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Measuring User Journey Friction in Search Engines

ABSTRACT

This disclosure describes techniques to measure user friction in search tasks performed by a user using a search engine. User friction can be defined as the inverse of total time spent in refinement before a user obtains a desired search result. User friction is indicated by the amount of user actions taken before the user obtains a desired search result. Based on user-permitted metadata indicating queries and actions input by the user, a user search session is divided into user visit segments classified based on the query intent of the user, each segment indicating a search task. User friction scores are determined for completed search tasks based on counts of user friction interactions, such as returning to a search results page after selecting a search result or refining a query. The described techniques can measure friction in user search tasks involving multiple interactions in a user journey and can enable improvement in the experience of using a search engine.

KEYWORDS

- Search engine
- Search query
- User journey
- Query intent
- Search task
- User friction
- User experience metric
- A/B testing
- Interaction design

BACKGROUND

Current ways of estimating user experiences with search engines depend on measuring outcomes at query result interaction level by measuring parameters such as click-through rates (CTR), time spent on the result page, and/or user retention over time. A/B testing based metrics can compare individual task-specific friction (e.g., "users on average required 10ms more to click on a blue link) but cannot measure friction for a user journey that involves multiple interactions. Experiments that evaluate different designs for user journeys in search engines may often not be feasible due to many factors. However, a problem in user experience design is to assess and quantify the hindrances to a meaningful experience for users when interacting with a product. The aforementioned ways of estimating user experiences in search engines ignore the contextual friction associated with multiple actions a user may take in sequence or in an overall search task, and thus may miss important factors that affect the user experience.

DESCRIPTION

This disclosure describes techniques for measuring obstructive user friction in a search engine with user permission. User friction is the cumulative effort of users to find satisfying search results using the search engine. A user may experience friction in a user journey involving a search engine, e.g., in a search task that includes searching for desired information. A user search experience that has zero or small amounts of friction is typically more satisfying for the user, since the desired results are obtained easily and quickly.

The described techniques measure user friction during the use of a search engine by linearly aggregating various user actions and determining whether the user has had satisfying interactions and results. For example, measurement of friction includes counting the number of user actions in the user interface as well as measuring the time that the user spends on a

particular search result landing page. The user data utilized for the purpose of measurement of friction is obtained with specific user permission and the user is provided options to permit or restrict use of such data.

The described techniques allow measurement of friction to users who are using a search engine and user interface. Such measurements are valuable, for example, to search engine providers for evaluating user experiences of their search engines and adjusting the engine and interface, e.g., to help users find desired results and types of information faster and with less frustration, and/or to determine whether particular types of information are more difficult to obtain. A search engine as referred to herein may be a general purpose internet search engine, a special-purpose or domain specific search engine, a search interface within an application, or any other modality through which a user can perform a search. In some examples, the measurements can be a useful benchmarking tool that allows a comparative analysis of user friction as experienced for different types or categories of search topics or subjects, and/or analysis of user experiences of different interface features.

The described techniques can be implemented on any suitable device or system, e.g., desktop or laptop computer, portable user device (e.g., a smartphone), server device(s), etc. The user is provided with options to enable or disable described techniques. The user can permit specific user input, search topics, queries, or other user interactions with the search engine to be processed via the described techniques and can deny processing of other user interactions.

User experience and friction during a search task

Examples of user actions and friction encountered by the user during use of a search engine for a search task are shown in Fig. 1.

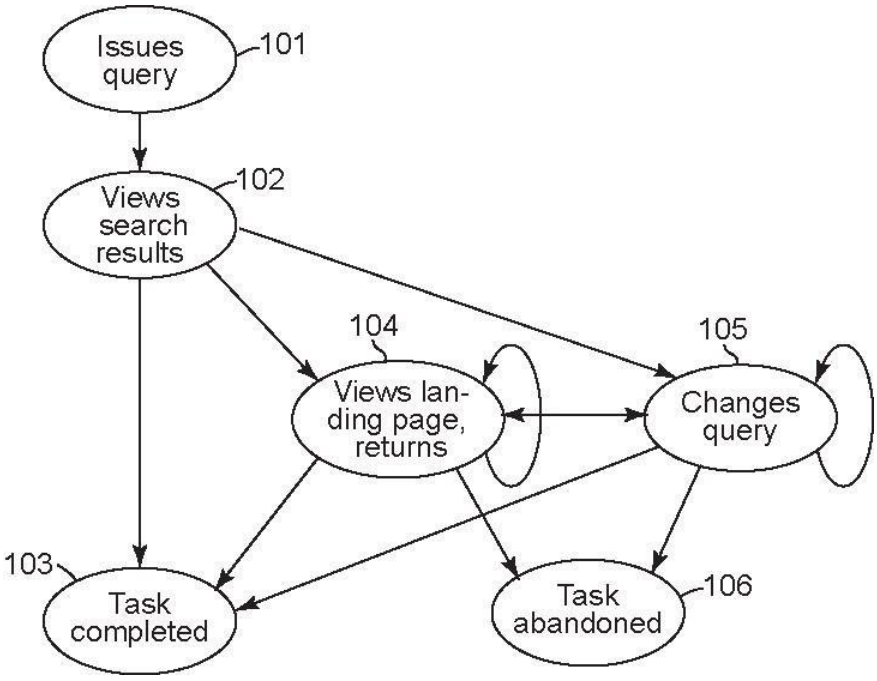

Fig. 1: Example user actions during use of search engine

As shown in Fig. 1, the user experience can start with the user issuing a query (101) in a search engine. For example, the user can input one or more words in a field of the search engine to form the search query. The user then views (or otherwise receives) search results (102) that are output by the search engine in response to performing a search based on the query.

At this stage, the user experience has several possibilities. In some cases, the user may select one of the search results that satisfies the user's query intent (e.g., a landing page that provides the information that the user seeks is displayed), such that the user's search task is completed (103), transitioning directly from viewing search results to task completion, without viewing a landing page for one or more of the search results. As described below, the completion of the search task can be detected based on predefined criteria, such as a length of time that the user views the landing page resulting from the selected search result.

In some cases, the user selects one of the displayed search results and views the landing page resulting from the selected search result but is not satisfied with the landing page and returns to the search results (104). For example, the user may select a search result link in a search results page, view the web page resulting from the selected link, and select a back button to return to the search results page. This may occur multiple times, e.g., each time the user selecting a different search result, viewing the associated landing page, and returning to the search results. When the user returns to the search results after viewing a selected result, it can be considered user friction, since the user is not satisfied with the result that was viewed and continues to search. The more selection and views of landing pages and returns to the search results that the user performs, the greater is the user friction experienced by the user.

In some cases, the user changes the query (105) to refine the search, and views search results that are provided by the search engine in response to the new query. The user can change the query by, for example, inputting a new search query in place of a previous query, or by modifying an existing query (e.g., changing one or more words or terms of the query). The user may refine the query after inputting a previous query and viewing search results, or after selecting a search result, viewing a landing page, and returning to the search results page. The user may refine the query multiple times. All of these actions can be considered user friction, since the user did not obtain a desired result and continued to search using the search engine.

At some point the user's search task may be considered to be abandoned (106). This may occur, for example, after the user views a particular result and returns to the search results, or after the user changes a query and views the results provided by the search engine. As described below, abandonment of a search task can be detected based on particular criteria, such as a lack of task completion within a particular range of time or sequence of user actions.

Measuring user friction during search tasks

An example method to measure user friction occurring in use of a search engine for a search task is shown in Fig. 2.

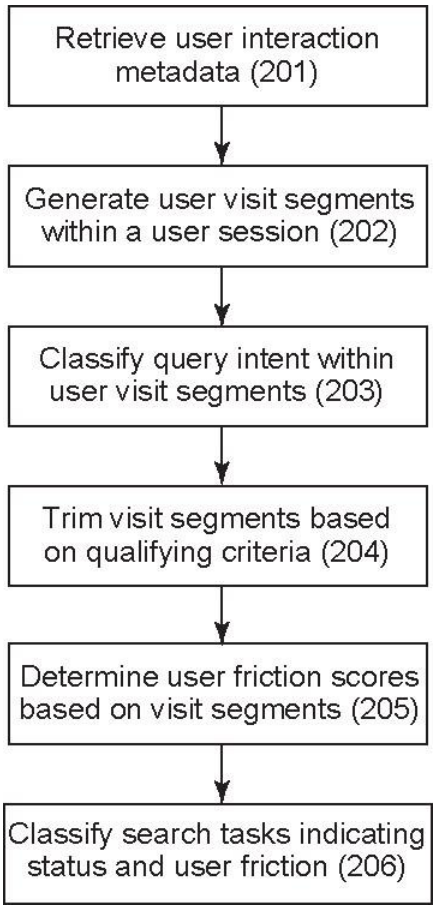

Fig. 2: Example method of measuring user friction in a search task

As shown in Fig. 2, user interaction metadata is retrieved (201), with user permission. The metadata can be retrieved from product logs and can include queries that were input in a search engine by a user, as well as other metadata that describe events, the actions that were performed by the user during use of the search engine or for pages selected via search results (e.g., clicks, selections, etc.), and timestamps indicative of when the actions were performed. The metadata can include labels assigned to queries by classifiers that can categorize the subjects or

topics of queries based on, for example, keywords in the queries. Queries can be labeled with multiple categories or classifications of different specificity or breadth by a classifier, e.g., a machine learning model trained for classification. In some cases, a simple classifier, e.g., based on regular expression matching or other techniques can be used.

The metadata that is retrieved includes at least one query that is associated with qualifying query intent criteria, which is criteria that indicates a particular query intent of the user for which friction is being measured. For example, the user's query intent may be indicated by query subjects as indicated by labels assigned to the queries. Such query intent can be, in one example of narrowing classifications, purchasing a product, purchasing electronic equipment, purchasing a television, and/or purchasing a particular brand of television. The retrieved metadata can be limited to a particular user session, e.g., a single login session of the user, or a set of search engine actions that occurred within a certain time period (e.g., three hours).

Next, user visit segments within the user session are generated based on the retrieved metadata (202). A user visit segment can be an uninterrupted series of user actions in the search engine, which include a search task. Timestamps associated with the user actions of the user session are examined to determine when interruptions occur in the user session. Interruptions are indicated by a threshold time period in which no user actions occurred in the search engine, and user visit segments are defined between such interruptions. In some cases, user actions within the visit segments can be sequenced according to their timestamps, if the user actions are not already provided sequentially in the metadata.

Next, query intents are classified within the generated user visit segments (203). In some examples, a query intent can be associated with each user visit segment based on the queries input by the user in that segment. For example, the query intent of the segment can be based on

the classification of the majority of queries input within the segment. The classifications of the queries may be included in the metadata as described above or can be determined by a classifier.

Next, user visit segments are trimmed of queries and metadata based on matching qualifying criteria (204). The qualifying criteria can include a particular classification of query, such that queries within a user visit segment that do not match the particular classification are trimmed from portions of the segment. In some examples, the first query of the visit segment that matches the criteria is found, the last query that matches the criteria is found, and the queries and user actions occurring before and after the first and last queries are trimmed. For example, the first query that has been classified as "television" may match a query intent of purchasing a television, and queries of the visit segment before that first query are removed from the segment. Similarly, queries after the last matching query in the segment are removed.

In other uses, only some queries, or no queries, are trimmed from the user visit segments. For example, intermediate queries that do not match the qualifying criteria, which occurred between the first and last matching queries, can also be trimmed from the user visit segments. In other cases, such non-matching intermediate queries may be retained in the user visit segments to be counted as actions of the user that indicate user friction. In some cases, non-matching intermediate queries may also be retained to deduce patterns of user behavior, e.g., whether many search tasks start by searching for a particular topic, and then user selections are often made of a particular category of topics. In some cases, no queries are trimmed. For example, if the labels assigned to queries (as described above) do not have a minimum confidence of accuracy, all queries and actions can be retained since there is less certainty regarding which queries are related to the qualifying criteria.

Next, user friction scores are determined based on the user visit segments (205). Friction scores can be based on user actions that occurred during the user visit segment. In an example, friction actions within the segment are counted, such as the user returning to a search results page after selecting a particular result and viewing a landing page, and the user refining the search by modifying the query. Other user actions can also be counted such as scrolling the search results page or a landing page, selecting additional links within the landing page and later accessed pages, opening a tab in a browser or other application for a new search, enabling a particular search mode (for text, images, etc.), etc. The number of friction actions within a user visit segment is considered the friction score for that segment.

In the next step (206), user search tasks of the respective user visit segments are classified based on the associated user friction scores to indicate their status and user friction involved in performing the search tasks. For example, each search task can be classified as having a status of "completed" or "abandoned." In a completed search task, a user is satisfied with provided information, and in an abandoned search task, the user is not satisfied, e.g., did not find the desired information in the search. A search task is considered completed if the user viewed a landing page within the user visit segment for more than a threshold amount of time before leaving that page. For example, the threshold amount of time can be two minutes, three minutes, etc. If the user did not view any landing page within the search task for more than the threshold amount of time, the search task is considered abandoned.

If the search task is determined to be completed, the amount of friction experienced by the user is also classified based on the user friction score determined for the associated user visit segment. The user friction score is compared to one or more threshold scores. In some examples, if the user friction score is zero, then the classification of the search task is no friction. If the user

friction score is less than a threshold of three (or four), then the classification is low friction. If the user friction score is above a threshold of four (or five), then the classification is high friction. The thresholds can vary depending on the task at hand. The context of the task can be determined using heuristics or by conducting user research on user information satisfaction, e.g., the extent to which information retrieved from the search engine satisfies the information needs of the user.

The classification of the search task can be used as an indication of the user experience (whether the search task was completed) and as a measurement of the friction experienced by the user during the search task. Described techniques can also be used to determine the amount of time that users spend to find desired information. This data can be used by developers to understand the behavior of users in a search engine. In some examples, a web browser application or an extension for such an application can use the described techniques and evaluate user friction for searches on a website, to determine whether user experiences have a large amount of friction and, for example, whether the interface and/or search engine capability needs to be streamlined or otherwise improved.

As described herein, search tasks can be categorized by the types of information being searched. User friction measured for different search subjects or topics can be compared and evaluated to determine whether a search engine is performing well. For example, measured user friction for searches for one type of information, e.g., hotel reservations, can be compared to measured user friction for searches for a different type of information, e.g., flights. User friction can also be measured and compared between searches for the same type of information in different contexts, such as searches for hotels or flights in different geographical locations. A

higher amount of friction for a first type of information than a second type can indicate that the first type of information is more difficult to obtain for users.

Users are provided with options to grant permissions to and/or to disable described features entirely. The various features of the system are implemented only with user permission to access user information that serves as input to the system (e.g., user queries, user-provided images or other content items, user context information, camera input, user's preferences, etc.). Users may be provided with controls allowing the user to make an election as to both if and when systems, programs or features described herein may enable collection of user information, and if the user is sent content or communications from a server. Certain techniques are not implemented if users deny permission. In addition, certain data may be treated in one or more ways before it is stored or used, so that personally identifiable information is removed. For example, a user's identity may be treated so that no personally identifiable information can be determined for the user. Thus, the user may have control over what information is collected about the user, how that information is used, and what information is provided to the user.

CONCLUSION

This disclosure describes techniques to measure user friction in search tasks performed by a user using a search engine. A user search session is divided into user visit segments classified based on the query intent, each segment indicating a search task. User friction scores are determined for completed search tasks based on counts of user friction interactions, such as returning to a search results page after selecting a search result or refining a query. The described techniques can measure friction in user search tasks involving multiple interactions in a user journey and can enable improvement in the experience of using a search engine.