International Research Institute MICA

Multimedia, Information, Communication & Applications

Pham Thi Ngoc Yen ***Vietnamese co-director***

Eric Castelli ***French co-director***

International Research Institute MICA

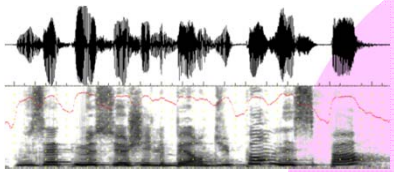
Multimedia, Information, Communication & Applications

UMI 2954

Hanoi University of Science and Technology

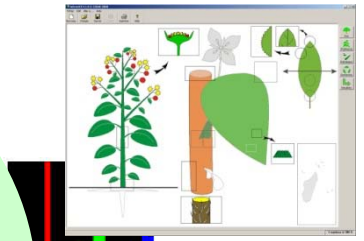
1 Dai Co Viet - Hanoi - Vietnam

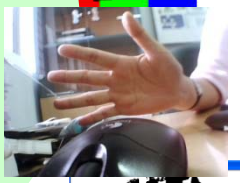
Map of **research** activities



Speech processing

Vietnamese
Khmer, Lao
minorities





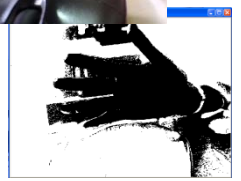


Image & video processing

Applis for Vietnam

MULTIMEDIA Multimodalities

Extraction and use of semantic information

H-M Interfaces and pervasive environments

Applis for Vietnam

Advanced instrumentation

MICA structure

CNRS – HUST – Grenoble INP

Scientific & training Committee

MICA direction

Administrative team

Cadre fédérateur
H-M Interaction

Departments & Center

Computer Vision
- Images & Videos Understanding
- H-M Interaction & Computer vision

Speech Communications
- Vietnamese Languages
- Multilingual studies
- H-M Interaction with Speech

Pervasive Spaces & Interaction
- Information Resources Managt
- Modeling
- Multimodal H-M Interaction

Center of Technological Transfer
- Client service
- Product design service
- Project managt service

Platforms

- Specific Research Platforms
- Common Platforms
- Showroom
- Applications Development

Department
Speech Communications

- **Fundamental research activities**
  - But oriented for application development
- **Fundamental Research**
  - Phonology for languages : Vietnamese, Khmer and Lao
  - Prosody and tones
- **Development of vocal technologies**
  - In Vietnamese, Khmer and Lao
  - Analysis, synthesis and recognition of speech
- **¶ languages (under-resourced and endangered languages)**
  - Khmer, Lao
  - Minority dialects of Vietnam

Hoa Sen
recognition

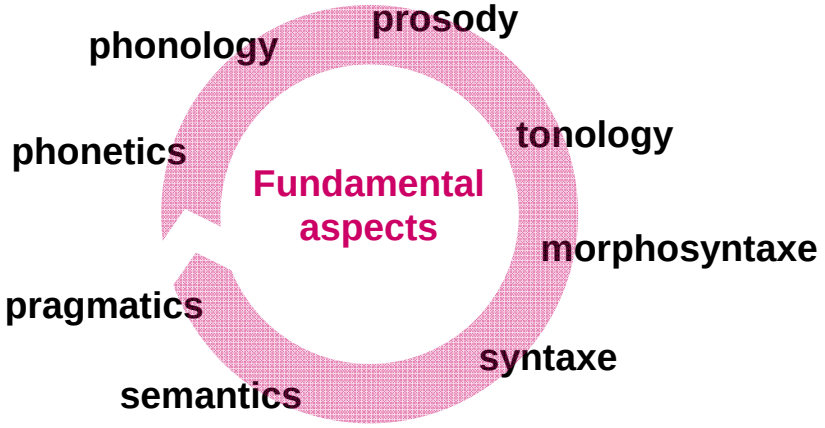
Hoa Sung
synthesis

Minorities
H-Mong
Mo Piu

MICA is the only lab in Vietnam studying both aspects simultaneously
Fundamental (linguistics, phonetics, phonology, etc.)
Applications (vocal technologies)

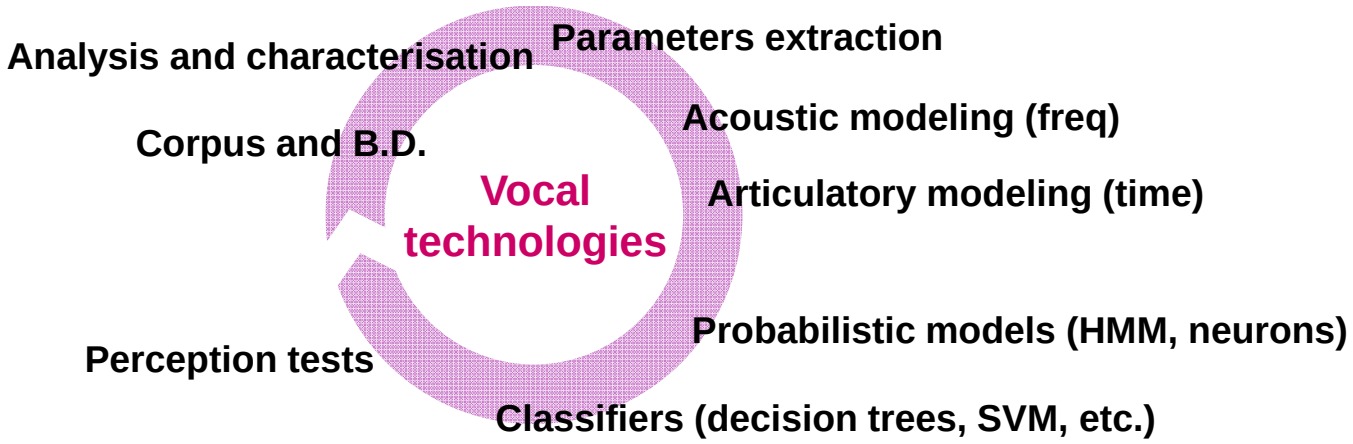
Department
Speech Communications

- **Studies on phonology and tonology, phonetics, prosody, linguistics on languages:**
  - Vietnamese, Khmer, Lao, Mo Piu
  - *Mapping (cartographie)* languages characteristics
  - Comparisons
    - Of these languages to each other,
    - With other languages of the region (Mandarin, Cantonais, Thaï),
    - With other tonal languages (Bàsàa = African Bantu language)



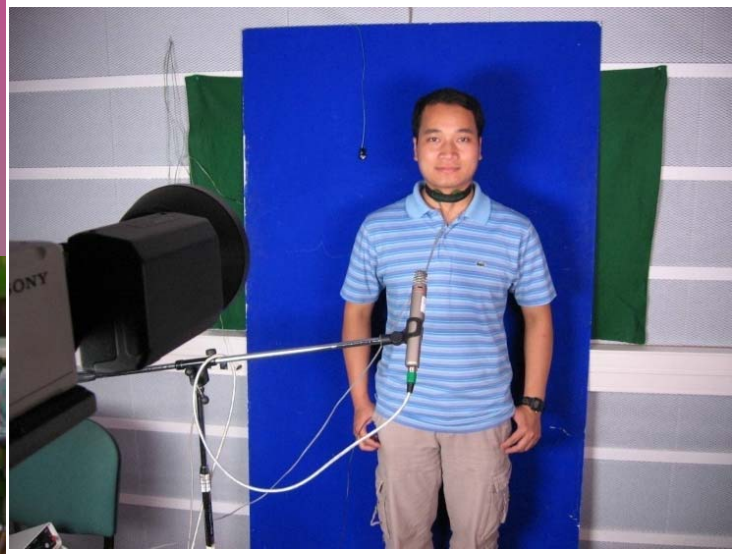
Department
Speech Communications

- **Development of vocal technologies**
  - Automatic synthesis and automatic recognition
  - For the 3 languages (Vietnamese, Khmer & Lao)
  - For human-machine dialog applications and multimedia data bases indexing
  - Development of applications into embedded systems
    - Smartphones, PDA or DSP based systems, robots



Attitude corpus (audio+visual)

- 90 mn audio-visual signal
- 2 speakers
  - 1 woman, 1 man



Maternel

Autorité

Séduction

Department
Speech Communications

H-Mong minority

- Aims: Collect data about ethnologic subjects
  - Origins, technology, religion, **language**, social structure, ...

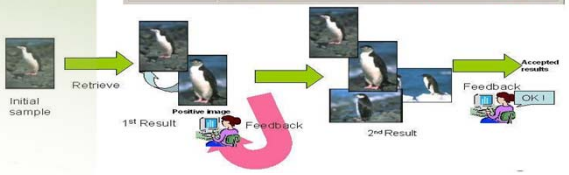
Mo Piu minority

Idnguages

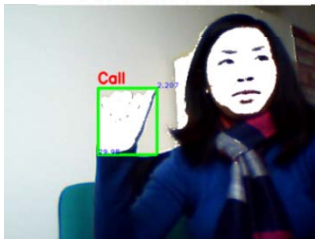
Au Co project

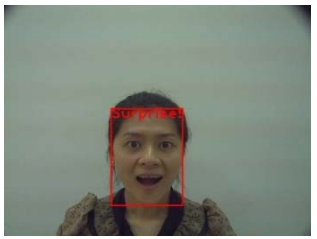
Under-resourced languages

Department
Computer vision



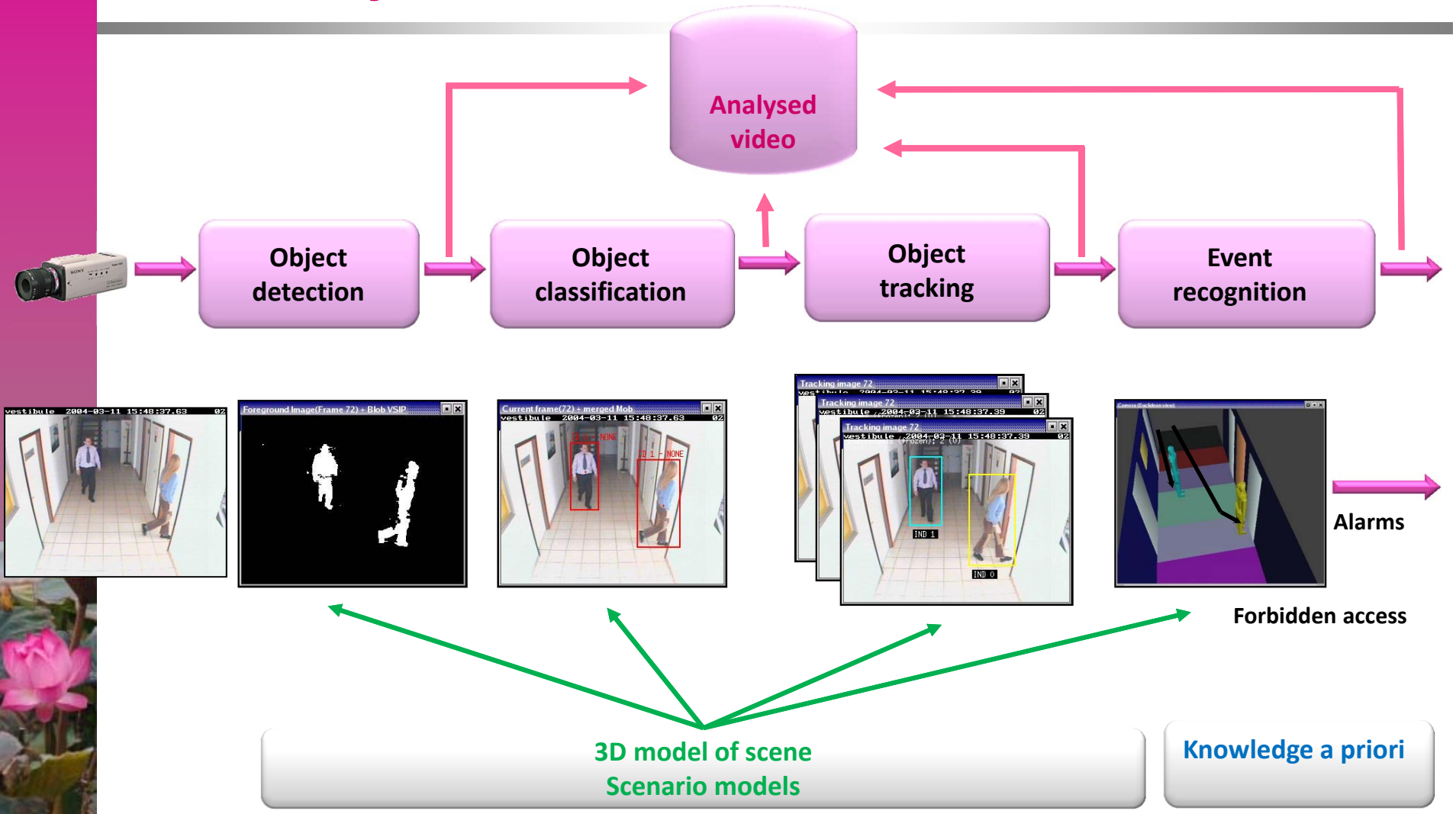
- **Research**
  - **Visual based object detection and recognition**
    - Determination of new characteristics
    - Combined use of different types of characteristics
  - **Indexing and search based on image/video content**
    - based on user interaction through the relevance feedback
    - query language for surveillance video
  - **Multimedia analysis**
    - Images
    - Videos
- **Applications**
  - **Applications for hand gesture and facial emotion recognition**
    - Human-machine interaction
    - Human-robot interaction
  - **Applications for video analysis**
    - Object characterization (i.e. humans, cars, etc.)
    - Object tracking (person tracking)
    - Event detection
  - **Applications developed for Vietnam**
    - Nôm character recognition on granite stele - Project SEPIA
    - Applications for biodiversity
    - Automated fabric defect detection system





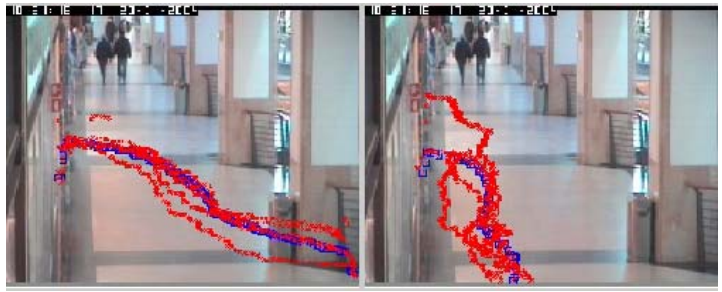
Department Computer Vision

Video analysis & semantic extraction

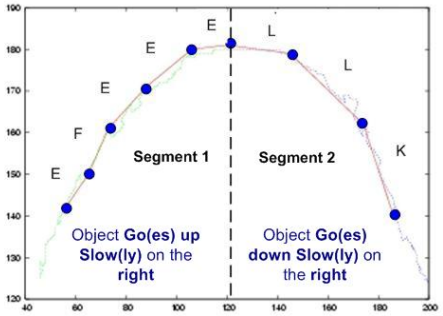


Not only objects, but also "events"

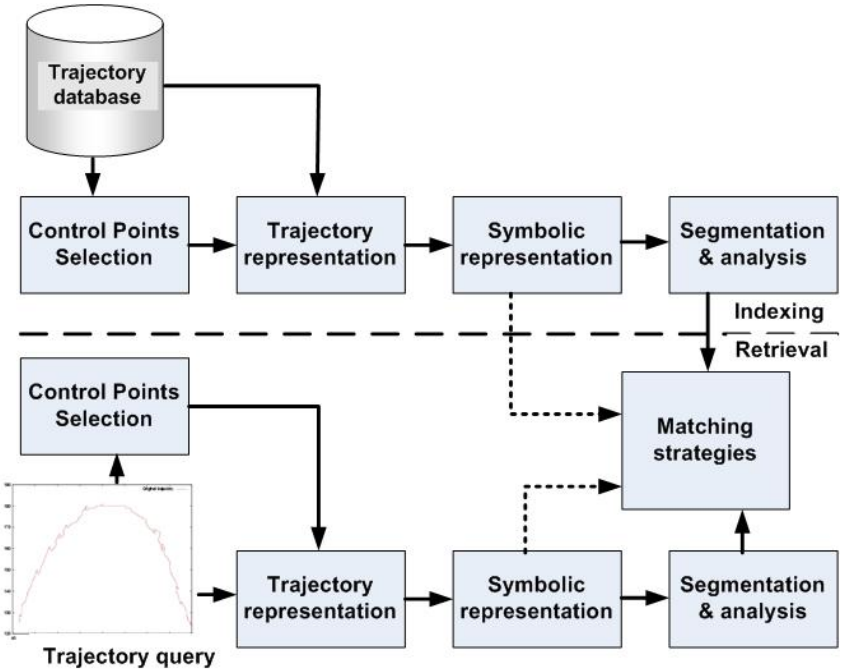
→ Trajectory-based video indexing and retrieval

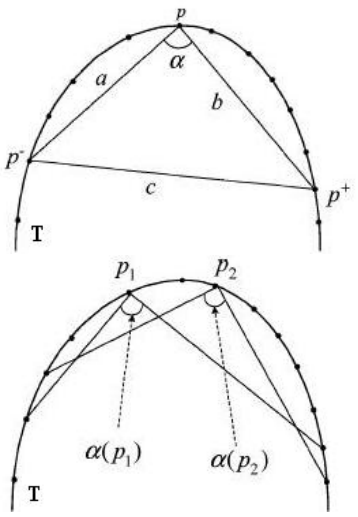


Extracted trajectories from videos



Symbolic representation





Control Point Selection

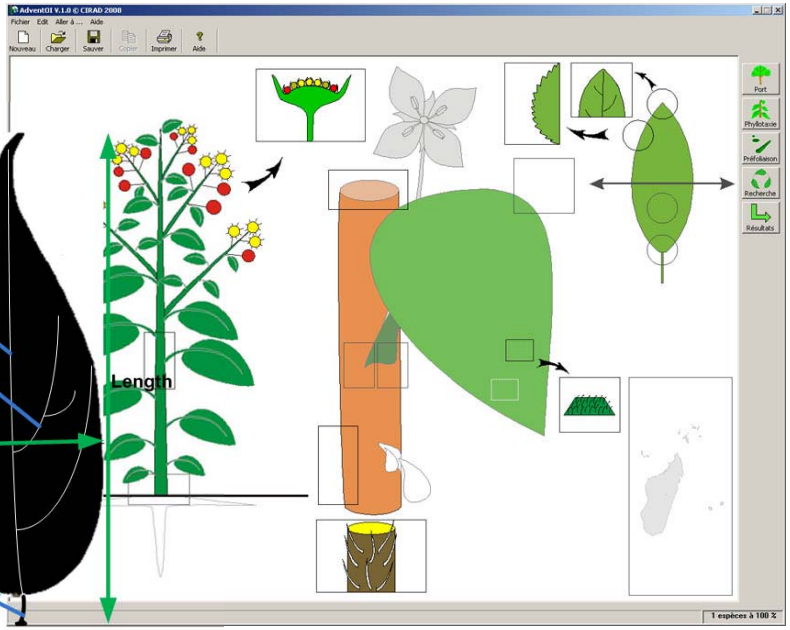
Department
Computer vision

- **Knowledge representation**
  - Help in identifying species
  - Help to assess the floristic composition and faunal

Automatic leaf characteristic extraction

Image feature extraction

Leaf characteristic identification



Shape of the leaf;
Primary venation;
Secondary and tertiary venation;
Margin of the leaf;
Ration length / width
Ratio petiole / lamina

Department
Computer vision

- **Major international convention**
  - International Convention on Biological Diversity (CBD)
  - Convention on Climatic Changes
  - Washington Convention on Illegal Trade of Endangered Species (CITES)

- **Autosuffisance alimentaire du VN**
- **Vietnam's food self-sufficiency**

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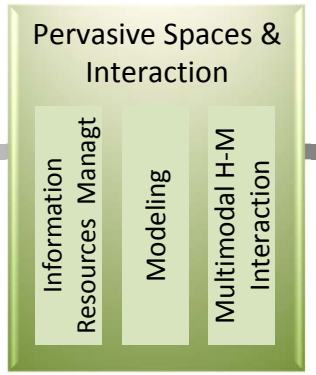
Department
Pervasive Spaces & Interaction



- **Information technologies and multimedia are powerful enough to allow a new approach in the managements of environments**

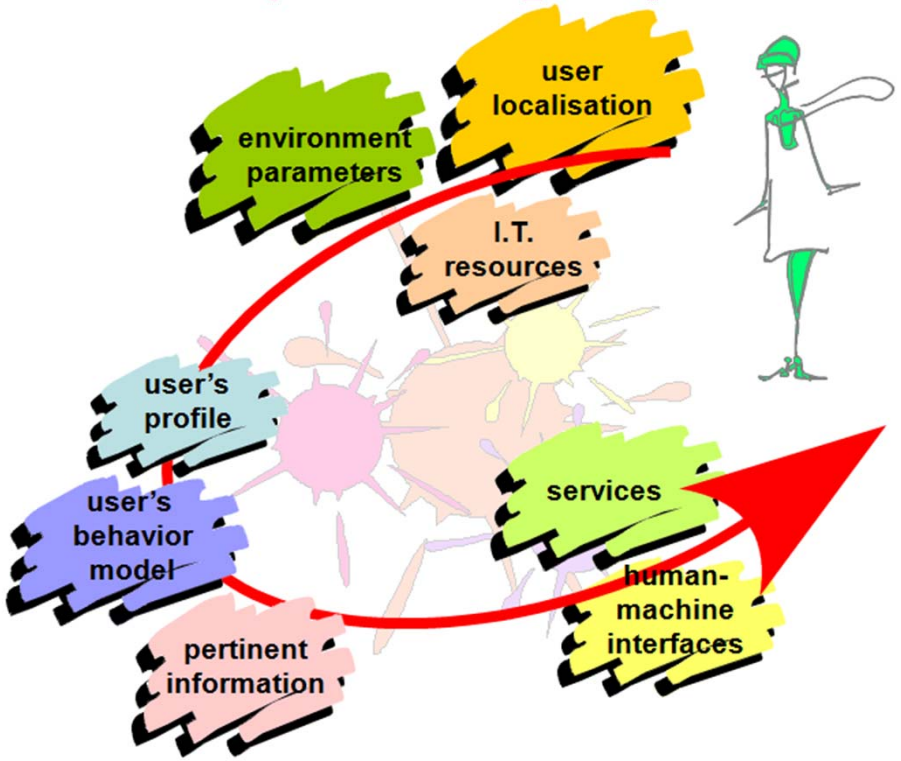
- **However, if we want these new services are best used, with efficiency and safety, by the targeted users, it is necessary to study their ergonomic design and carefully specify their specifications**
  - Meet the needs, expectations and wishes of users
  - For best production, best resource management, good security and good information privacy

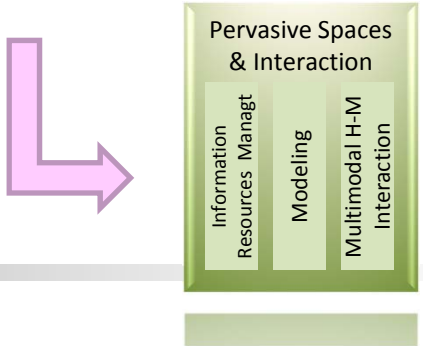
- **Perceptive and pervasive environments**
  - room, building, area, district, city, etc.
  - with various sensors
  - managed by computer(s) and wireless communications

Department
Pervasive Spaces & Interaction

- **Three sets of tasks in a user-centered processing loop**

- **1 - Analysis**
  - Environment (context)
  - User situation
  - Available computing resources
- **2 – Modeling and extraction**
  - User profile
  - User behavior
  - Pertinent information extraction
- **3 – Service & interaction**
  - Service design
  - Best HMI





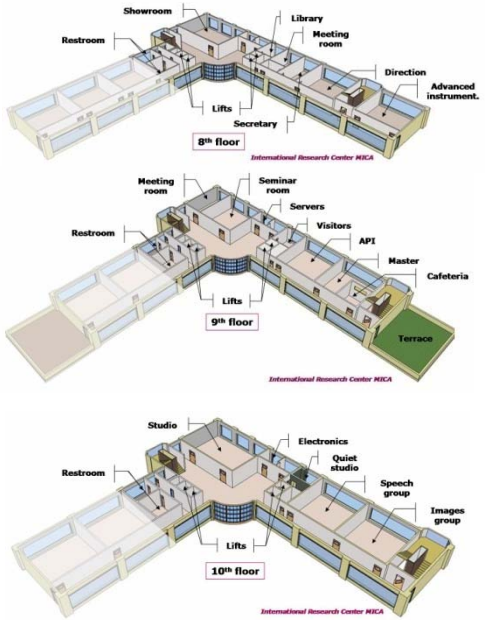
Department
Pervasive Spaces & Interaction

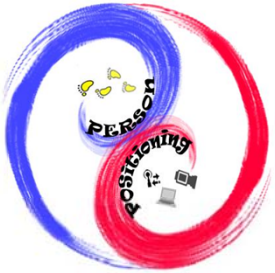
- **Wireless sensors network**
  - For large scale perceptive environments
  - Applications for biodiversity studies in Vietnam and South-East area

- **SWEET-HOME project (international)**
  - ⋆ Funded by France
  - Build a **new framework** for modeling everyday life activities at home → **for erderly people telesurvey**
  - Acquistion and fusion of muti-sensor information (audio/video/biomedical) to detect activities and evaluate human behavior

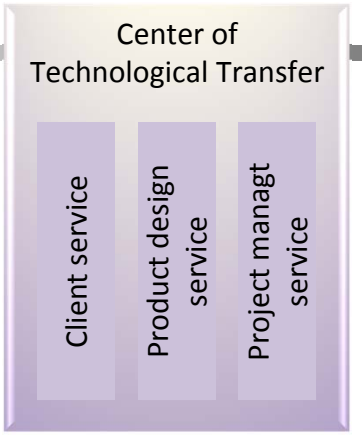
User localization

- **Project PERSPOS (Personal Positioning)**
  - **Main goal**: propose a new methodology for user localization using heterogeneous data from different technologies (GPS, Wifi triangulation, RFID, caméra, etc.)
  - LIG/Prima & MICA





Center of Technological Transfer



- **Main objectives**
  - Development of applications and prototypes
    - For MICA researchers → research prototypes
    - For Vietnamese industrials → industrial prototypes
- **Try to find/create new industrial partnerships**
  - Dissemination of MICA research results
  - Center of TT → a bridge between MICA research groups and companies
- **Structure**
  - Organised in 3 main tasks
    - Client service → find/create new industrial partnerships
    - Product design service → design/realisation of prototypes
    - Project management service → management of R&D projects

Center of Technological Transfer

Project examples

- **National research project Smart Robot**
  - In strong cooperation with
    - ⋆ Speech Communications Department: design and realisation of the Automatic Speech Recognition engine
    - ⋆ PSI Department: design of the robot control system

- **Industrial projects (in process)**
  - Cooperation with Speech Communications Depart.
  - ASR Prototype of a one-line client service center: VMG Vietnam (Vietnam Mobile Gateway)
  - Speech synthesis prototype for an Vietnamese Android game « qui veux gagner des millions » (in Vietnamese): company SUNNET ITC Solution

+ 10 000 downloads in 1,5 month

Research Projects

- **2002 – 2005**
  - 7 projects completed successfully
    - 2 internal projects
    - 3 national projects
    - 2 international projects
- **2006 – 2007**
  - 8 projects completed successfully
    - 3 national projects
    - 5 international projects with 2 European projects
- **2008 – 2009**
  - 7 projects completed successfully
    - 5 national projects
    - 2 international projects
- **2010 - 2011**
  - 11 projects completed successfully
    - 8 national projects
    - 3 international projects
- **In process**
  - 13 projects
    - 2 internal projects
    - 6 national projects
    - 5 international projects

From the creation of MICA
33 completed projects

17 international projects
29 national projects
TOTAL: 46

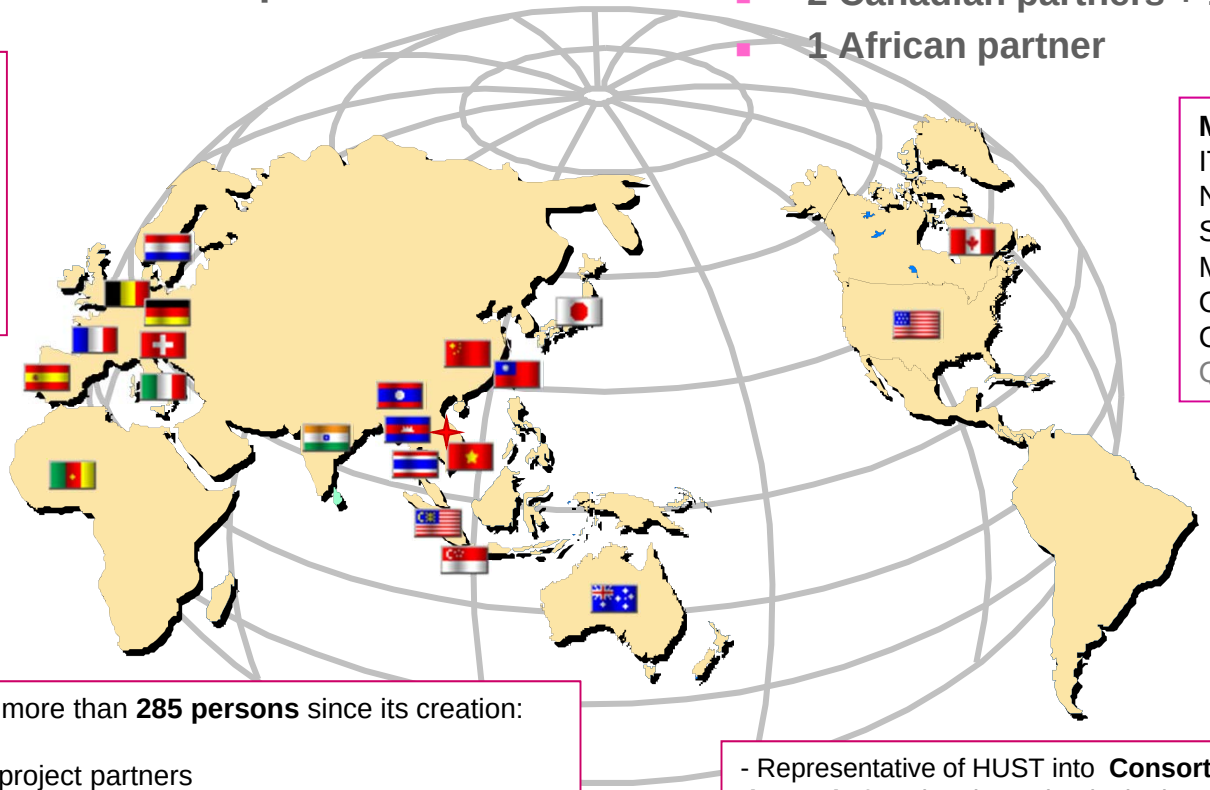
International cooperation
100 partners from 22 countries

- 11 Vietnamese partners
- 45 French partners
- 5 Franco-Vietnamese partners
- 1 partner Francophonie

- 23 Asian partners
  - From 11 countries
- 11 European partners
  - From 6 countries
- 2 Canadian partners + 1 U.S.
- 1 African partner

MICA member of **Groupement AURA** of CNRS

Representative for 2011



MOU with
ITC Cambodia
NII Japan
Sains Universiti Malaisia
Mons University Belgium
ORANGE/FT Group
CIRAD France
Queensland, Australia

MICA Institute received more than **285 persons** since its creation:
• invited researchers
• commun international project partners
• visits of personalities, delegations, officials VIP

- Representative of HUST into **Consortium International d'Appui** of *Institut de Technologie du Cambodge*
-**Leader** of the international network SPAN (Speech Processing Asian Network)

Some figures

- **103 persons in June 2012**
  - 63 persons = researchers (permanents, postdoc, PhD and masters) + admin staff
  - 40 engineer student internships
- **PhD**
  - 21 completed PhD
  - 17 PhD in process
  - 2 stopped PdD
- **More than 750 scientific publications**
  - 55 % = books, revues & journals, and conferences
- **46 research projects**
  - MICA leader of 28 projects
  - 33 completed projects and 13 projects in process
- **International cooperation with more than 100 international partners from 22 countries**
  - MICA received more than 30 invited researchers
- **16 R&D projects R&D with industrials**
  - MOU with ORANGE/FT Group
    - 1 R&D project in process
  - Central node of the competitiveness cluster IMAGINE-IT

11 nationalities
Vietnam, France, Cambodia, Laos, China, Malaysia, Cameroon, U.S., Switzerland, Madagascar, Roumania