FORTH
Foundation for Research & Technology - Hellas
Institute of Computer Science
Computational Vision and Robotics laboratory

Visual Human-Robot Interaction within the INDIGO project

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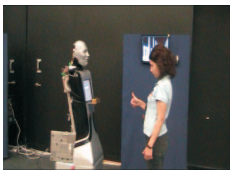
The INDIGO project

INDIGO aims to develop human-robot communication technology for intelligent mobile robots that operate and serve tasks in populated environments (such as museums and exhibition centers). To achieve this goal, the project exploits and advances technologies from various sectors:

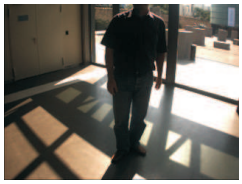
- Robotic hardware
- Multilingual speech recognition
- Robust natural language interpretation
- Advanced navigation capabilities
- Appropriate user models for humans and robot
- **Visual perception capabilities::**
  - **a. Identify and track the face and the hands .**
  - **b. Visually recognize/interpret hand&face gestures.**
  - **c. Visual speaker detection**
  - **d. Recognition of a set of simple facial features and/or expressions**



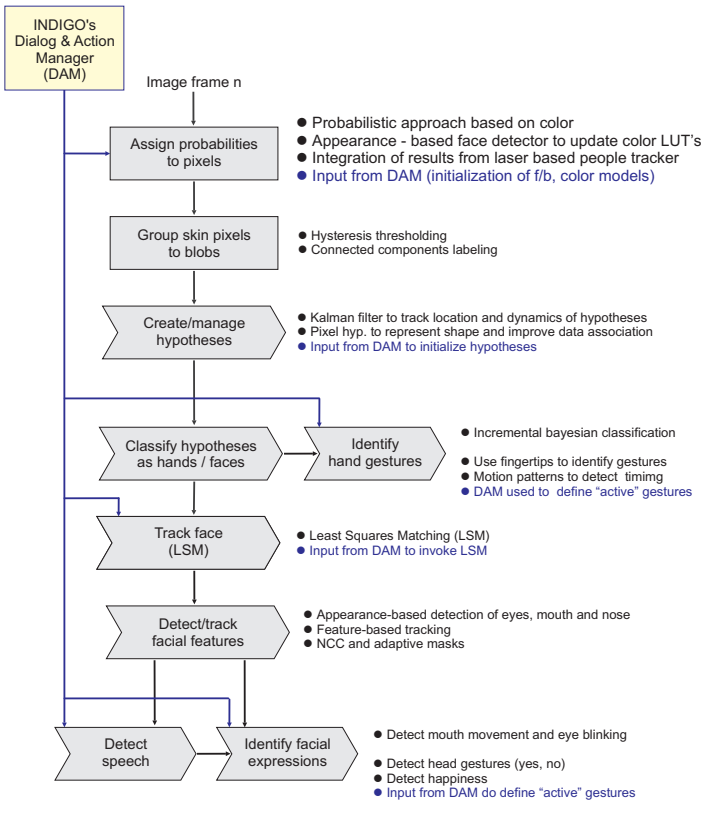
Major Chalenges of the visual system

- Unconstrained lighting conditions, dynamic backgrounds
- Real-time processing at high framerates
- Distinguish beween face and hands
- Need for occlusion handling
- In-plane and off-plane head rotations

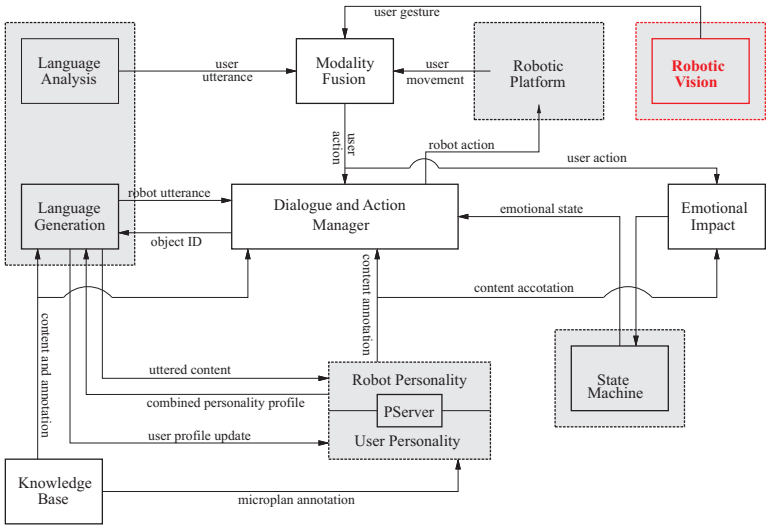




Block diagram



System Architecture



Sample results

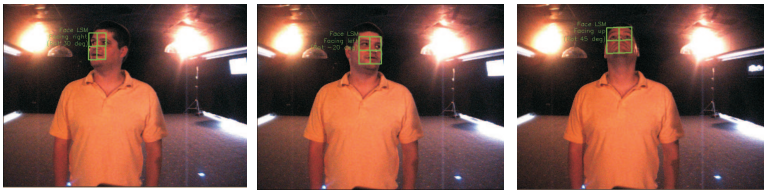
From pixel probabilities to hand/face hypotheses

Using laser based tracking to improve results

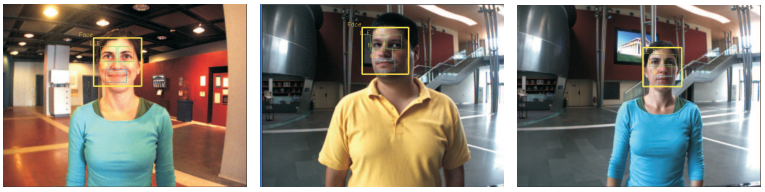
Motion patterns to detect hand gestures

Using number/relative location of fingertips for hand gesture recognition

Head pose tracking with Least Squares Matching (LSM)



Facial feature detection and tracking



More information on INDIGO project homepage: http://www.ics.forth.gr/indigo