Preliminary Findings of the Interactive Systems Vision Group

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META-FORUM meeting, Brussels

The Vision Group Interactive Systems

META VISION

- **Chair**
  - Alex Waibel (KIT, CMU & Jibbigo, Germany/USA)
- **Rapporteur**
  - Volker Steinbiss (RWTH & Accipio, Germany)
- **Convenors**
  - Joseph Mariani (LIMSI-CNRS & IMMI, France)
  - Bernardo Magnini (FBK, Italy)
- **Meetings**
  1. Paris, September 10, 2010
  2. Prague, October 5, 2010

The Vision Group
Interactive Systems

META VISION

- **Fields:** Telephone and mobile communication, Call centers, Internet navigation, Social Networks, Videoconferencing, Interpretation and translation, E-commerce, Finance, Healthcare, (Autonomous) Robotics, Car navigation, Security, Entertainment (Games), Edutainment, CALL (Computer Aided Language Learning), etc.

- **Stakeholders:** Telecom and internet companies/operators, Network companies (videoconferencing), Software companies, Translation companies, E-commercial companies, Banks, Robotics companies, Automotive industry, Security companies, Edutainment and game companies, Audiovisual sector, Service providers, etc.

- **Technologies:** Speech recognition, synthesis, understanding, Spoken and Multimodal Dialog, Speaker and language recognition, Emotion analysis, Voice search, Information Retrieval (Question&Answer), Text analysis and synthesis, Topic identification, Speech Acts analysis, Summarization, Machine translation and speech translation, Sign Language Processing, Image and gesture analysis and synthesis, Computer graphics, Computer vision, Acoustics, etc

Situation Interactive Systems

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- Very long deployment process (started in the 1950's)
- (Successful) applications now in many different areas:
  - ***SmartPhones:*** *Dialling, Control (Samsung,…), Voice search (Google, Nuance…), Speech translation (Jibbigo…), eMail answering, Service (SIRI), Voice Dictation (SMS) (Nuance)*
  - ***On line Information:*** *, Call Centers, Customer care and technical support, (public) Information access (such as train time table) and transactions, Museum guides and public information kiosks*
  - ***Car*** *interfaces (in particular navigation)*
  - *Spoken dialog in* ***Video games*** *(MS Kinect, MILO)*
  - ***Military*** *applications (translation and training)*
  - ***Aids to the handicapped*** *(Reading machines for the blind, Sign language in railway stations)*

Enabling and Prohibitive Factors

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SOCIETY & ECONOMY

+ *Ageing*
+ *Globalization*
+ *Automatization of society and more efficiency*
+ *Reduced costs of hardware*
+ *Huge market*
+ *Online availability (App Store)*
+ *Green technologies (Videoconf.)*
– *Cultural, political and economic*
– *Psychological (Human Factors)*
– *Privacy and Ethics*
– *Price for personalized systems*
– *Business Models*

TECHNOLOGY & SCIENCE

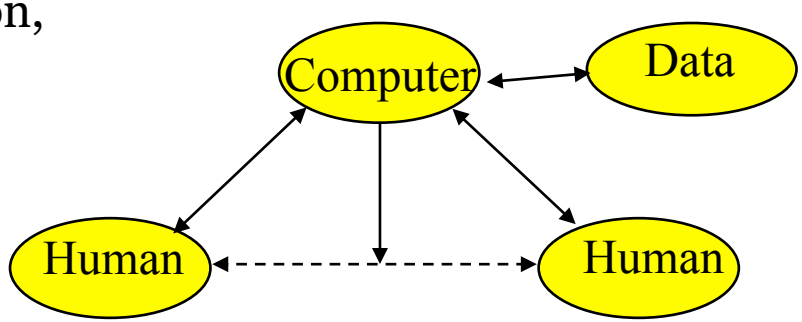
+ *Technology advances*
+ *Ubiquitous technology availability (at low cost)*
+ *Intelligent ambiance*
+ *User-centric, Crowd-sourcing*
+ *Low Barrier of Entry (Apps, Cloud)*
+ *LT Evaluation (TRL)*
+ *LR availability*
– *Limited LT Evaluation*
– *Limited LR availability*
– *Limited knowledge*
– *Technological complexity (//)*
– *Server Cost*

Grand Visions 2020

The Multilingual Assistant

META VISION

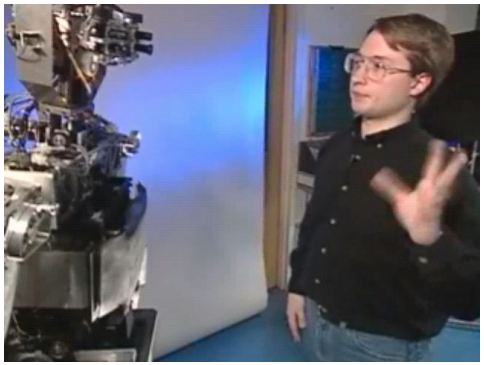
- Multilingual Assistants to Support Human Interaction
- Greater Realism and Universality
  - Interaction Styles:
    Computer-Supported Human-Human Interaction,
    Human-Computer-Human Interaction,
    Human-Computer Interaction,
    Human-Artificial Agents (robots)

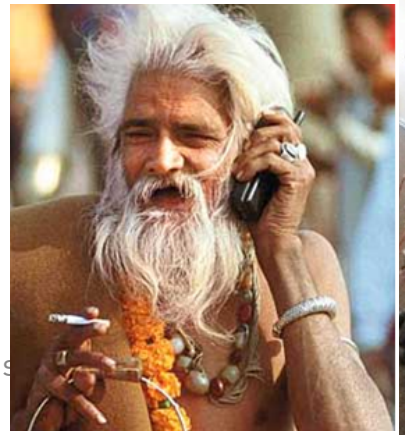


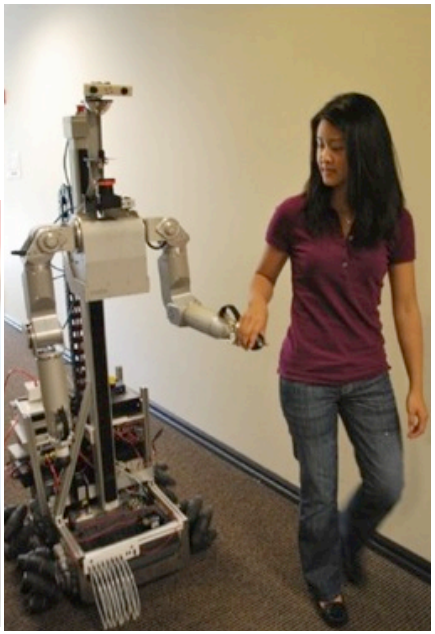
  - Environments:
    Office, Meeting Room, Lecture Hall, Restaurants, Cars, Streets, Cities, Transportation, Roads, World Wide Web, Virtual worlds…

Domain specific visions

- Vision #1. Interacting naturally with Agents and Robots
  - Interaction with Conversational Agents (in games, entertainment, education, communication, etc), Interaction with robots, Spoken dialog, also in instrumented spaces
- Vision #2. Communicating everywhere
  - Mobile applications, Augmented Reality
- Vision #3. Technologies which help limitations
  - Crossmedia, Assistive applications, Sign Language
  - Adapted communication (cars, meetings)
- Vision #4. Community Building
  - Social networks and fora, Multiparty communication humans, agents, robots



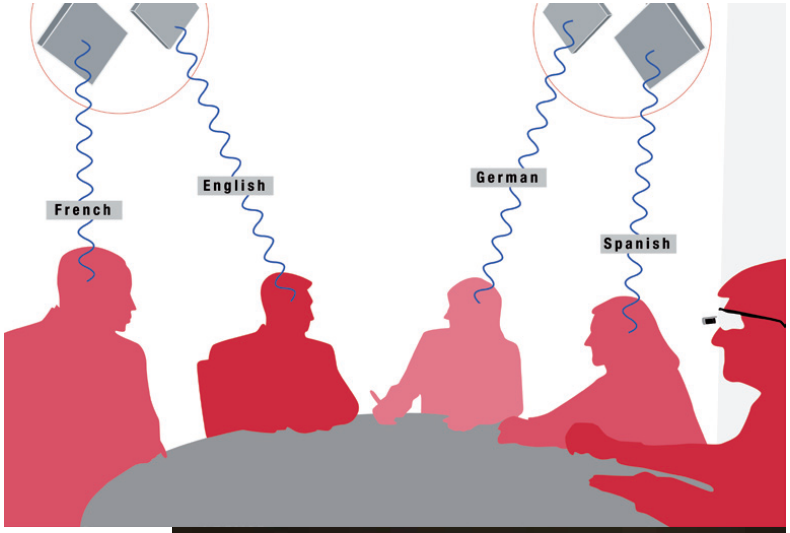




Domain specific visions

META VISION

- Vision #5. I speak your language!
  - Speech-to-Speech Translation, Interpretation in meetings / Videoconferencing, Cross-lingual information access
- Vision #6. Gutenberg still alive
  - Speech transcription, Close-captioning
  - Reading machine, Multimedia book
- Vision #7. My private teacher
  - Computer Aided Language Learning, Education
- Vision #8. I know who you are
  - Person, Biometrics
  - Gender, Style
  - Accent, Language



Research/Technology Needs

Research/Technology Needs

META VISION

- **Need #1. Better core Speech & Language Technologies**
  - More basic research (incl. physiological, perception and cognitive processes)
  - Speech Recognition
    - Lower the Word Error Rate, Accommodate noisy environment / far-field microphone, Open vocabulary, any speaker
    - Robustness: Noise, Cross-Talk, Distant Microphone, Always On
    - Lower Maintenance: Self-Assessment, Self-Adapting, Personalization, Error Recovery, Learning *and Forgetting* of New/Old
  - Speech Synthesis
    - Control parameters for linguistic/paralinguistic meaning, speaking style, voice conversion and emotion
  - Sign Language analysis / generation

Research/Technology Needs

METAVISION

- **Need #2. From Recognition to Understanding**
  - Speech is Communication, not only STT / TTS
  - Communication should be Multimodal (text, speech, gestual, visual), Crossmodal and *Flexi*modal. Accept pragmatically best suited Modalities.
  - Semantic and pragmatic models of Speech and Language
    - Contextual Awareness: Model rapidly linguistic expression and domain
    - Self-Assessment: What is plausible?
  - Detect and recover interactively from mistakes
    - Learn continuously and incrementally from mistakes
    - Unsupervised or by interaction
  - Include paralinguistics (prosody analysis, visual cues): emotion, laughs
  - Necessitates cooperation with psychologists and communication experts
  - Production of adequate Language Resources, Annotation: Huge effort
    - Methods to better use massive amounts of poorly annotated data

Research/Technology Needs

META VISION

- **Need #3. Going to Natural Dialog**
  - Spoken / Multimodal dialog
  - "Transparent" systems
    - Multiple microphones in (non-stationary) noise, Open microphone, Multiparty conversations (humans, artificial agents, robots), cocktail party effect, bi-modal communication (lip reading)
    - Use of other sensor-devices: RFID, motion capture, GPS, etc
  - Dialog models
    - Faster Dialog Models
    - Pro-active (not only reactive)
    - Detect that a voice emission is in machine intention, Interpret a silence
    - Process direct/indirect Speech Acts, including lies, humor…
  - Study of Human factors, and usability
    - Speed, Interface
  - Define dialog systems evaluation metrics / protocols
  - Produce LR (acquisition /annotation) from Real World
    - Incremental system design
    - Use of data available on internet (conversation, talks shows)

Research/Technology Needs

META VISION

- **Need #4. Handling Multilingualism**
  - Interactive systems should cover, or be easily portable to all EU languages
    - 23 official languages + regional languages (catalan, basque, etc)
  - General Language Portability: From few to *Many* Languages
    - Connect to/from non-European languages
  - Speech Translation in Human-Human interaction (e.g. meetings)
    - Speech translation among multiple human users, speaking different languages
  - Deal with Languages, Accents and Dialects effectively
    - Should recognize and adapt to accents, dialects and languages
    - Cross-Cultural Support
  - Provide cross-lingual access to information and knowledge
  - Availability of Multilingual Resources (data, tools)
    - Taggers, Morph Decomposition, Lexica, etc.
  - Availability of Language Resources and Evaluation in all languages, or adaptability within a language family

Summing up: Topics with Strong Visionary Potential

META VISION

- Domain-specific
  - The Multilingual Assistant
  - Provide interaction between humans, humans and agents and intelligent" spaces
  - Able to transfer information across media and across languages
  - Demonstrate advanced functionalities
  - Meet and support many application areas

- Domain-independent
  - Single European Information Space based on Multilingualism
  - As a guiding principle, all EU languages should benefit from LT
  - Cross-Cutting Infrastructure Measures (Research, Appstore, Servers)