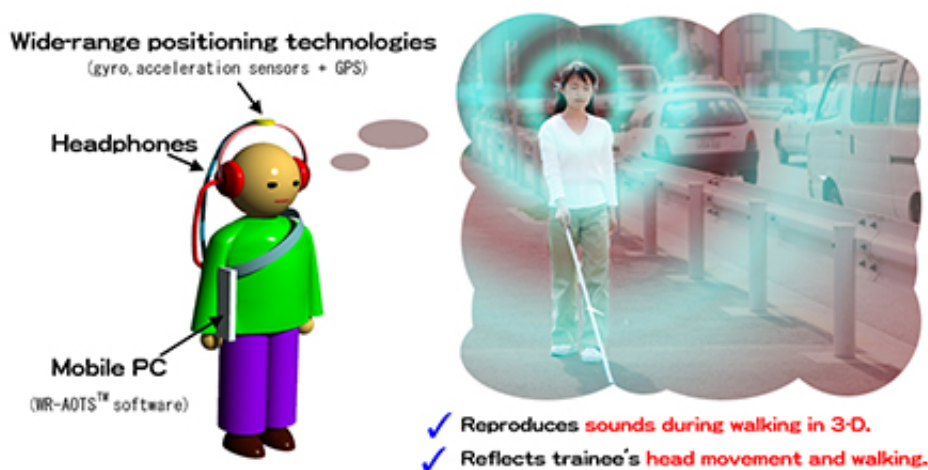


Free distribution of auditory orientation training system for the visually impaired

May 21 2013



Auditory orientation training system for the persons with visual impairment.

Researchers from the National Institute of Advanced Industrial Science and Technology (AIST), and the Research Institute of Electrical Communication (RIEC) of Tohoku University have jointly developed an auditory orientation training system for the visually impaired. This technology artificially reproduces the clues to auditory orientation used by a visually impaired person during walking, such as the movement and reflection of sounds, by using three-dimensional acoustic technology. Through downsizing and cost reduction, the researchers have developed it into a practical training system that allows a visually impaired person who has just started orientation and mobility (O&M) training to receive auditory orientation training safely and effectively. Starting on April 11,

2013, the software for the training system is available for free to people and organizations concerned with the visually impaired.

Use of this system is expected to help improve the safety and efficiency of rehabilitation and special needs education and promote participation of the visually impaired in social activities.

Details of this technology will be presented at the 22nd Annual Meeting of the Japanese Association for the Visually Impaired to be held in Niigata, Niigata Prefecture, from June 22 to 23, 2013.

In conventional auditory orientation [training](#), a visually impaired person receives training from an instructor in actual daily life settings and builds up experience in perceiving the surrounding environment by listening to various ambient sounds. However, such training involves situations where a novice trainee can feel a sense of fear and face danger and it can be provided only in limited settings. Therefore, there is room for improvement in safety and efficiency of the training.

Several studies of acoustic training technology have been conducted in Japan and overseas to solve these problems. However, these studies have covered only a very small part of auditory orientation, called "sound localization." The acoustic training systems developed from these studies are too expensive to introduce into actual training sessions and are not suitable for practical use. Therefore, there is a need for a practical auditory orientation training system for safe and efficient rehabilitation to encourage the visually impaired to participate in social activities.

In 2003, AIST and NRCDD started to develop a training method that combined "sound localization" and "obstacle perception," and in 2005 they completed an auditory orientation training system. At the same time, they demonstrated that the system was effective in reducing the stress of O&M training and preventing the phenomenon in which the

trainee walks off the designated walking path.

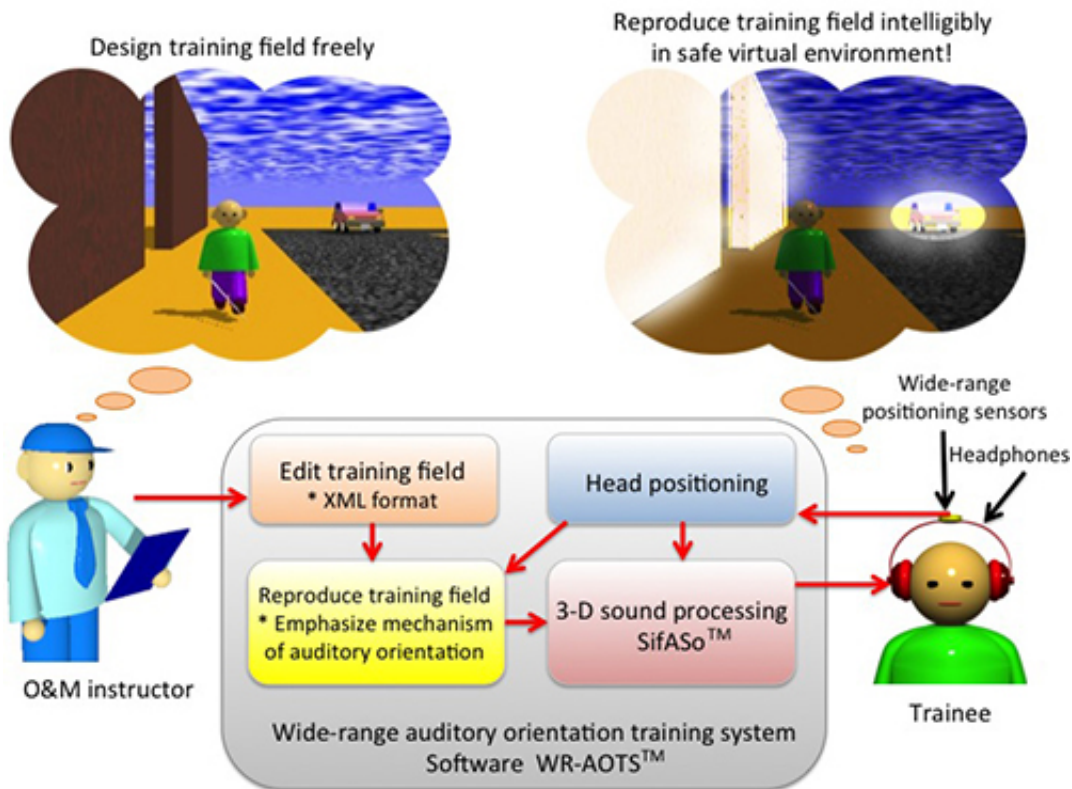


Figure 1: How the auditory orientation training system works: The system reproduces the training environment designed by the instructor in an easy-to-understand and safe manner by using three-dimensional acoustics.

However, at about 5 million yen the system was expensive. Also, it was too large to carry and enabled the position and orientation of the head to be measured over a distance of no more than 1 m at a time. Thus trainees cannot walk while using it.

Since 2008, AIST and RIEC, in cooperation with [Tohoku Gakuin University](#), [Tohoku Fukushi University](#), and others, have been jointly attempting to reduce the size of the auditory orientation training system,

to expand its coverage, and to reduce its cost.

This development has been supported by the following projects:

- AIST's "Study of Orientation and Mobility Training for the Persons with Visual Impairment by using Wide-Range Three Dimensional Acoustical Technologies," the Cooperative Research Project Program of RIEC, FY2007–2009.
- AIST's "Development of Auditory Orientation Training Curriculums for Persons with Visual Impairment by using Wide-Range 3-D Sound," the Research Grants of the Okawa Foundation for Information and Telecommunications, FY2006.
- Tohoku Fukushi University's "Development of universal training system using acoustic virtual reality technique," the Cooperative Research Project Program of RIEC, FY2010–2012.

The developed training system consists of special-purpose software, "WR-AOTS," a personal computer (PC), a stereo headphone set, and a commercially available game controller (for wide-range positioning).

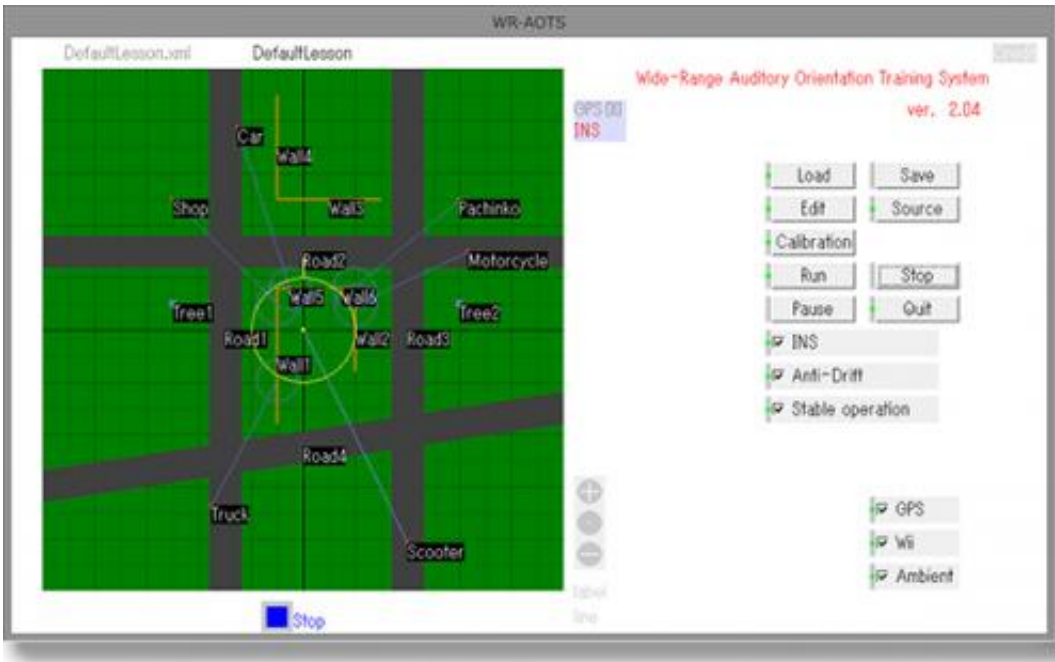


Figure 2: Image displayed on the PC screen by WR-AOTS training system software. The instructor can check the virtual training environment.

Three-dimensional sound processing to artificially reproduce the auditory orientation clues used by a visually impaired person during walking is achieved by calculation with a commonly available general-purpose PC central processing unit and "SifASo" technology of RIEC, without the need for an expensive dedicated DSP (digital signal processor). To measure head position, an inexpensive, low-precision wide-range positioning technology has been introduced. Its precision is stabilized by software processing, and it uses the built-in acceleration and gyro sensors in a commercially available game controller costing several thousand yen, instead of expensive, high-precision narrow-range positioning technology priced from several hundred thousand to several million yen (Fig. 1). These improvements have resulted in a substantial reduction in the cost of auditory orientation training. The system has been made compact by using a laptop PC, allowing the trainee to walk

with it (Fig. 2). The trainee can receive training safely while walking in a spacious area free of obstacles, such as in the grounds of a blind school.

In the training of the [visually impaired](#), the developed system will be used for simulation training of novice trainees, before they start walking training in actual daily life settings. The researchers intend to continue to improve the auditory orientation training system to meet the needs of instructors and trainees. They also aim to train instructors to provide training with the system.

More information: staff.aist.go.jp/yoshikazu-seki/AOTS/index.html

Provided by Advanced Industrial Science and Technology

Citation: Free distribution of auditory orientation training system for the visually impaired (2013, May 21) retrieved 26 April 2024 from <https://medicalxpress.com/news/2013-05-free-auditory-visually-impaired.html>

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