

**A Blind Spot in Indoor Navigation – Needs and Requirements of Visually Impaired People**


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### **Abstract**

Globally, an estimated 2.2 billion people have a visual impairment or blindness (Vision impairment and blindness, 2021). Loss of vision affects people of all ages and can occur at any time, yet most people with impaired vision are over the age of 50. With an aging general population (UN. Population Division, 2019), the number of people with impaired sight will likely rise and their requirements should be addressed. Smartphones are an important tool in everyday life for most people, especially the visually impaired. They provide their users with helpful tools such as magnifying glass functions and navigation applications, which can also be used for preparation purposes (Khan & Khusro, 2020). As one substantial component of self-determined life is independent and safe locomotion, smartphone navigation contributes to the idea of inclusion and improves quality of life (Albrecht & Devlieger, 1999). Yet navigation via GPS outside of buildings poses problems for many visually impaired people (ViP) and indoor-navigation is generally unavailable (Williams et al., 2013). While studies often focus on testing the navigation system itself (e.g. Guerreiro et al., 2018), a survey of blind and ViP in the run-up to development takes place less frequently. Yet special navigation applications for individual user groups have already been available and used for several years. Users have been able to gain experience and can already provide important and useful information about applications' advantages and disadvantages. What special requirements and wishes do users have for indoor navigation applications? And is it possible to standardize application settings for people with visual impairments and blindness keeping in mind that each individual has their own idiosyncratic way of dealing with their disability (Williams et al., 2013)?

Data was collected through an online questionnaire created via LimeSurvey and distributed to associations and institutions for ViP and blind people, as well as a press release and Twitter. 88 people participated, but only 44 questionnaires were completed, 29 of them by blind persons or ViP and 13 with physical constraints. In parallel, 10 guideline-based interviews were conducted by telephone or video call. The content validity of the survey was ensured by having two experts in the education and integration of blind students review the comprehensibility of items and the technical

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aspects of the questionnaire concerning the compatibility to different screen readers. The questionnaire was in German and consisted of 6 categories (demographic data, technical affinity, daily smartphone use, accessibility tools on the smartphone, navigation and - applications, and personal opinion) and a total of 45 questions plus a separate questionnaire for contact information, in order to preserve anonymity. From the technical affinity questionnaire (TA-EG) only the sub-rating scales *excitement* and *competence* were used (Karrer et al., 2009). The questions consisted of yes/no, multiple choice and semi open-ended questions. The guideline-based interview consisted of 29 fixed questions for each participant. Further questions arose from the respective interviewees, the situation or were adapted. A question about experience with AR applications was only asked of people who still had some residual vision.

*Keywords:* blind navigation, people with visual impairments, indoor navigation, orientation, accessibility, user requirements

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