Remo: Generating Interactive Tutorials through Demonstration by Remote Peers to Assist Older Adults

AMBER AFTAB, Virginia Tech, USA
RUIPU HU, Virginia Tech, USA
SANG WON LEE, Virginia Tech, USA

Older adults often have limited digital literacy and struggle to keep up with our increasing dependence on websites for everyday tasks like paying bills or booking flight tickets online. They often get in-person assistance from their friends and family but such help may not always be possible. Remote assistance from peers such as phone calls, or written instructions via email or text messages can be useful. However, remote methods of assistance may lead to communication issues between the helper and the help-seeker, due to a lack of shared visual context; a helper cannot see the help-seeker's screen. Moreover, older adults are often unacquainted with the terminology associated with web navigation. In order to bridge the gap between in-person support and remote help, we develop Remo, a web browser extension, which will allow helpers to create interactive tutorials by demonstration. These tutorials will be embedded within a web page and will make use of visual cues to direct older adults to specific parts of the page. Remo aims to provide opportunities for older adults to complete online tasks by following the step-by-step and task specific tutorials generated by their peers. Using Remo, we anticipate that older adults will be able to get personalized assistance, similar to in-person support, and eventually learn how to complete broader online tasks independently.

CCS Concepts: • **Human-centered computing** → **Interactive systems and tools**; • **Information systems** → *Web applications.*

Additional Key Words and Phrases: older adults, accessibility, remote assistance, interactive tutorials

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1 INTRODUCTION

The existence of the Internet has greatly enhanced our lives. Not only is it a source of knowledge, but it also allows people to access essential services like banking and shopping. While the internet affords people a multitude of conveniences and is seemingly ubiquitous, it has not been designed in a way that is inclusive to all [19]. Research has shown that older adults often experience accessibility issues such as confusing navigation and unclear terminology [2].

When older adults struggle to use the Internet, they resort to remote or in-person help for basic web tasks [14]. In-person assistance may not always be available for older adults and their peers often choose to help them remotely [21]. However, remote assistance can be challenging. Not being able to view the context within which the individual is asking for assistance makes it difficult for helpers to understand what the individual is trying to convey and vice versa. A lot of helpers resort to communicating using technical terms, or jargon, which older adults struggle to understand [12].

Additionally, it is difficult for the helpers to take out time in order to assist someone remotely at the same time. All of these issues of remote help point towards the need for an easier and asynchronous alternative, for the helper as well as the recipient. Video tutorials are potentially one solution to this, but these are fast-paced and hard to follow for those not well-acquainted with navigating through the web [22]. Additionally, these tutorials are not situated within the web page itself, making it inconvenient for older adults to switch back and forth between the task and the tutorial [22]. Lastly, while video tutorials are available for basic tasks, it can get difficult to find such tutorials for specific tasks.

To address these challenges, this paper shares our plan to develop Remo, a recording tool that allows users to generate interactive tutorials of basic web tasks that can be used by older adults who struggle to navigate the web. By applying the method of *generating interactive tutorials by demonstration*, Remo aims to create tutorials within the context that older adults are working in, by overlaying the actual web pages using visual cues and written instructions. Through the interactive tutorial, older adults will be guided step-by-step to accomplish a web task.

Our hypothesis is that such tutorials will make it easier for the helper to give assistance at their own convenience, by simply recording their browsing activity while carrying out a certain web task. Additionally, older adults will be able to complete web tasks with relative ease by following tutorials embedded within the web page. Our goal is to facilitate older adults in learning how to carry out web tasks independently.

2 RELATED WORK

Research shows that 70% of adults, ages 65 and older, that are internet users go online on an average day [26]. Despite the widespread usage of the internet amongst older adults, their online activities are restricted to emailing and basic web searches [10]. Older internet users struggle with navigating from page to page, locating target elements, foraging for new information and completing tasks online [13]. Older adults are also prone to experiencing information overload when navigating a web page [1]. Additionally, unlike young internet users, older adults often experience computer anxiety and question their ability to complete a task if they can not accomplish it immediately [23]. Despite these challenges, studies have shown that older adults are able to pick up on new skills when trained [17]. These findings highlight the need for systems which can help older adults accomplish web tasks. Prior work outlines design guidelines to facilitate web usage amongst older adults. These include interactive approaches using clear step-by-step instructions [3, 5, 18, 21]. Additionally, since older adults spend a significant amount of time viewing web pages and navigation options compared to their younger counterparts [24], there is a need to clearly differentiate between the distinct options available. The aforementioned design guidelines provide a framework for the development of tools that facilitate web navigation, specifically for older adults.

There exists a body of literature which addresses challenges in designing web-based tutorials for novice users. Previous works allow users to generate macros with a record and replay function [15, 16]. Other works allow users to augment web pages with notes and screenshots containing visual cues in order to generate step-by-step tutorials for specific tasks [25]. The design of Remo draws ideas from these works to create within-context tutorials that have proven to be effective for novice users [7, 8, 20]. Rather than using screenshots or the replay of browsing activity to help users accomplish a task, Remo overlays the actual web pages, similar to LemonAid [9], for help-seekers with visual cues and allows them to follow the step-by-step, interactive tutorials generated by helpers' demonstrations. We use visual cues as they are effective in guiding people's attention [6] and increase learnability [11].

The works mentioned above are most relevant to Remo as the contributions of the aforementioned works have inspired the idea behind the tool. Our work differs from these works as it targets a specific population - older adults with limited digital fluency. Additionally, our design goals take into account the design guidelines highlighted in Section 2.

3 FORMATIVE ASSESSMENT FOR HELPERS

We conducted a need-finding user survey with 84 participants to figure out the problems helpers encounter while offering in-person or remote help. Once participants filled out the survey, we performed thematic analysis on the participants' responses. Through this thematic analysis, we narrowed down the fundamental issues that helpers face while offering in-person or remote assistance to others.

- **In-person assistance:** With in-person assistance, participants reported finding it difficult to strike a balance between helping someone and taking over and doing the task for them. 23 participants reported that communication was a huge barrier when helping an individual accomplish a task on their own. As on participant reported, one of the main barriers they faced before accomplishing a task for someone in-person was *"Understanding what they want to accomplish (sometimes); recognizing what knowledge/skill they do/do not have or what jargon they understand"*. This communication barrier is due to the differences in digital literacy between the helper and the help-seeker. The helper may use words that the help-seeker is not acquainted with, making communication difficult.
- **Remote help:** With remote help, participants reported difficulties in understanding the problem without having access to an individual's computer screen. The communication barrier gets even more pronounced with remote help, as both the helper and the help-seeker have to rely on each other's words in order to understand and navigate through the web task. Differences in how well-acquainted both individuals are with internet jargon makes offering help remotely a difficult task. One participant reported, *"If the person has a very low digital literacy, it is almost impossible or at best very time consuming to guide them remotely."*

With Remo, helpers will be able to create tutorials for a web task by performing the task themselves. Since 27 participants reported that doing a task for an individual was quicker, convenient and more efficient than talking them through the task, we hypothesize that helpers will find it easier and more convenient to automatically generate tutorials using Remo by performing a web task themselves. Remo will not only allow older adults to access tutorials at their own convenience, it will also provide helpers with a quicker and more convenient way of helping someone navigate through a web task.

4 NEED-FINDING STUDY FOR OLDER ADULTS

We initiated a need-finding user study in order to better understand the needs of our target population. The aim of our study was to give us more insight into the problems older adults encounter while navigating the web so we could adjust our design goals accordingly.

For the purposes of our study, we used a Macbook computer. The study consisted of two online tasks followed by an interview. In the first task, participants were asked to book a flight ticket from Roanoke, Virginia to New York City using Google flights with specific constraints. In the second task, participants were asked to order a specific item from Texas Roadhouse. We chose these tasks because we wanted our participants to perform basic, but specific tasks which involved multiple facets of web navigation such as typing, filtering out relevant targets, redirecting to different pages, and interacting with novel interfaces. Participants were given printed step-by-step instructions, along with screenshots, to guide them through each web task. During the tasks, they were encouraged to think-aloud. Participants signed a consent form that informed them that we were recording their screen and voice. A compensation of $25/hour was given for participating in the study.

Recruitment of participants was a challenge due to the COVID-19 pandemic. Additionally, remote studies with our target population proved to be challenging. For that reason, our initial user study consisted of two participants.

Based on our user study, we highlight some of the general problems encountered by our participants.

- Both participants struggled with the User Interface (UI). For the website interface, participants struggled with figuring out which button to press to proceed to the next step. Participants also had difficulty differentiating between scrolling *within* a section of a web page and scrolling *between* sections on the web page.
- In addition to the website interface, participants also struggled with the browser UI. Both participants struggled with auto-completion in the address bar. They also had trouble with browser popups and the back button feature provided by the browser.
- Participants had difficulty focusing on the relevant parts of the web page and would often spend a lot of time viewing every element of the web page before proceeding to the next step. This is in-line with previous research, which highlights how older users spend more time looking at parts of the web page, including areas of the web page not relevant to the task, compared to younger users performing the same task [1, 24]. This can be attributed to "cautious clicking" [4] that older adults engage in, in order to minimise errors. During the interviews, one participant pointed out that the option to add a coupon code during the second task confused her, and she spent a lot of time thinking about how to find the coupon code in order to proceed. This highlights the need to direct users' attention towards interface elements currently relevant to the task at hand, through the augmentation of those elements, which is in line with our design goals.
- Despite having each step outlined in the printed tutorials, we observed that participants preferred explicit verbal feedback after each step to confirm that they were on the right track. This was also confirmed by one of our participants in the interviews. This highlights the need for a system that validates user actions at each step.
- Both participants struggled with the difference in keyboard layouts (for example, the *Return* key on the Macbook keyboard as opposed to the *Enter* key on Windows keyboards). This highlights the need for instructions specific to the system that the user is using.

While the findings of the need-finding user study gave us some insights towards the problems older adults encounter when navigating the web, there is a need to conduct the study on a larger scale before making additional claims. The above section summarises the findings based on the studies conducted on two participants only, which makes the result limited and not generalizable yet. We plan on conducting this study with a larger number of participants in the future, and adjust our design goals accordingly.

5 REMO: ASSISTING OLDER ADULTS WITH ONLINE TASKS REMOTELY AND ASYNCHRONOUSLY

Based on our initial findings, we consider the following design goals in Remo:

- **Providing an interactive tutorial situated within the actual target task webpage:** Our goal is to provide users visual cues within the web page that will allow them to navigate through a web task. The cues will consist of highlighted regions, arrows and written instructions that guide users to a specific part of the web page.
- **Making the tutorial creation process more convenient than providing in-person or remote help:** Users will be able to create tutorials with relative ease. By carrying out the task themselves and using the record feature, they will be able to create tutorials. The tutorial creation process will be faster and more convenient than existing methods of assistance.

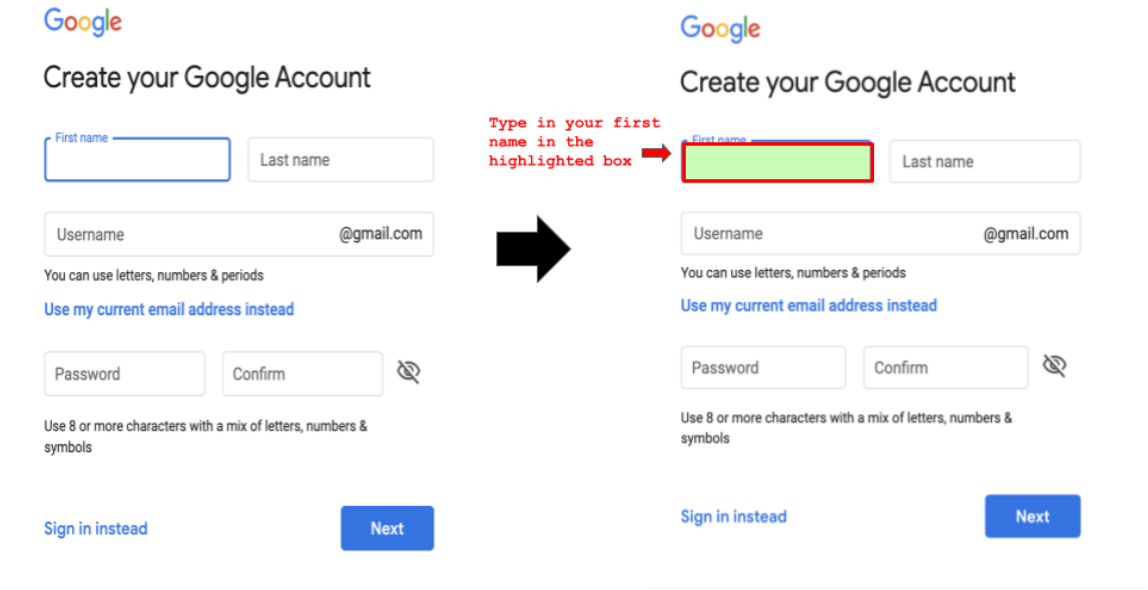

Fig. 1. Remo: Highlighted regions that act as visual cues to allow users to interact with specific elements in the web page

- **Generating instructions that are more understandable to a layperson:** The language used in the created tutorial will be understandable for someone who is not well-acquainted with internet jargon.
- **Providing explicit feedback at each step:** Older adults will get immediate feedback at each step to validate their actions and inform them of any errors.
- **Generating system-specific instructions:** To account for differences in systems and keyboard layouts, the instructions generated will be specific to the system being used by older adults.

Remo will record the interaction trace of a user who demonstrates how to complete an online task. This interaction trace will be analyzed and used to generate tutorials consisting of visual cues such as arrows and highlighted regions (Figure 1) to guide the user's attention to a specific part of the web page with customized instructions.

In short, we hypothesize that Remo will be a better experience for both helpers and older adults compared to in-person or remote means of assistance. Helpers will find it less time consuming to create tutorials. Additionally, the help process will be asynchronous and older adults will be able to use the tutorial at their own convenience. Lastly, the tutorial will be situated within the web page allowing older adults to carry out tasks without the need for context switching.

6 EVALUATION OF REMO

Once our system is fully functional, we will conduct a user study to validate our hypotheses. We aim to answer the following research question through the user study:

- Do older adults accomplish their target tasks more effectively using the interactive tutorials than the traditional method?

- Do older adults learn more from the interactive tutorials than from other alternatives?
- How does the method of generating interactive tutorials by demonstration allow helpers to provide remote assistance more conveniently and effectively compared to other alternatives (e.g.,written instructions)?

In order to answer our research questions, we plan to conduct controlled user studies, which involves both helpers and older adults accomplishing an online task.

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