Elodie BOUZBIB

Date of Birth: 19/09/1992 (31 years old), Versailles (France)
Telephone: (+33) (0)6.32.53.14.17
Mail: elo.bouzbib@gmail.com
Website: www.bouzbib.com

RESEARCH DOMAIN

I work in Human-Computer Interaction, at the crossroads with Haptics, eXtended Realities and Robotics. I notably work of the integration of haptics - the sense of touch - in extended realities, through interfaces I design, implement and evaluate. My aim is to explore the design space of haptics in extended realities and to formalise it for a given context, so the user experiences can be improved while simplifying the designers' work load. This objective will be realised by (1) defining performance criteria for each use-case, (2) proposing novel hardware solutions (e.g. tangible interfaces) and software solutions (e.g. interaction techniques, models) and (3) validating them iteratively with technological, interactional and perceptual perspectives. This will notably enhance the comparison of constraints and characteristics among different applications, and enable their potential transposition between-environment (virtual ↔ mixed ↔ real).

AWARDS

- **PhD Thesis Award 2021**: Awarded by AFIHM ; Invitation to present my PhD work at IHM'22, by winning the award of best *pluridisciplinar* thesis ("Prix de Thèse"; Video link) (8 candidates).

- Election of CoVR as **Federating Project within the ISIR laboratory (Paris, France)**. The objective of the "federating project" is to have a display application for the lab. CoVR was an interface I designed during my PhD thesis. ISIR and the CNRS (National Scientific Research Center) then co-financed (2×55 k€) for a second version of my prototype to use as a multimodal platform at ISIR.

PROFESSIONAL EXPERIENCES

2024 Visiting Researcher - Post-doctorate fellow at **Upna Lab** (Pamplona, Spain).
Supervisor: Asier Marzo (Lecturer, Universidad Pública de Navarra, Pamplona).

2023-2021 Post-doctorate fellow at **Centre Inria de l'Université de Rennes** - **IRISA** (France) and **Skolkovo Institute of Science and Technology** (Russia)
Topic: "Ubiquitous Haptic Interfaces in eXtended Realities".
Supervisors: Anatole Lécuyer (DR Inria - Irisa *Hybrid*), Claudio Pacchierotti (CR CNRS - Irisa - *Rainbow*) et Dzmitry Tsetserukou (Ass. Professor, Skoltech Moscow).

2021-2018 PhD Candidate in HCI at **ISIR**, Institute of Intelligent Systems and Robotics et **ISCD**, Institut of Data and Calculus Sciences - **Sorbonne Université** in Paris (France)
Topic: "Robotised Tangible User Interface for Multimodal Interactions in VR: Anticipating Intentions to Physically Encounter the User."
Design, Implementation and Evaluation of a robotised haptic interface in virtual reality.
PhD supervisors: Gilles Bailly (DR CNRS - ISIR) and Pascal Frey (Pr, ISCD).

2018-2015 System Integration Team Lead at **StretchSense Ltd**, Auckland (New-Zealand)
Responsible for the conception and development of the company prototypes, made out of flexibles sensors notably integrated in smart clothing.

2015 Research Engineer intern (6 months) at **LAAS-CNRS** (Toulouse, France)
Topic: Conception and development of a smart insole for the elderly.

2014 Research Assistant (3 months) at the **University of Glasgow** (Glasgow, Scotland), in the Biomedical Engineering Division.
Topic: Development of a point-of-care diagnosis system using microfluidic waves.

EDUCATION

2021-2018 **Doctorate in HCI, Haptics, Virtual Reality, Robotics**
Sorbonne Université, Paris (France), ISIR, Multi-Scale Interaction team
Duration: 36 months (1st October, 2018 - 20th October 2021)
Doctoral School SMAER - *Mechanical Acoustics Electronics and Robotics Sciences* - Paris
Jury: Maud Marchal (IRISA), Indira Thouvenin (UTC), Jan Gugenheimer (Télécom Paris), Vanda Luengo (LIP6), Sinan Haliyo (ISIR).

2015-2012 **Master of Science and Engineering at École des Mines d'Albi-Carmaux**
Engineering of Advanced Materials and Structures,
Specialization: "Bureau d'Etude", Research&Development, Microsystems

2012-2010 Classes preparing for entrance examinations to the French Grandes Ecoles,
Physics-Technology, PTSI - PT*
Lycée Jules Ferry, Versailles

YOUNG RESEARCHERS AND STUDENTS SUPERVISION

Internships Supervision

1. Master 2 Internship supervision of Linghao Zheng, student at Université Paris-Saclay.
Supervision **20%** with Gilles Bailly (40%) and Vincent Guigue (40%) **over 6 months** (2024).
Topic: Using Deep Learning to Predict User Intention in Virtual Environments.

2. Master 1 Internship supervision of Noé Guillemin, student at De Vinci Innovation Center.
Supervision **90%** with C.Pacchierotti (5%) and A.Lécuyer (5%) over **5 months** (2023).
Topic: Development and Evaluation of a Swarm of Modular Haptic Interfaces in AR.

3. Master 1 Internship supervision of Gauthier Gendreau, student at De Vinci Innovation Center.
Supervision **90%** with C.Pacchierotti (5%) and A.Lécuyer (5%) over **5 months** (2023).
Topic: Development and Evaluation of Novel Pseudo-Haptics Interactions in AR.

4. Master of Research Internship supervision of Nicolas Laurent, student at Arts et Métiers.
Supervision **90%** with C.Pacchierotti (5%) and A.Lécuyer (5%) over **6 months** (2022).
Topic: Development and Evaluation of a Tangible Reconfigurable Interface in VR.

5. HCI Master Internship supervision of Clara Rigaud, student at Sorbonne Université.
Supervision **40%** with Gilles Bailly (60%) over **6 months** (2019).
Topic: Development of Novel Multimodal Interactions in VR.

6. Engineering Master Intership supervision of Camille Roquelaure, student at Arts et Métiers.
Supervision **20%** with Gilles Bailly (40%) and Sinan Haliyo (40%) over **6 months** (2019).
Topic: Development of an Encountered-Type Haptic Interface.

Student Projects Supervision

1. Fingertip Haptics Project: help for the conception and development of an on-demand fingertip haptic interface, for the perception of force and pressure in VR. This project is done by Louis Badr, Master student at De Vinci Innovation Center (2022). Assistance on the definition of the project, its development, its scope and positioning, and user experiences.

2. Large-Scale Clay 3D Printer: help for the conception and development of a large-scale clay 3D-printer - inspired from CoVR, the interface I designed during my PhD. This project is done by Philibert Le Gonidec de Kerhalic, Master student at De Vinci Innovation Center (2022). Assistance and notice on the design and material choices for the printer, and debugging help.

3. Sign Project: help for the conception and development of a sign-language translator for deaf people. This project was done by K. Guerda, B. Cauley, M. Abouzaid, T. El Robrino, T. Mouzon at Sorbonne Université (2018). Supervision **40%** shared with Sinan Haliyo (60%). Assistance on the definition of the project, specifications, material and sensors choices, and their integration.

INTERNATIONAL PROJECTS

2024 **InteVol** Project (ERC Starting Grant): Interactions with Future Reach-Through Volumetric Displays.
Visiting researcher.

2023 **GuestXR** European Project
Ongoing project with the Amedi Lab on neuroscience and pseudo-haptics.

2021 *Associated Teams Inria* **Project - FRANTIC**
Writing and development of the collaboration Skoltech Moscow (Russia) - *currently on hold.*

SERVICE TO THE ACADEMIC COMMUNITY

AFIHM: Association Francophone d'Interaction Humain-Machine
French-speaking Association of Human-Computer Interaction
https://www.afihm.org

- Member of the "Young Researchers in HCI" group ("Jeunes Chercheuses et Jeunes Chercheurs en IHM" - JCJC−IHM) since 2021 ;

- Member of AFIHM since 2019.

Participation in the Organization of Conferences

- Conference ACM IHM 2024: **Proceedings Chair**

- *to come*; Conference ACM IHM 2025: Proceedings Chair

Participation in Program Committee

- Conference ACM UIST 2023: International Conference on User Interface Software and Technology Symposium (10 reviews).

- Conference and Journal IEEE VR 2023: 30th IEEE Conference in Virtual Reality and 3D User Interfaces (8 reviews).

- IEEE World Haptics 2023 WHC 2023: Vice-chair Work-In-Progress (8 reviews);

Article Reviews (# articles): $\geq$ **40**

- International Conference on Human Factors in Computing Systems (ACM CHI) 2023 (1), CHI Interactivity 2020 (1);

- International Conference on User Interface Software and Technology Symposium (ACM UIST) 2022 (2); 2023 (10) - **Highly useful review**;

- International IEEE Conference on Virtual Reality and 3D User Interfaces (IEEE VR) 2022 (4); 2023 (8);

- International Conference on Interactive Surfaces and Spaces (ACM ISS) 2022 (1) - **Special recognition for Outstanding Review**;

- ACM symposium on Virtual Reality Software and Technology (ACM VRST) 2022 (1);

- Journal IEEE Transactions on Haptics (ToH) 2022 (1);

- IEEE World Haptics 2023 Conference (WHC) 2023 Proceedings (1); Work-In-Progress (8);

- International Conference on Association Francophone d'Interaction Homme-Machine (ACM IHM) 2023 (1) - **Special recognition for Outstanding Review**, ACM IHM 2024 (1);

- International Journal of Human-Computer Interaction (IJHCI) 2023 (1);

- International Journal of Human-Computer Studies IJHCS 2023 (1);

- International Conference of Technical Committee 13 (Human- Computer Interaction) (IFIP INTERACT) 2023 (2) - Highly useful review.

Student Volunteer
- International Symposium on System Integrations (SII 2019) in Paris.

Scientific Mediation & Visibility

Demonstrations and Events

- Participation in "Les Innovantes" - Scientific popularization to high school students (over 130 participants) and promoting women excellence in scientific research (5th *Dec 2023*).

- Presentation to Pint of Science ($22^{nd} - 24^{th}$ *May 2023*).
  Scientific popularization and presentation to the general public, in bars.

- Participation and animation at the Inria Rennes stand at Laval Virtual ($12^{th} - 14^{th}$ *Apr 2023*).

- Participation to **IHM'23 Doctoral Consortium Jury** (3rd *Apr 2023*).

- Participation and Demo at the National Committee for the Numeric Ethics (CNPEN) *(Jan 2023)* to discuss around the metavers ethics.

- Organisation of a seminar on the "dark sides of VR" with Wen-Jie Tseng at Inria Rennes (*2022*).

- Presentation at GdR IHM×IG×RV (*2021*) - 1st Day of Human-Computer Interaction, Graphics Computing and Virtual Reality 2021: Tangibles.

- Participation and demos at **Fête de la Science** *2018* and *2021* at ISIR.
  Demos and scientific popularization to a hundred people (general public and kids).

- Participation in Gt5 Robotics "Perception and Human-Robot Interaction" (*2020*).

- Demo of CoVR to the 80th **anniversary of CNRS** (*2019*): CoVR was chosen to celebrate the birthday of the CNRS. International journalists could test an experience I had designed for it.

- Demo of CoVR of the association "L'Envol" (*2019*), promoting scientific research to talented kids from humble neighbourhoods.

- Participation in the demo "Paris Parc", showing VR to Parisian deputies and its mayor in *2019*.

Videos and Articles

- More than 2400 views on CoVR's video.

- Article by Summit Sorbonne Université: Project CoVR 2.0: a revolutionary tactile experience in virtual reality.

- Interviews by Sorbonne Université and ISIR.

- Participation in Hybrid and JCJC-IHM communication (Twitter accounts).

Industry Experience

- R&D Project Engineer at StretchSense Ltd in Auckland (New-Zealand) in 2015 (13 people start-up company).

- Evolution as responsible for all the prototypes in the Product department in 2016 up to 2018.

- Conception and development of a project under my responsibility, then brought to mass production (Zozosuit 1.0, ordered over a million times).

- Evolution to *Systems Integration* Team Lead (R&D, Integration, Calibration, Quality/Control, UX), with multiple engineers, designers and technicians in my team, under the supervision of the CTO (letter of recommendation attached).

- Participation in the expansion of StretchSense to over 200 employees.

- In-the-field trips for user experiments and/or developments in Japan (multiple times), Germany, USA; Quality/Control in Vietnam.

Multiple patents were submitted, including one that was released in 2019.

Teaching Experience

Qualifications: 27 (Computer Science) et 60 (Mechanics)
Total Tutoring: 231h (including 12h of Master's lectures) - PC: Practical Courses

Year	Level	Topic	Location	Nb of Hours
2019 - 2021	Master 2	Highly Interactive Virtual Environments	Master Androide Sorbonne	8h lecture - 16h PC
2018 - 2020	Master 1	Prototyping, Arduino	Master Androide Sorbonne	4h lecture - 8h PC
2018 - 2019	Bachelor 3	Electronics Project	Polytech Sorbonne	40h PC
2019 - 2021	Bachelor 2	Conception, Simulation of Systems and Robotics	Bachelor Mechanics Sorbonne	32h PC
2018 - 2021	Bachelor (1, 2, 3)	Electronics	Bachelor Electronics Sorbonne & Polytech Sorbonne	96h PC
2023 - 2024	Bachelor 1	Algorithmic and Complexity	ISTIC (Rennes) - CS Bachelor	27h PC

References

- Dr. G.Bailly, CNRS Research director in Paris (France) and former PhD supervisor;

- Dr. T.Gisby, CTO at StretchSense Ltd (New Zealand), former manager;

- Dr. A.Lécuyer, Research director at Inria Rennes (France), and former post-doc supervisor;

- Dr. A.Marzo, Director at Upna Lab - Future Interactive Devices, current post-doc supervisor.

Dr. Gilles Bailly
ISIR - Institut des Systèmes Intelligents
et Robotique
Sorbonne Université
Place Jussieu
75005 Paris
France
Phone: +33.144276362
Email: gilles.bailly@sorbonne-universite.fr

Dr. Anatole Lécuyer
Inria Rennes
Campus Universitaire de Beaulieu
263 Av. Gen. Leclerc
35000 Rennes
France
Phone: +33 2 99 84 74 83
Email: anatole.lecuyer@inria.fr

Dr. Todd Gisby
CTO and Co-Founder at StretchSense
114 Rockfield Road
Penrose
Auckland 1061
New Zealand
Phone: +64.27.473.6613
Email: todd@stretchsense.com

Dr. Asier Marzo
Upna Lab
Universidad Pública de Navarra
Edif de la Encinas
31006 Pamplona
Spain
Phone: +34.662259371
Email: asier.marzo@unavarra.es

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LIST OF PUBLICATIONS

International Journal Articles (2)

TVCG23a **E. Bouzbib**, C. Pacchierotti, A. Lécuyer, 2023 (DOI)
"When Tangibles become Deformable: Studying Pseudo-Stiffness Perceptual Thresholds in a VR Grasping Task"
Special Issue **TVCG**: IEEE Transactions on Visualization and Computer Graphics, IEEE, 2023.
VR'23 - Proceedings of IEEE Conference on Virtual Reality and 3D User Interfaces, IEEE, 2023. 10 pages.

TVCG23b **E. Bouzbib**, M.Teyssier, T.Howard, C. Pacchierotti, A. Lécuyer (2023) (DOI)
"PalmEx: Adding Palmar Force-Feedback for 3D Manipulation with Haptic Exoskeleton Gloves"
TVCG: IEEE Transactions on Visualization and Computer Graphics, IEEE, 2023. 7 pages.

Articles in Peer-reviewed Conference Proceedings (4)

VR22 **E. Bouzbib**, G. Bailly (DOI)
" "Let's Meet and Work it Out": Understanding and Mitigating Encountered-Type of Haptic Devices Failure Modes in VR"
VR'22 - Proceedings of IEEE Conference on Virtual Reality and 3D User Interfaces, IEEE, 2022. 11 pages.

IHM21 **E. Bouzbib**, G. Bailly, S. Haliyo, P. Frey (2021) (DOI)
" "Can I Touch This?": Survey of Virtual Reality Interactions via Haptic Solutions"
IHM'20'21 : Conférence Francophone sur l'Interaction Humain-Machine, ACM, 2021. 16 pages.

UIST20 **E. Bouzbib**, G. Bailly, S. Haliyo, P. Frey (2020) (DOI)
"CoVR: A Large-Scale Force-Feedback Robotic Interface for Non-Deterministic Scenarios in VR"
UIST'20 - Proceedings of the 33rd Annual ACM Symposium on User Interface Software and Technology, ACM, 2020. 14 pages.

ICOST18 E Campo, D Brulin, Y Charlon, **E Bouzbib** (2018) (DOI)
"Activity Recognition by Classification Method for Weight Variation Measurement with an Insole Device for Monitoring Frail People"
ICOST'18 - International Conference on Smart Homes and Health Telematics, Springer. 12 pages (simple column).

Patents (2)

2021 System for Improved Interaction in a Virtual World
Inventors : **E. Bouzbib**, G. Bailly, S. Haliyo
Applicants : Sorbonne Université; Centre National de la Recherche Scientifique (**CNRS**)

2019 Interconnecting circuit board to stretchable wires
Inventors : T. Gisby, P. Guininbert, L. Sims Johns, A. Wong, F. Lun, J. Labrado, L. Harpham, **E. Bouzbib**
Applicants : StretchSense Ltd

Articles in Reviewing Process (3)

TOH-XX **E. Bouzbib**, L. Kuang, P. Robuffo Giordano, Claudio Pacchierotti, A. Lécuyer (2024)
"Survey of Wearable Haptic Technologies for Navigation Guidance"
TOH: IEEE Transactions on Haptics, IEEE 2024. 14 pages.

TVCG-XX **E. Bouzbib**, L. Badr, Claudio Pacchierotti, A. Lécuyer (2024)
"Haptixel: Enabling Object and Data Physicalization through a DIY Wearable Unit for Encountered-Type Fingertip Haptics"
TVCG: IEEE Transactions on Visualization and Computer Graphics, IEEE, 2024. 15 pages.

IJHCI-XX **E. Bouzbib**, G. Bailly (2024)
"Within-Object User Intention Prediction Model for Grasp Interaction in Virtual Reality"
IJHCI: International Journal of Human-Cumputer Interaction