Ph.D./M.Sc. Project:
Design of an in-ear earpiece with superior comfort

General Information

Research fields:	Design of an in-ear earpiece with superior comfort
Advisors:	Prof. Jérémie Voix <Jeremie.Voix@etsmtl.ca>
Location:	École de technologie supérieure, Montréal, Quebec, Canada
Starting date:	Winter 2022 Semester

1 Description

The goal of this project is to provide the wearer with a comfortable experience with their in-ear device, both from a physical (temperature and pressure) perspective, while ensuring superior noise isolation for total control of the user's perceived audio world. Currently, acoustical and mechanical models of in-ear devices, integrating their coupling with the human earcanal have been developed at ÉTS and can provide clear guidelines for the mechanical properties of the earpiece material to be used, to maximize its insertion loss or minimize the occlusion effect [1-2]. Models of physical comfort and identification of its main attributes for in-ear devices are currently pursued at ÉTS, while the mapping of human earcanal tactile sensitivity is currently conducted at CRITIAS [3]. Proposed Research will explore the effect of earcanal moisture and temperature on the comfort of in-ear devices on a human subject.

[1] Baermaker, S.D., "Cartographie de la sensibilité cutanée du conduit auditif humain: caractérisations mécaniques préalables au développement d'un bouchon sonde (Phase II)," École de technologie supérieure - Université du Québec, Montreal (QC), Canada, 2020.

[2] Paris, M., "Cartographie de la sensibilité cutanée du conduit auditif humain," École de technologie supérieure, Montreal, QC, Canada, 2018.

[3] Sgard, F., Doutres, O., Berry, A., Voix, J., Trompette, N., Wagnac, E., Negrini, A., Carre, M., Lewis, R., Matchen, S. "Développement d'une panoplie d'indices de confort pour les bouchons d'oreille afin d'améliorer la protection auditive des travailleurs," 2015, IRSST (accessed May 20, 2021).

2 Supervision and Funding

Supervision will be provided by Prof. Jérémie Voix. Prof. Voix is an acoustics specialist and chairholder of CRITIAS. Financement via la Chaire de recherche industrielle ÉTS-EERS en technologies intra-auriculaires (www.critias.ca) ainsi que via des stages MITACS au sein de la compagnie EERS Global Technologies Inc. (www.eers.ca)

3 Location

École de technologie supérieure is located in Montréal, Québec, Canada. Often described as an appealing blend of North American and European culture, Montréal is a safe, multicultural city, nice to live in, with an affordable cost of living. Since its inception in 2016, Montréal has constantly ranked as Quacquerilli Symonds' Best Student City in North America. Montréal is also recognized for its quality of life. Close to both peaceful rural beauty and exciting ski slopes, this dynamic city offers lively districts and many green spaces. Located in the heart of the city, the ÉTS campus is easily reached by bicycle or public transit.

Since its creation, ÉTS has pursued a mission that is deeply rooted in all its activities: To meet the needs of the industrial sector, which is in need of engineers who have not only a good theoretical background, but also practical knowledge. To fulfil this mission, ÉTS has a unique partnership with the business and industrial spheres that includes both small and large companies. It stands out from other universities in Quebec because of the applied training it offers students, as well as its research activities conducted by and for companies. Furthermore, this position is affiliated with the ETS-EERS Industrial Research Chair in In-Ear Technologies (CRITIAS) located at the Carrefour d'innovation INGO, which offers a unique and intimate relationship with the industrial partner EERS, located just across the hall.

4 Requirements

- Good oral and written communication skills in french and/or english
  Une préférence sera accordée pour les candidat.e.s maîtrisant le français, langue officielle du Québec
- Bachelor's degree in Mechanical Engineering or other with courses in material science, industrial design, ergonomics and human factors.
- Proficiency in signal processing
- Experience with machine learning is an asset

5 How to Apply

Interested candidates should send to Prof. Jérémie Voix <Jeremie.Voix@etsmtl.ca>, their CV, university transcripts, contact information of suitable references, and a short statement (max. 1 page) describing how their experience is relevant to successfully carrying out this project.