SILENSE | (ultra)Sound Interfaces and Low Energy iNtegrated SEnsors

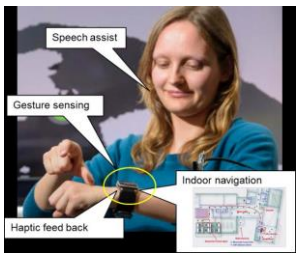
PROJECT NEWS

On the last day of April we have closed the first year of our work on the SILENSE project which main aim is to develop new concepts and technology for novel acoustic and ultrasonic transducers, low power signal acquisition ICs, and advanced data processing algorithms to be able to apply them into many areas of human life. We have worked specifically on new design of ultrasonic transducers using MEMS elements, specialized packaging technologies, new algorithms for fixed-point calculations and gesture recognition. We have defined broad range of possible use cases realizable by several demonstrators. All publishable outcomes of the project is available on the project website at www.silense.eu.

ELABORATION OF USE CASES

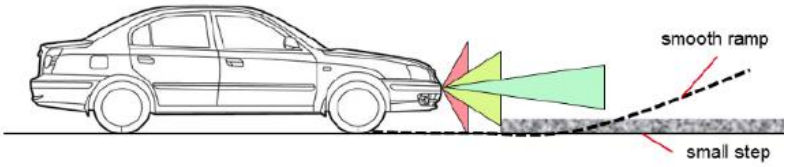
First task of the project was to perform an analysis of potential applications for the technology we are developing within the project and to define real use cases, where these principles can be successfully exploited. We have focused on three main domains:

- *Wearable and mobile*
  - **Dive buddy localization system**
  - **Underwater data communication**
  - Multi-purpose gesture recognition system
  - Smart acoustic wearable system
  - Body motion tracking



- *Smart home/smart building*
  - Smart access control
  - Gesture recognition for medical applications
  - Touchless interaction and ultrasound infrastructure

- *Automotive*
  - In-cabin gesture detection system
  - Automotive and robot radar or navigation



COORDINATOR FOREWORD

Dear project partners and supporters,

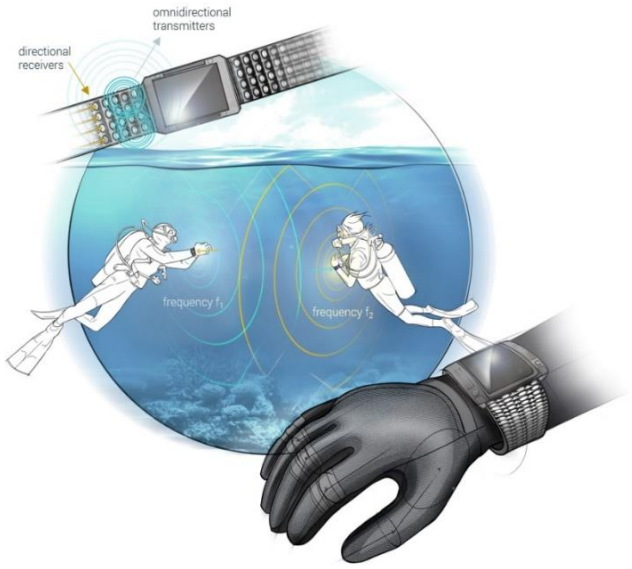
SILENSE project has finalized its first year and we are going to present our work, achievements and future plans within the project during an upcoming meeting in Brussels. I am sure that we will show that SILENSE team is strong and competent and definitely not silent. This consortium has high potential to achieve significant results in the field of application of ultrasound in all demanded domains. During the first year, our project team has defined several interesting use cases for this technology and work on all technical aspects necessary for its final realization and implementation into nice demos.

With the best wishes,
Radu Surdeanu

On the next page, we would like to present you two nice use cases in the underwater wearables domain. We hope that these two examples will give you an insight into our visions and possible applications of ultrasound technology in this field and offering two different benefits.

DIVE BUDDY LOCALIZATION SYSTEM

A common problem for divers, especially in difficult conditions such as murky water or strong currents, is staying together with their dive buddy. It is common practice to dive in pairs of two persons with the pair staying within a couple of meter from each other. This is a basic safety practice, which is followed by all major dive organizations. In clear tropical water, visibility is multiple tens of meters. In darker waters, visibility can be reduced to tens of centimetres. When a diver loses his/her buddy, common practice is to stay in place and look around for 30 seconds. If the buddy cannot be located, both divers have to resurface and the dive is over. After resurfacing, divers normally do not go under again to prevent decompression accidents.

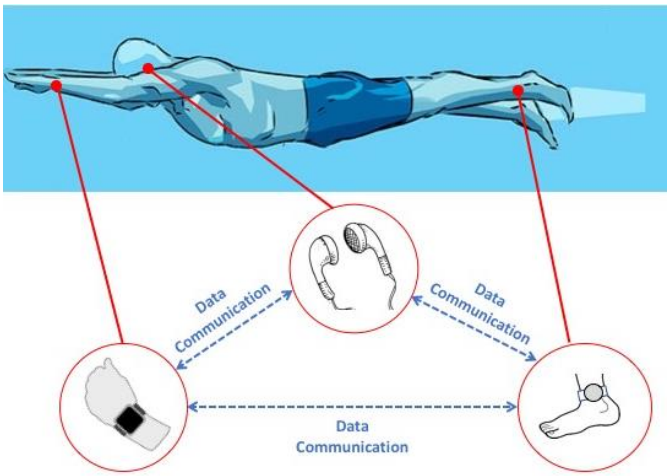


An at least partial solution would be to have a localization system to track a dive buddy. The nature of the underwater environment prevents the use of electromagnetic based systems. An ultrasound system however could provide the means to track and localize a diver. The envisioned localization system has the size of a typical dive computer, essentially an oversized wristwatch as the one on the figure. The end goal is to prove that an ultrasound localization system can be integrated into a diver's watch in a way that is commercially viable.

UNDERWATER DATA COMMUNICATION

Swimming as a sport and as an activity, has very much been the poorer relation of other sports such as cycling and running when it comes to wearables and trackers market that have grown over the last 5-10 years. There are essentially two main reasons for this, the first is the difficulty in actually measuring what a swimmer is doing to a level of accuracy that is useful and the second is providing this information to the swimmer in a useful, meaningful way. Outdoor sports such as running and cycling have the advantage of using global navigation satellite systems to take measurements of movement. In addition, the athlete is not submerged in water, which obviously creates a number of technical issues related to measurement of the swimmer.

A number of products have made it to market which are capable of measuring swim metrics and providing a level of feedback in the moment to the user, however there is a clear need for improvements to the two outlined issues.



Most of the products are located in a single position on the swimmer's body e.g. the wrist or head, meaning measurements and feedback can only be made from that point. Being able to communicate and fuse data from multiple locations on the swimmer's body would enable an improvement in swim based metric measurements and allow a more flexible approach to swimmer feedback. Current 'air based' technologies are unsuitable for use in water and for that reason the SILENSE project will endeavour to develop an underwater data communication technology, using ultrasound, to enable a distributed on body network to be achieved.

You can look forward to more details about interesting applications for the automotive domain in next newsletter.

SILENSE is an ECSEL JU project and brings together 32 partners from nine European countries. It started in May 2017 and is also supported by the respective National Authorities.
The project researches acoustic technologies and develops concepts to activate and control devices by gesture, data communication, and indoor positioning. These concepts will be used in different domains: wearables, automotive and smart home application.