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Improving Deaf Accessibility in Remote Usability Testing

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ABSTRACT
For studies involving Deaf participants in United States, remote usability testing has several potential advantages over face-to-face testing, including convenience, lower cost and the ability to recruit participants from diverse geographic regions. However, current technologies force Deaf participants to use English instead of their preferred language, which is American Sign Language (ASL). A new remote testing technology allows researchers to conduct studies exclusively in ASL at a lower cost than face-to-face testing. The technology design facilitates open-ended questions and is reconfigurable for use in a variety of studies. Results from usability tests of the tool are encouraging and a full-scale study is underway to compare this approach to face-to-face testing.

Categories and Subject Descriptors
H.5.2 [**User Interfaces**]: Interaction styles (e.g., commands, menus, forms, direct manipulation)

General Terms
Measurement, Documentation, Design, Experimentation, Human Factors, Verification.

Keywords
Remote Usability Testing, Accommodations for the Deaf

1. INTRODUCTION
One barrier to better Deaf[1] accessibility to technology is the current process of usability testing itself. Members of the Deaf community in the United States use American Sign Language (ASL), not English as their preferred language. Although face-to-face usability testing protocols can incorporate certified ASL/English interpreters [1], barriers of scheduling, cost and localization remain. Hearing researchers must coordinate not only the schedules of their team and the schedules of the Deaf participants, but also the schedules of certified interpreters.

The cost of interpreters further confounds scheduling issues since rates for certified interpreters are typically $50.00 per hour with a two-hour minimum. This motivates researchers to schedule back-to-back testing sessions, imposing further time constraints and stress on the test team. As previously noted [1], the resulting low numbers of participants can interfere with statistical analysis.

Localization is another challenge of face-to-face testing [2]. Testing of this kind typically draws users from a limited geographic area, which often results in an adversely small numbers of participants. Further, participants drawn exclusively from a particular locale may yield skewed results when compared to a more geographically diverse sample.

2. CHALLENGES OF REMOTE TESTING
In contrast, remote testing can be done asynchronously, easing the burden of scheduling [3], and has been used in recent years to evaluate web sites, virtual prototypes, and software [4]. This technology allows researchers to test with large, geographically diverse populations. Data are collected asynchronously over a network and stored in a central database, leading to faster collection and lower costs [5].

Remote testing holds the potential to tap a large, geographically diverse Deaf population in a more cost-effective manner [6], particularly since many members of the Deaf community have embraced the Internet as a preferred means of communication [7]. Through the use of webcams, the Deaf communicate directly in ASL and avoid the necessity of typing.

However a significant language barrier remains. Remote testing technologies designed for hearing audiences in the United States use written English. English is not a viable option because the average reading fluency of a Deaf adult is at the fourth-grade level [8]. American Sign Language (ASL) is the preferred language of the Deaf community, and differs radically from English. Asking Deaf participants to test with written English is asking them to test in a second language. This barrier motivates a new approach to remote usability testing.

3. A MORE DEAF-FRIENDLY APPROACH
To lower barriers and increase the size of the participant pool, we have developed a reconfigurable, web-based evaluation tool that uses ASL exclusively. The goal is to capitalize on the advantages of remote testing – flexibility of scheduling and lowered cost – but without the barriers posed by written English. All information and instructions in this new tool, from informed consent to post-test questionnaire, are presented in ASL.

Figure 1 shows the screen layout for a closed-ended question. Recordings of the test moderator appear in the upper right window and test stimuli appear on the left. The test participant views instructions from the test moderator and observes test stimuli. The participant can view a stimulus for as long as s/he wants and

[1] The term "Deaf" with a capital "D" refers to the community that uses American Sign Language as their preferred language and shares a common culture, history and experience.

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then answer questions in the response area on the lower right. Across the top of the screen is a progress indicator.

As is apparent in the figure, there are no labels associated with the response choices. Instead, the interface takes advantage of a unique visual aspect of signed language called *indexing* [9]. Indexing occurs in ASL when a person refers to an object or another person in the environment, and involves pointing at the entity. The signed instructions in this tool use indexing to refer to the response choices. This is analogous to asking a hearing person to respond to the choices of a Likert scale.

The tool also provides for open-ended questions via an innovative approach for capturing responses via the participant's webcam. The test moderator asks the participant to sign their response for the webcam. The response area changes to show webcam input, and a webcam control. The participant signs a response in ASL and clicks the control when done. The participants are comfortable with this due to their previous experience in using webcams and the assurances in the informed consent that the recorded responses are only used for collecting aggregate data and are destroyed at the end of the study.

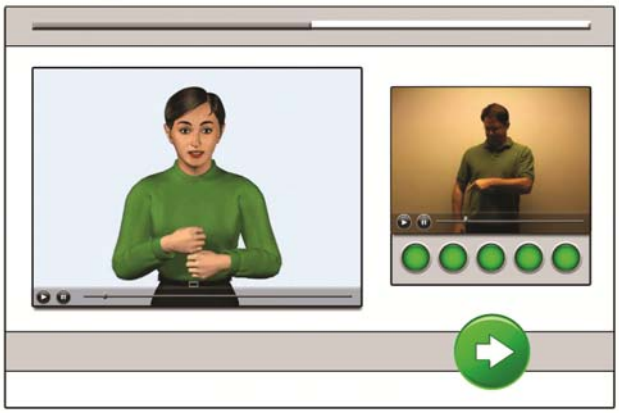

Figure 1: A screenshot of the interface

4. ADVANTAGES

Interpreter costs are greatly reduced because it is only necessary to hire an interpreter to voice the responses to open-ended questions. This is a small fraction of the time required to interpret an entire session. Further, the researcher can wait until the testing is complete and hire the interpreter to voice all of the responses in a single session.

5. CONFIDENTIALITY

For data analysis, we only retain the voice recording of the interpreter and destroy the original video. This is analogous to destroying recordings of a face-to-face test. In fact, since the researchers never see the face of the participant, this method has an enhanced level of confidentiality.

6. CONFIGURABILITY

The tool is written in Adobe ActionScript and accommodates any number of test stimuli and most common formats for questions. To create a test, a Deaf researcher or certified interpreter records videos of informed consent, instructions, questionnaires, etc. and inserts them into the tool. Since the tool itself is language-neutral, it has the potential for use with any type of signed language, as well as for populations having low literacy levels.

7. RESULTS

Early results from usability testing (IRB# 101609JSCDMR1) are promising. Of a group of eight users, seven indicated that the indexing technique was easily or very easily understood, and all agreed or strongly agreed with the statement "ASL is better than English for this type of test." Participants described the test approach as "inspired", "excellent", "super-great", and "beneficial to the Deaf community". The most common suggestion was to include a way to replay the facilitator's instructions, and the authors are in the process of implementing this feature.

8. FUTURE WORK

We are collecting data with this new tool to compare with data previously collected via face-to-face testing. Ultimately, we want to make an open source version of this tool for distribution.

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