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Braille Lab: A New Design Approach for Social Entrepreneurship and Innovation in Assistive Tools for the Visually Impaired

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Abstract : Unfortunately, many people still do not have access to communication, with specific regard to reading and writing. Among them, people who are blind or visually impaired, have several difficulties in getting access to the world, compared to the sighted. Indeed, despite technology advancement and cost reduction, nowadays assistive devices are still expensive such as Braille-based input/output systems which enable reading and writing texts (e.g., personal notes, documents). As a consequence, assistive technology affordability is fundamental in supporting the visually impaired in communication, learning, and social inclusion. This, in turn, has serious consequences in terms of equal access to opportunities, freedom of expression, and actual and independent participation to a society designed for the sighted. Moreover, the visually impaired experience difficulties in recognizing objects and interacting with devices in any activities of daily living. It is not a case that Braille indications are commonly reported only on medicine boxes and elevator keypads. Several software applications for the automatic translation of written text into speech (e.g., Text-To-Speech - TTS) enable reading pieces of documents. However, apart from simple tasks, in many circumstances TTS software is not suitable for understanding very complicated pieces of text requiring to dwell more on specific portions (e.g., mathematical formulas or Greek text). In addition, the experience of reading\writing text is completely different both in terms of engagement, and from an educational perspective. Statistics on the employment rate of blind people show that learning to read and write provides the visually impaired with up to 80% more opportunities of finding a job. Especially in higher educational levels, where the ability to digest very complex text is key, accessibility and availability of Braille plays a fundamental role in reducing drop-out rate of the visually impaired, thus affecting the effectiveness of the constitutional right to get access to education. In this context, the Braille Lab project aims at overcoming these social needs by including affordability in designing and developing assistive tools for visually impaired people. In detail, our awarded project focuses on a technology innovation of the operation principle of existing assistive tools for the visually impaired leaving the Human-Machine Interface unchanged. This can result in a significant reduction of the production costs and consequently of tool selling prices, thus representing an important opportunity for social entrepreneurship. The first two assistive tools designed within the Braille Lab project following the proposed approach aims to provide the possibility to personally print documents and handouts and to read texts written in Braille using refreshable Braille display, respectively. The former, named 'Braille Cartridge', represents an alternative solution for printing in Braille and consists in the realization of an electronic-controlled dispenser printing (cartridge) which can be integrated within traditional ink-jet printers, in order to leverage the efficiency and cost of the device mechanical structure which are already being used. The latter, named 'Braille Cursor', is an innovative Braille display featuring a substantial technology innovation by means of a unique cursor virtualizing Braille cells, thus limiting the number of active pins needed for Braille characters.

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