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CHIST-ERA Projects Seminar

Topic IUI

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(based on slides from S. Dupont)

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FUTURE & EMERGING TECHNOLOGIES scheme





Introduction: Projects of the topic

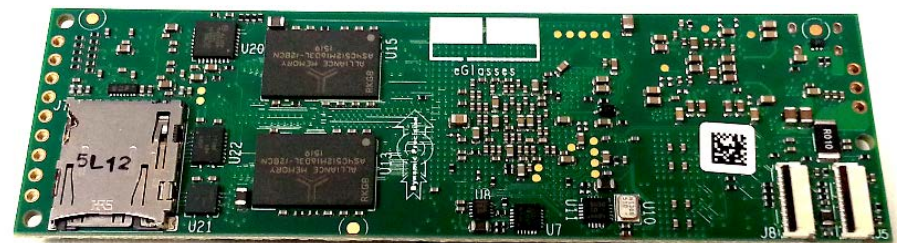
- ❖ **eGlasses: The interactive eyeglasses for mobile, perceptual computing**
 - ❖ **IMOTION: Intelligent Multimodal Augmented Video Motion Retrieval System**
 - ❖ **JOKER: JOKe and Empathy of a Robot/ECA: Towards social and affective relations with a robot**
- ⇒ **Support of diverse set of IUI applications, provision of different technologies**



Major achievements and output: eGlasses ...

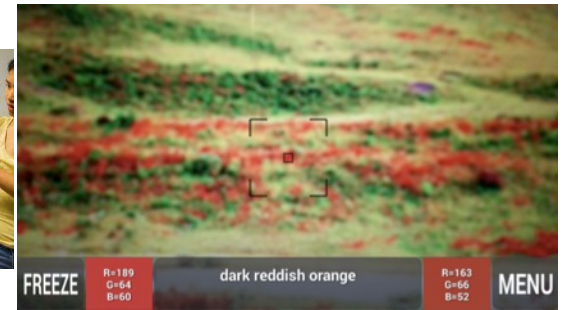
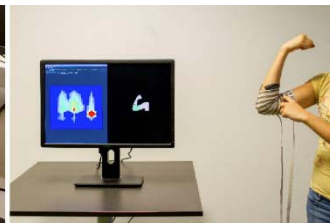
The eGlasses project has created an open modular SW and HW R&D platform with look and feel user experience of multisensory electronic glasses supporting enhanced interaction techniques, tools and methods for developing and testing new IUIs, including:

- ✓ The HW platform prototype equipped with multiple input sensors like proximity, eye-tracking, IR, accelerometer, smart textiles and output like near-to-eye displays, sound, vibro;
- ✓ The SW APIs to control all input/output devices and to support standardized IoT wireless communications (BT)



The eGlasses open R&D platform has been successfully used for:

- ✓ interaction with recognized patients and smart IoT objects;
- ✓ testing of new interaction methods like proximity-based text entry and gesture recognition, eye-tracking for micro-display events, design and use of smart fabrics;
- ✓ AAL cases like context analysis, initial navigation and color recognition, labelling and dichromacy transformations;
- ✓ experiments with biomedical signals measurements like ECG, EEG, EMG, and respiration waveform related to the user;





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Major achievements and output: JOKER ...

Laugh with robots to live better with

❖ Multi-modal communication model

- ✓ High + low level communication process

❖ Human-like perceptive modules

- ✓ Affect bursts, laughter detection and classification offline and in real-time (audio, video, motion capture)
- ✓ Fast large vocabulary ASR system
- ✓ SLU: a neural approach: Attention Based RNN

❖ Human-like generation and synthesis

- ✓ Speech laugh synthesis
- ✓ Multi-level smiled speech and affect burst (disgust, surprise, startle, amusement) audio synthesis (HMM based)
- ✓ Multimodal and multi-level synthesis of laughter and smiling





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... Major achievements and output: JOKER

❖ Corpus : collection and annotation - evaluation

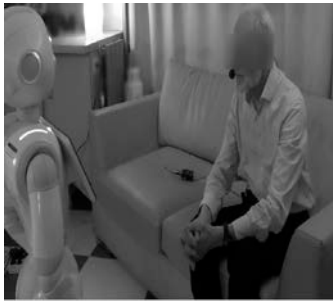


- ✓ Audio/video: humorous human-robot dialogues (English/ French)
- ✓ Open domain textual dialogues, freely available at <https://ucar.limsi.fr>
- ✓ Corpus collected in French with elderly people (audio/video data)
- ✓ Multimodal databases for affective expressions



Human-(Ro)bot experiments tools

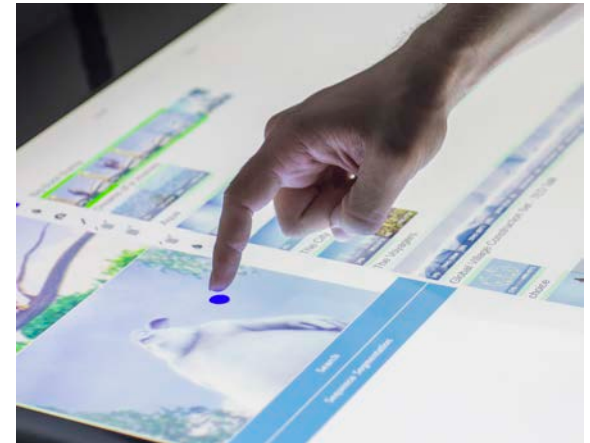
- ✓ JOKER real-time dialogue system (paraling and ling)
- ✓ Online and distributable real-time dialogue platform (CARA system)
- ✓ Real-time controllable avatar (face direction, facial expressions, etc.)
- ✓ Laughter responsive robot (Furhat robot)





Major achievements and output: IMOTION ...

- ❖ **Intelligent Multimodal Video Motion Retrieval System**
- ❖ **Multiple modes of user interaction: sketch, speech**
 - ✓ Multimodal user interfaces
 - ✓ Complementary for Information Retrieval applications
 - ✓ Possibility to seamlessly switch between modes
 - ✓ Support a large variety of query modes
 - **Keywords, query-by-example, query-by-sketch, motion, semantic concepts, speech**
 - **And any combination thereof**
 - ✓ Anticipation of user needs
 - **Sketch auto-completion**
 - **Consider temporal nature of sketches**
 - **Dealing with ambiguity in sketches**





... Major achievements and output: IMOTION

❖ Multiple features to represent multimedia content

- ✓ Static: concept recognition
- ✓ Dynamic action recognition

❖ Support for very large collections (Big Data)

❖ Early prototyping and competitions

- ✓ Participation at evaluation campaigns
- ✓ Winner of the Video Browser Showdown 2017

❖ Open source results / Reproducibility

- ✓ Multimedia retrieval engine vitrivr (Google Summer of Code 2016)
- ✓ Open Source Video Collection for evaluation purposes

❖ Sustainable collaboration: Cotutelle UMONS-UNIBAS



Target Outcomes (IUI Call)

Methods and models for interacting with the user using **multiple modes of interaction**, **seamlessly combining** them and **switching** from one another, so that the multimodal interaction makes sense to the user as a whole and makes the interfaces more **natural** and more **effective**;

Richer user models that include **behaviour models**, **mental models**, **capacity expertise**, etc.;

Methods and models to build an **affective, social, behavioural representation** of the user from multiple forms of interaction, over short to very long periods of time;

Multiple-interaction systems tailored to non-conventional needs, **assistive** technologies and **accessibility** (children/learners, the elderly, disabled people, including those with very limited communication means);

Multi-modal interfaces for **collaborative** and/or **remote tasks**;

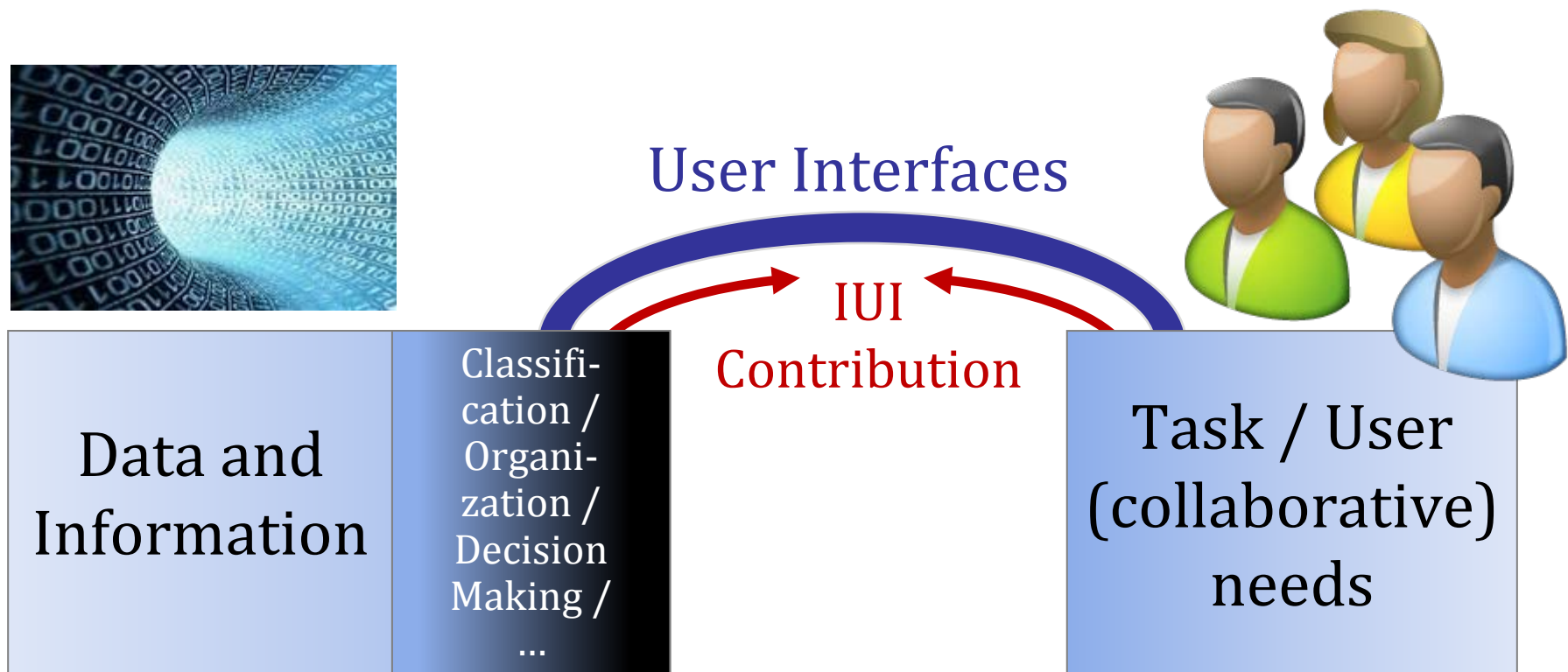
Representative **data sets**, **metrics** and **protocols** to study any of the above;

eGlasses	JOKER	IMOTION
✓	✓	✓
✓	✓	✓
✓	✓	✓
✓	✓	✓
✓	✓	✓
✓	✓	✓



Role of Intelligent User Interfaces

❖ What is intelligent in UIs?





Challenges and Needs beyond IUI Call ...

❖ User Models

- ✓ comprehensive & adaptive (learn from previous mistakes)

❖ Data Needs (Modeling & Evaluations)

- ✓ Methodologies for annotations
- ✓ Methodologies for gathering user needs
- ✓ Challenge of privacy / ethics / reproducibility
- ✓ ML methodologies such as transfer learning, active learning (making previously unpractical things practical)
- ✓ In-context evaluations

❖ Deep Learning

- ✓ Possible loss of application focus.
- ✓ Still little contribution of DL from IUI point of view.



... Challenges and Needs beyond IUI Call ...

❖ Interaction Modes

- ✓ Comprehensive range of modes, seamless integration
- ✓ voice, dialogue, sketch, tangible, haptic, body, gaze, augmented reality, BCI, traditional interfaces, ...
 - **Automatic selection of most effective fusion given context/user/application.**
 - **Get these modes work in natural contexts & ambiguity**
 - **Assistive technologies.**

❖ Information Visualization

- ✓ IUI are inherently interactive
- ✓ Dealing with very large volumes of information
- ✓ Immersive interfaces



... Challenges and Needs beyond IUI Call

- ❖ **Interaction between technology development and user behavior**
 - ✓ Acceptance, customization, learn from early failures, etc...
- ❖ **Changes of user behavior**
 - ✓ Adaptivity
- ❖ **Proactive/predictive interfaces**
 - ✓ Sensing Context and Human
 - ✓ Special needs

- ❖ **Representative data sets, metrics and protocols to address these challenges (Reproducibility)**



❖ Industry

- ✓ Ambient Assisted Living (Integrated Solutions)
- ✓ SME/spin-offs in concrete application domains

❖ H2020

- ✓ Interfaces for accessibility (deadline: April 25th)
- ✓ ECSEL 2017 (PPP, Deadline May 2017)
- ✓ M-ERA-NET (Smart Textiles)
- ✓ Cultural Heritage ERA-NET

❖ Others

- ✓ Bilateral projects
- ✓ National projects



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Questions

