Improving the accessibility of IoT platforms: Two study cases

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***Abstract* — This abstract introduces two examples of Assistive Technologies (ATs) that have been developed in collaboration with end users and stakeholders. The former is an Internet-based platform enabling remote communication among deafblind via tactile Sign Language, their native language. The latter is a platform to make accessible TV streams and, in general, any multimedia content. The preliminary experimental activities have validated both the ideas and prototypes; future works will deal with improvement and sharing of the outcomes.**

Keywords — Assistive Technologies, Remote Communication for Deafblind, Accessible TV Streams

I. INTRODUCTION

Every person exposes a large potential, but whether it is expressed or it remains unveiled is often a matter of external circumstances and chance. Unfortunately, things turn typically bad when coping with disability. The word *disability* itself typically carries a negative connotation.

Dialing with disabilities, we are registering a worldwide lack of official, precise, and up-to-date statistics on the number of people with one, or more. Nevertheless, the general picture is clear enough: almost one billion people, i.e., ca. the 15% of the world's population, experience some form of disability, and between 110 and 190 million people experience today a severe disability[1]. These individuals encounter difficulties in their everyday life, being often excluded from the labor market and from participating to the active society.

Assistive Technologies (ATs) help fulfilling this *ability divide*. ATs is an umbrella term spreading horizontally to cover almost all the fields of human research, production and knowledge, comprising any item, piece of equipment, software program, or product system that is used to increase, maintain, or improve the functional capabilities of individuals with disabilities. ATs do not involve just the final tool(s) with which the individual interacts, but also its whole development process, starting from the requirement analysis towards the project and the production. A key step in designing and developing ATs is to foster the direct contact with the end-users, who should be considered more as begin-users and actively involved in the design and development activities.

This abstract introduces two study cases where the involvement of users with disabilities and stakeholders (e.g., associations, caregivers) have proven essential to provide services of real importance and utility.

The former is PARLOMA[2], a remote communication system for deafblind [1]. In the last four years, we have been working with deafblind individuals and Italian major associations (Lega del Filo d'Oro ONLUS and Unione Italiana dei Ciechi e degli Ipovedenti ONLUS) to provide them with a low-cost reliable platform allowing them to communicate, remotely and in real-time, through their native language: tactile Sign Language (tSL, a tactile-feedback based transposition of Sign Language). In the PARLOMA project, remote communication is enabled resorting on state-of-the-art technologies, which had never been used for making remote communication accessible, such as Computer Vision algorithms for markerless non-invasive Hand Tracking for capturing and encoding hand gestures, cloud robotics and network connections for their transmission, and 3D-printed anthropomorphic robotic arms with whom the receiver(s) can interact. The project poses the bases for improving dramatically the social inclusion and participation in active society of deafblind individuals, enabling new modalities of accessing to information and of interacting with the community.

The latter is the Stretch&Easy TV, a project aiming at making accessible the TV stream, and more generally any multimedia content. In the last year, we have been working with focus groups organized by the Centro Ricerche e Innovazione Tecnologica (CRIT) of Rai (Turin, Italy) to develop a platform encompassing a commercial USB decoder, an embedded processing unit (in the first tests simulated with a dedicated PC, a late 2016 Mac Mini) connected to the Internet, and a TV screen. Leveraging this connection and any Android or iOS-based smartphone, the user can, via a simple and intuitive mobile app, intervene in real-time on the multimedia stream, by slowing it down of a fixed percentage, equalizing it to compensate for the user's hearing losses, changing channel, adding or removing subtitles, or replying the last few seconds of the transmission. This platform is configured as an expandable set of services, so more features will be added.

In both the cases, the preliminary experimental validations have validated the idea and the design of the platform itself, and its first prototypes have already been delivered to the users. In the next future, we will work even more with the users and their associations to improve the overall reliability of both the systems and to make them perfectly compliant with users' requirements and desiderata, and on sharing the outcomes of our experiences with the community.

[1] http://www.worldbank.org/en/topic/disability

[2] https://parloma.github.io

[1] Russo, Ludovico Orlando, et al. "PARLOMA–a novel human-robot interaction system for deaf-blind remote communication." International Journal of Advanced Robotic Systems 12.5 (2015): 57.