Position Paper for Key Issues in Sensory Augmentation Workshop

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Q. What technologies are available for building sensory augmentation devices?

Place of SureSight in Sensory Augmentation.

Sensory augmentation spans a myriad of different technologies and disciplines and is utilised for a wide variety of different purposes. This position paper briefly outlines an ultra-pragmatic approach to using sensory augmentation to enable visually impaired users to augment their auditory senses with data provided from computer vision based analysis of webcam images. The system identifies markers denoting locations of interest (e.g. toilet, lifts, stairs etc…) and directs the user to these points by stating the nature of the marker, the distance and the direction.

Systems to assist the visually impaired use diverse technologies ranging from GPS, Infra red signs, RFID tags to novel approaches such as pulsing electrical charges on the tongue to "paint" an image of visual data. The SureSight prototype was developed essentially from a bottom up perspective looking at what was viable, possible and easily implemented to provide the maximum benefit to the user.

The system has been implemented using a range of widely available inexpensive components. An Intel Celeron-M based ASUS 4G Eee PC sub notebook (clocked at 630 MHz) weighing 0.92kg and measuring 8.9 × 6.5 × 1.4 inches forms the base of the prototype system. A Phillips SPC900NC webcam provides 640x480 video and was chosen as the attached clip allows easy mounting on the individual e.g. on a belt. AR Toolkit is used to handle the pattern recognition due to its ease of use. A separate application, the ARToolkit Pattern Maker, was used to create a bank of 100 recognisable markers.

The interface identifies the various markers and uses speech synthesis to "speak" the nature, distance and direction of the marker. The possibility of deploying the system on a high end mobile phone points towards the option that new users could download the system and then use it immediately.

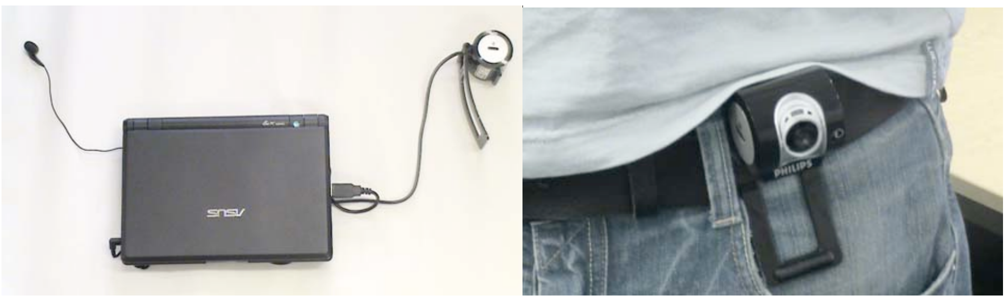

Figure 1: (left) The prototype SureSight system. (right) the camera worn by a user

Figure 2: Raw data provided by ARToolkit used for navigation

Benefits of this approach

It could be argued that a key differentiating factor of the SureSight system comes not from the use of the technology, but rather from the potential availability of the system at virtually no cost to the user. A system where the non-user could simply download it directly to their cell phone, and the location manager can simply use a simple website to print markers on a standard printer, is a radically different proposition to a more complex, more expensive system involving the implementation of extensive infrastructure and proprietary hardware.

Some of the most pervasive pieces of technology for the visually impaired are Braille and the cane which indicate that cost, availability and ease of use are the driving forces behind widespread adoption. In light of this one could reasonably argue that consideration should be given to comparatively low cost/high benefit systems when looking at how to leverage sensory augmentation to benefit real users.

An analogy to this approach could be seen in the complex evolution of technologies relating to solar power and battery development to provide radios to the poorest parts of the world. In reality the wind up radio designed and patented in 1989 by British accountant Trevor Baylis as a response to the AIDS crisis was the technology that actually brought radio to poorer communities in significant numbers.

Whilst in any given scenario there will always be a technology available which is superior to simple computer vision the potential of making a system available at low (or no) cost arguably outweighs the technological limitations.