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LECI – Proposta de Projeto Eng.a de Computadores e Informática

PROJECT TITLE

Agiwatwo[1]: assisting speech-impeded people with gesture-based communication at home

KEYWORKS

multimodal interaction, gestures, in-home scenarios, smart environments, wearable.

WORK COORDINATION

Co-supervisors:	Ilídio Castro Oliveira (ico@ua.pt)
	António J. S. Teixeira (ajst@ua.pt)
	Ana Patrícia Rocha (aprocha@ua.pt)
Collaborators:	Samuel S Silva (sss@ua.pt)
	José Maria Fernandes (jfernan@ua.pt)
	Miguel Oliveira e Silva (mos@ua.pt)

CONTEXT AND MOTIVATION

There are several conditions or events in life that limit our ability to use voice to communicate with others (e.g.: health conditions). Individuals with aphasia, mostly resulting from a stroke, are a clear example that the inability to communicate also materializes as a strong barrier for them to live independently; it influences everyday living and acts as a barrier for communicating their (sometimes urgent) needs to family, friends, and caregivers.

When speech is not an option to communicate with others, we may explore alternative interaction methods that are minimally intrusive and keep some of the advantages of speech (such as the ability to perform communication at a distance), still practical enough to provide friendly alternatives for regular users (e.g., call for help, interact with the surrounding technology in a smart home).

In this context, aspects relating to body movement, gestures and pose can potentially play a role as alternative ways to communicate, both implicitly and explicitly, and the proposal of solutions that are minimally intrusive, e.g., relying on sensing that is wearable or placed in the environment, can potentially provide a versatile approach.

The use of assistive technology for people with speech impediments, and for aphasics in particular, is a field of R&D in the APH-ALARM project[2]. Early prototypes have been developed by the University of Aveiro that apply AI to detect meaningful gestures from arm movement, quantified by radar and activity sensors from smartwatches.

PROPOSED OBJECTIVES

This proposal aims at developing gesture-based communication support for speech-impeded users, especially while in bed, extending the R&D already started in the context of the APH-Alarm project, providing complementary and/or new approaches.

While a further analysis of target scenarios is due in the scope of this work, the students' group is expected to work on these major topics:

- integrate low-cost, wearable sensors in the existing prototype and adapt the Machine-Learning gesture detection pipeline accordingly;
- develop a simple dialog system between the impaired user (who performs gestures) and

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[1] A Gesture Is Worth A Thousand WOrds ;)
[2] https://aph-alarm-project.com/

another person, such as the caregiver/familiar (who may react using a mobile application);

- participate in the preparation of data sets (data collection and labeling) to enhance the ML gesture recognition models;
- extend the sensing infrastructure to the bed/mattress itself, integrating a new set of sensors in the platform.