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Automatic Personalization of User Interfaces based on User Interaction Analytics

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ABSTRACT

The default user interface (UI) of software applications is the same for all users, even though users differ in terms of their needs and preferences for using the software. UI customization is typically limited to the most advanced and/or highly active users. As a result, a significant proportion of users of a software do not reap the benefits of having a UI that is personalized to them. This disclosure describes techniques to determine and present a personalized UI to each user or an application, with the user's permission. UI personalization is performed based on analytics of user-permitted data of user interaction and other relevant information. The analysis can be performed by a suitably trained machine learning model which outputs the optimal personalized UI for each user. Model training and execution is performed on the user device, and if the user permits, on a server that trains the model based on aggregated, non-identifiable user data.

KEYWORDS

- User Interface (UI)
- User interaction data
- Application telemetry
- UI personalization
- UI Customization
- User preferences
- Custom interface

BACKGROUND

Different users of a software application differ in terms of their needs and preferences for using the software. However, the default user interface (UI) of software applications is the same for all users. While some applications include features for users to customize the UI, the use of such customizations is typically limited to the most advanced and/or highly active users. As a

result, a significant proportion of users of a software do not reap the possible benefits of having a UI that is more personalized to their unique needs, preferences, and practices.

DESCRIPTION

This disclosure describes techniques to automatically determine and present a personalized UI to each user or an application, with the user's permission. Therefore, users can use the application with a personalized UI that is optimized for their own specific needs, practices, and preferences.

If users permit, personalization of the UI for each user is achieved by obtaining analytics of user interaction with the application coupled with other relevant information. With user permission, user interaction analytics and other relevant information are input to a suitably trained machine learning model that outputs the optimal personalized UI for each user.

For example, if telemetry data of the user of a web browser obtained with permission indicates that the user frequently invokes menu options for translating web pages from German to English, the output of the trained machine learning model can result in the addition of a "German-to-English" button to the browser toolbar for that user. The user can then use the added button on the personalized toolbar to translate web pages from German to English with a single click. On the other hand, users who rarely or never perform German-to-English translation of web pages are not provided with such a translate button in their browser toolbars, thus avoiding cluttering their UIs with buttons they are unlikely to need.

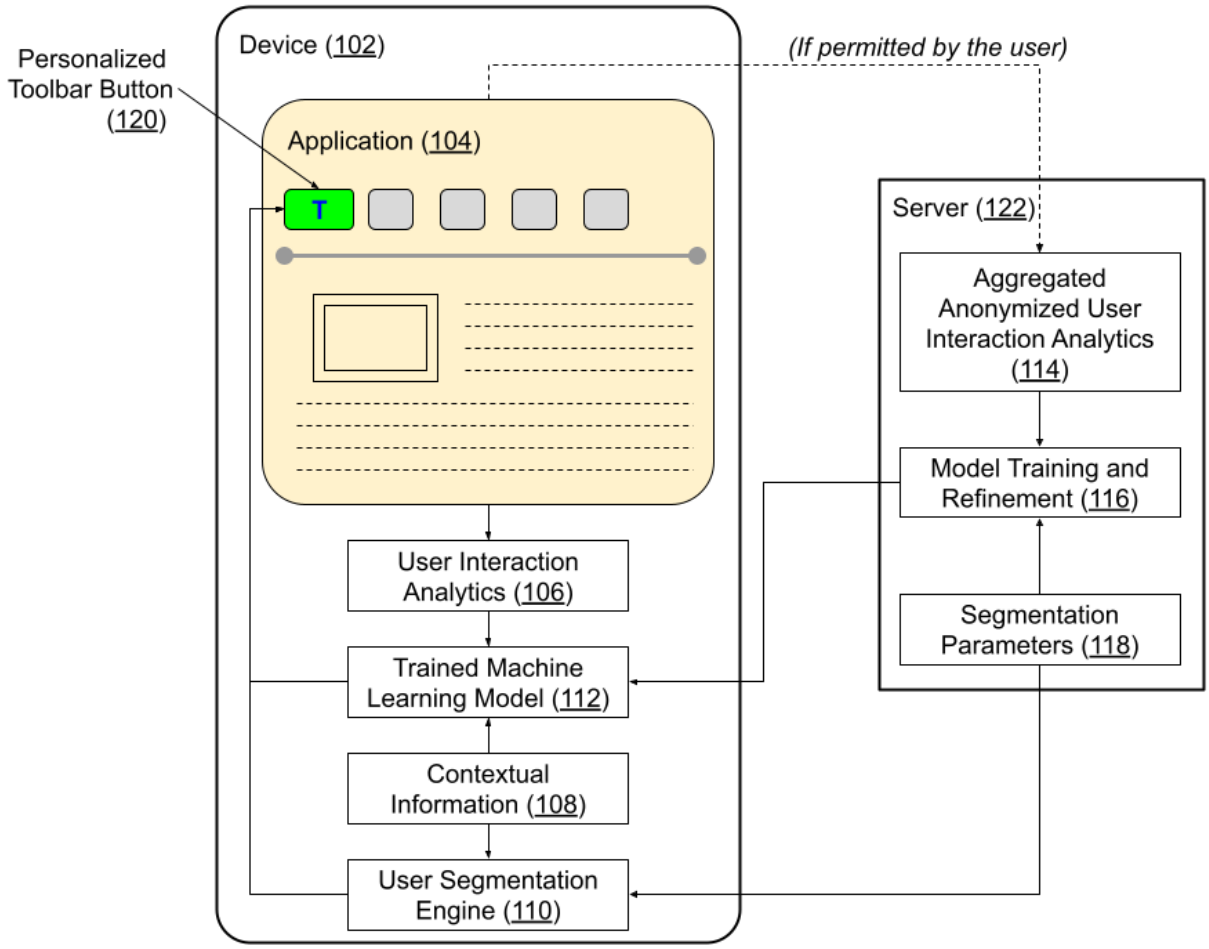

Fig. 1: Determining and presenting a personalized UI based on analytics of user interaction

Fig. 1 shows an example of operational implementation of the techniques described in this disclosure. A user interacts with an application (104) via a device (102). Analytics of the user's interaction with the application (106) are performed/obtained with user permission and stored locally on the device. If the user permits, the analytics can be provided to a server (122) that stores aggregated anonymized analytics across users (114). A model is trained and refined (116) based on the aggregated analytics and other relevant parameters for user segmentation (118), e.g., such as region of use.

The segmentation parameters and the trained machine learning model (112) are relayed to the user device for local execution. Contextual information (108) obtained from the device with

user permission is included as input to the locally executed segmentation engine (110) and trained machine learning model. The output of the segmentation engine is used for broad UI customization for the specific user bucket. Output of the trained machine learning model based on the local user interaction analytics and contextual information are employed for further personalization of the application UI for the specific user. For instance, as Fig. 1 shows, the automated personalization operation results in the addition of a button (120) to the user's application toolbar to enable the user to perform frequently invoked tasks, such as translating content.

If users permit, the user interaction analytics and other contextual and preference information can be relayed (after removal of all identifiable information) to a server for storage, analysis, and model execution. The use of a server with user permission can enable faster and more efficient operation. Moreover, if users permit, the server-side model can be refined based on anonymized usage and preference data pooled across a large number of users, obtained with permission from each of the users.

Alternatively, the techniques can be implemented such that data about a user's interactions, preferences, and context is confined to the user's device. In such cases, the trained model and/or decision logic for deriving the personalized UI is obtained from the server and stored on the user's device. Moreover, the server can relay information to the client about specific data to obtain and store on the device with user permission in order to provide suitable input for client-side model execution. For instance, the client device can be instructed to obtain the number of times per day the user invokes the search function of the application and store it locally on the device temporarily, e.g., for a month. The number of searches per day can then be

used as part of the input to the model executed on the client-side to personalize the UI for the user with permission.

Further, with the user's permission, client-side UI personalization can optionally obtain and use additional relevant information from the server. For example, with user permission, the server can provide information such as UI preferences common to users in a region, UI choices optimally suited for specific device types or application versions, etc. Such information can be derived by the server from aggregated anonymous user data obtained with permission.

With user permission, the described techniques can be implemented to work alongside UI customizations derived via other sources, such as regional defaults, segmentation of users into various predefined buckets based on preferences, practices, and context, etc. In such cases, implementation of the techniques can serve to refine and focus the broader customization derived via such sources.

Users can choose whether they wish to permit an application to present a personalized UI and can turn off the feature entirely. Moreover, the techniques can be implemented such that users can decide separately on personalization of different UI components, such as toolbars, buttons, menus, information hierarchy, backgrounds, etc. In such cases, automated UI personalization as described in this disclosure is applied only to the specific components of the UI chosen by users. All other UI components are presented as usual based on default settings or manual configuration.

The techniques described in this disclosure can be employed for automated personalization of the UI of any software, such as a standalone application, an online service or platform, an operating system, etc. Implementation of the techniques with user permission can enable all users to benefit from personalized UI optimally suited for their specific needs,

circumstances, and preferences, thus boosting their efficiency, and enhancing the user experience (UX).

Further to the descriptions above, a user is 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 interaction with an application user interface, commands issued by the user, application telemetry data, 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 are 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 has 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 determine and present a personalized UI to each user or an application, with the user's permission. UI personalization is performed based on analytics of user-permitted data of user interaction and other relevant information. The analysis can be performed by a suitably trained machine learning model which outputs the optimal personalized UI for each user. Model training and execution is performed on the user device, and if the user permits, on a server that trains the model based on aggregated, non-identifiable user data.