

CHIST-ERA Projects Seminar Topic IUI

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(based on slides from S. Dupont)

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- Glasses: 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
- \Rightarrow Support of diverse set of IUI applications, provision of different technologies

(c) Chist-era 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)





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Intelligent User Interfaces - IU



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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Intelligent User Interfaces - IUI



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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

... 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 <u>https://ucar.limsi.fr</u>
- ✓ 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)
- \checkmark 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 sketchs
 - Dealing with ambiguity in sketches



... Major achievements and output: IMOTION

Search butto

Object choose

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)

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- ✓ Open Source Video Collection for evaluation purposes

Sustainable collaboration: Cotutelle UMONS-UNIBAS

Weight

Result displa



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
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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

- \checkmark Possible loss of application focus.
- \checkmark 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)

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C Potential Sources of Further Funding chist-era

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





