

Machine Translation SUMMIT XI
Copenhagen September 10 - 14 2007

Human Communication Technology

Development of Speech Translation Technology for Hand-held Devices

Akitoshi Okumura
NEC Corporation, JAPAN
September 13, 2007

Outline

- . Human Communication Model
 - making communication bottlenecks clear
- . Speech Translation Progress
 - overcoming certain language barriers
- . Rich-media Message Creation Robot
 - helping human communication by filling in background knowledge gaps
- . Japanese Government Projects
 - building future technology

Human Communication

- Definition :
 - process by which people exchange information or express their thoughts and feelings (LDOCE)
- Value :



Pleasure of connecting

Generating mutual understanding

Creating new ideas

Sharing feelings and ideas

Building fellowship and consensus



- Goal : Maximizing communication value
Removing communication bottlenecks
- What are the bottlenecks ?

Knowledge Bottlenecks

Even if communication channel is established, communication is not always successful.



Language Barrier



Sometimes, even if the same languages are used, communication is not always successful.

NLP
(New life plan)
.....



Background Knowledge Gap



NLP
(Natural language processing)
..... ??

. Speech Translation Progress

- How can we overcome certain language barriers ?
- Related URL list
 - <http://www.nec.co.jp/rd/Eng/innovative/E5/top.html>
 - <http://www.nec.co.jp/rd/innovative/E5/top.html>
(in Japanese)
 - <http://www.nec.co.jp/rd/Overview/soshiki/media/natural-language.html>
(in Japanese)
 - <http://www.nec.co.jp/techrep/ja/journal/g05/n05/t050511.pdf>
(in Japanese)
- Press Release
 - <http://www.nec.co.jp/press/en/0601/0401.html>
 - http://www.nec.europa.com/news_and_events/news_archive_2005/24_october_2005.html
 - <http://www.nec.co.jp/press/ja/0501/1101.html> (in Japanese)

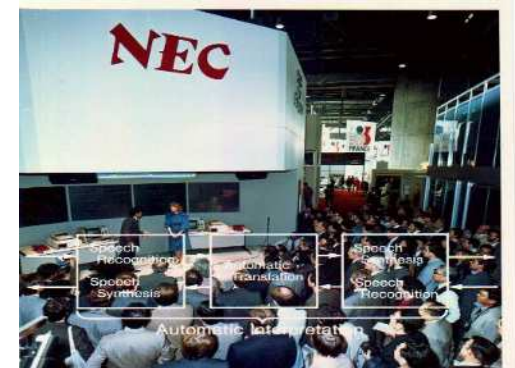
C&C

- Dr. Koji Kobayashi
 - former chairman of NEC, 1907-1996
- Presented C&C, integration of Computers and Communications at INTELCOM 1977 in Atlanta
- Proposed the concept of speech translation telephone at Telecom 1983 in Geneva

<http://www.nec.co.jp/techrep/en/journal/g07/n02/070223.html#c1>
http://www.nec.co.jp/profile/empower/history/1977_1.html
(in Japanese)

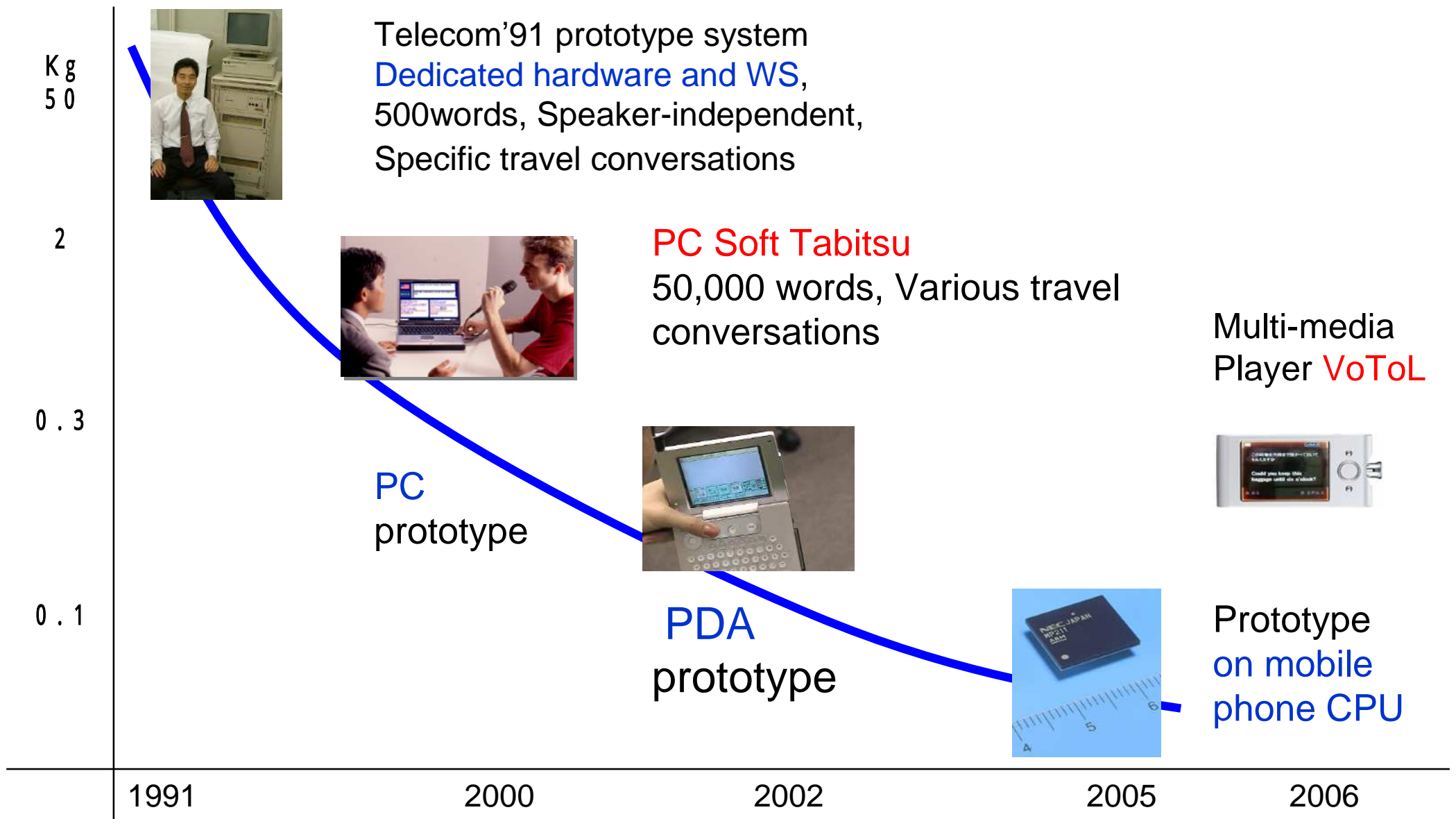


INTELCOM'77



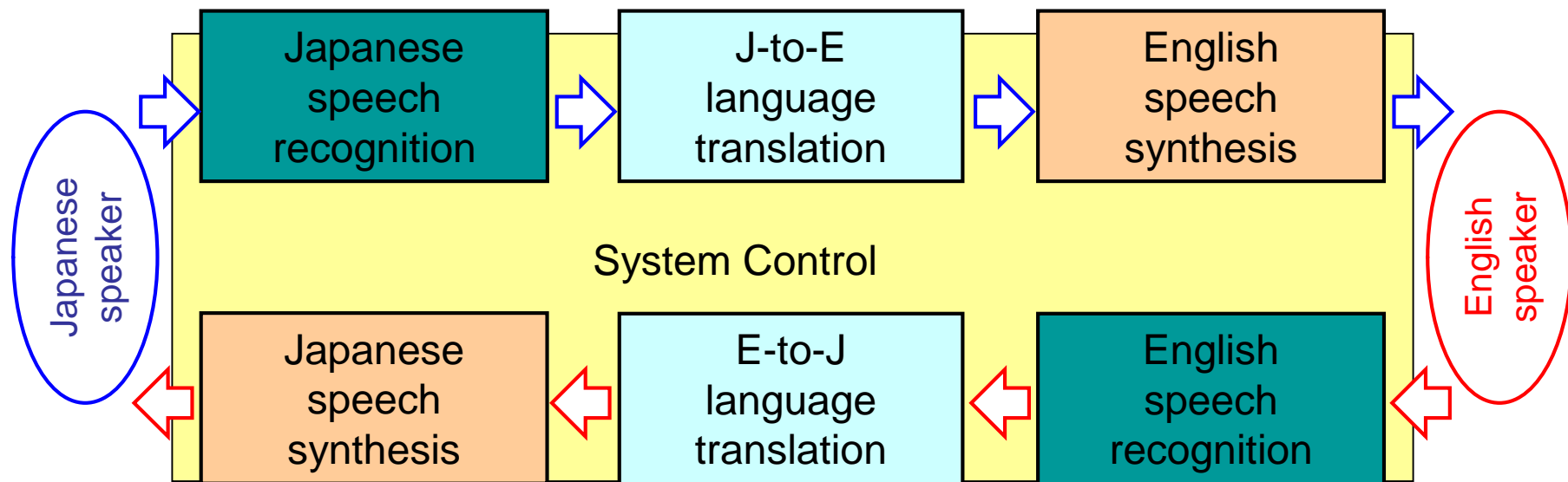
Telecom'83

Progress of Speech Translation Systems and Devices



TABITSU, PC Software

- Japanese-English bi-directional speech translation system
- Rich vocabulary
 - 50,000 words (J),30,000 words (E)
- Various conversations in travel situations
 - Hotel, restaurant, transportation, shopping, ...
- Real-time on Mobile PC
 - CPU: Pentium 400MHz, RAM: 128MB, OS: Windows98/ME/NT4/2000/XP



Compact Implementation on PDA

- Speech recognition
 - decreased memory size of acoustic model and decoder by reducing total number of Gaussian mixtures and by improving dictionary structure
- Language translation
 - decreased memory size by using external storage effectively and improving internal data structure
- Japanese speech synthesis
 - decreased memory size by improving pronunciation dictionary structure and speech synthesis units

cf: Isotani et al., "An Automatic Speech Translation System on PDAs for Travel Conversation", Proc. ICMI'02, pp.211-216, Oct. 2002.

Mobile Multimedia Player *VoToL* featuring Speech Translator

◆ Provide users with music and video playing functions as well as speech translation between English and Japanese

<http://www.nec.co.jp/press/ja/0602/1401.html> (in Japanese)

. Rich - media Message Creation Robot

- How can we overcome background knowledge gaps ?
- Related URL list
 - <http://www.nec.co.jp/press/en/0703/0501.html>
 - http://www.incx.nec.co.jp/robot/english/robotcenter_e.html
 - <http://www.nec.co.jp/press/ja/0703/0501.html> (in Japanese)
- Related Papers
 - Okumura et al, “Multimedia Blog Creation System using Dialogue with Intelligent Robot”, Proceedings of the ACL 2007 Demo and Poster Sessions, pages 9–12, Prague, June 2007.
 - Okumura et al, “Evaluation of Multimedia Blog Creation System using Dialogue with Intelligent Robot”, FIT2007 (The 6th Forum on Information Technology), LE-009, pp.135-138, September 2007 (in Japanese)

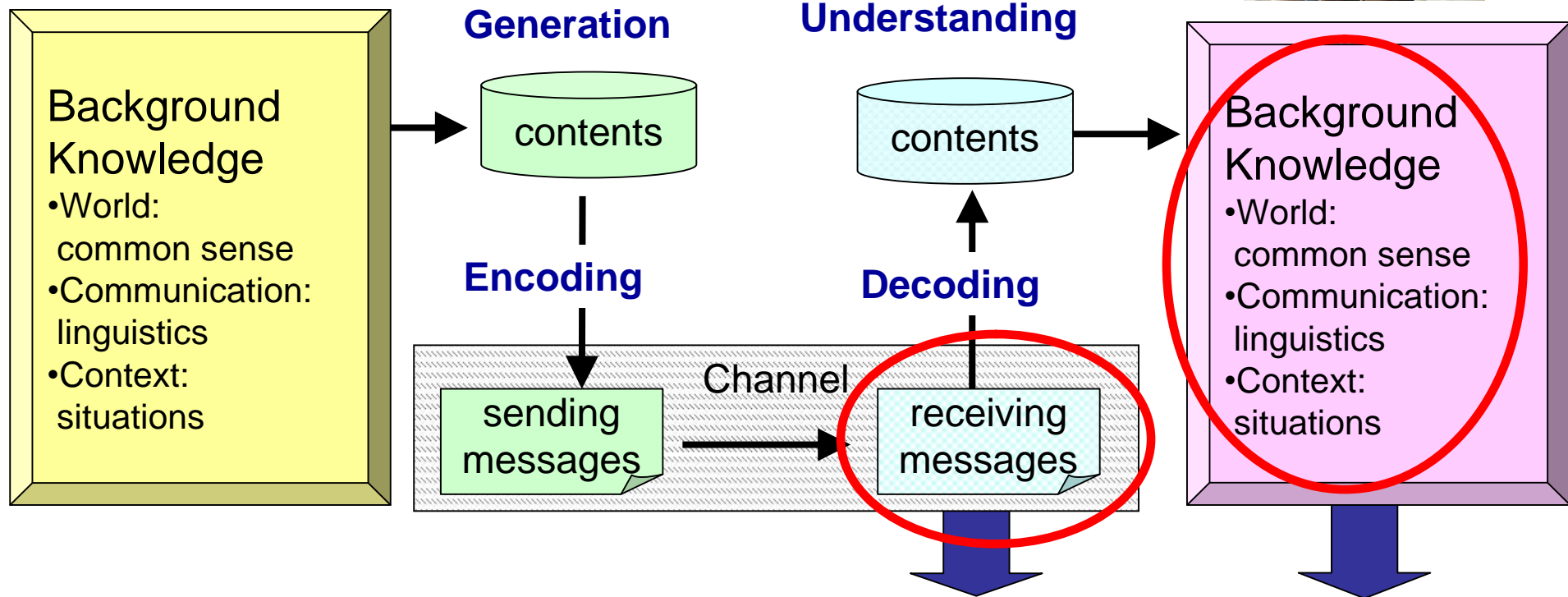
Understanding Model using Background Knowledge



Sender



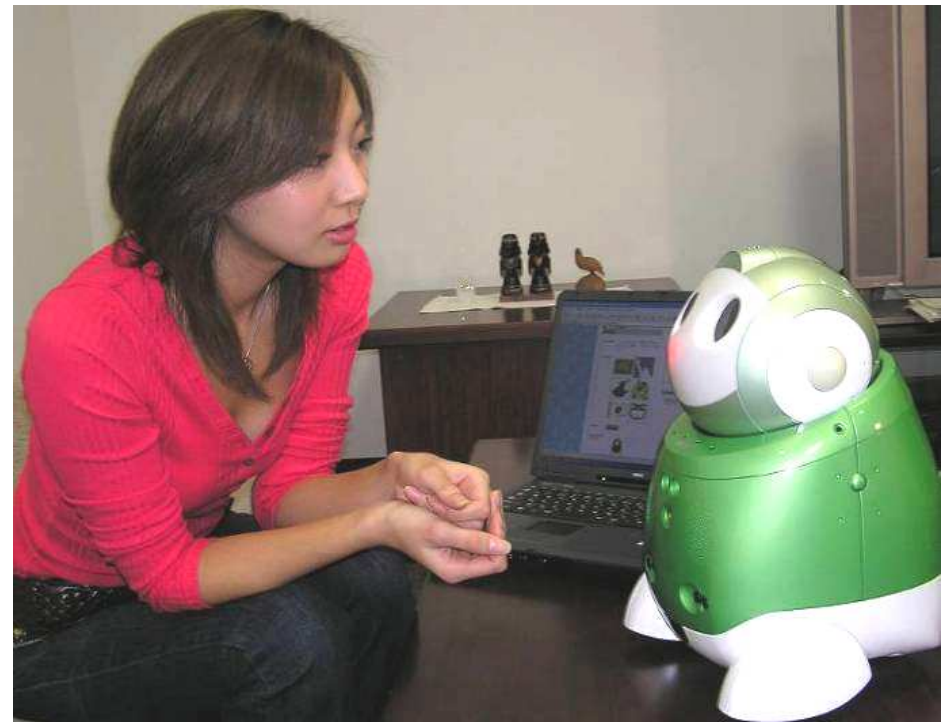
Receiver



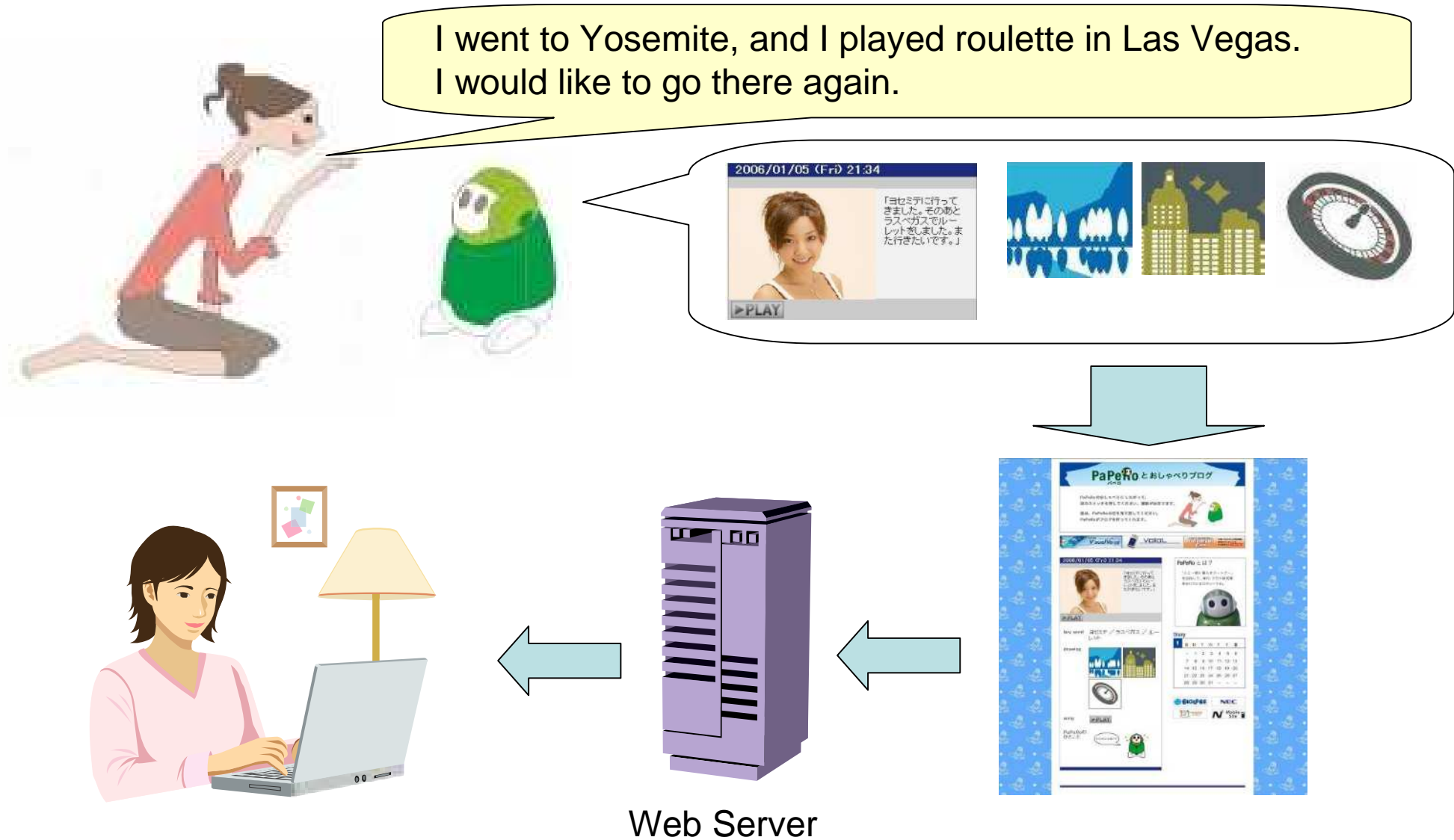
Filling in gaps between his messages and her background knowledge can help a receiver understand!

Rich-media Message Creation Robot

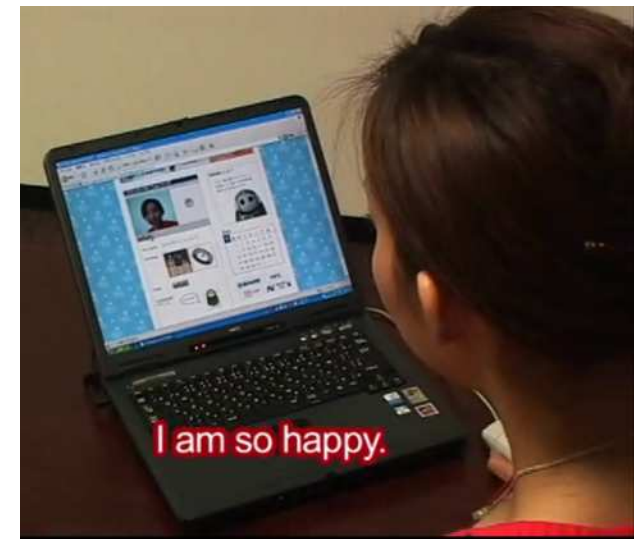
- First step for communication agent
 - Enhancement of blog messages for easy understanding
 - Facilitation of blog creation
- Process
 - Recording a video message through dialogue
 - Searching related information
 - Creating rich-media message
- Platform
 - Personal robot, PaPeRo



Outline of Rich-media Message Creation



Video Demo



. Japanese Government Projects

- Innovation 25
- Universal Communication

Thank you very much.



Empowered by Innovation

NEC

U can change.