Service Design through Intercultural Collaboration

from fifteen years of experience

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Intercultural Collaboration Experiment 2002
Develop open source software using machine translation

Japan Team
Ice2002 Organizers
Translation Checker
Korea Team
China Team
Malaysia Team
Talk Outline

1. Service Design as Human-Aware AI
2. Our Research on Service Design
   • The Language Grid
   • Agricultural Consulting Services in Vietnam
3. Lessons Learned and Discussions

Service Design

• Service design is a form of conceptual design that involves the activity of planning and organizing people, infrastructure, communication and material components of a service in order to improve its quality and the interaction between the service provider and its customers.

• If a successful method of service design is employed, the service will be user-friendly and relevant to the customers, while being sustainable and competitive for the service provider.
Wicked Problem in Design

Wicked problem is a phrase originally used in social planning to describe a problem that is difficult or impossible to solve because of incomplete, contradictory, and changing requirements that are often difficult to recognize.

Because of complex interdependencies, the effort to solve one aspect of a wicked problem may reveal or create other problems.

Wikipedia
Frame Problem in AI

The frame problem is the challenge of representing the effects of action in logic without having to represent explicitly a large number of intuitively obvious non-effects.

Is it possible, in principle, to limit the scope of the reasoning required to derive the consequences of an action?

Stanford Encyclopedia of Philosophy

Design Process as Problem Solving

- In design processes, problems are not independent, they are related to each other.
- Because of unknown factors in the design process, solutions are always tentative.
  - Design processes (problem solving) should be continued.
  - Design teams (problem solving organizations) should guarantee contentious commitment to the problem field.
Intercultural Collaboration

• Participants in the same problem field with different cultures and languages work together towards shared goals.
• Field here is defined as a spatio-temporal area that is hard to be governed by any analytical and/or engineering approach due to various individuals and entities being co-existent, which causes unexpected happening of accidental events thus necessitating our continuing commitment and caring (Osamu Katai).
• Since the research target emphasizes collaboration rather than communication, we can clearly identify research objectives; goal-directed group activities can be evaluated both qualitatively and quantitatively.

Language Services Infrastructure

Fragmentation and recombination is the key to creating customized language environments for different types of user activities.

The Language Grid

German Research Center for Artificial Intelligence
National Research Council, Italy
Kookmin University
Stuttgart University
Chinese Academy of Sciences
NECTEC
University of Indonesia
Kokkinn University
NICT
Kyoto University
NTT Research Labs
Asian Disaster Reduction Center
Princeton University
Google, Inc.
In the case of disaster, people should be evacuated to a school nearby their house.

Disaster shelter is school close from a house.

Your disaster shelter is the school closest to your house.

Participants and Services

**Participants (22 countries, 170 groups)**

- University/Research Institute
  - Kyoto Univ. (Japan), Univ. of Indonesia, ITB (Indonesia), Shanghai Jiao Tong Univ. (China), Univ. of Stuttgart (Germany), IT Univ. of Copenhagen (Denmark), Princeton Univ. (U.S), DFKI (Germany), CNR (Italy), Chinese Academy of Sciences (China), NECTEC (Thailand), and more.
- NPO/NGO/Public Sector
  - NGOs for disaster reduction and intercultural activities, Junior-high schools, City Boards of Education, and more.
- Corporate (CSR activities/language resource providers)
  - NTT, Toshiba, Oki, Google, Kodensha, Translution, and more.

**Language Services (225 services)**

- Machine Translator
  - J-Server (ja/en/ko/zh), Web-Transer (ja/en/ko/zh/fr/de/it/es), Toshiba (en/zh), Parsit (en>th), Google Translate (51 languages), and more.
- Bilingual Dictionary, Concept Dictionary
  - EDR, Wordnet, Life Science Dictionary, Multi-language Glossary on Natural Disasters, and more.
- Parallel Text
- Morphological Analyzer, Dependency Parser
Language Grid Server Software

The software is a general distributed cloud service platform and not depending on language services at all!

Available at SourceForge and GitHub.

Language Grid Operation Centers

Share 225 language services among Language Grid Operators

EU Meta Share Project ELRA/ELDA

Xinjiang Operation Center (Xinjiang Univ., 2014-)

Kyoto Operation Center (Kyoto Univ., 2007-)

NSF LAAPS Grid Project LDC

Federated Operation of the Language Grid

Bangkok Operation Center (NECTEC, 2010-)

Jakarta Operation Center (Univ. of Indonesia, 2012-)

Central Asian Languages

East Asian Languages

South-East/South Asian Languages
Role of the Language Grid

The Language Grid supports users to customize NLP technologies.

A small number of professional researchers

A large number of non-professional users

Real World

Computational Model

Natural Language Processing Research

Agricultural Consulting Service in Vietnam

The goal is increase rice productivity and to decrease the environmental burdens caused by excess use of agrichemicals.

The challenge is to transfer agriculture knowledge at realtime from Japanese experts to Vietnamese farmers in rural areas with low literacy rate.

A youth-mediated communication (YMC) model was invented, where the children received ICT training, and then act as mediators between their parents and experts.
Overview of the Project

- **Organizations**
  - Kyoto University: Multilingual Communication
  - NPO Pangaea: Education, Activities
  - University of Tokyo, Mie University: Agricultural Knowledge
  - Vietnam National University: Local Arrangements
  - MARD, DARD: Planning and Controlling Experiments

- **Schedule**
  - 2011/02 ~ 2011/03 1st Experiment (Thien My, Vinlong Province)
  - 2012/10 ~ 2013/01 2nd Experiment (Thien My, Vinlong Province)
  - 2013/09 ~ 2014/01 3rd Experiment (Thien My and Dong Thanh, Vinlong Province)
  - 2014/02 ~ 4th Experiment (Dong Thanh, Vinlong Province)

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Example of Experiment Schedule

<table>
<thead>
<tr>
<th>2012/09</th>
<th>2012/10</th>
<th>2012/11</th>
<th>2012/12</th>
<th>2013/01</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparing Experiment Workshop</td>
<td>Sowing</td>
<td>Rice Planting</td>
<td>Rice Reaping</td>
<td></td>
</tr>
</tbody>
</table>

- 2012/10/19 Chocon
- 2012/10/29 Phuc
- 2012/12/1 Bang
- 2012/12/15 Phuc
Designing Language Services

Japanese: たんぼの準備として、田起こしや代掻き、あぜぬりをして下さい。
Vietnamese: Chuẩn bị đất là kết hợp giữa canh tác đất, cày bừa và đắp bờ.
(English: Land preparation is a combination of tillage of the soil, puddling and levee painting.)

Example-based Composite Translation Service

Composite Translation Service with Agricultural Dictionary

Multilingual Dictionary for Agriculture

Japanese-English Translator

English-Vietnamese Translator

Vietnamese Parallel Texts for Agriculture

Japanese Parallel Texts for Agriculture

Example-Based Machine Translator

Japanese Dependency Parser

Best Translation Selection

Online Consultation by Human

☆ Multilingual Dictionary for Agriculture is provided by NPO Pangaea, Japan National Agriculture Research Center, Vietnam MARD. Entry Number: 3,099 (Sep. 2014)
☆☆ Multilingual Parallel Texts for Agriculture is provided by NPO Pangaea, Japan National Agriculture Research Center, Vietnam MARD. Entry Number: 2,485 (Sep. 2014)

Improving Language Services

Improve agricultural dictionaries and parallel texts to enable monolingual bridgers can improve the quality of machine translations

Japanese Expert

Parallel Texts (JA→VI)

Vietnamese Youth

Human Translation (JA→EN)

Machine Translation (EN→VI)

Post-Editing (VI→VI)

Japanese-English Bridger

Vietnamese Bridger

Pre-Editing (JA→JA)

Machine Translation (JA→EN)

Post-Editing (EN→VI)

Japanese Bridger

English Bridger

Vietnamese Bridger
Performance Improvement

Human Translation
(Accuracy: 5; Duration: 150 min)

Experiment in 2nd Season
(Accuracy: 4.28; Duration: 77 min)

3rd Season

Final Process in 1st Season
(Accuracy: 4.40; Duration: 102 min)

Refined Process 2 in 1st Season
(Accuracy: 2.67; Duration: 20 min)

Refined Process 1 in 1st Season
(Accuracy: 2.14; Duration: 10 min)

Initial Process in 1st Season
(Accuracy: 1.36; Duration: 0.03 min)

Duration of Translation Process (an A4 page of sentences)

User Interface for Youth

Question from children

Answer from expert

Machine translation

By NPO Pangaea
Enrich Youth-Mediated Communication

Language services are not enough for knowledge communication.

Tasks of Youths

1. Measure the plant height
2. Check the leaf color
3. Record all data on your Passport
4. Check the bag
5. Use your cellphone and take a picture
6. Ask parents if they have any problems

1. Measure temperature and humidity
2. Record all data on your Passport
3. Send data from your cellphone to YMC system
4. Check the bag
5. Use your cellphone and take a picture
6. Ask parents if they have any problems

at home and paddy
at YMC Center and home
Lesson 1: Service Design as Human-Aware AI

SERVICE DESIGN

User Modeling (Persona Design)

Intercultural Collaboration

Agent Modeling (Extended Finite State Automata)

Multi-Agent System (Social Simulation)

HUMANITY

MECHANISM

WICKED PROBLEM

FRAME PROBLEM

Lessons Learned

Human-Aware AI

Participation Observation (Ethnography)
Lesson 2: Problem Solving Organization

Processes and organizations of problem solving are related to each other. Solving a problem may affect positively or negatively its problem solving organization.


Lesson 3: Profit and Non-Profit Organizations

Bridging Profit and Non-Profit Organizations is the key to create sustainable and competitive services.