Sensing Surrounding 3-D Space for Navigation of the Blind

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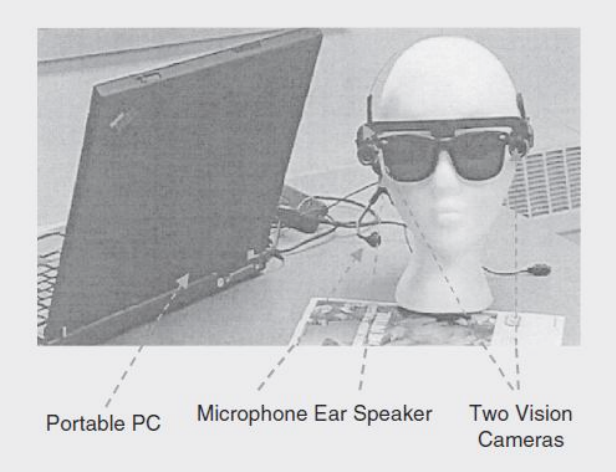
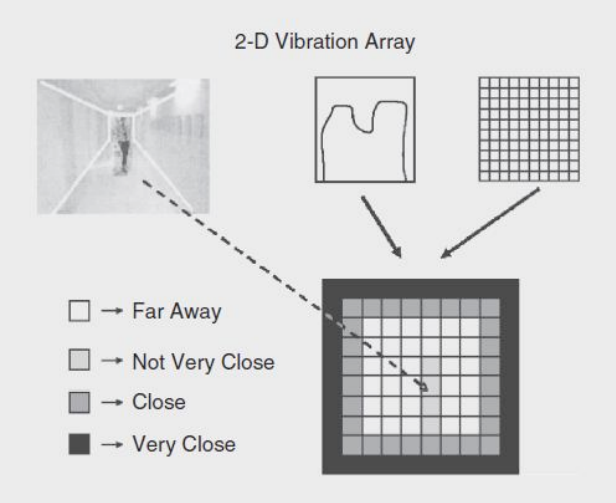
It is estimated that there are over six million blind and visually impaired people on the United States. A lot of research has been done in trying to come up with new ways for blind people to get around easier and better their living environment through new technology. A lot of these adaptive technologies include various drawbacks, such as inconsistent feedback, disorientation due to overuse, redundant information coming from the system, or even just the overall quality assurance. The following prototype system features vibrating arrays and data fusion at an attempt to provide as near to real-time feedback as possible, in order to sense the surrounding space for navigation for the blind.

The Tyflos mobility assistant captures the data from the environment surrounding the user and maps it out in the format that the user chooses. This prototype consists of glasses with two cameras on the side, a microphone headpiece, a small ear speaker, a laptop, text-to-speech device, audio recorder, language sensors, GPS sensors and range sensors. There is a range sensor in this system, which scans the surrounding environment and makes a log of it in the portable computer. This computer takes a scan of the range data and converts the three-dimensional perceived depth image into a two-dimensional array by use of a digital to analog converter.





There is a two-dimensional vibration array, which is a pad placed on the chest or stomach of the user. The pad is a square that represents the space in front of the person. Different parts will either vibrate in quick motions to indicate something close by, slow motions to indicate something far away, or not at all to indicate open space. When something in the way is hanging off of the walls it has a width on the vibration pad, and when there is an object (like a person) on the ground the pad vibrates in depth. This system is supposedly not difficult to get used to after a short training.

There are some limitations to this design, but is obviously an easier alternative to using a cane or a guide dog. The system comes as an FPGA, so the person must go through training on how to use it, so somebody can't just pick the product up and expect to utilize it immediately. The system only loads at one frame per second, assuming that the person walks one to three steps per second. But overall, in comparing the limitations of the product to its benefits in blind navigation, this prototype system has a lot of potential to be the future of blind navigation.

Reference:
Bourbakis, N., Sensing Surround 3-D Space for Navigation of the Blind, *IEEE Engineering in Medicine and Biology Magazine,* Volume 27, Issue 1, Jan-Feb 2008.