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# A Quality-aware View of Accessibility for Voice-based Interfaces

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**Abstract**

Voice interfaces are giving people who have difficulty using graphic-based systems more access to information and services on the Internet. However, there hasn't been a widely-acknowledged definition of accessibility in this research field. While progress in voice-interface technologies do improve people's user experience, privacy issues arise and contradict with the nature of accessibility in many cases. In our extended abstract, we try to propose a definition of accessibility from a quality-aware perspective. Accessibility (as generally defined), usability, personalization, confidence and privacy are adopted as five metrics for evaluating quality-aware accessibility. Privacy issues are given special attention when we pursue better accessibility. Real-world experimental platforms can be built under this guidance later on.

**Author Keywords**

Voice interface; impairments; quality-aware accessibility; privacy; biometrics

**ACM Classification Keywords**

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous

## **Background**

Older adults and people with motor/vision impairments often have trouble accessing information and services on graphic-based systems. Many efforts have been made toward enabling them to better handle tasks and interact with the world (e.g. personal assistants [Alisha et al. 2018], conversational assistants [Stefan et al. 2018], cognitive assistants [Maria et al. 2016], speech interactions for deaf people [Raymond et al. 2018]).

We use Web browser which is one of the most important media on the Internet and change modern people's life greatly for a case study.

*Jeffrey et al.* [2008] introduced TrailBlazer to help blind users complete web-based tasks efficiently in a step-by-step fashion. It directs users' attention by providing accessible shortcut keys.

I.V. et al. [2017] stressed usability as another key metric other than accessibility.

While lots of efforts have been made to improve user experience of targeted users, there hasn't been a well-defined notion of accessibility in existing literature. As a result, no standard or design guidance is available when we try to design "better" voice interfaces.

## **Quality-aware Accessibility**

In social science, accessibility is generally understood as an attribute that design of products, devices, services, or environments for people with disabilities should obtain. Accessibility can be regarded as a well-enough-defined term in some cases, e.g., when we build wheelchair ramps in public infrastructure. We can say with confidence that this measure meets needs of nearly

all disabled people with motion impairments. However, in many cases where services have to meet more than people's basic needs, i.e., people have stricter and more various demands for quality, accessibility is no longer a once-and-for-all metric to evaluate services. Unfortunately, Internet services indeed fall into this category. In response to the arising needs to evaluate voice interfaces, we tentatively define accessibility from a quality-aware perspective, terming it quality-aware accessibility.

We judge whether a voice interface is accessible considering the combination of several metrics: accessibility (as generally defined), usability ([2]), personalization, confidence and privacy. The five metrics are briefly and informally defined as below.

Accessibility means never excluding anyone from access to a certain service.

Usability mainly concerns about user experience. In our case of Web browser usage, it's measured by how hard or easy it is for a user to be directed to the right place on a webpage. Even someone with great patience will get annoyed when having to listen to lines of content before meeting the wanted item.

Personalization can be achieved by training online assistants based on users' habits, along with extracting common characteristics of a certain group of people having same kinds and close degrees of impairments.

Confidence measures the extent to which the system is sure that it serves the user right. If the system isn't confident enough, users would prefer turning to manual assistance.

Privacy is always a big issue when exposed to the complicated world of Internet. The situation is worse when concerning usage (or even sole usage) of speech-based systems. One common example is when one needs to enter her/his SSN (Social Security Number) or weight in a public areas. The speak-out way of input can be either dangerous or embarrassing. Thus privacy-enhancing technologies have to be delicately designed for this group of users.

### **Privacy Issue**

Privacy is often less considered than other metrics in the process of designing voice interfaces. However, privacy is rather important for guarantee of users' security and overall user experience.

At the same time, privacy issues concerning usage of voice-based systems are much harder to handle. The main reason is that there don't exist alternatives like typing to enter private information in many cases. One example has been presented at the end of previous section.

One potential solution, from our perspective, will use knowledge of biometrics, i.e., adopt fingerprints, iris and other characteristics that differ by individual as sensitive information carriers.

This requires cooperation of the whole Internet community, but it's worth trying. It creates a more privacy-enhanced online world, benefiting not only people with vision impairments.

### **Conclusion**

In the extended abstract, we give a quality-aware definition of accessibility, taking into account

accessibility (as generally defined), usability, personalization, confidence and privacy. Privacy issues arising from the speak-only nature of input for voice-based systems are considered and one potential solution is put forward. In our future work, a more detailed framework for evaluating accessibility of voice interfaces will be proposed. Other open problems in the process toward a more privacy-enhanced community include preserving privacy via biometrics authentication and constructing corresponding Internet infrastructure for security which is missing in the original TCP/IP design.

### **Acknowledgement**

We would like to thank Daniela Grassau who kindly offered two real-life cases of voice interface for the disabled, which help us a lot in developing a novel definition of accessibility.

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