Supporting Classroom Activities toward the Ubiquitous Learning Environment

Hiroaki Ogata
Dept. of Information Science and Intelligent Systems,
Faculty of Engineering,
University of Tokushima, Japan

University of Tokushima, Japan

- 7,800 students and
  2,600 faculty members
- 5 Faculties:
  Medicine,
  Dentistry,
  Pharmaceutical Sciences,
  Integrated Arts and Sciences,
  and Engineering.

Research & Practice toward Ubiquitous Learning

- Practice

  u-Campus project using PDA

  Advanced e-Learning

- Research

  CSUL: Computer Supported Ubiquitous Learning

  Language Learning

u-Campus

- Ubiquitous campus project in Tokushima University (u-Learning)
- Technology enhanced campus with PDAs, mobile phones, and wireless networks.
- HP grant for mobile technology in Education 2004 ($110,000 for 1 year)
- US$900,000 for 3 years from MEXT, Japan

Japanese proverbs

- Those who know most speak least.
  (能ある鷹は爪を隠す)
- Know everything by hearing one thing.
  [Have a very perceptive mind.]
  (一を聞いて十を知る)
- Regard one's teachers with deep veneration.
  (師を敬う)
- Japanese students are very quiet and passive in classrooms.
- The main aim of u-Campus is making students more active inside and outside class.

Objectives of u-Campus

- Making students more active and interactive;
- Providing right thing at right time and right place through seamless learning.
- Fostering collaborative learning by knowledge awareness,
- Making e-portforlio for authentic evaluation
- Reducing time consuming tasks: attendance taking, report collection etc

Seamless Learning

- between inside and outside classroom
- between one-way teaching and interactive learning
- between teacher-centered classroom and learner-centered learning
- between the virtual (info) world and the real world

Inside classroom → **u-Learning** ← **Outside classroom e-Learning**

Equipment

- PDA: HP 46, NEC 100, Fujitsu 100, Sharp Linux Zaurus 60, Toshiba 30
- Tablet PC; 20 HP tablet PC
- Wireless access: in our campus

Mobile phone vs. PDA in Japan

- i-mode access
- Narrow band
- Students pay Univ. not pay
- Small screen
- Not-easy to develop software

- WiFi access
- Broad band
- Univ. pays for infra. Students not pay
- 640x480 screen
- Easy software dev.
- A lot of free software

Design of learning environment using mobile devices

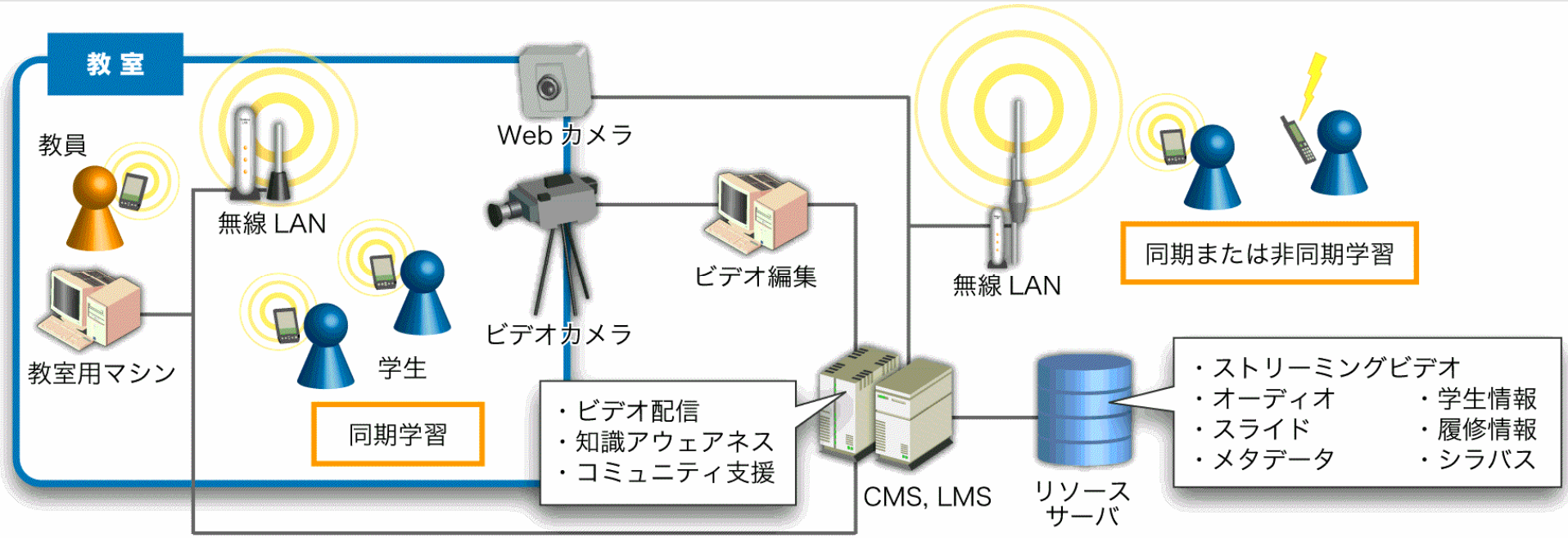
Mobile devices

- Portable & low-cost
- Slow CPU & small memory
- Personal
- Connectable
- Multi-purposes

Software

- Persistent
- Simple
- Adaptive
- Collaborative
- Seamless learning

System configration of u-Learning

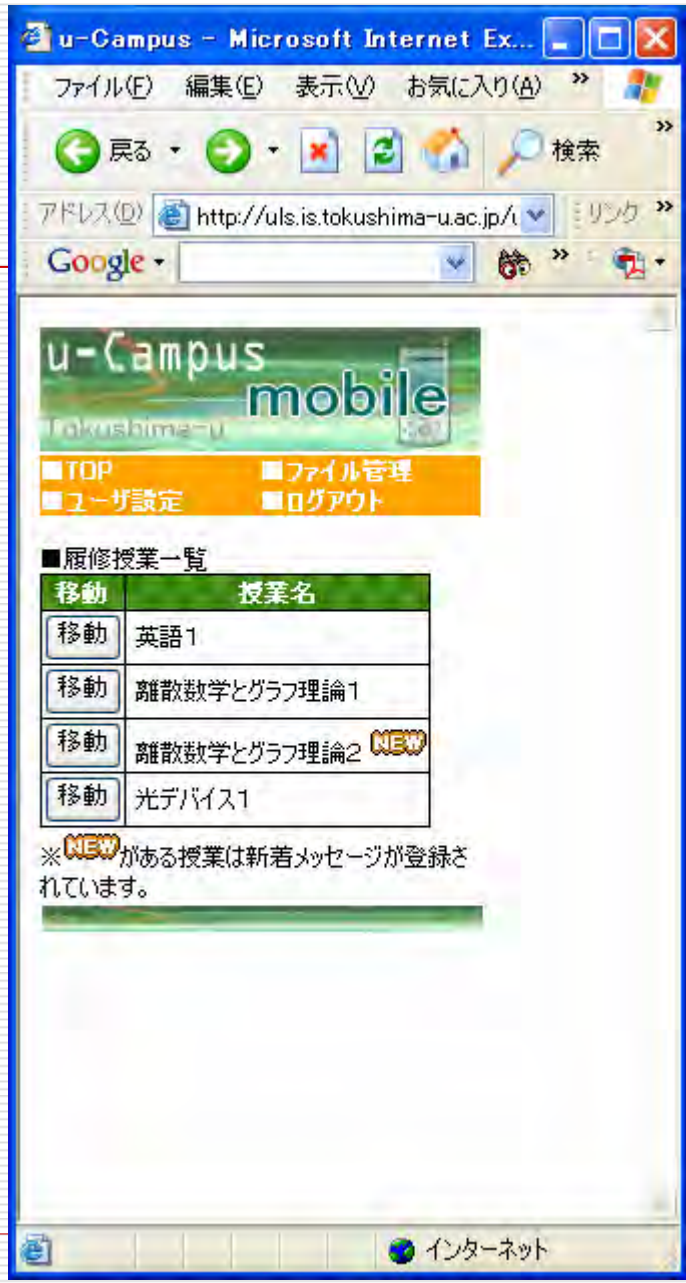


Functions inside vs. outside classroom.

	Synchronous communication	Asynchronous communication
Inside classroom	Attendance taking Response system Data distribution and gathering	
Outside classroom	Video streaming Response system Data distribution and gathering	Video on demand Data gathering activities

u-Learning


U-campus system - Microsoft Int...
ファイル(F) 編集(E) 表示(V) お気に入り(A)
戻る
検索
アドレス(D) http://uls.is.tokushima-u.ac.jp/
リンク
Google
国立大学法人
徳島大学
u-Campus
System
Select the proper interface
PDA version
PC version
copyright 2005, Tokushima University
インターネット


u-Campus - Microsoft Internet Ex...
ファイル(F) 編集(E) 表示(V) お気に入り(A)
戻る
検索
アドレス(D) http://uls.is.tokushima-u.ac.jp/
リンク
Google
u-Campus mobile
Tokushima-u
TOP
ファイル管理
ユーザ設定
ログアウト
■履修授業一覧
移動
授業名
移動 英語1
移動 離散数学とグラフ理論1
移動 離散数学とグラフ理論2 NEW
移動 光デバイス1
※NEWがある授業は新着メッセージが登録されています。
インターネット

Classroom with PDAs (Case 1)

- 50 master course students in Computer Science Department
- Intelligent CAI course
- 65 PDAs, Wireless LAN, Projector, Camera
- Real time broadcasting, and recording
- Access video on demand after the class


CSCLへの経緯

アンケートを見る

表示するコースとアンケートを選んでください。

アンケート情報

コース: CAI2

Survey: 1-2

1. RFIDは何の略は？

- Rapid Frequency Identification
- Radio Frequently Identification
- Radio Frequency Identification

2. RFIDタグの特徴で正しいのはどれ？

- 非接触でタグから情報を読める。
- 複数同時読み取りが不可能。
- 通信距離は100m以上。


STYLE


SanDisk
NEC
Pocket PC
Windows Media
10:34
再生しています
0:26
PocketGear

BSUL - View survey result charts - Microsoft Internet Explorer

ファイル(F) 編集(E) 表示(V) お気に入り(A) ツール(T) ヘルプ(H)

http://localhost/bsul/stats/create?course=2060775&survey=48534&type=hbar&Submit=%E8%A1%A8%E3%82%B2%E8%A1%A8%E7%A4%BA

問い合わせ

グラフ結果

登録数: 61　ログイン数: 35　回答数: 36

ページが表示されました　イントラネット

スタート　Start PointBase　domain1 - J2EE 1.4 S...　BSUL - View survey ...

Case 2: Discrete mathematics and graph theory

- The department of information science and intelligent systems has started to use the U-learning system for 76 students of the 1st year
- There are 70 man and 6 women in this group We are using this equipment in:
- Taking attendance
- Response system
- Video streaming

Some relevant data

- % of PC utilization
  before the 1st year (21%), between the 1st and the 2nd year (22%), and after the 2nd year (57%)
- % of PDA
  from the beginning (88%), between the 1st and the 2nd year (12%)
- Input method used by the system
  handwritten (1%), alphabetical characters (90%) and hiragana (9%)
- do you use a PDA after classes?
  Yes(55%), No(45%)


POCKET LOOX
FUJITSU

Case 3: English I

- English teacher is from USA.
- reading comprehension class for 36 students of the 1st year
- 9 men and 27 women
- % of PDA
  from the beginning (94%), between the 1st and the 2nd year (6%)
- The system is used to learn vocabulary and perform small tests
- Students upload sound files containing their own pronunciation. (data gathering activity)


MAXIM


MAXIM

Comments from students

- The system makes fast the processes of attendance and evaluation
- It was possible to check the attendance at the time of entering the class, it does not waste time in vain
- It was possible to do a test in your own pace
- It was a pleasure to attend this class
- It is easy for the professor to perform the attendance process within the system
- It was very interesting system
- I am not sleepy nor bored in this class

Student's comments

- The system makes the verification of attendance very simple
- student can ask and answer questions whenever they need
- It is easy to identify my own errors
- It is not necessary to take notes depending of the situation
- It is possible to receive an interesting class
- This is an interesting framework

Points to be improved

- It was difficult to make WiFi Network connection. (because of the security: WPA + Tkip)
- The system some times operates well some times not because of overload of the server and the network.
- The battery problem needs to be solved.
- Students could not record voice clearly.

Comments from the teachers

The good

- Students can record their own voice
- Students can verify their own records and their attendance state.
- When the PDA is used weekly the acknowledge of its operation is acquired
- The system increases the way of teaching

Comments from the teachers (2)

The bad

- There are WiFi connection problems
- Battery problems
- It makes upset the user specially when a problem appears and the IT specialist is not there
- It makes difficult to walk in the classroom because there are many cables in the floor
- Making online the contents of a quiz is a little bit difficult.

Research level

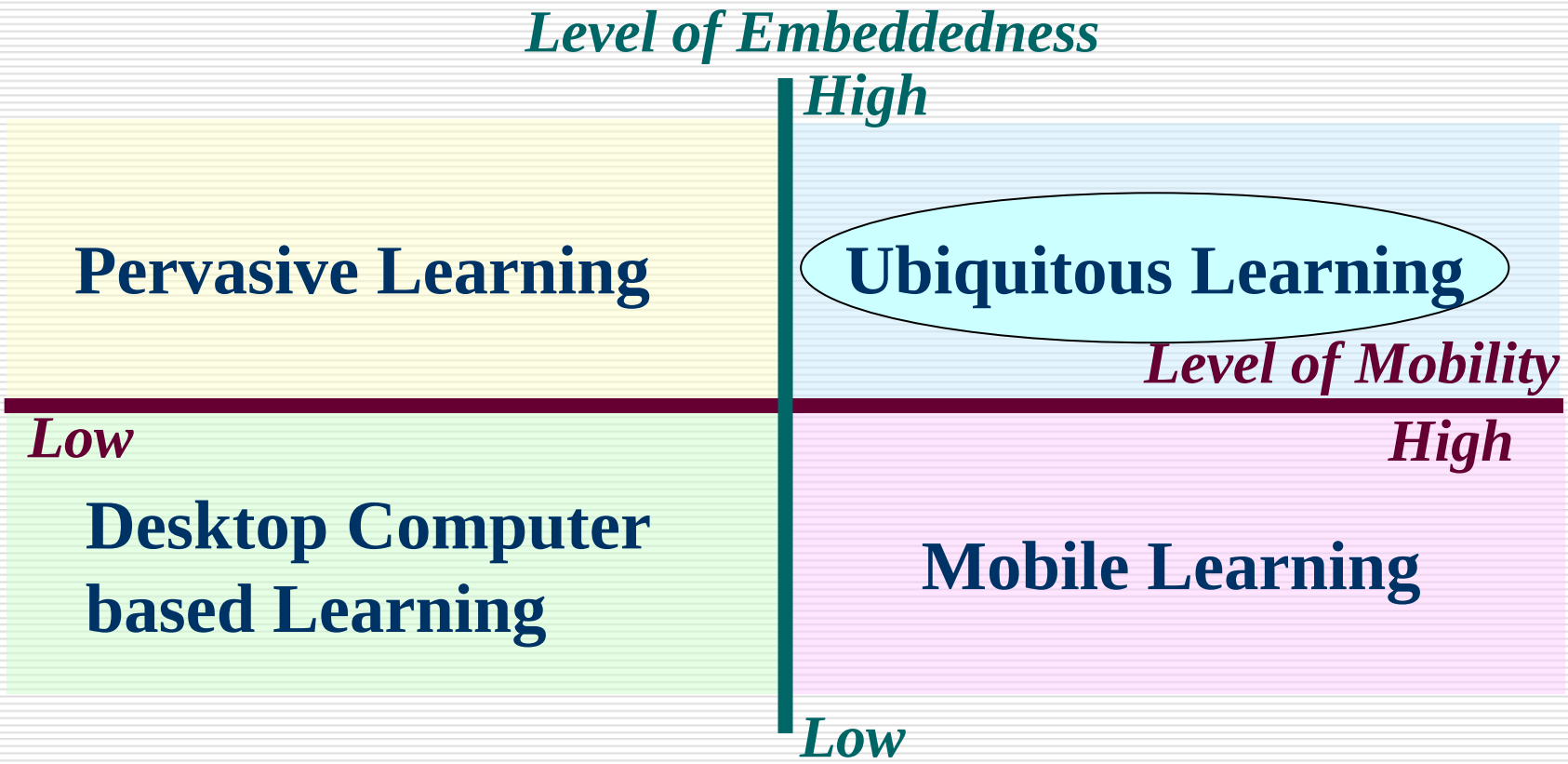
- CSUL (Computer Supported Ubiquitous Learning)
- Prototype system for Language Learning

CSUL (Computer Supported Ubiquitous Learning)

- Be coined for everyday learning supported by ubiquitous computing technologies, which are embedded and invisible computing-devices and networks.

Back to real world!

What's CSUL from the tech.?



Based on Lyytien, K, and Yoo Y.: Ubiquitous Computing, Comm. of ACM, Vol.45, No.12, pp.63-65 (2002).

One of learning theories for CSUL

- Authentic Learning
  Learning from what happens in the real world.

  Brown, J. S., Collins, A., and Duguid, P.: Situated Cognition and the Culture of Learning. *Educational Researcher*, (Jan.-Feb.), pp.32-42, 1989.

- Authentic language learning
  Vocabulary is learnt not only inside schools but also outsides schools.

  Miller, G.A., and Gildea, P.M.: How children learn words, *Scientific American*, No.257, pp.94-99, 1987.

System development

1. **TANGO: Tag Added Learning Objects system for vocabulary learning**
2. **JAPELAS: Japanese Polite-Expressions Learning Assisting System**
3. **CLUE: Collaborative Learning support-system in Ubiquitous-computing Environments**
4. **LOCH:** Supporting informal language learning outside the classroom with handhelds

The Japanese meaning of "tango" is "word" in English.

1.TANGO: Learning Vocabularies

- Leaning environment

  the room where some of objects have RFID tags.
- Information on the objects

  Name, Pronunciation, Expressions, Q&A.
- Reading RFID tags, the system detects the objects around the learner, and provides a suitable question to the learner in order to link vocabulary and real objects.
- Learners can annotate to the objects, and share them. This promotes collaborative learning through making shared-understandings about objects.

RFID (Radio Frequency Identification) tag

- Read/write electronic storage technology
- Non-contact, and non-line-of-sight for communication
- Operate without a separate external power source
- Robust constructions available.
- Will replace barcode.
- Auto ID center, Ubiquitous ID center

We assume some of the object in the real world have RFID tags, and computers can understand the objects around themselves.

μ-chip by Hitachi Co. in Japan

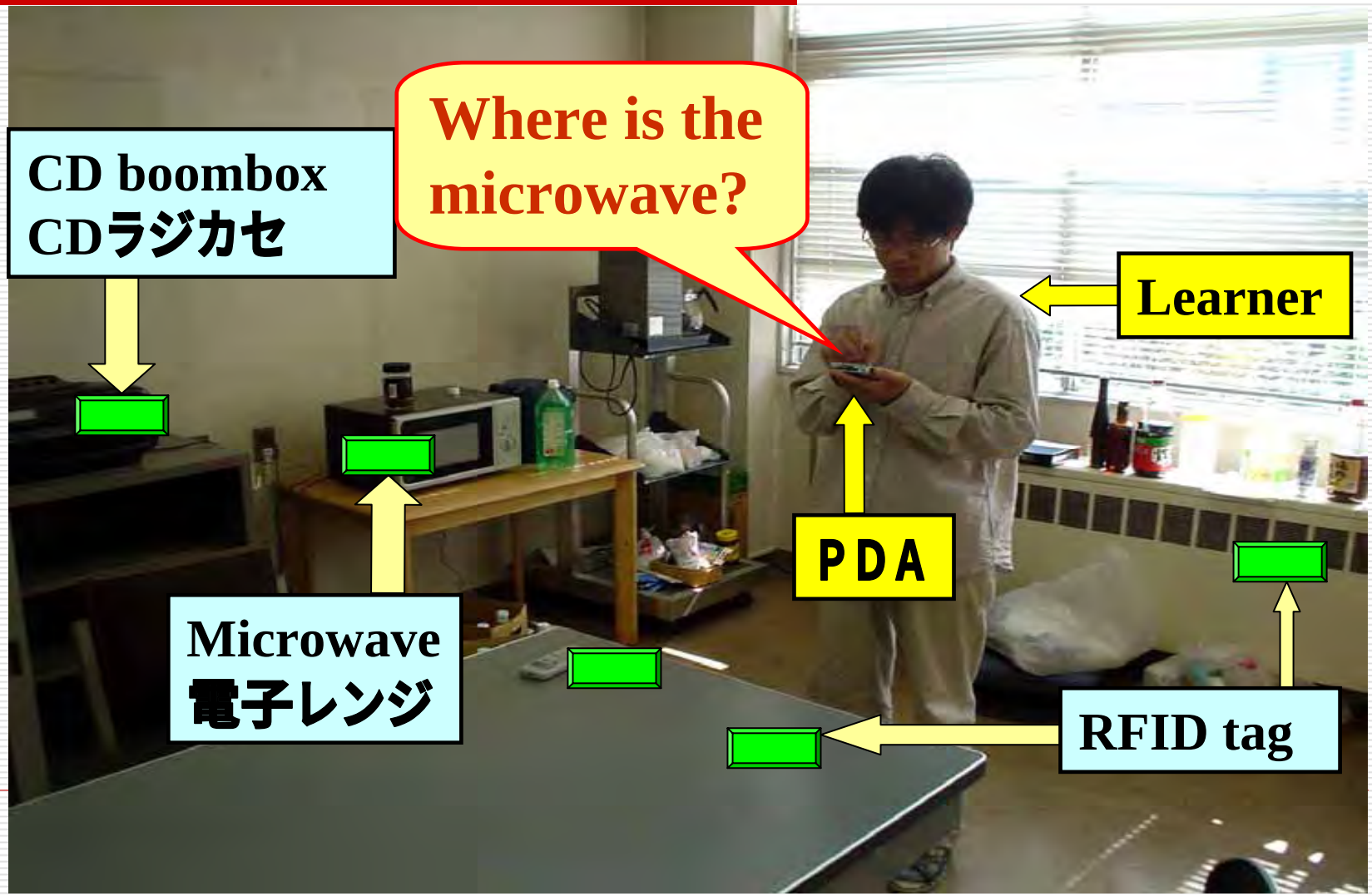
- Size: 0.4 mm(D,W), 0.06mm(H)
- Data: 128 bit
- Athena built-in
- Enable invisible computing

RFID tag **RFID reader / writer**

Implementation

- PDA, Toshiba Genio-e 550C
- Wireless LAN network (IEEE 802.11b)
- RFID tag (Omron, V720)
- MS Embedded Visual Basic

Ubiquitous Language Learning room



Interface

Where is the rice cooker?

"Microwave" is also used as a verb

Voice

Hint

Scan

Read comment

Next question

Exit

Experimentation

- User: six high-school students (age:16)
- Question: 10 questions

  Ex: Where is the CD boom box?

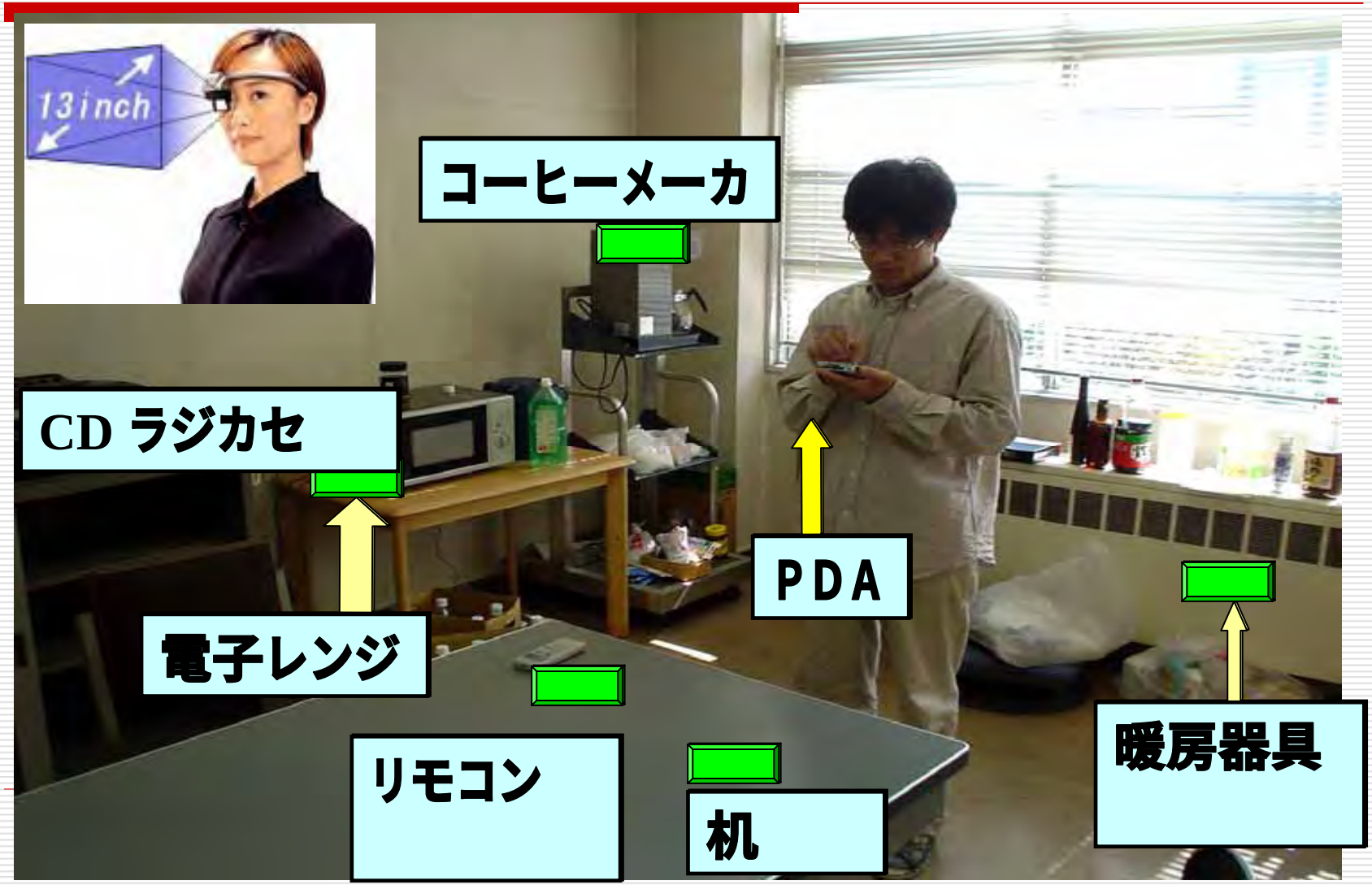
  If the user scan its tag, then get the point.
- Ubiquitous LL game:

  5 min. for each user

  Compete the score.


VIDEO

With TANGO & trans. HMD, you can see objects in the world as if you were in English / Japanese environment.



2. JAPELAS

- **Four levels of polite expressions in Japanese language: casual, basic, formal, more formal.**
- **The level changes according to hyponymy, social distance, and formality of the situation.**
- **Every user has a PDA and exchange personal information via IrDA, e,g, like Active Badge. Then, the system tells the appropriate level of politeness in the situation.**
- **JAPELAS also supports participatory simulations in language learning courses.**

Level of politeness　カナ

Level	Example (eat)
Casual	くう.
Basic	食 (た) べる.
Formal	召し上がる、頂く、口にする。
More formal	お召し上がりになる、ご賞味させて頂く

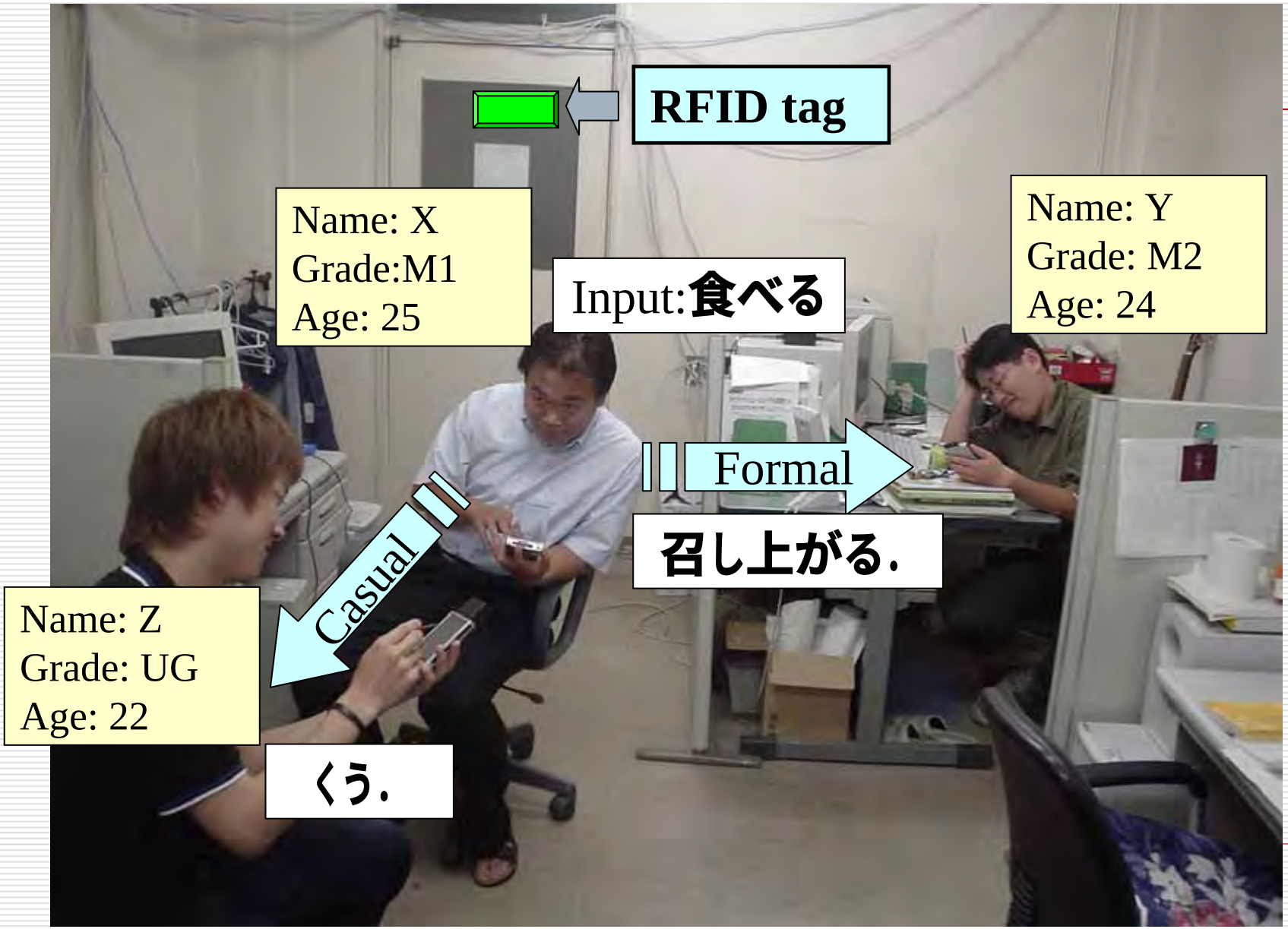
Factors for changes in politeness

Factor	Elements
Hyponymy	affiliation, age, position (social status)
Social distance	colleague, friends, relatives
Formality	ceremony, banquet, meeting (situation)

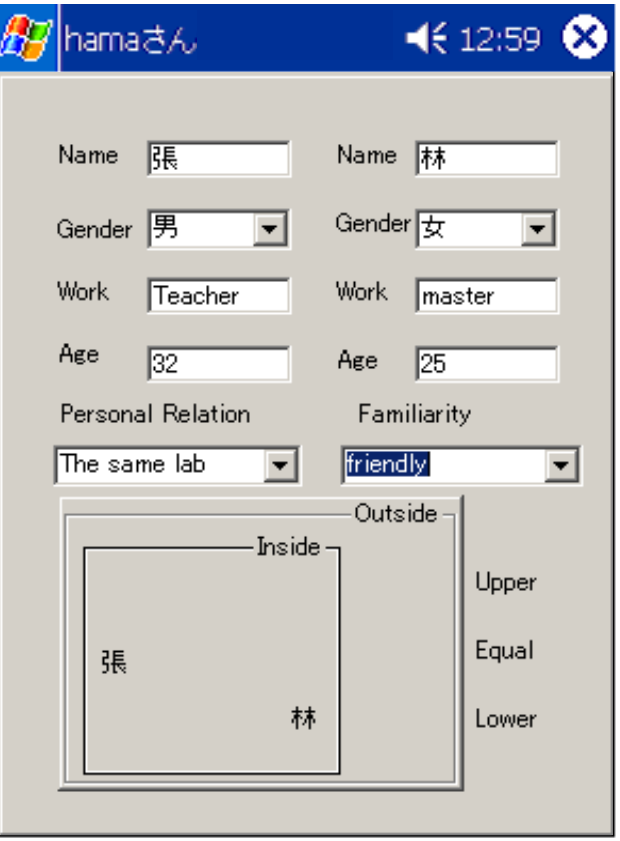
Implementation

- PDA, Toshiba Genio-e 550C
- IrDA (Infrared Data Association)
- RFID tag (Omron, V720)
- MS Embedded Visual C++

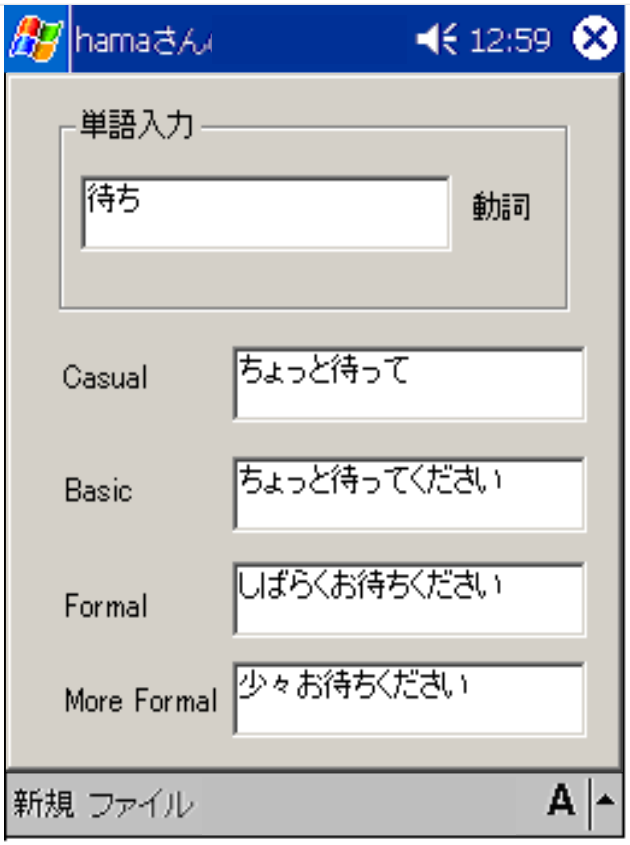
Overview of Japanese Polite Exp. Learning



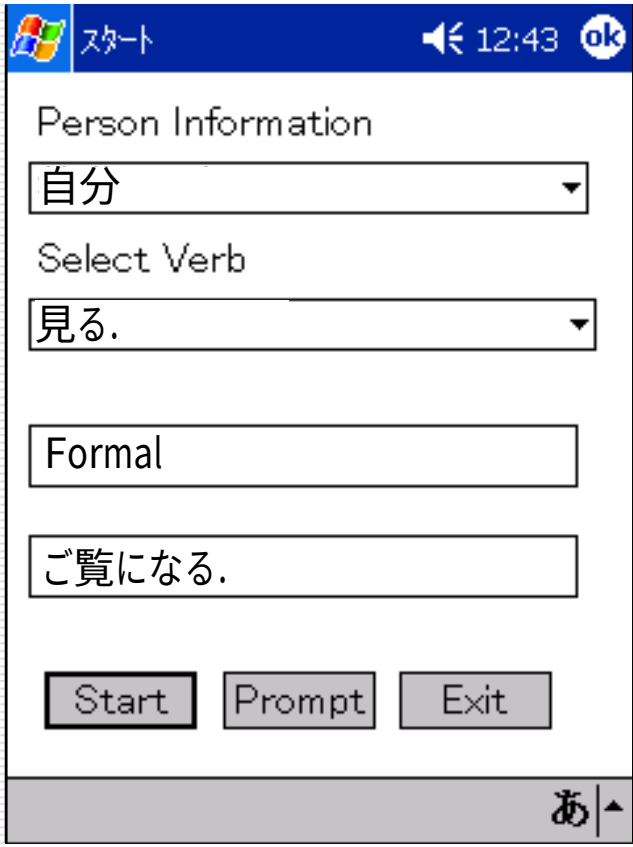
Interface of JAPELAS



Settings



Dictionary



Main

Experimentation

- User: 18 high-school students
  average age:16.94
- Polite expression: 10 sentences
- Role: myself, elder friend, younger friend, teacher, father, brother, etc.
- Time: 30 min.


VIDEO
2003 8 24

3. CLUE

Collaborative-Learning support-system in a Ubiquitous Computing Environment

- Domain:
- Japanese language learning for overseas students
  English learning for Japanese students

Features of CLUE

- **Each learner has a his/her own PDA, and shares interaction experiences in everyday life with the contexts (location, and time).**
- **According to the learner's context, the system provides the right information in the right form at the right place at the right time.**
- **The system provides knowledge awareness for inducing collaboration and facilitating knowledge sharing.**

Interactions in a campus life

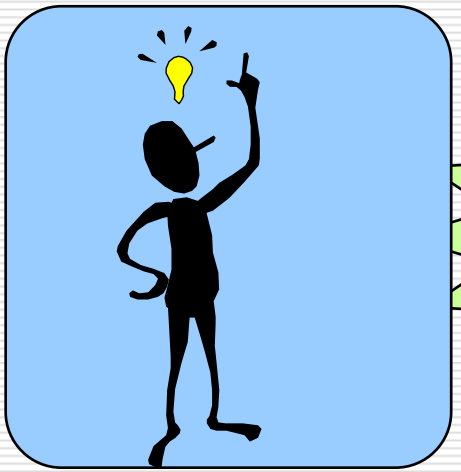
RTRP Learning

Ubiquitous learning +	Personalization
Any information	Right information
In any form (media)	In right form
At any time	At right time
At any place	At right place

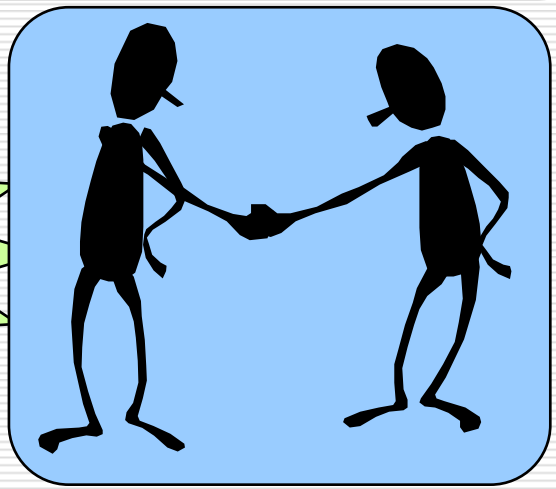
Fischer G.: User Modeling in Human-Computer Interaction, the 10th Anniversary Issue of the Journal of User Modeling and User-Adapted Interaction (UMUAI), Vol. 11, No.1/2, pp.65-86, 2001

Knowledge Awareness

KA is information about other learners' activities in the shared knowledge space for inducing collaboration.



Knowledge Awareness



Individual learning → Collaborative learning

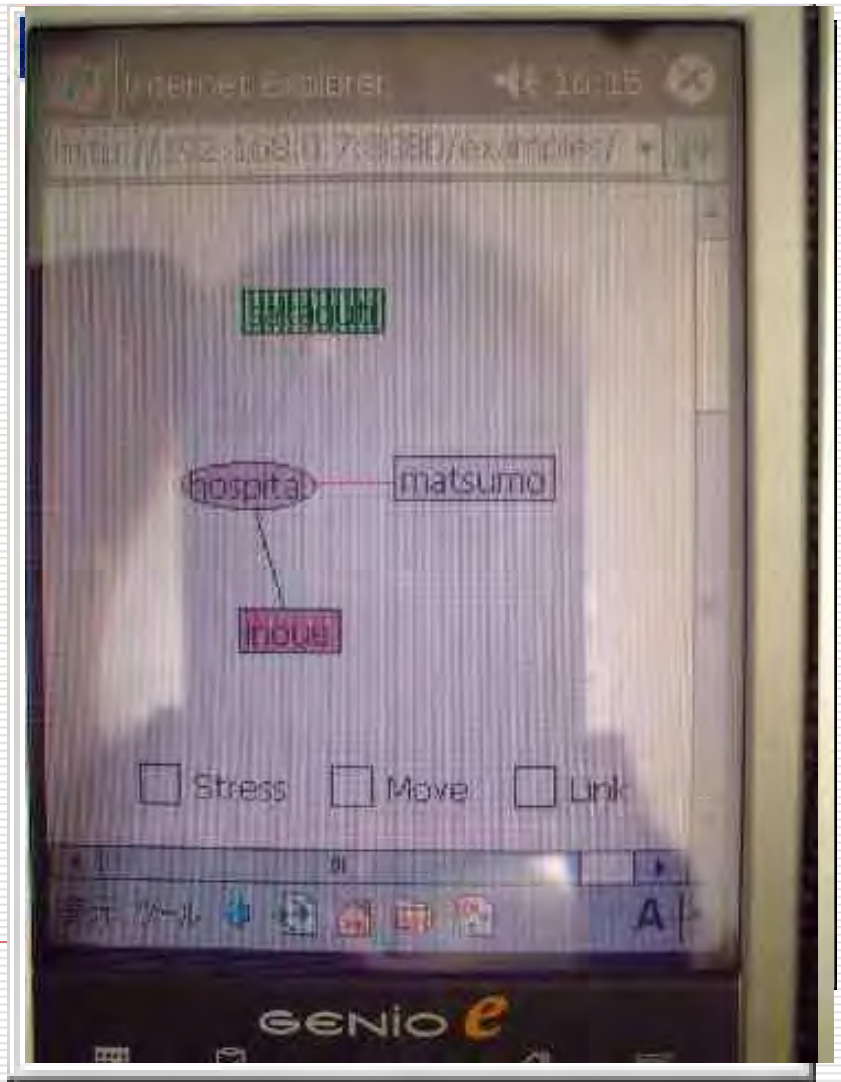
KA map

- Visualize objects in the map and expressions as educational materials,
- Visualize the links between expressions and learners to induce collaboration,
- Recommend appropriate collaborators to discuss about the expression.

Implementation

- PDA, Toshiba Genio-e 550C
- Wireless LAN
- GPS Unit (Empex, PokeNavi 508PC)
- Personal java, Embedded Visual C++, Embedded Visual Basic

User Interface




COROLLA

4. LOCH

- Supporting informal language learning outside the classroom with handhelds
- Location awareness service for the foreign students who are learning Japanese language in order to enhance the adaptation of knowledge learned in the class.
- Teacher gives some tasks to the students.
- The students go around with PDA, PHS (108kbps) and GPS, and complete the tasks while asking a question in Japanese.
- The teacher gives instruction during the trip.
- After the trip, students and teacher make a reflection for sharing knowledge.

Japanese lang. course

- Overseas students enrolled in the Japanese language intensive course at Tokushima University.
- 7 students (2 women / 5 men).
- 20 ~ 35 years old.
- From: Korea, Bangladesh, China, Peru, Philippines and Thailand.
- Different level of expertise in the use of computer devices.

Tasks

- The teacher scheduled tasks such as:
  - Touristic information stand in Tokushima JR Station -> ask about the places you can visit in one day and the price.
    Record the answer and send it back.
  - Awaodori Kaikan -> ask about the price and schedule for the rope way.
    Record the music of the Awaodori and *take pictures* of the souvenirs displayed in the shop.
- Students go around under the teacher's guidance.


EMTAC
Bluetooth
GPS
b-mobile
FUJITSU

LOCH system (cont.)

Giving a task


Ask the way to the Japanese woman…

Ask the way, again, to a Japanese woman

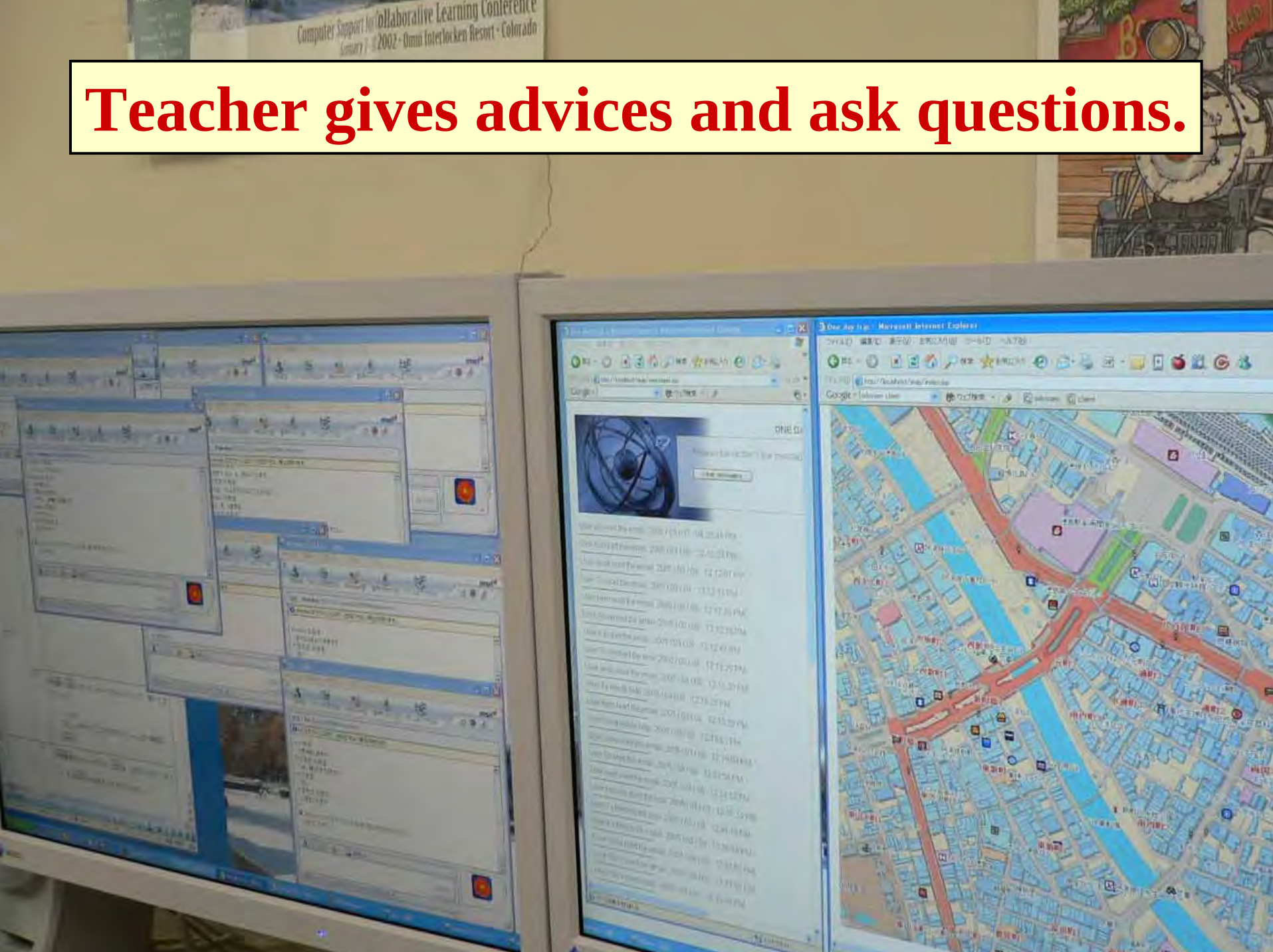
Once more…

And more…


Here you are…
Awa-Odori musium.
HOPE
280
270
270

Teacher can monitor learner’s place.

Teacher gives advices and ask questions.



Students took pictures and record voices.

Reflection.

Table 1: Results of the questionnaire

No.	Question	Ave.	SD
Q1	Do you think that the one day trip with PDA was exciting?	4.9	0.4
Q2	Do you think the PDA was easy to use?	3.3	1.2
Q3	Was the PDA helpful when you found some troubles completing the tasks?	4.4	0.5
Q4	Do you think the system was easy to use?	4.0	1.1
Q5	Would you like to use the system again?	5.0	0.0

Findings of interest

- Students have an active participation in real life situations.
- Knowledge learned in the course became more available.
- Sharing the students' strategies in discussion.
- Students carry out the tasks without anxiety about getting lost.

Additional Information

- WMTE
- G1:1

WMTE2005

- 3rd IEEE International Workshop on WMTE (Wireless and Mobile Technologies in Education)
- November 28-30, 2005, Tokushima, Japan
- PC chair, Mike Sharples (U. of Nottingham, UK) and me. (Acceptance rate: 12%)
- http://lttf.ieee.org/wmte2005/
- Invited speakers:
  Gerhard Fisher, L3D, CU, USA
  Claire O'Malley, UN, UK
  Ken Sakamura, U. of Tokyo, Japan

Banquet 1: Dancing

Banquet 2: Wearable PC fashion show

G1:1 research initiatives

- International Researchers Network on one to one technology enhanced learning
- http://www.g1to1.org
- Members are from more than 15 countries.
- A social network, not a formal organization.

What is G1:1?

- Members having extensive connectivity to Kaleidoscope, ISLS, APSCE, IEEE, AIED, mLearn, and some SIGs

- Past events were directly or indirectly supported by EU, NSF of USA, and NSC of Taiwan, HP Japan.

What is 1:1 TEL?

One-to-one technology enhanced learning refers to learning in which every student is equipped with at least one wireless portable computing devices with Internet access and communication capabilities

Events in 2003 & 2005

- 1st G1:1 Workshop
  - Taiwan
  - 6 international participants
  - called Global Public-Private Partnership Platform (G4P) meeting
- 2nd G1:1 Workshop
  - Taiwan
  - more international participants
  - prior to WMTE2004

Events in 2005

1. 3rd G1:1 Workshop (prior to CSCL), Taiwan
   (Jeremy Roschelle, Charles Patton)

2. G1:1 Panel in CSCL, Taiwan
   (Tak-Wai Chan, Ulrich Hoppe)

3. G1:1 Panel in IEEE ICALT, Taiwan
   (Kinshuk)

4. Panel in Kaleidoscope Symposium, Germany
   (Nicolas Balacheff, Ulrich Hoppe)

Events in 2005 (cont'd)

5. Panel in Knowledge Building Summer Institute, Canada

   (Marlene Scardamalia, Mary Lamon)

6. 4th G1:1 Workshop (prior to mLearn), South Africa

   (Mike Sharples, Charles Patton, Tom Brown, Herman van der Merwe)

7. 5th G1:1 Workshop (prior to WMTE), Japan

   (Kinshuk, Hiroaki Ogata)

8. G1:1 Panel in ICCE, Singapore

   (Chee-Kit Looi, Michael Jacobson)

Events in 2006 (planning)

1. G1:1 event, USA (prior to AERA)
   (Jeremy Rocschelle)
2. G1:1 event, Taiwan (prior to ITS)
   (Tak-Wai Chan)
3. G1:1 event, Greece, (prior to WMTE2006)
   (Kinshuk)
4. G1:1 event, Netherlands, (prior to ICALT2006)
   (Kinshuk)
5. G1:1 event, Canada, (prior to MLearn2006)
   (Rory McGreal)
6. G1:1 event, Beijing, (prior to ICCE2006)
   (Ronghuai Huang)

Thank you, HP!!

- **mailto:ogata@is.tokushima-u.ac.jp**

We love HP