Tactile-Acoustical Navigation Assistant for Real and Virtual Explorations of the Environment

Andreas Hub, Stefan Kombrink, Thomas Ertl

University of Stuttgart
Visualization and Interactive Systems Group
Universitätsstraße 38
70569 Stuttgart
andreas.hub@vis.uni-stuttgart.de

A precise determination of the current location of a blind person is necessary for orientation and safe navigation. Commercially available navigation systems are usually inoperable indoors without installation of a time and/or cost intensive signal or marker infrastructure. They are also inoperable outdoors if GPS signals are absent. We present a new navigation assistant, optimized thus far for indoor applications, which does not require infrastructure installation. Once the initial position is entered, e.g. the main entrance, it determines the user's current position using a 3D compass, 3D gyroscope and an acceleration-based step recognition algorithm. Related positional data, such as room numbers, architectural details, or distance covered along a specific route can be presented acoustically or visually, on a touch screen integrated into a small portable tablet PC. By moving one's finger on the map, the user gets a spatial impression of the current environment, or of any other area where adequate digital mapping has been done. Stored text information can be accessed via tactile-acoustical switches, allowing the user to address navigational tasks and virtually explore alternative routes. Accuracy of one step can be achieved when walking in areas without interfering electromagnetic fields. By synchronizing map information with collision and corner detection methodology, accuracy is maintained at reasonable levels even in the presence of interference, or for long walks in large buildings. Combined with our vision-based sensor module, presented in previous work, construction of 3D environmental models also allows detection and localization of objects and people within the same building.

Acknowledgements: This project is funded by the Deutsche Forschungsgemeinschaft within the Center of Excellence 627 "Spatial World Models for Mobile Context-Aware Applications".

Envision 06 Conference, 2006 September 21-24, Kansas City, Missouri