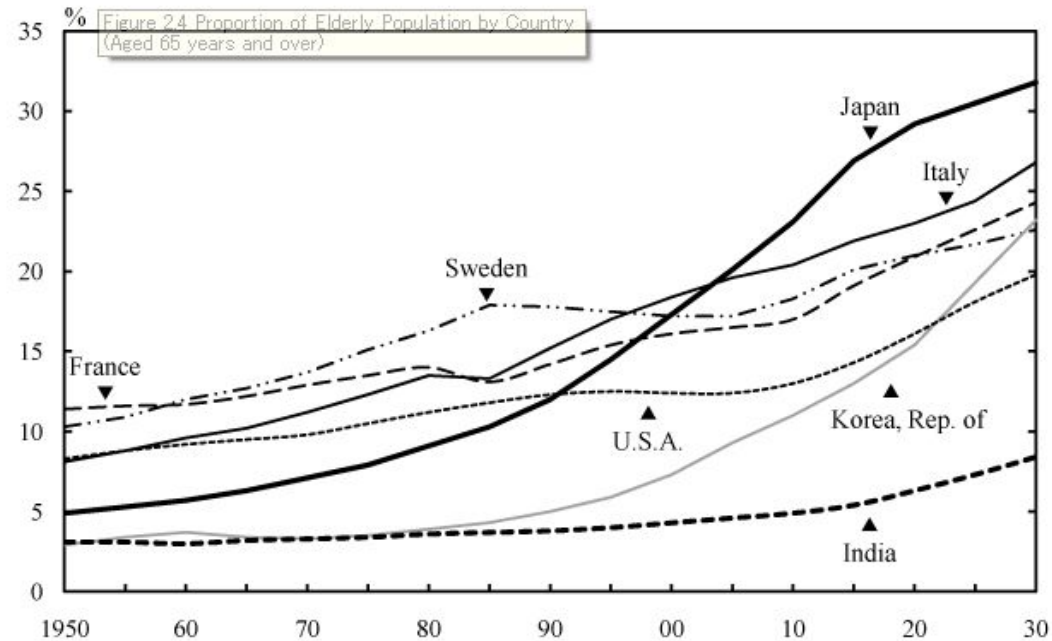
In June 2006, the **Diet** (Japanese Congress) passed a comprehensive package of reform to make the delivery system more efficient. First, the **average length of stay in hospitals** is to be **decreased**. To achieve this goal, the number of **long term care (LTC)** hospital beds will be reduced from the 2006 level of **380,000 to 150,000** by the end of fiscal year **2011** and converted to LTC Insurance facility beds and assisted living [Leflar, 2005].



Need to have a system that participate to provide medical doctor with a support

helping physicians to manage the diagnosis procedure using the same knowledge that physicians have by copying (mimic) his/her style, mentality, diagnosis routines and medicine recipes.

Proportion of Elderly Population by Country (Aged 65 years and over)



Source: Statistics Bureau, MIC; Ministry of Health, Labour and Welfare; United Nations.

It is not replacing the physicians

The system helped as well to mental health solution and mobile technology.

The number of *Taiwan's* 65 plus residents had risen to account for 10.7% of the total *population* by the end of 2010 (estimated as 19.1% 2030)

- Top three challenge health
 - Trained resource
 - Regional healthcare balance
 - Health care cost
-
- Opportunities: medical tourism, day care surgery, specialty hospitals, private medical insurance, and health IT
 - Health care to be double to 68.4RM in 2018.
-
- Asia Pacific Health Market: RM 1.14 Trillions, in 2012
 - To become RM2.32 Trillions 2018.

<http://www.bloomberg.com/news/2012-09-13/aging-baby-boomers-face-losing-care-as-filipinos-go-home.html>

Why should we use Cloud Robotics ???

- offloads the heavy computing tasks to the cloud
- Lower the barrier to entry for robotics
- Scalable CPU, memory, and storage
- shared knowledge database
- hardware upgrades are invisible & hassle-free



5,000,000 SERVICE ROBOTS



10,000 DEFENSE ROBOTS



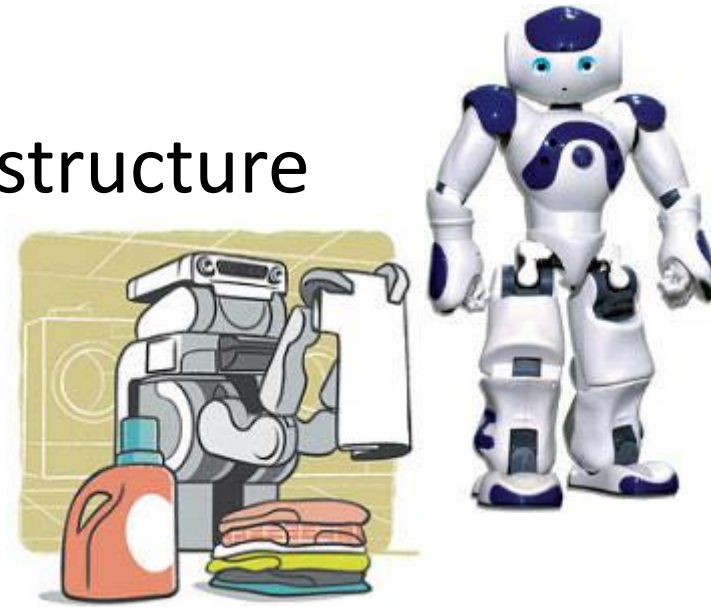
2,000 SURGICAL ROBOTS

Needs Improvisation

- Cloud Robotics is still taking baby steps, so will have to wait for the platforms to develop.
- cloud-based applications can get slow or simply become unavailable leaving the robot “Brainless”.
- Tasks that involve real-time execution require onboard processing.

Implementations till now..

- RoboEarth - to develop a “World Wide Web for robots”
- ASORO’s Cloud Computing Infrastructure
- Google’s initiative with Android
- Nao Humanoid Robots
- Google’s street View Robot
- DAViCi framework
- Project Phondox
- Turtlebot from google

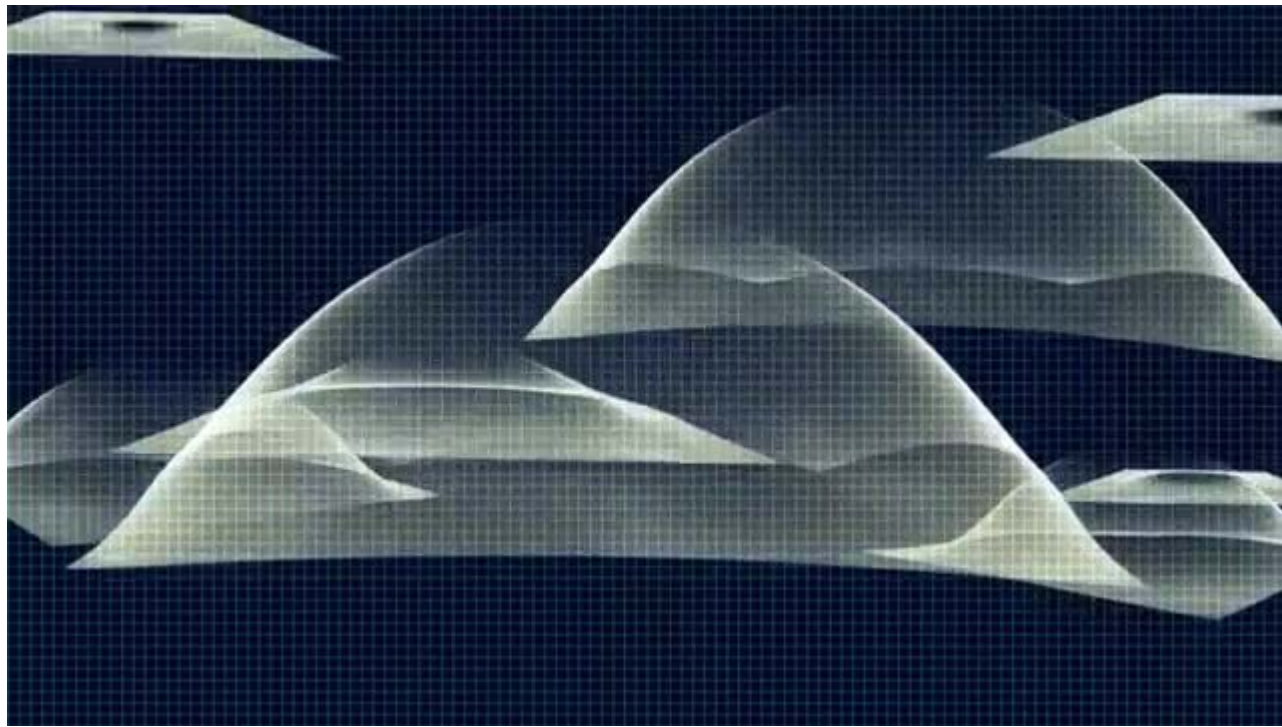
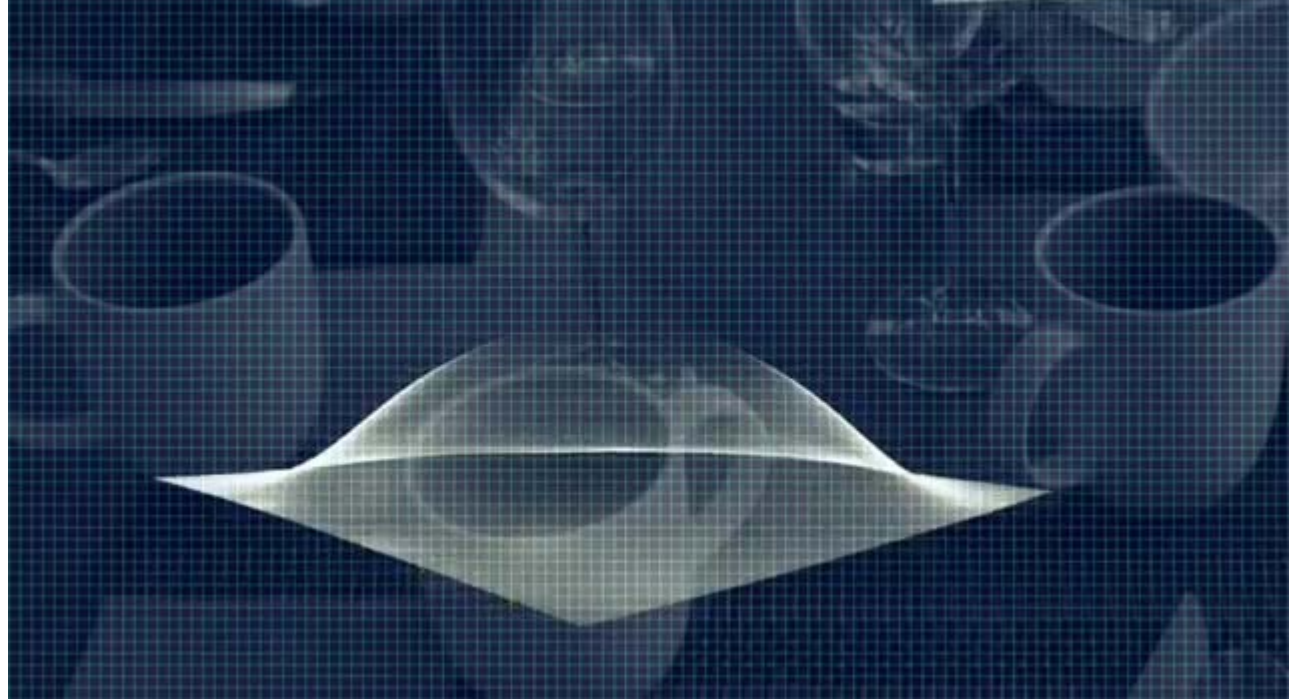


FIVE ELEMENTS:

1. BIG DATA







Believe Space

Probabilistic
based model

Big Data technology =>create user profiles, monitor **social behavior**, provide decision support based on **social trends** or discover **new service** providing opportunities.

The objective of this workshop is to highlight new research directions in providing **services granules** represented in **Cloud Semantics** based on **IoP (internet of People) preferences**.

“Raymond” Ray Kurzweil



Photo-Illustration by Phillip Toledano for TIME

[The Age of Intelligent Machines](#) 1983 *Computer knowledge in Chess game*

[The Age of Spiritual Machines](#) 1999 *internet predictions, etc.*

Recently subjective criteria is being studied by several research;
-It is mostly related in having experts provide opinion on the criteria

In granular computing like those concepts given by Y. Yao,
zooming in (decomposition refinement)
and zooming out (deleting and combining attributes)
However, doing this need more subjective understanding on these attributes.

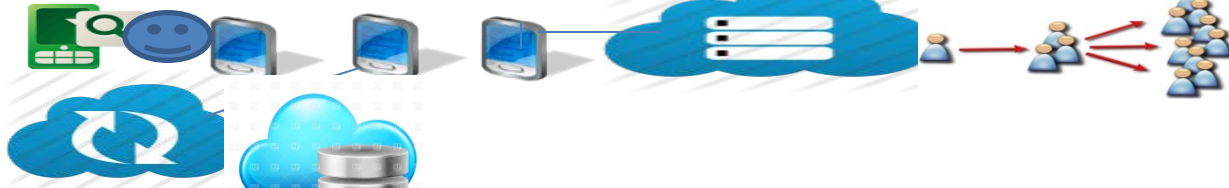
Simple cases for three ways Decision Making

It is a sort of probability RS in relation (α , β)
The main difference is RS and PRS is in the uncertainty is doing upper and
Lower approximations.

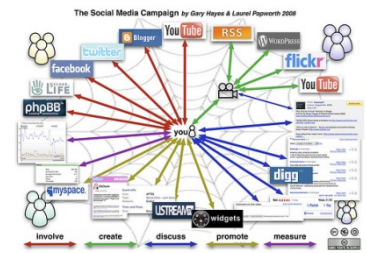
Title: Knowledge-Base Granules of Decision Support Systems Infra Service Provider based on

Acquisition from Big data

The internet, twitter, Instagram



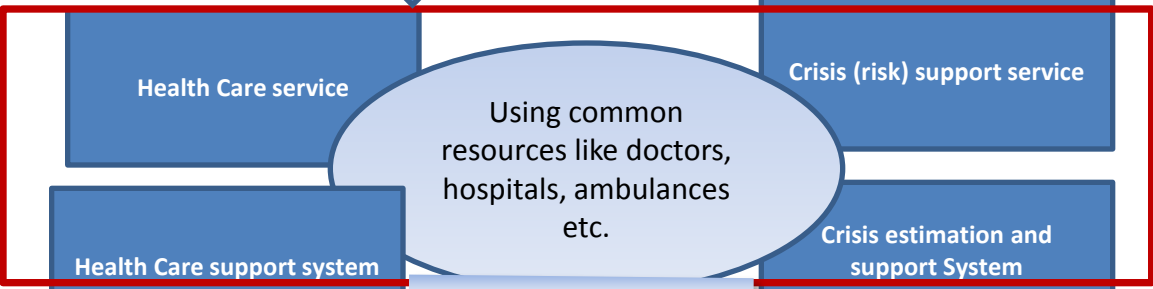
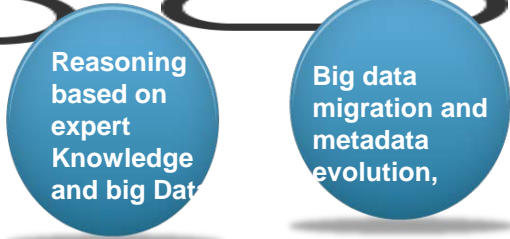
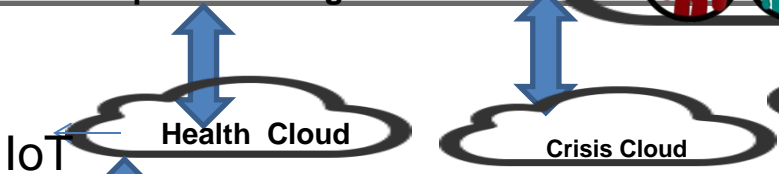
information filtering and System fusion,



Face_book,
 Friend_of_Friend (FoF) Ontology,
 Trust based on Word_of_Mouth (WoM) (negative and Positive)
 Sentimental analysis and opinion mining IoP

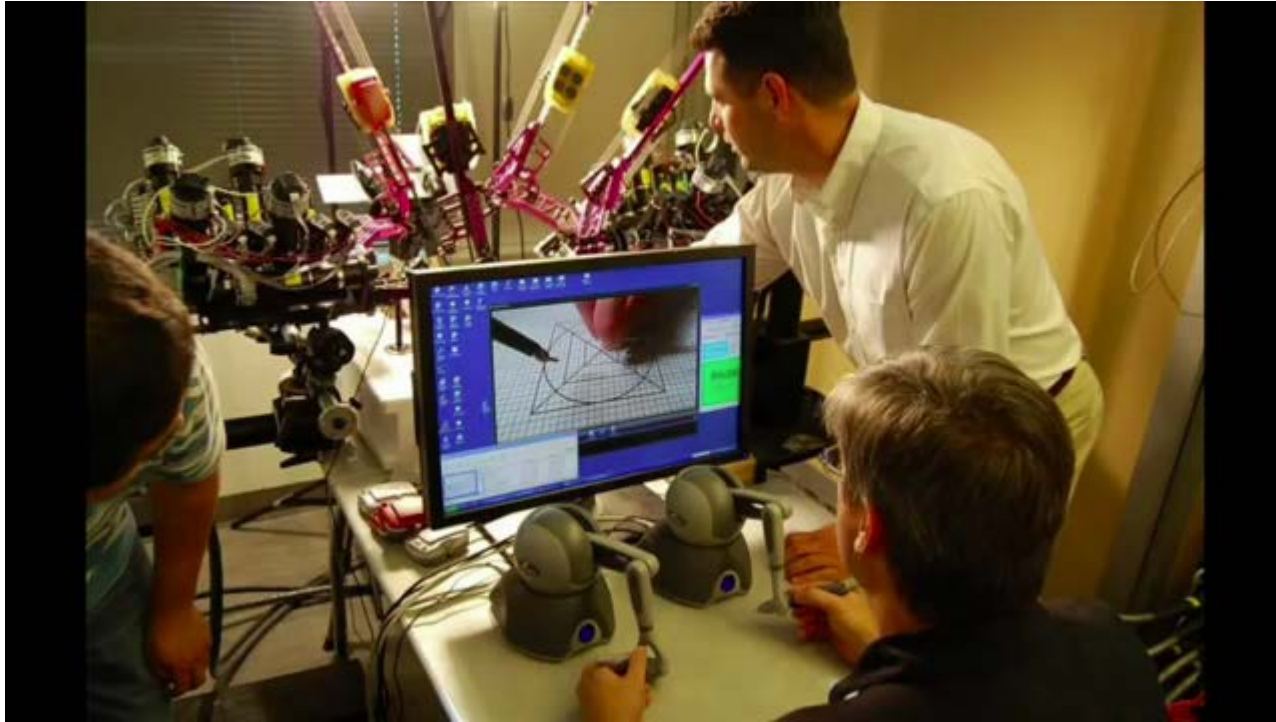


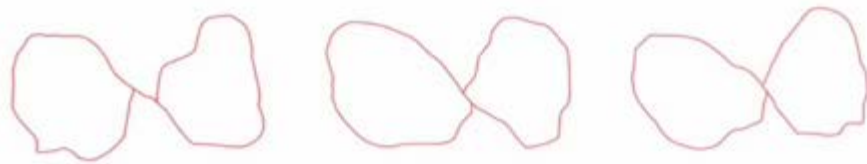
To make the cloud



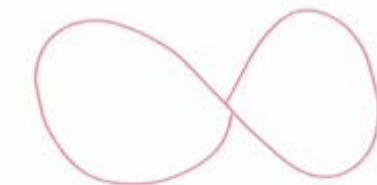
<p>Advancing active and healthy ageing Early risk detection Knowledge health data improving diagnosis EHealth Interoperability VDS+ (Advanced VDS!!)</p>	<p>Shared Resources and logistics used in health care and risk support: Digital Laboratory and health data</p>	<p>Crisis prediction system Digital privacy Early warning system</p>
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!!VDS is a system developed by Japan Unit (supported by SCOPE project) and extended by the Italian group.

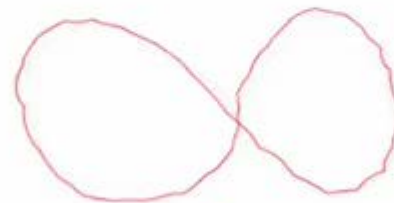




Human Demonstrations



Inferred Task Trajectory

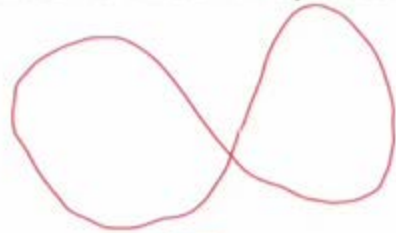


1x

Robot Demonstrations Using Iterative Speed-up

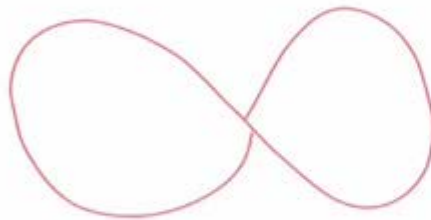


Inferred Task Trajectory



7x

Robot Demonstrations Using Iterative Speed-up



Inferred Task Trajectory



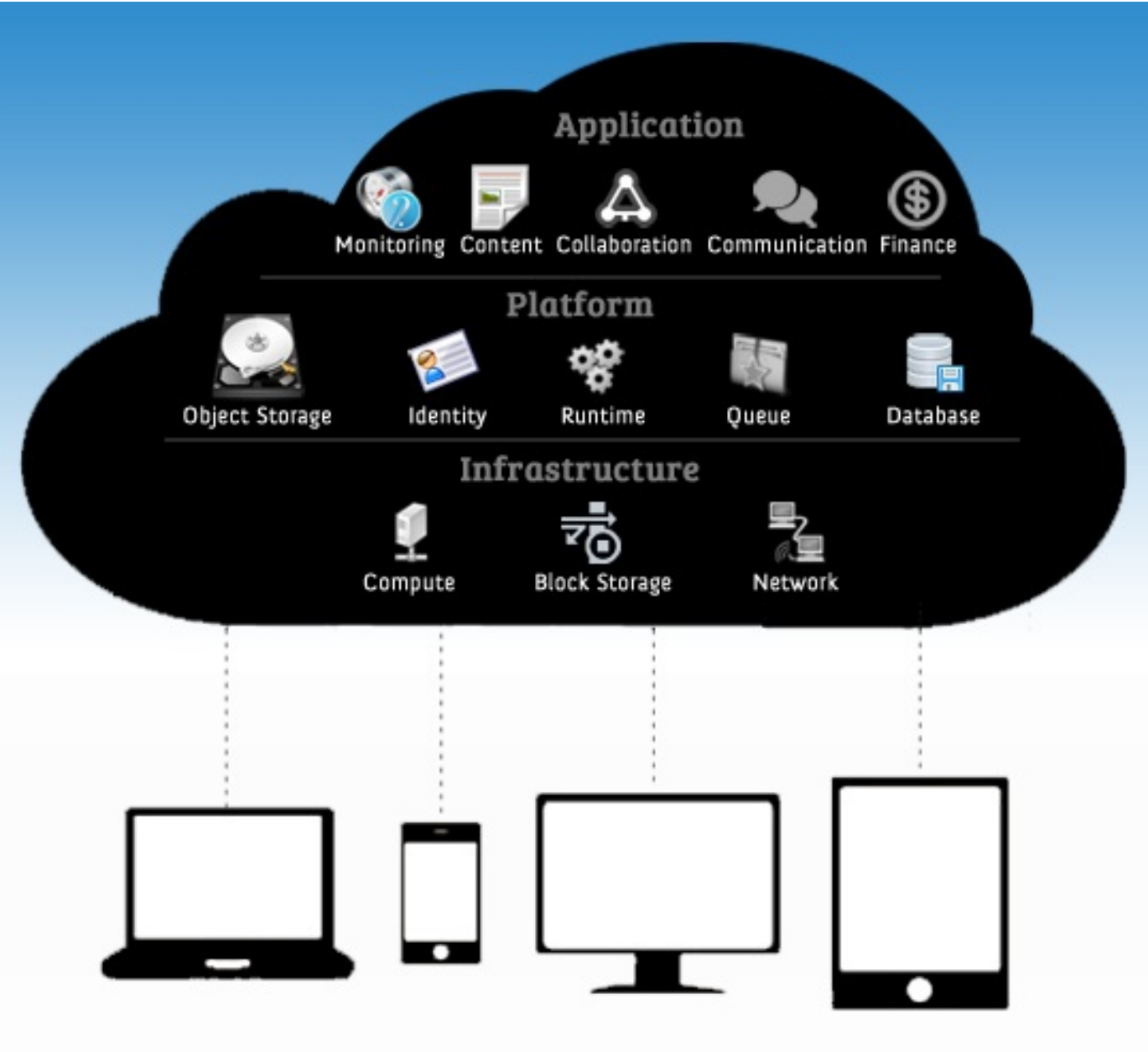
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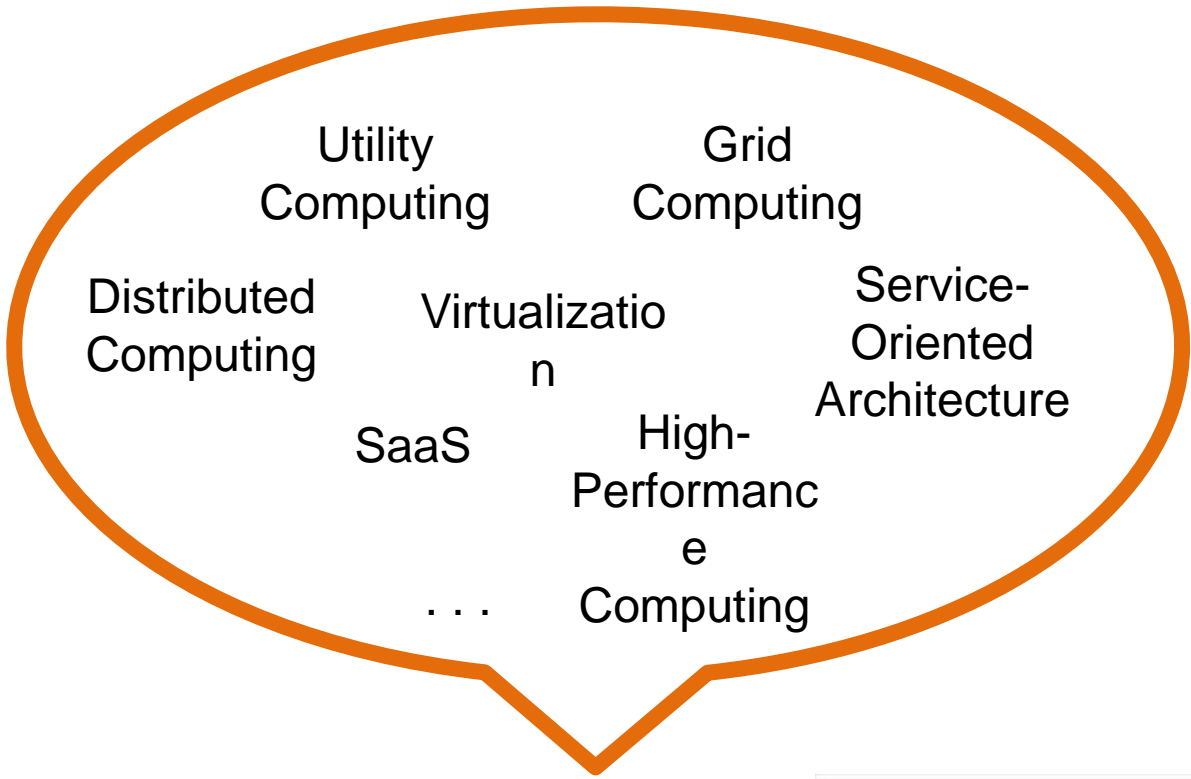




1. BIG DATA
2. CLOUD COMPUTING
- 3.







CLOUD COMPUTING



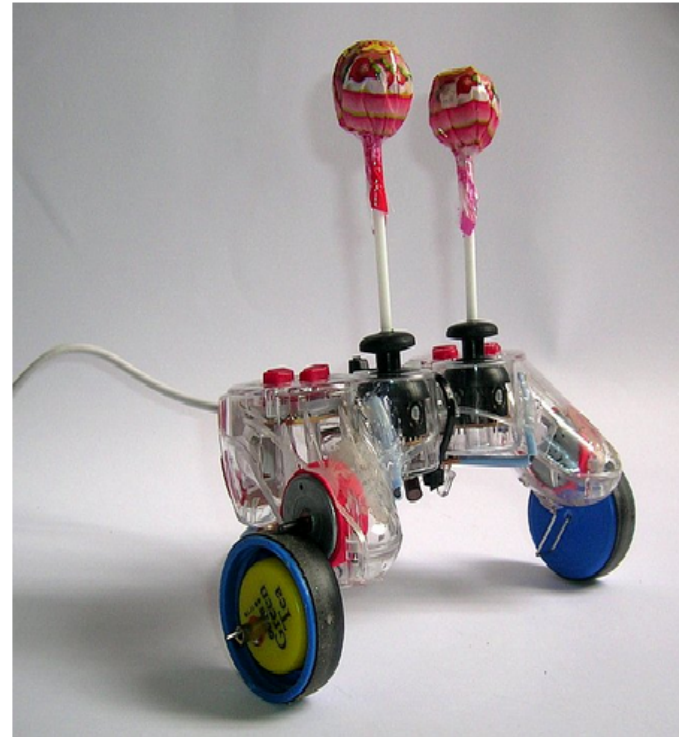
1. BIG DATA
2. CLOUD COMPUTING
3. OPEN-SOURCE
- 4.

Winners of \$10 Robot Challenge Announced

By Erico Guizzo

Posted 1 Oct 2012 | 2:03 GMT

[Share](#) | [Email](#) | [Print](#)



The Suckerbot, one of the winners.

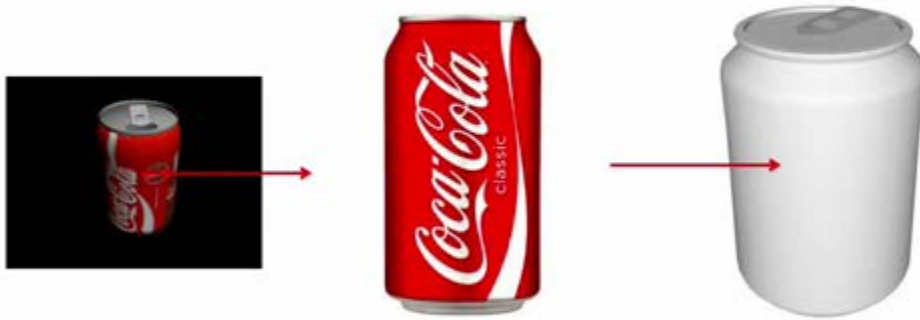
The [African Robotics Network \(AFRON\)](#) announced today at Maker Faire in New York the winners of its 10 Dollar Robot Design Challenge.

[AFRON](#) is a group of roboticists who want to mobilize institutions and individuals working on robotics-related areas to improve communication and

1. BIG DATA
2. CLOUD COMPUTING
3. OPEN-SOURCE
4. ROBOT LEARNING
- 5.



Google goggles



CLOUD ROBOTICS



1. BIG DATA: IMAGES, MAPS, MODELS
2. CLOUD COMP.: EC2 FOR STATISTICAL LEARNING
3. OPEN-SOURCE: HUMANS SHARING CODE, DESIGNS
4. ROBOT LEARNING: ROBOTS SHARING CODE, DATA
5. CALL CENTERS: ON-DEMAND HUMAN GUIDANCE

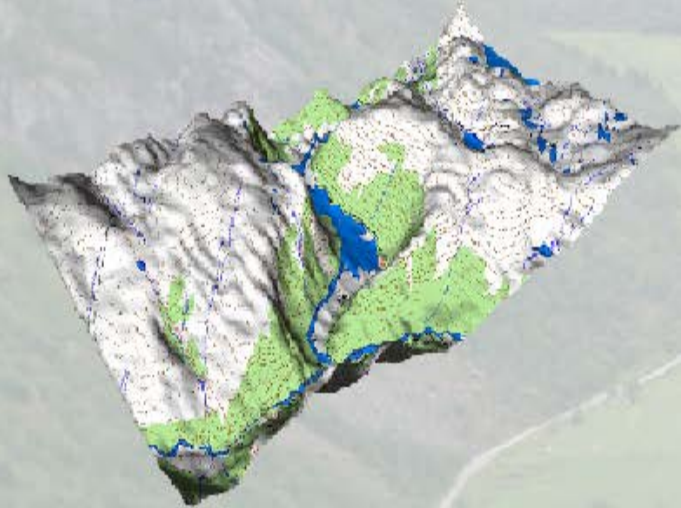
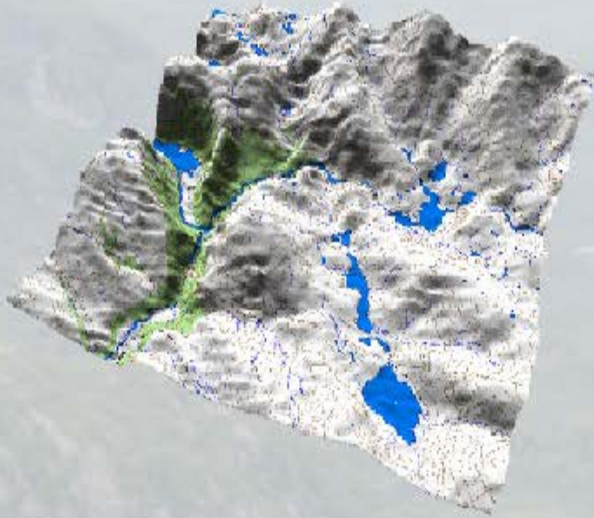


Probably the program injected does not fit for you but fits for her

Back!

More Trefall 3D map (further down this page some Elk meadows in 3D model).
Click these pictures to make it bigger.

Copyright © karrobbestall.com . W 12/10





MANILA (Thomson Reuters Foundation) - Devastating floods and heavy rains across the country have prompted the Philippine government to begin producing 3D flood hazard maps to help make better planning decisions about flood risks. (2013, 25th Sept)

HEALTHCARE

RADIATION THERAPY

“SUPERHUMAN” SURGERY

Medical Robotics



Needle Steering



Haptics for Robot-Assisted Surgery



Neuromechanics and Rehabilitation





CREGG Medical

MEDICAL EQUIPMENT SOLUTIONS FOR YOU

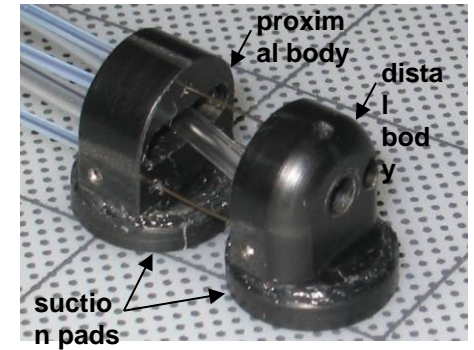


MACH4

PHARMA SYSTEMS

Vision for Medical Robotics

- Blur the boundary between specialist and surgeon
- Shorter length procedures
- Enable New Procedures
 - Natural orifice
 - single port access
- Robotic tools, not robotic surgeon



Ecomat – Fixed Footprint Robot for Community Pharmacy with Some Hospital Use too



Length 6m

Width/Depth - Community Pharmacy 1.31m

Width/Depth - Hospital Pharmacy 1.61m

Height 2.75m

- Where space is at a premium
- For small to medium Pharmacies
- No conveyor required



Storage - up to 10,000 packs

Stocking Rate - up to 150 packs per hour using
unique Fill-In-Door

Dispensing Rate - up to 300 packs per hour

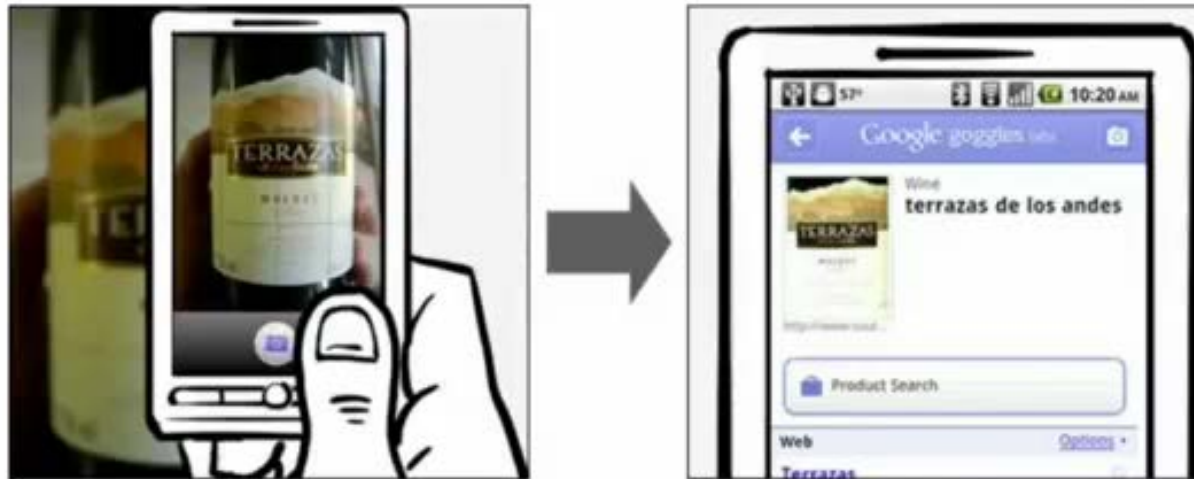
Product reading/identification

Photoscanner

Barcodes Reader – Barcode and 2D Data

Matrix type GSI smart code





Google Goggles is an image recognition mobile app developed by Google.

It is used for searches based on pictures taken by handheld devices. For example, taking a picture of a famous landmark searches for information about it, or

taking a picture of a product's barcode



searches for information on the product.



Future of medical health

Intelligent medicines

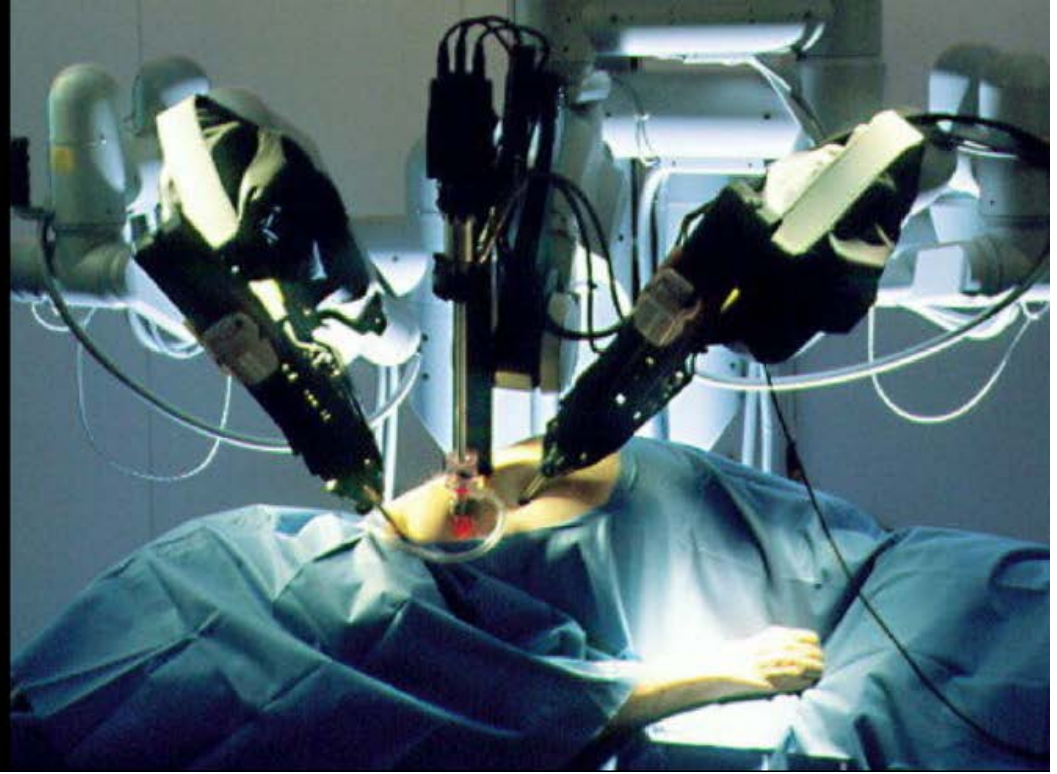
Personalised healthcare

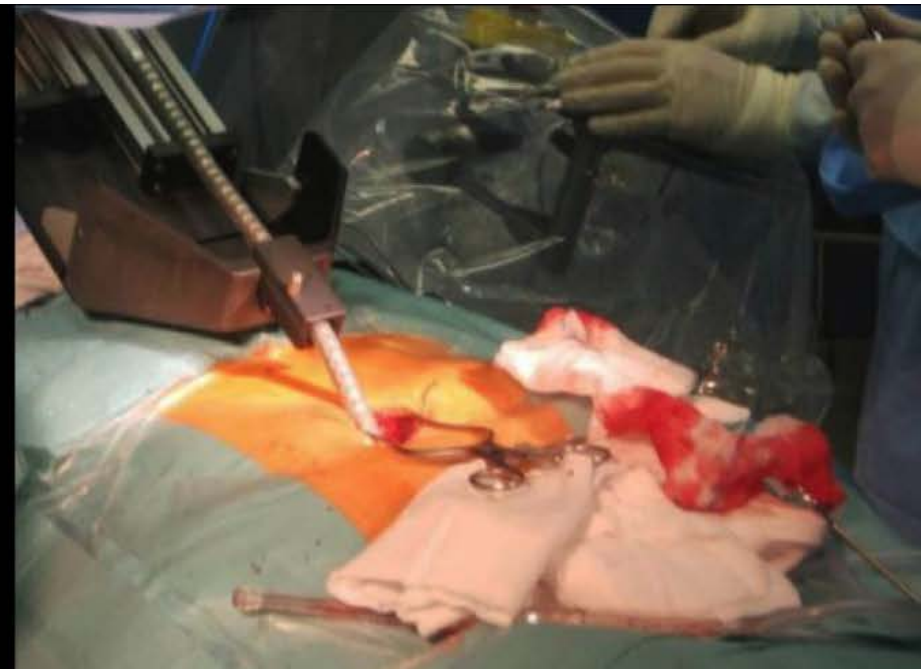
Regenerative medicine

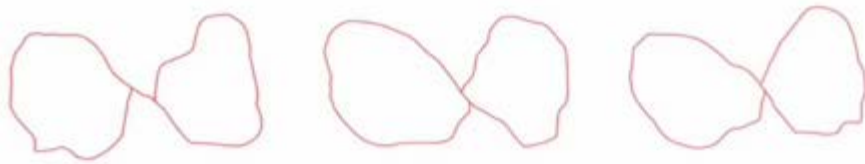
Gene and Oligo-based therapy

Drug delivery systems

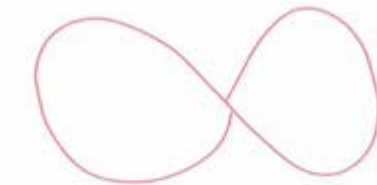
Global marketplace



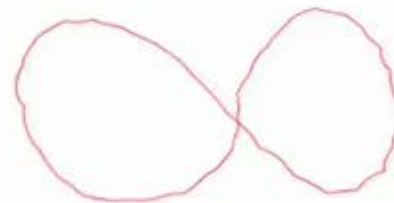




Human Demonstrations



Inferred Task Trajectory

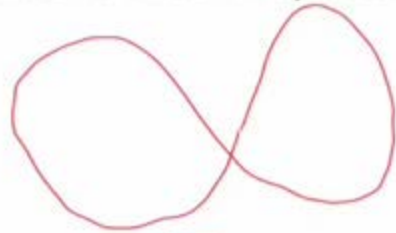


1x

Robot Demonstrations Using Iterative Speed-up

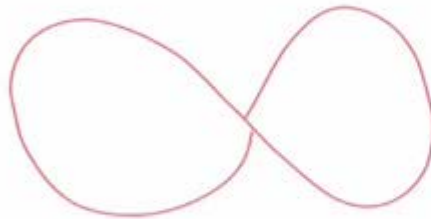


Inferred Task Trajectory



7x

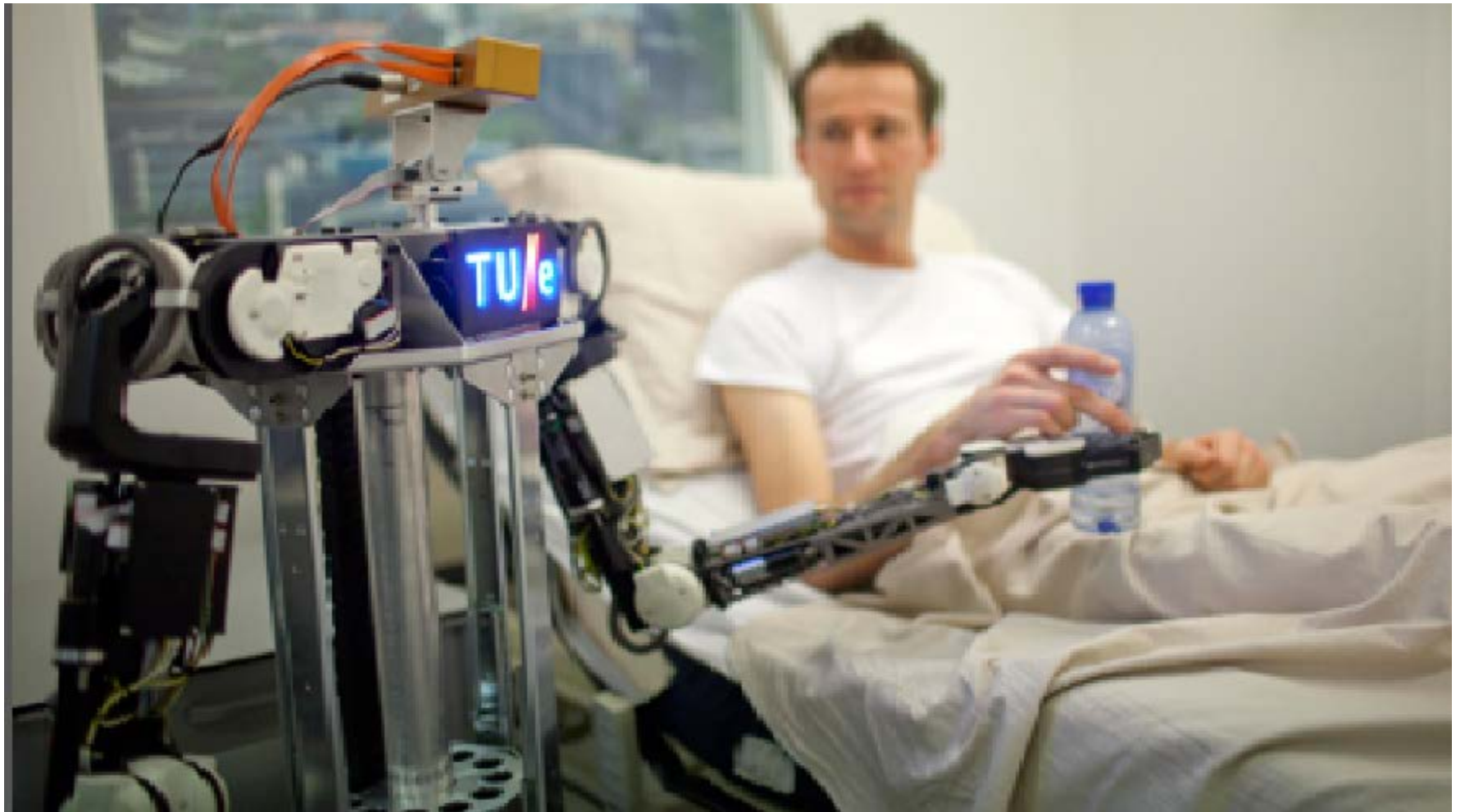
Robot Demonstrations Using Iterative Speed-up



Inferred Task Trajectory



10x



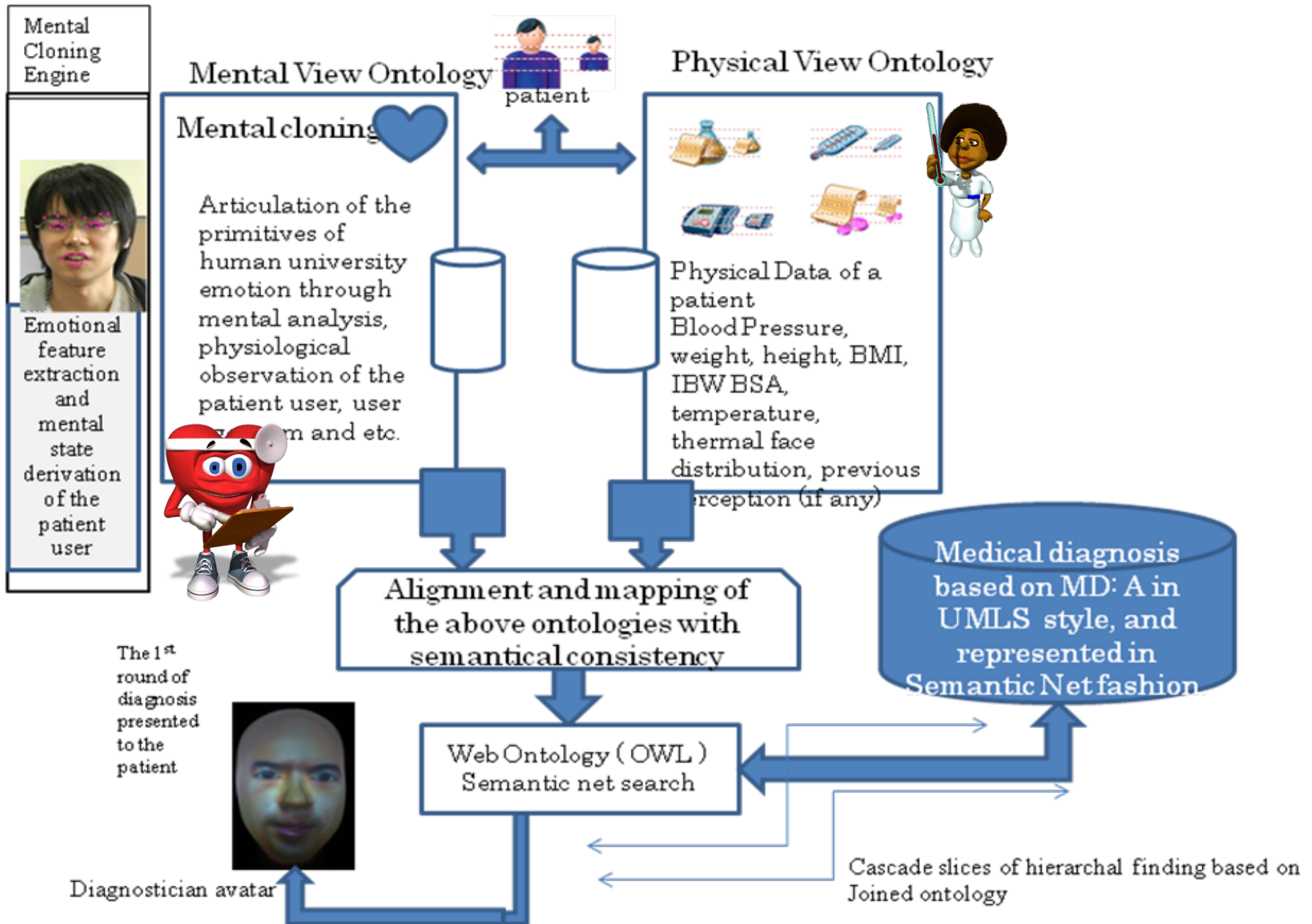
WHAT IF ROBOTS HAD
UNLIMITED MEMORY
AND COMPUTATION?

Fujita's system for Elderly drivers support system



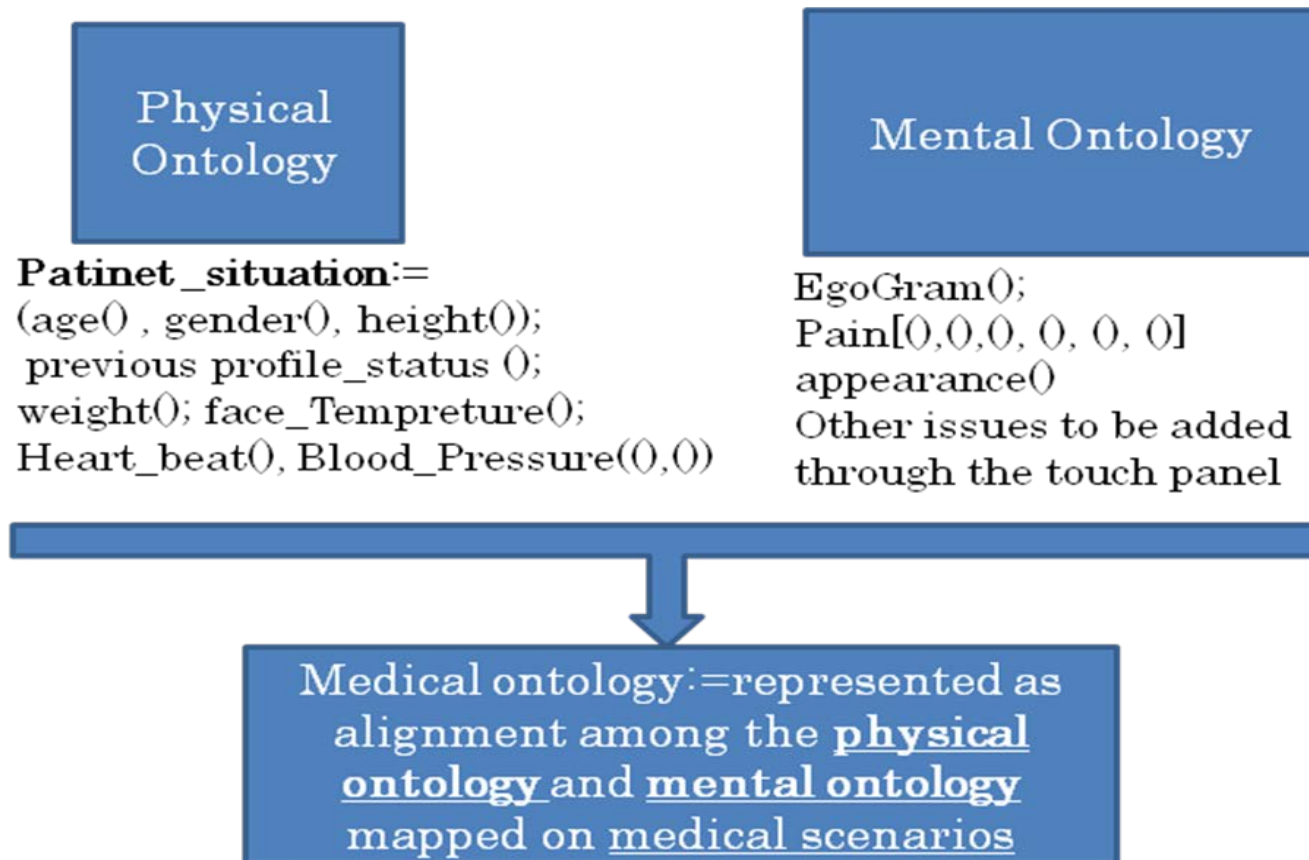
Fig. 2: Drive simulation measuring subjective driver profiles

Virtual doctor System implemented by Fujita's Research Group

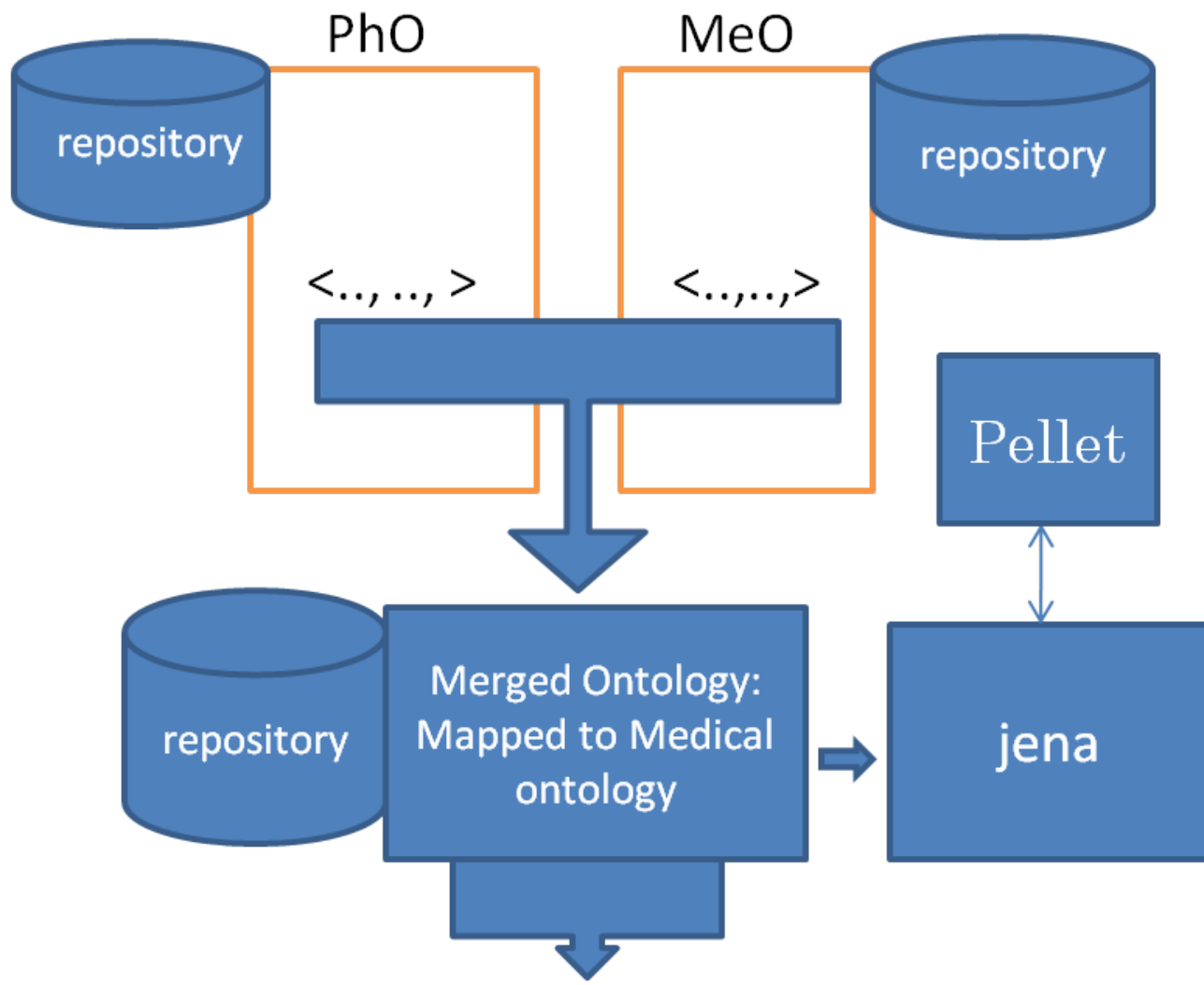


- Mental cloning of the MD is presented. The articulation of the mental cloning in abstract form would be used to factorize the mental view articulated with knowledge token extracted from the mapping of the patient mental view and physical view.
- This work is been experimented for evaluation purposes.

We have built a technology to situation the user mental states based on Transactional analysis.



the “alignment ontology” consists of axioms merging classes, individuals and properties. Uses Jena Ontology API



- Ontology, and alignment.
- related reasoning based on aligned views; MeO, PheO.
- select the best match of narrative scenarios that can be selected based on mental state of the user.

That is to have context issues be involved,

Context is used to assign interpretation to assertions and refine inquiries by the user.

Context is used in knowledge representation and reasoning.

We develop ontologies that collected from categorized classes diagnosis: that reflected from real medical practices; classified as: Simple_Class, non-Simple_class

Simple Class:= defined as medical diagnosis relative scenarios that do not lead to criticize

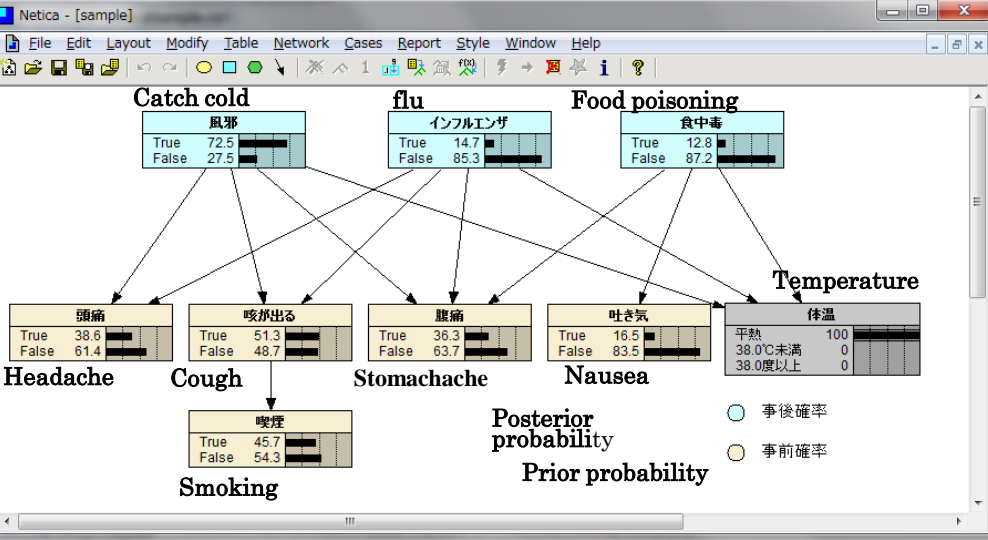
Patient routine life-style: These are modeled by rdfs, and owl.

Simple Case: Catch Cold: = reconciliation of two Super Class:
Physical, Super Class: Mental SuperClass

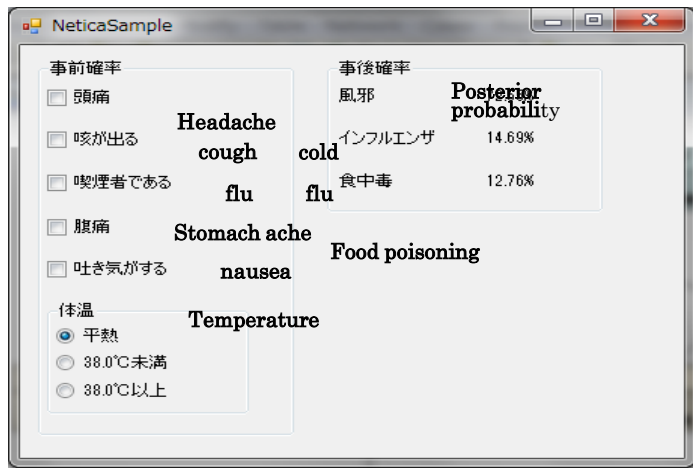
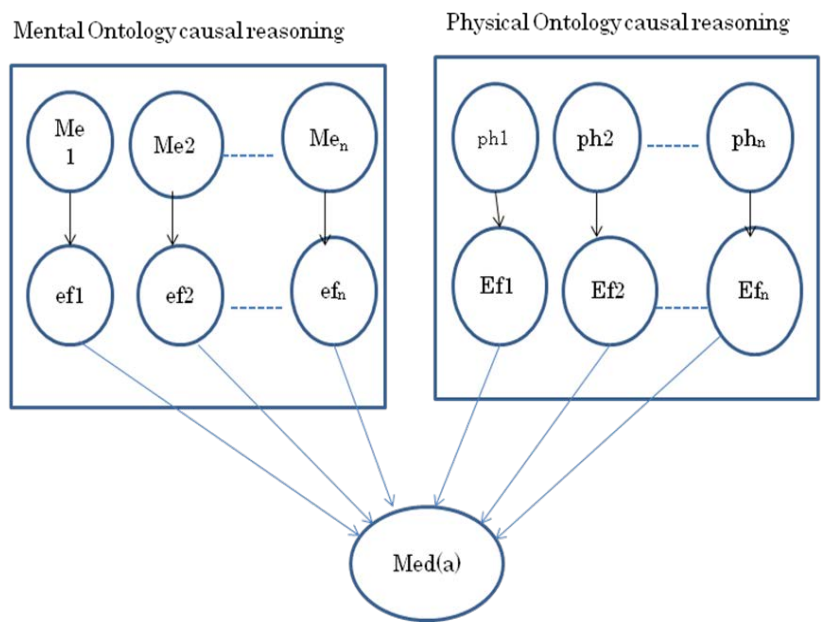
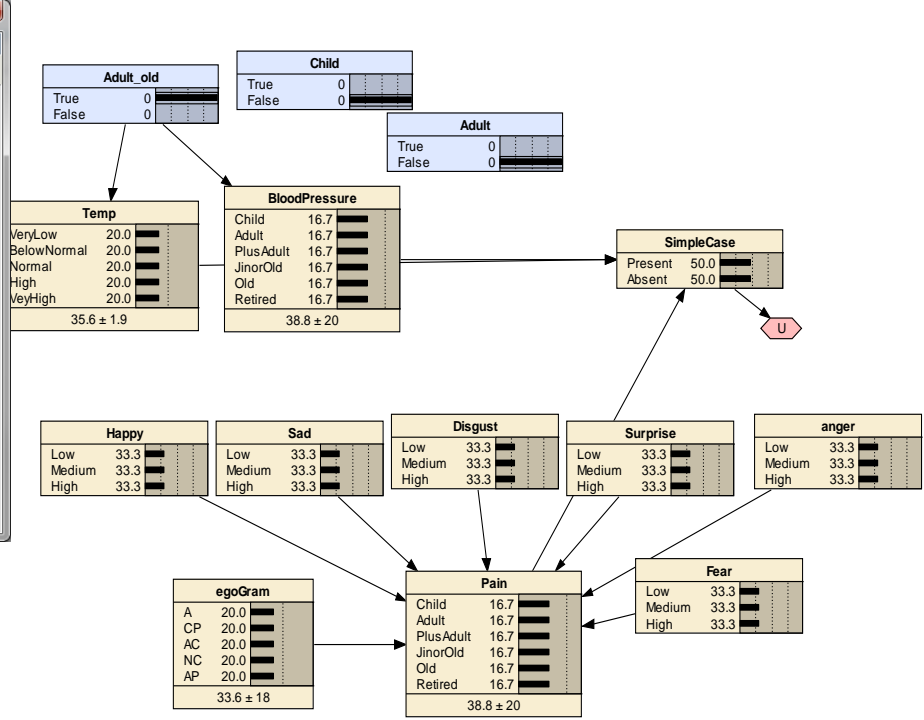
Eg: Simple cases analysis: Catch Cold: Physical Property: mild Type Fever, Mental Property: Tired:=(diguestState(50%), SadState(30%), depressedState(20%))

These states decision related values are fuzzy values and inferred from data set reflected to emotional recognition.

Computational intelligence related approach is by using correlation matrix, Specifying the alignment as positive and negative in relation to the medical knowledge articulated on threshold values submitted by medical doctors These threshold values are relative to nominated MD.



Applying netica in MD provided simple case



API application for the simple case

[打撲]

VDS

痛い場所はどこですか？

左肩

次へ

中止

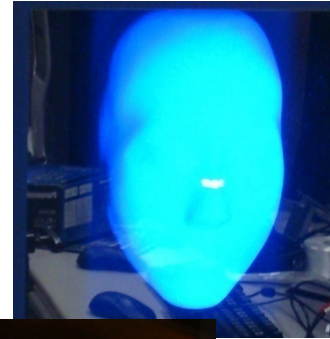
9

6

3

17

A touch panel that patient can specify pain location and value as high, Med, low







Iwatani
プロンアルミで
カサッとする
泡立て剤
CASHETTE FOR SHAVE-AL

The mask used to make screen





Attributes involving is decision making:

- Features points on the face and their articulation related to universal template
- Voices (pitch and power) values.
- Heart rate (heart rate sensor)
- Respiration rate (respiration rate sensor)
- Patient body orientation (directions)



[Microsoft's Kinect Camera](#)



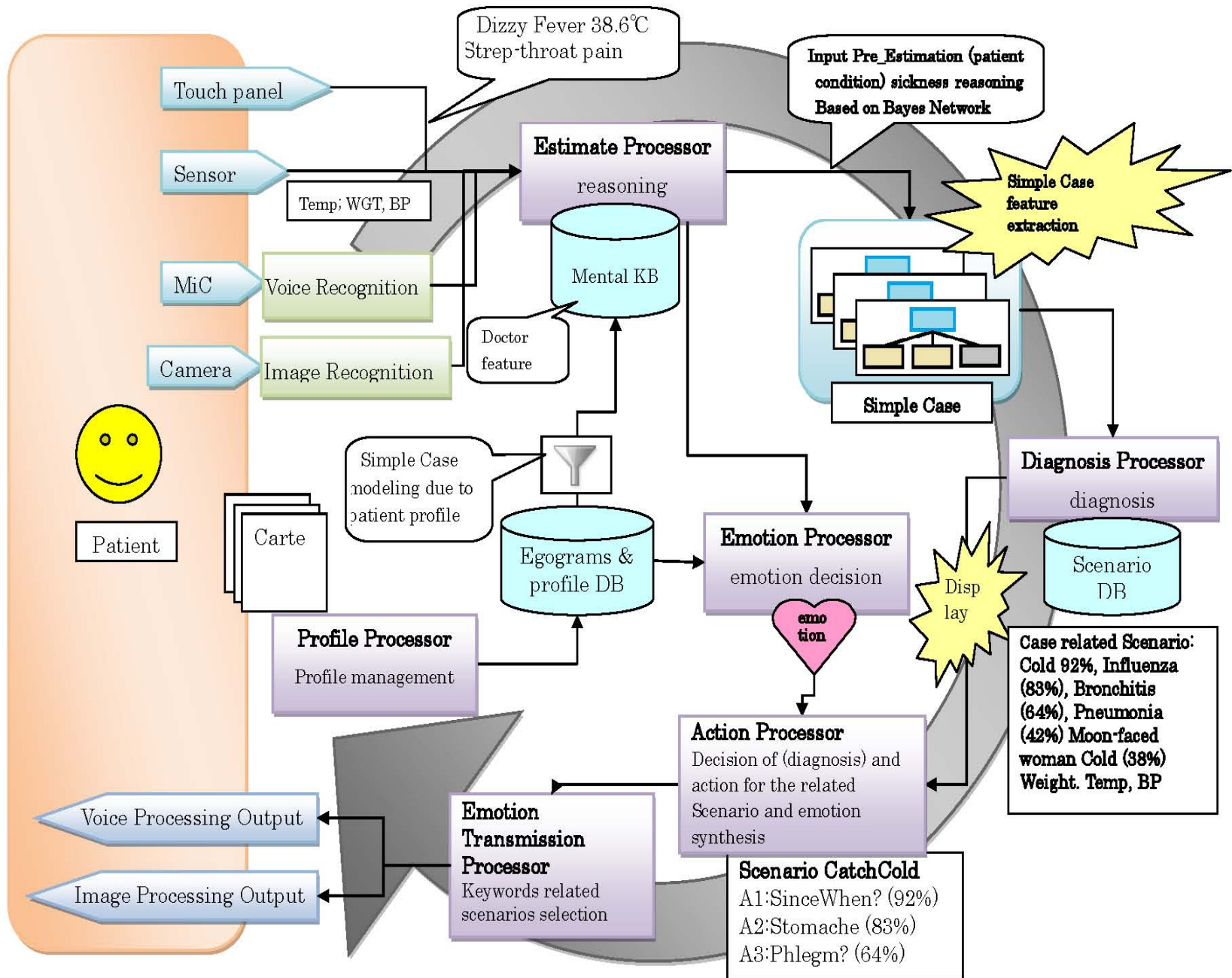
emotive
you think, therefore, you can

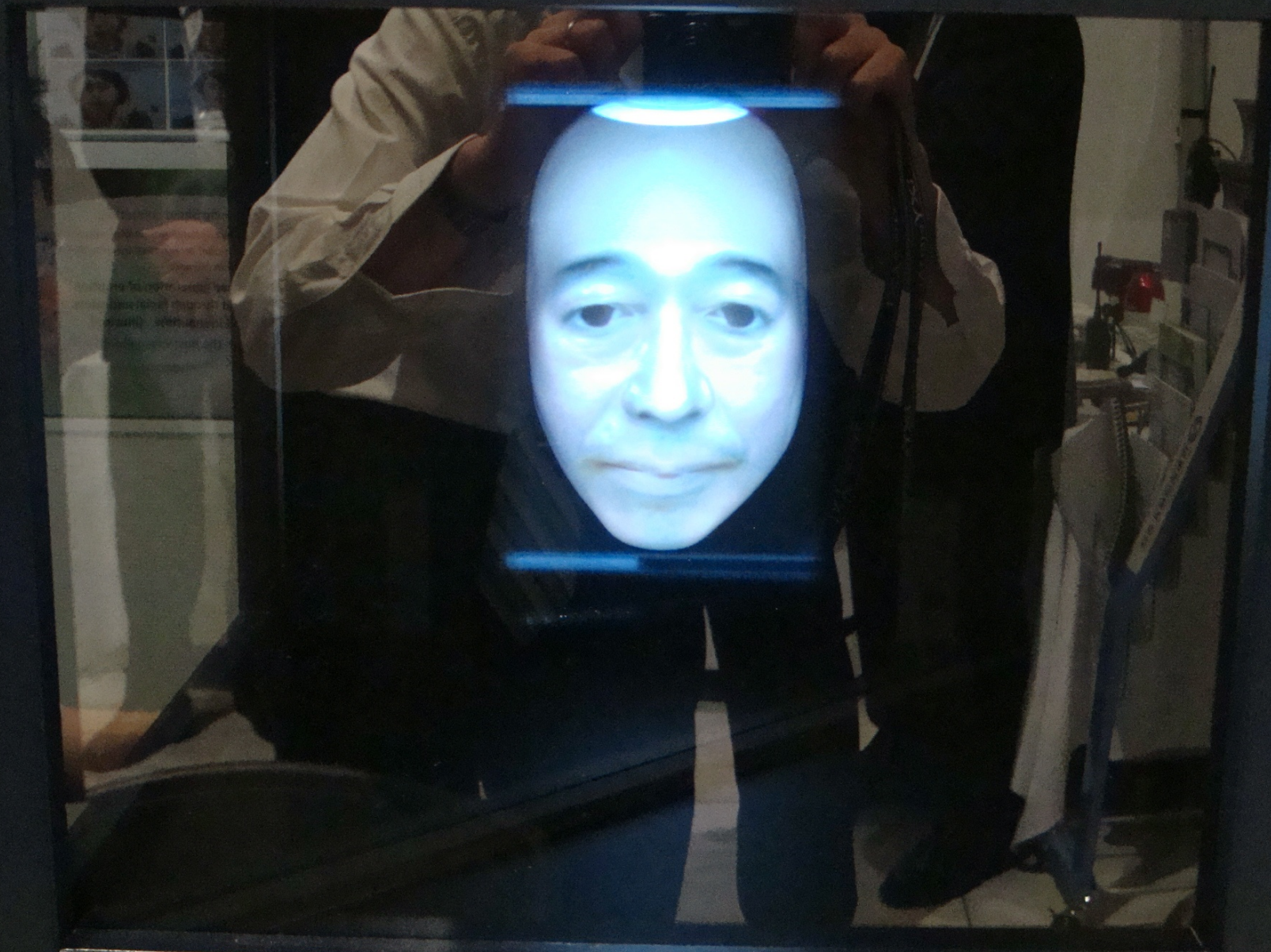


[EMOTIV: EEG-based Brain-Computer Interface](#)



[ENPATHIA HEAD MOUSE](#)

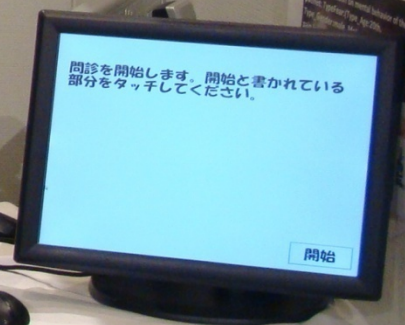
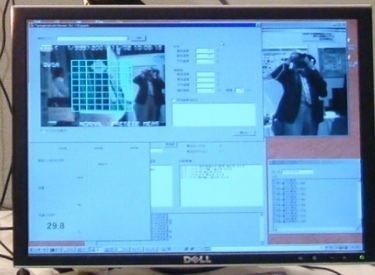




SCOPE

バーチャル・ドクター・システム研究開発

岩手県立大学ソフトウェア情報学部藤田研



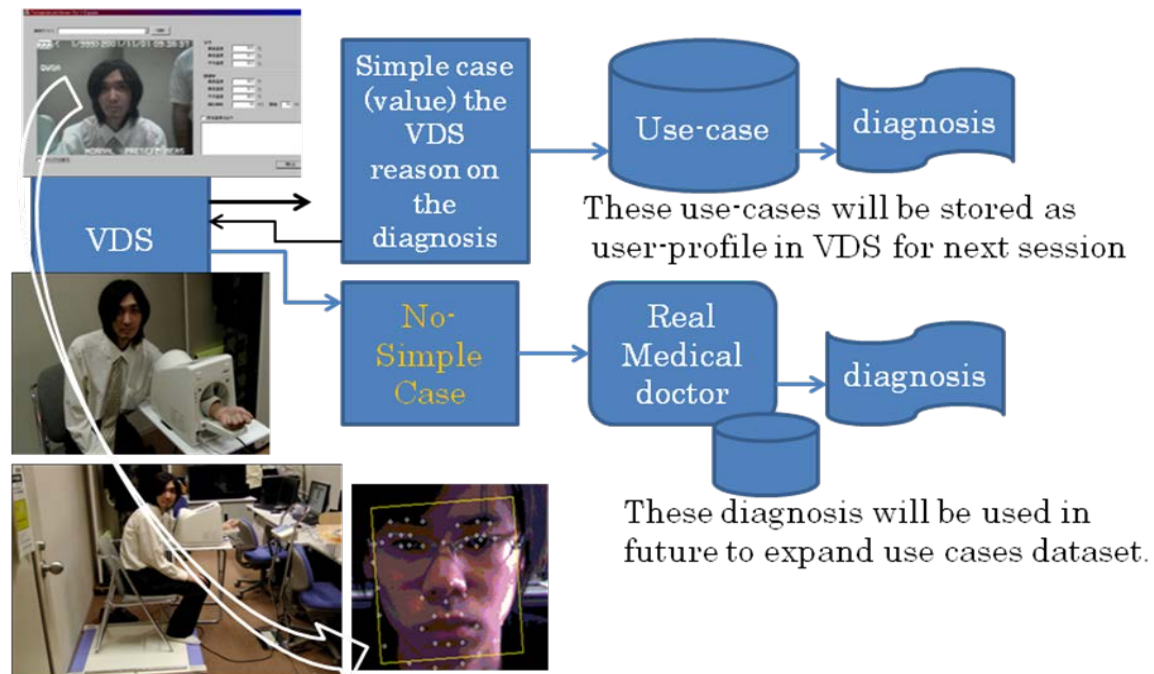
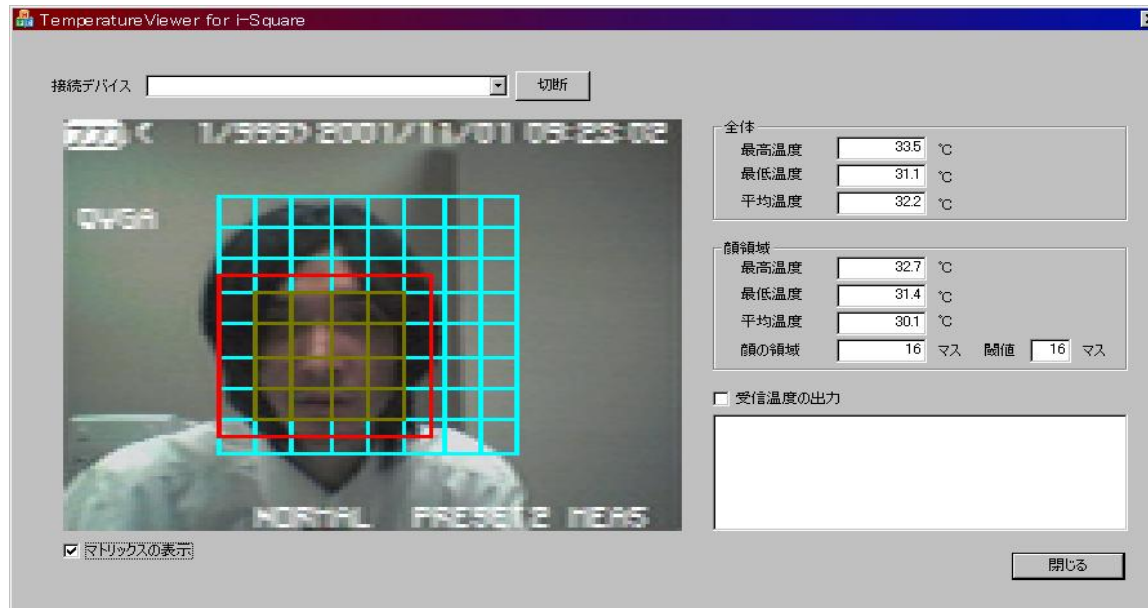


Figure 10: The physical ontology and VDS related simple case



Project Information
Project Name: [illegible]
Project Manager: [illegible]
Start Date: [illegible]
End Date: [illegible]
Status: [illegible]
Priority: [illegible]
Risk Level: [illegible]
Budget: [illegible]
Resources: [illegible]
Progress: [illegible]

お話を伺ったところ、今までの状況が
どうも、実際に発生していることが
明らかです。







Project Information
Project Name: [illegible]
Project ID: [illegible]
Project Manager: [illegible]
Project Status: [illegible]
Project Start Date: [illegible]
Project End Date: [illegible]
Project Budget: [illegible]
Project Risk: [illegible]

お話を伺ったところ、今までの状況が
どうも、実際に発生していることが
明らかです。



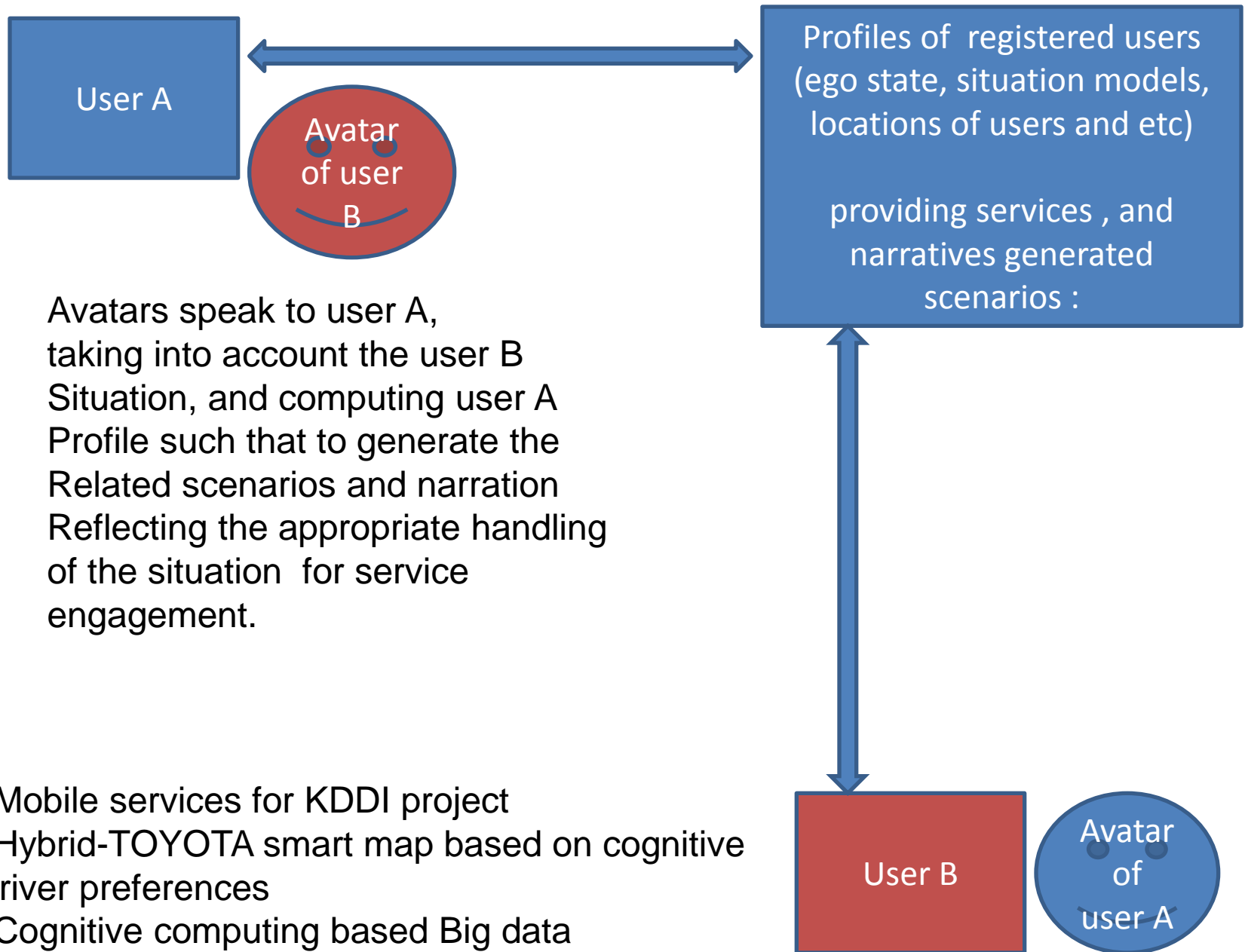
```
{Stereotype_Voice(pitch, power), Stereotype_ (Face(happy, sad,..), situation (gender(Boolean), temperature(integer), blood pressure(integer,integer), BMI(integer)))}.
```

The Face(...) class definition would participate to reason for example to the type of headache

The pain type is; Pain (burning, steady, sharp) can be collected from the articulation of the six primitives of face emotion.

However, particular expressions to painful stimulation occurred with regularity and that the durations of these expressions changed differentially with age

These two different ontology stereotypes information represent the mental cloning of the user for reasoning purpose.



Avatars speak to user A, taking into account the user B Situation, and computing user A Profile such that to generate the Related scenarios and narration Reflecting the appropriate handling of the situation for service engagement.

- *Mobile services for KDDI project
- *Hybrid-TOYOTA smart map based on cognitive driver preferences
- *Cognitive computing based Big data Acquisition System

Conclusion

Impact of Subjective Intelligence on providing **fitness** and **appropriateness** justification to users habits, mental stated and other criteria that collectively rank the objective criteria in flexible manner based on preferences.

For example in medial:

Diagnosis are modeled based on the two type of ontology presented
The selection is due to necessity to merge ontologies, and built association rules differentiated among the mental view and physical view.

This would make interoperability, that to execute medical diagnosis based on open world reasoning: (Things that are not defined does not mean that are not exists).

The system and user is based on physical and mental interaction.

The system is at the implementation stage, and to be installed in a hospital in the city.

-Big Data, social , aged driving system

Thank you for your participation and attention

- Questions comments are welcome
- If not then we may chat at coffee breaks or else. Email: Hfujita-799@acm.org