INFORMATION SHEET

Interaction and uses

On the ergonomic, co-adaptive and intelligible design of interfaces

With the increasingly advanced digitalization of companies, human interaction with digital systems is becoming a pivotal aspect of industrial activities and services. These interactions can be deployed in several ways (haptic, gestural, written, vocal, visual, etc.), and must both simplify human activity and increase its cognitive power.

CHALLENGES

The quality of the interaction between humans and digital systems determines the acceptability of these systems, their efficiency and their security when they are critical. One key element in the implementation and success of these interactions is to consider their uses.

POSITIONING OF THE INSTITUTE

In order to facilitate the understanding of the representation spaces in which systems evolve, IRT SystemX approaches techniques linked to data visualisation, user interfaces (in particular those integrating artificial intelligence bricks) and virtual reality. Such techniques are particularly valuable as they concern dynamic or large-scale problems that are difficult to grasp in a simple way with standard tools. Given its key role in decision aids and the importance of man-machine interactions within systems, this field is transverse to the institute's other scientific and technological fields, which thus benefit from design and conception skills.

EXPERTISE

Human-computer interaction, user-centred design, visualization of massive data, virtual assistant, virtual and augmented reality, design, cognitive sciences

Projects in this field

CMI project

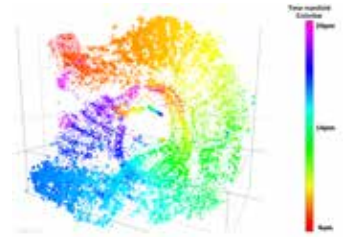
On the creation of an Interactive Multimodal Cockpit for the Delegated Driving Car, in order to reduce the cognitive load of the driver and to improve intuitiveness

- Development of contextualised multi-modal HMIs
- Establishment of guidelines for HMI design
- Exploration of the contribution of virtual assistants

BST project

Blockchain for Smart Transactions: demonstrating the uses and services facilitated by the adoption of blockchains

- Identification of uses and monitoring of decentralised architectures
- Definition of the technical, legal, economic and social conditions for the deployment of blockchain-oriented services
- Development of a modular digital platform for cross-domain use cases based on blockchain



IVA project

Augmented Passenger Information: optimising multimodal travel on the Ile-de-France transport network

- Development of an AI-based mobility assistant
- Modelling behaviour of travellers faced with information in troubled situations

CAB - IA2 project

Developing a Bidirectional Cockpit and Assistant for the aeronautics, rail, energy and telecommunications sectors

- Design of a bidirectional learning between an operator and a virtual assistant based on AI
- Personalization of recommendations to the situations encountered, considering the operator's level of expertise
- Explanation of the recommendations proposed by the virtual assistant

Roadmap

SCIENTIFIC AND TECHNOLOGICAL CHALLENGES	RELATED RESEARCH FIELDS
Human-Machine Interaction	• Visualisation of large-scale data • Design of complex interactions • Design methodology
Human Interaction with AI	• Adapting AI to the user • Strong integration between HMI and AI • Visualisation for interpretation of Machine Learning models
Human interaction for simulation	• Simulation of human behaviour • Interaction for system engineering

Platforms and demonstrators

MININGVIS

- Visualising Bitcoin mining data
- Understanding pooling strategies

Target of IRT SystemX publications in this field (HAL collection)

● JOURNALS

IEEE Transactions on Visualization and Computer Graphics, International Journal on Interactive Design and Manufacturing, Design Studies

● CONFERENCES

IEEE ITSC (International Conference on Intelligent Transportation Systems), IEEE CDC (Conference on Decision and Control), IEEE CSMC (Control Systems Magazine), IFAC-ADEHMS (Conference on Analysis and Design of Hybrid Systems), ITS World Congress, ICED (International Conference on Engineering Design), DSC (Driving Simulation Conference), ECCE (Annual Energy Conversion Congress and Exposition), ERGO'IA, JADT (Journées internationales d'Analyse statistique des Données Textuelles)

Interaction and uses

ACADEMIC PARTNERS

CentraleSupélec

Bordeaux INP ENSC

Inria

Université Gustave Eiffel

université PARIS-SACLAY

Université Polytechnique Hauts-de-France

RESEARCH GROUPS AND SCHOLARLY ORGANIZATIONS

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ARPEGE

CNRS GDR Groupement de recherche GPL Génie de la programmation et du logiciel

INDUSTRIAL PARTNERS

ARKAMYS

Atos

Covea

Dassault Aviation

ERCOM

La Poste Groupe

Île-de-France Mobilités

IDIT

Kisio Digital

orange

Renault Group

Rte

Saint-Gobain

SNCF

SPIROPS

Stellantis

Valeo

ABOUT IRT SYSTEMX

SystemX is a technological research institute (IRT) with expertise in the fields of analysis, modelling, simulation and decision support for complex systems. As the only IRT dedicated to digital systems engineering, it coordinates partnership research projects, bringing together academics and industry in a multi-sector perspective. Together, they work to solve major scientific and technological problems in four priority application sectors: Mobility and Autonomous Transport, Industry of the Future, Defence and Security, Environment and Sustainable Development.

Through use-case oriented projects, SystemX's research engineers respond to the major societal and technological challenges of our time, and thus contribute to the acceleration of the digital transformation of industries, services and territories.

Located at the Paris-Saclay plateau and in Lyon, SystemX was created in 2012 as part of the future investment programme.

IN THE TEAMS

7 engineer-researchers

8 PhD projects, **5** of which have been defended

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