Assessing Mobile-wise Individual Differences in the Blind

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ABSTRACT
Every human is different. This diversity has not been given enough attention in mobile UI design. Disabled groups, with specific individual differences, face difficulties with traditional or stereotypical interfaces. My goal is to identify the individual features that influence mobile interaction, considering the blind, and match them with mobile interaction modalities in a comprehensive and extensible design space.

Categories and Subject Descriptors
H.5.2 [**Information Interfaces and Presentation**]: User Interfaces –*Input Devices and strategies, User-Centered Design.*

General Terms
Design, Experimentation, Human Factors.

Keywords
Individual Differences, Blind, Assessment, Mobile Accessibility.

1. MOTIVATION AND GOALS
Mobile devices present opportunities beyond our imagination and it is difficult not to be amazed with mobile computing recent growth. Most, mobile user interfaces are designed to fit a common user model, shaped with a few adaptable and adaptive mechanisms. However, no two persons are alike. We can usually ignore this diversity as we have the capability to adapt to the devices and, without noticing, become experts in interfaces that were probably misadjusted to begin with. However, this adaptation is not always at the user's reach. One neglected group is the blind. The age of blindness onset, age, cognitive, motor and sensory abilities are some characteristics that may diverge between users. The enormous diversity found among these particular group turns the "stereotypical blind" idea inadequate. Regardless, all are presented with the same methods and opportunities disregarding their capacities and needs. Moreover, interaction with mobile devices is highly visually demanding which increases the difficulties.

My goal is to evaluate the match between users and the interfaces by using various measures of compatibility. This assessment can be performed at several levels (sensory, motor and cognitive). I intend to study low-level capabilities and how they influence mobile performance (e.g., is it better, and how better, for a person with peripheral neuropathies to perform an onscreen gesture than pressing a specific key). Further, I want to be able to mix it all together and predict performance for particular tasks, e.g. text-entry, and thus be able to point the best devices and interfaces. So far, my studies have focused on revealing the differences among users and the impact on their lives:

Preliminary probes. We developed three text-entry methods with different requirements and advantages: NavTap [1], BrailleTap[1] and NavTouch [2]. Each has shown to surpass the difficulties or take advantage of particular capabilities. Results were a motivation to understand the differences among users.

Long-term NavTap analysis [3]. This study was performed during 19 weeks with 8 users and featured daily logging and regular experiments to observe the users' capabilities and evolution. We found blind users with astonishing Braille reading performance but also those with peripheral neuropathies who can hardly feel the keypad. Results showed different evolution patterns revealing individual factors that may determine users' relation with devices.

Feature Refinement. I interviewed specialized professionals working closely with blind people (3 psychologists, 2 occupational therapists, 4 rehabilitation technicians and 1 IT teacher). The study aimed at validating the features and identifying previously unidentified ones. It revealed a determinant feature set composed by: tactile sensitivity, spatial ability, dexterity, memory, IQ, blindness onset age, age and motivation.

The current challenge is to quantify the impact of each characteristic and create a model including all that are relevant:

Individual Differences Assessment. This study will be performed with a diverse set of blind users (>50). The goal is to relate low-level user characteristics with different interaction modalities demands. User assessment will be performed resorting to well-defined examinations.

Predictive Model and Design space. In possession of a thorough characterization of how different users relate to different interaction modalities, I will derive a model that allows us to make predictions regarding the performance of particular user/modality pairs. This will be tested asking users to perform a set of tasks and comparing performance metrics to the model's predictions.

2. ANTICIPATED CONTRIBUTIONS
1) Identify the features that influence the most a blind user's performance in a mobile interaction context; 2) Characterize and relate each user feature with devices and their demands; 3) Create a model that predicts user performance with different interfaces based on their characterization; 4) Instantiate the model in a comprehensive design space, able to relate an individual with the available interfaces. It will also be a valuable tool for designers as it will show which interfaces suit the largest set of users.

3. REFERENCES
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