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Personalized suggestion system

ABSTRACT

This disclosure describes techniques to generate personalized suggestions. The personalized suggestions can be utilized and displayed in different applications. With user permission and consent, past user queries are analyzed to generate personalized suggestions for the user. Failed user queries are analyzed to generate query refinements that would provide a successful response. The personalized suggestions are based on user interests and utilize a prediction of possible future queries from the user. When users activate the feature, the personalized suggestions are suitably presented to the user.

KEYWORDS

- User queries
- Query history
- Personalization
- Query logging
- User notifications
- Zero-suggest
- Display advertising

BACKGROUND

Users receive prompts and suggestions from applications such as display advertising and content providers. Zero-suggest screens and patterns are utilized by such applications to suggest queries or links that are likely to be of interest to the users. However, display advertising applications sometimes suggest queries to users that are not relevant to the users. Non-

personalized suggestions often lead to poor user experience since unsolicited suggestions are often regarded as spam.

DESCRIPTION

This disclosure describes techniques to generate personalized suggestions that can be utilized in display applications. With user permission and consent, past user queries are analyzed to generate personalized suggestions for the user. The personalized suggestions are based on the interests of the user, and utilize a prediction of possible future queries prior to the entry of a query by the user. With user permission and consent, a history of failed queries is also analyzed to suggest alternative phrasing of the queries. The personalized suggestions can be utilized in zero-suggest applications.

The analysis is based on past queries and produces as results a prediction of future user queries. The analysis can be performed offline, e.g., at predetermined intervals, or at the time of the serving of a display. The query history analyzed can include, for example, queries from predetermined time-frames, e.g., the past several hours or days; a specific number of recent queries, e.g., last n queries; a combination of both; or other predetermined criteria. The query history is additionally analyzed online in real-time prior to a user query, e.g., before the user enters a search query or after the user opens a relevant application. Such real-time analysis enables generation of relevant suggestions by considering queries generated since the most recent offline or scheduled analysis.

With user permission and consent, the present techniques log outcomes of past queries and predict the success or failure of each past query accordingly. For example, responses to queries that run on the lines of: “I am sorry, we can’t play that” or “I am sorry, I don’t understand what you mean” are indicative of responses to unsuccessful queries since the action

requested or intended by the querying user was not completed. The outcome history is utilized to predict future user queries and notifications. Further, such determination can also be based on the response signals, e.g., whether the requested music played or did not play.

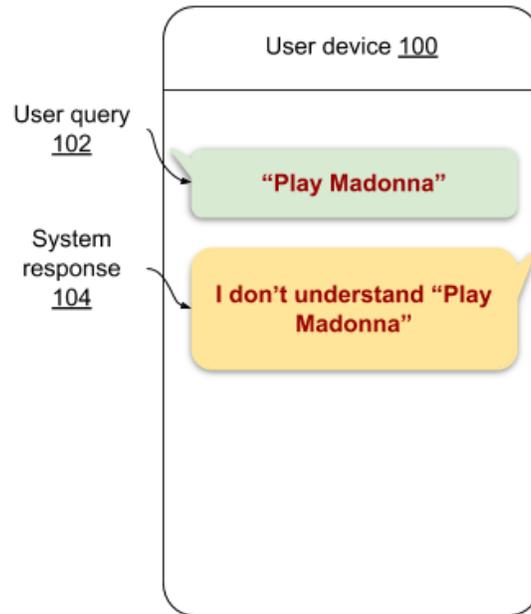


Fig. 1: Sample user query and response

In Fig. 1, the user device (100) is unable to interpret the user query "*Play Madonna*" (102) and responds with "I don't understand *Play Madonna*" (104). This response leads to a poor user experience and requires the user to perform the task of reframing the query or framing alternative queries.

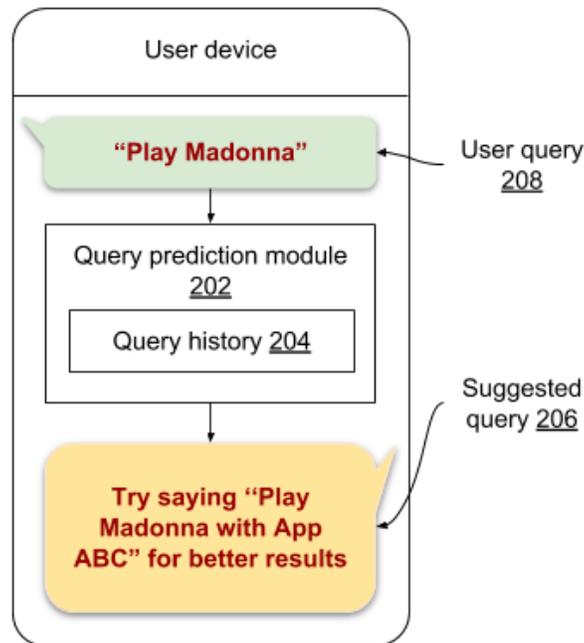


Fig. 2: User query analysis and prediction

With user permission and consent, failed queries are analyzed to predict related queries that lead to successful outcomes. This is illustrated in Fig. 2, wherein the user query “Play Madonna” (208) is unsuccessful. Based on the unsuccessful query, the query prediction module (202) uses query history (204) to predict a related query “Play Madonna with App ABC.” The predicted query is determined such that it is likely to yield a successful response. For example, the query can be determined by issuing sample queries to a system to identify queries that the system understands, via a whitelist or patterns, or other techniques. The predicted query is provided to the user as feedback: “Try saying *Play Madonna with App ABC* for better results” (206). For example, such query prediction can be used in applications that provide voice-based user interaction, e.g., smart speakers, phones, and other devices that accept voice queries.

Techniques described also analyze the most common failed queries to prompt users with alternative queries that have a greater probability of success. With user permission and consent, the alternative queries are personalized based on user interests, services and applications user has

access to, etc. Commonly utilized failed user queries from a larger set of users can also be utilized to generate useful query suggestions, e.g., in the absence of specific user query history data.

The present techniques can be utilized within virtual digital assistants, e.g., voice-controlled assistants, search engines, applications that execute user queries or requests, etc.

Further to the descriptions above, a user 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 (e.g., information about a user's social network, social actions or activities, profession, a user's preferences, or a user's current location), and if the user is sent content or communications from a server. 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, or a user's geographic location may be generalized where location information is obtained (such as to a city, ZIP code, or state level), so that a particular location of a user cannot be determined. 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 generate personalized suggestions. The personalized suggestions can be utilized and displayed in different applications. With user permission and consent, past user queries are analyzed to generate personalized suggestions for the user. Failed user queries are analyzed to generate query refinements that would provide a successful response. The personalized suggestions are based on user interests and utilize a

prediction of possible future queries from the user. When users activate the feature, the personalized suggestions are suitably presented to the user.