
A Comparative Study of Icon and Text-based Interfaces for Interactive Recommender Systems

1. Abstract

This research paper presents a comparative study conducted to determine the effectiveness of two different interfaces, namely icon-based and text-based, for an adjustable recommendation algorithm platform, essentially an extensive search engine. In this experiment, chosen participants interact with varying fidelity levels of prototypes which are either text based or more icon based. Experiments are carried out such as perceived ease of use, amount of interaction needed to achieve a goal, or filtering results in certain manners which aid in evaluating the interfaces. The results are inconclusive but suggest that even if an icon interface might be easier to and more pleasant to use, specifically for filtering and search engine purposes, a text based interface is more efficient.

2. Keywords

icon-based interface, text-based interface, interactive recommender systems, adjustable recommendation algorithm platform, user-friendly design, intuitive interface, utilizing advanced search options, counterbalanced

3. Introduction

In this study we explore the effectiveness of two different interfaces, icon-based and text-based, for an adjustable recommendation algorithm platform. Users often are not familiar with advanced search techniques and therefore find it difficult to access and use them effectively. This platform caters to less experienced users by providing a user-friendly interface to access the extensive capabilities of advanced search techniques. Some examples of world-leading interfaces for interactive recommender systems include Google's search engine; which uses a combination of text and icons to help users refine their searches, and Amazon's product recommendation system; which uses a combination of text and images to help users find suitable products.

Icons and words are often used in website design for simplicity and ease of use of the user, while both have their benefits and drawbacks, the implementation, change, or removal of both have been deemed ‘updates’ or ‘upgrades’ in various systems. One example would be the redesign of google app icons (Figure 3.1), favoring one color scheme and style over the varied colors and shapes, this meant users had difficulty distinguishing between the icons at a glance and relied on the names of the apps written underneath [3]. This, however, takes more time and energy than simply distinguishing by their specific colors and shapes. Icons should be easily recognizable and they possess the visual appeal that text does not [4].

Purposeful placement of icons can also save space, establish a brand or style and should be intuitive to the user due to their (preferably) distinct colors and shapes. On the other hand, text and phrases often convey their purpose more clearly than buttons that users are not familiar with, such as new users and users coming from different UIs and there could be a language barrier that hinders understanding [4]. By conducting a comparative study of icon-based and text-based interfaces, we provide valuable insights into designing more effective and user-friendly interfaces for advanced search techniques and similar applications.



Figure 3.1: Redesign of Google app icons

4. Method

4.1. Participants

Participants chosen at random but taken in account are variable levels of experience and familiarity with search engines and computer use in general. The study was performed with 5 volunteering participants, three female and two male, ranging from 19 to 50 years. The experiment participants volunteered unpaid, some very experienced others with minimal knowledge. None of them had any previous experience with the interface.

4.2. Apparatus (Materials/Interface)

To conduct this experiment, the following apparatus and materials will be utilized:

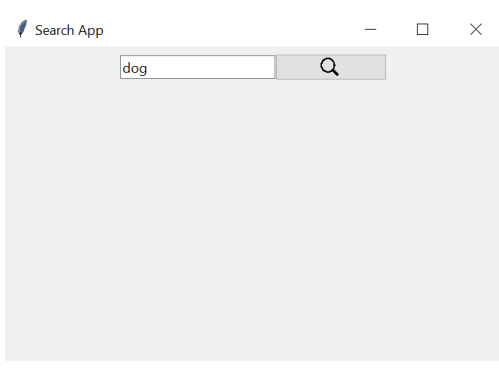
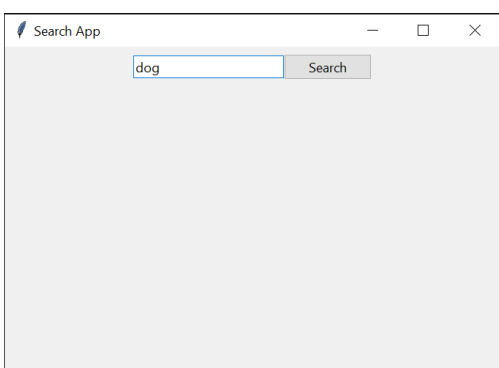
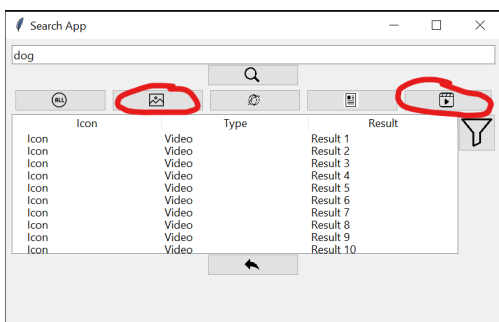
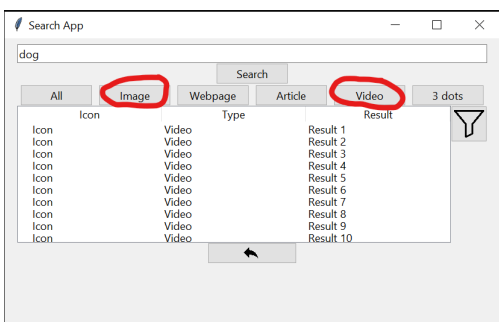
- 2021 Huawei Matebook 13 running on Windows 10 with Python and Tkinter installed along with (pyautogui, pynput, Pillow, matplotlib, numpy).
- No external mouse or keyboard.
- Prototype of interfaces downloaded on computer/laptop: The recommender system prototype that the participants are going to use to perform the filtering task.

- Consent Form: A document detailing the purpose and procedures of the study. Participants will be required to review and sign the consent form before participating.
- Questionnaires: A small questionnaire asking the age and study program of the participant.
- Scenario Instructions: Written instructions will be provided to participants, explaining the filtering task they need to perform based on the desired scenario.
- Pens and Paper: Participants need pens and paper to provide answers to the questionnaire.

4.3. Procedure

Participants answered the questionnaire before the experiment and every user was given specific instructions but no demonstration was shown. A laptop with a command window ready to open the interface was in place. The moment they pressed enter the interface opens and they have to perform the following tasks in the same exact order:

- Write the term "dog" in the search bar and click search.
- Filter all results to video through the bar at the top.
- Filter all results to image through the bar at the top.
- Click on the advanced options icon and fill in the survey based on individual needs and search through those filters.

Iteration	TEXT	ICONS
1		
2		

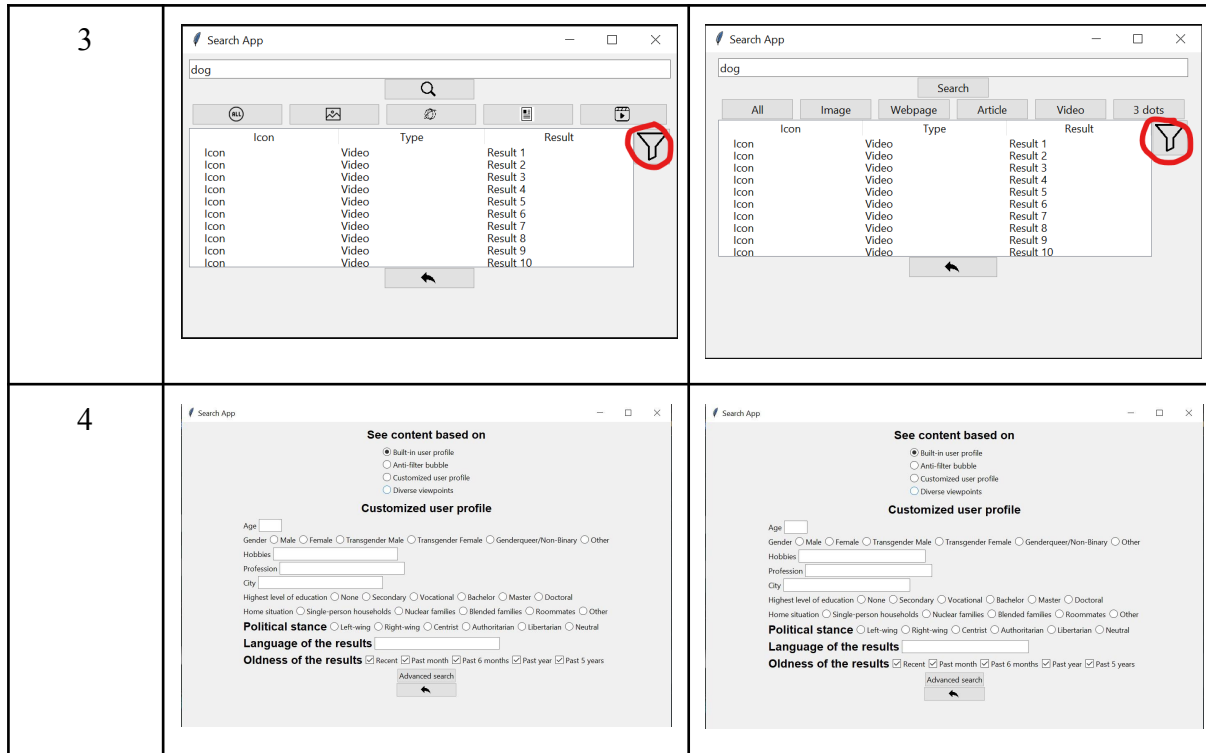


Figure 4.1: Iterations of both interfaces. How the two interfaces were designed and developed and ultimately where participants performed experiments on.

The goal was to test how effective it was for participants to navigate the interface and move through the required tasks. Timing of the experiment started the moment the window interface appeared. To measure the interactions we used a “perfect” interaction as a base where researchers, who are familiar and efficient with the interface already, timed by doing everything as precisely and quickly as possible. This was then compared to the data collected from the interactions of the participants with the “base interaction” and the results of both prototypes between each other. For data collection from participants, the mouse movement, mouse clicks and time between interactions was recorded.

Within the main platform there have been implemented scripts that the researchers developed in order to measure and record the data needed to complete the experiment. The logging script starts by setting the time and date of the interaction, providing a reference point for the events that follow. Furthermore it proceeds to record the coordinates of the cursor as it moves within the platform, providing information on the user’s mouse movements. The log file also records the coordinates of mouse clicks, indicating where and when the user clicked within the platform.

4.4. Design

The experiment employed a 3×2 within-subjects design with two independent variables: interface type and task. The interface type had two levels: icon-based and text-based. The task variable had three levels: searching for “dog”, filtering results to video and then image, and accessing advanced options. The dependent variables were the number of mouse clicks, the time between interactions, and the mouse tracking data.

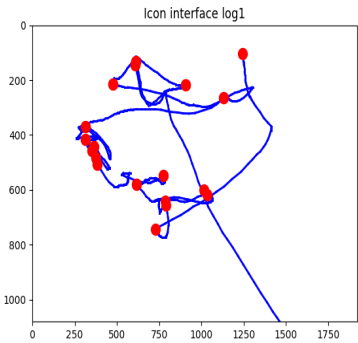
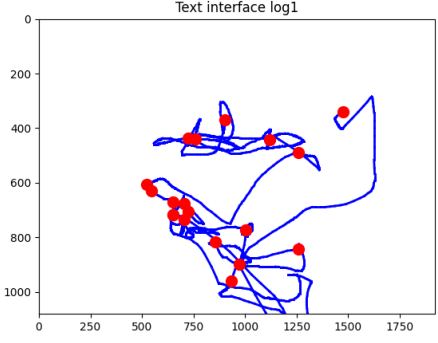
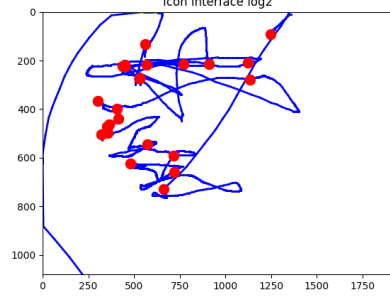
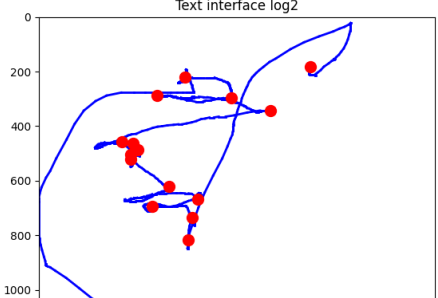
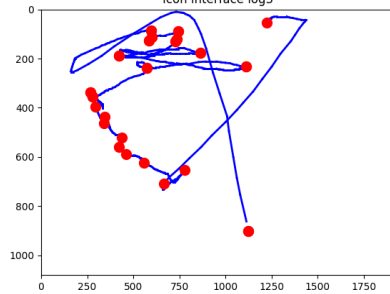
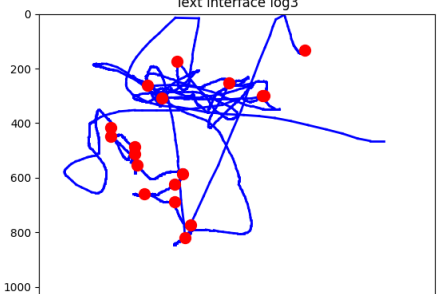
Participants were asked to perform a series of tasks using both prototypes of the adjustable recommendation algorithm platform. The goal was to test the effectiveness and efficiency with which users moved through the interface and found the correct options. A total of 10 trials were administered, with 5 participants each using both prototypes of the platform. The data collected included mouse clicks, time between interactions, and mouse tracking data.

5. Results and Discussion

The results of our experiments indicate that there are notable differences in user interaction with the platform when utilizing an icon interface as opposed to a text interface. Analysis of mouse tracking data revealed that the icon interface resulted in significantly reduced mouse dispersion, suggesting more precise mouse movement[2]. Conversely, the text interface exhibited greater dispersion in mouse movement.

Further examination of data obtained from log files demonstrated that the average total mouse movement for the icon prototype was marginally below 2000 total movements, while the text interface had a score marginally above 2000 total movements. Additionally, the average number of clicks while interacting with the platform was marginally below 40 for the icon interface and marginally below 20 for the text interface. The text interface yielding greater results in terms of misclicks can be due to the use of icons not being specific enough thus a text interface would make it clearer. Due to the absence of a standard usage for most icons, text labels are necessary to communicate the meaning and reduce ambiguity, this suggests that while icons may be more intuitive for navigation, their meaning may not always be clear to users[1].

These findings suggest that users find it more intuitive to navigate and interact with the platform when utilizing an icon interface compared to a text interface although the amount of misclicks in the icon interface suggests that icons are not clear enough, so they are easier to locate but harder to understand which would explain the lesser misclicks but the higher effectiveness when moving the mouse. Further research could delve into this observation in greater detail, including analyzing variance and randomness of differences in results to determine their statistical significance.

Participant ID	Icon Interface	Text interface
1		
2		
3		

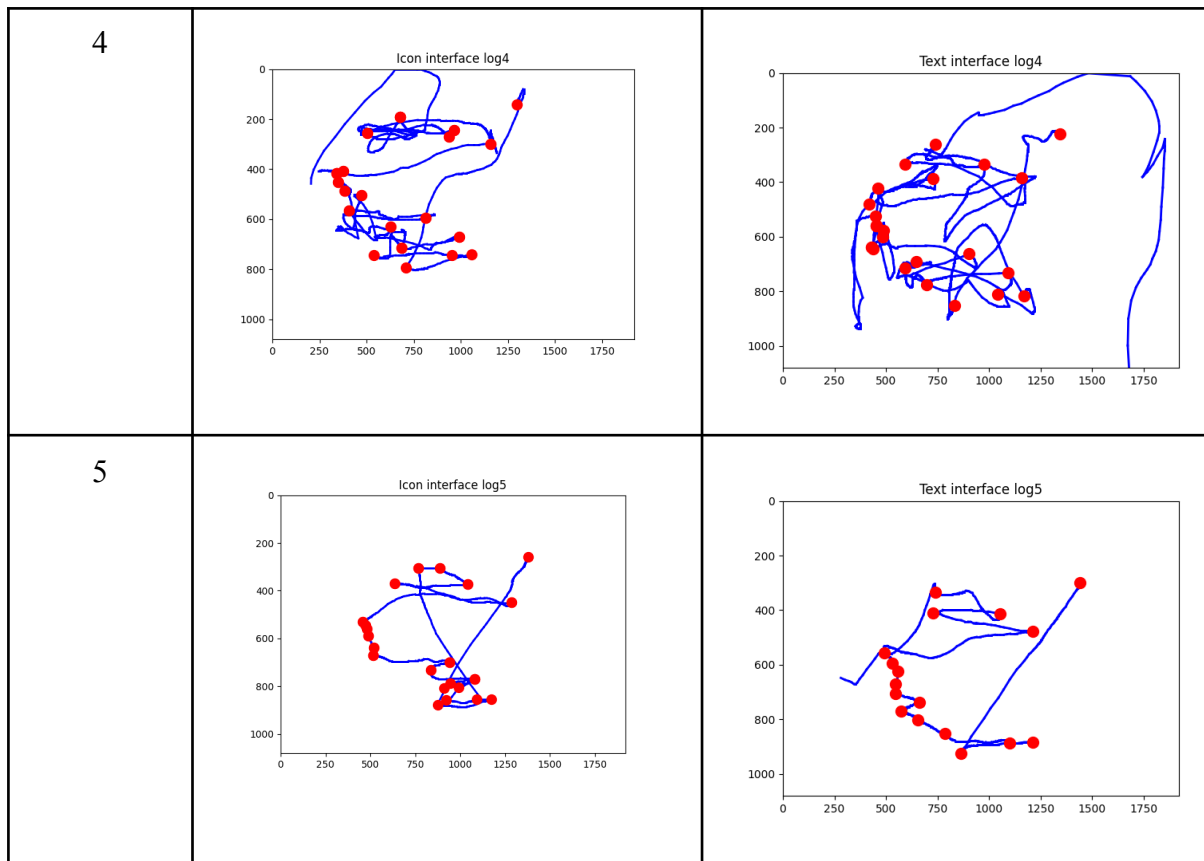


Figure 5.1: Mouse tracking and clicking of five participants navigating both interfaces

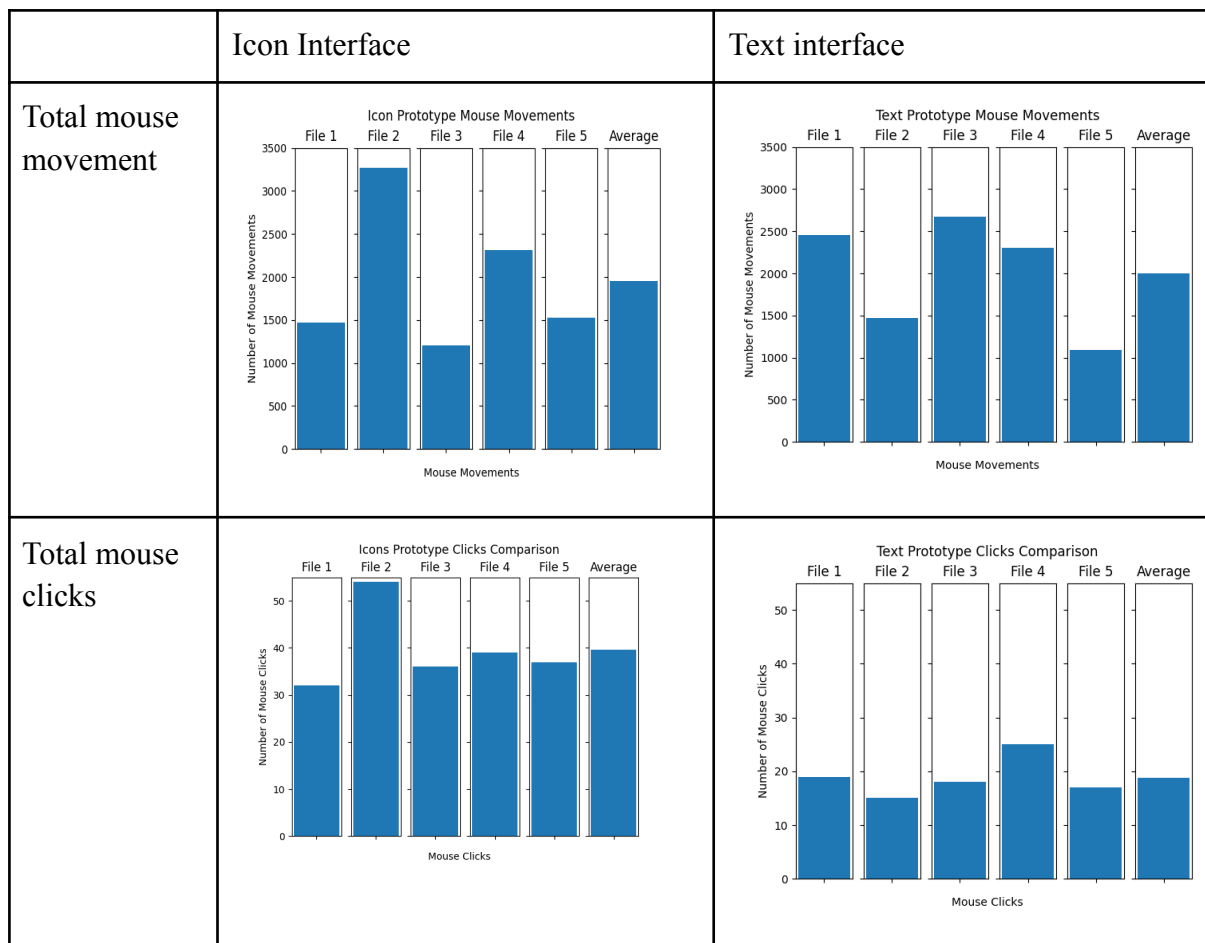


Figure 5.2: Total mouse movement/clicks of five participants when navigating both interfaces

Mouse Movement Graph description (Figure 5.1)

The graph generated by the script shows the number of mouse movements recorded in each of the five log files specified as input to the `compare_logs` function. The graph consists of six subplots arranged horizontally. The first five subplots show the number of mouse movements for each individual log file, with the title of each subplot indicating the corresponding file number. The last subplot shows the average number of mouse movements across all five log files. The y-axis of the graph represents the number of mouse movements and is shared among all subplots.

Clicks Graph description (Figure 5.2)

The graph generated by this script shows the number of mouse clicks recorded in each of the five log files specified as input to the `compare_logs` function. The graph consists of six subplots arranged horizontally. The first five subplots show the number of mouse clicks for each individual log file, with the title of each subplot indicating the corresponding file number. The last subplot shows the average number of mouse clicks across all five log files. The y-axis of the graph represents the number of mouse clicks and is shared among all subplots.

6. Conclusion

In conclusion, our comparative study of icon-based and text-based interfaces for an adjustable recommendation algorithm platform has yielded valuable insights into the design of interactive recommender systems. Our methodology included a rigorous selection of participants with varying levels of experience and familiarity with search engines and computer use. We employed advanced data collection methods such as mouse tracking and interaction logging to gather detailed information about user behavior. Our results showed that both interfaces have their strengths and weaknesses, with the icon-based interface being more intuitive for some users while the text-based interface provided more detailed information for others. These findings have important implications for the design of more effective and user-friendly interfaces for advanced search techniques. Further research is needed to explore how to optimize the balance between intuitiveness and information richness in interface design.

8. References (APA)

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