Smartwatch Interaction – More than just Notifications

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Abstract

This paper describes interaction patterns on smartwatches that are currently in use. Based on these patterns, we design a user study to compare different forms of interactions within the setting of a context-aware, proactive recommender system that pushes recommendations to the mobile user. We will compare the interaction forms "action button", "two button card" and "swiping".

1   Introduction

Apple, Asus, LG, Motorola and Samsung, the big players in the mobile device market have smartwatches in their product portfolio now (Edwards, 2013; Gent, 2014; Google Inc., 2015). Typical use-cases for smartwatches are notifications especially for organizational functionalities and messenger services (Yalcin, 2014). A user might see his next appointment synced from his electronic calendar without the need to pick up his phone. When a call is received, the user could see who is calling directly from his wrist.

To allow interaction, the smartwatch handles clicks on the touchscreen, voice input (Google Inc., 2015) or gestures (Bernaerts, Steensels, & Vermeulen, 2014). However smartwatches can be seen as low-interaction devices. A typical interaction on an Android device shall not be longer than five seconds (Google Inc., 2015). A context aware recommender system could make use of this notification design. For example a system might recommend places to visit based on the location and the time of the day. In a proactive recommender, these recommendations can be pushed to the user, without explicit user interaction.

This research describes different interaction types, how a user can provide feedback to the recommender system after s/he received a recommendation. As an action on the smartwatch requires less effort than using a handheld device, this might increase the users' willingness to rate recommendations. To get insight in the process of rating recommendations, we develop an interactive mockup. We will conduct a user study based on the mockup to get insight of which interaction types are faster to use and results in a better user experience.

2 Smartwatch Interaction

2.1 Classification of Android Wear Interaction

The Android Wear design guidelines describe several forms of interaction (Google Inc., 2015). In addition there are further interaction forms that are imaginable or already implemented by certain applications. In general, all on screen output is ordered into cards. By swiping on the device screen, the user can change the screen content. Swiping up and down replaces the current screen with a new card. For example, the user can change to the weather card from the currently shown calendar. Swiping horizontally shows more information on the current topic. For example, on the weather card, a swipe from right to left might produce a forecast for more days that what is shown on the first card. A swipe from left to right goes back to the card before. If the leftmost card is swiped again, the notification will close.

If the user is expected to only invoke one action while looking at a certain notification, s/he can click on an "on card" action (Figure 1.). With action buttons it is possible to attach several actions to one card. Figure 2 shows an action button to start the navigation on the handheld device. More actions can also be grouped on one screen. For example the music card offers four actions to the user (Figure 3.). When there are two actions of which one is confirmative and one is dismissive, swiping to the left or the right is used in some applications. A swipe from right to left means taking the call whereas a swipe from left to right declines the call. The application Tinder (Figure 4.) also uses this swiping method to show admiration or dislike for one picture. The screenshots originate from the applications named in brackets running on a Motorola Moto 360 smartwatch.
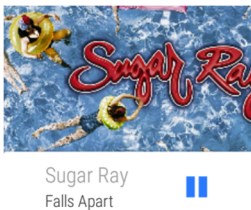

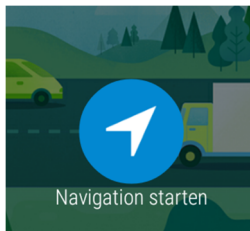*Figure 1. The on card action pauses the song [Google Music]*

Figure 2. The action button to start a navigation [Google Now]
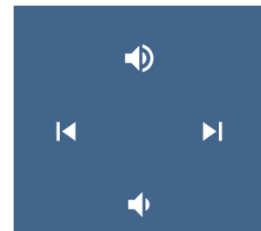
Figure 3. Music control with multiple buttons [Google Music]

Figure 4. Swipe interaction in the tinder application [Tinder]

2.2   Prototype Implementation

The implemented application consists of a handheld (e.g. smartphone) application with several buttons that invoke notifications on the smartwatch. The smartwatch shows the notification and lets the user interact to rate the current recommendation. All notifications use the picture of the location as background image and show the name of the location with some explanatory text. The implemented forms are "action buttons" (Figure 5), "two button card" (Figure 6) and "swiping". Action buttons are cards with single voting buttons right to the notification card and are shown after a swipe from right to left. The two button card implementation shows both voting buttons on the notification card. The swiping method allows voting by swiping on the notification card.
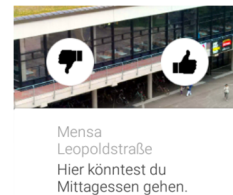

Figure 6. Recommendation using a "two button card"

Figure 5. Recommendation using "action buttons"

When the button on the Android handheld application is clicked, a timer starts. After a vote is successfully registered, the timer is stopped. The system logs and stores the time it took for the user to vote, the voting direction (up or down), the location and the interaction form for later analysis. The action button method is implemented using standard Android Wear notifications. The invoked voting actions will actually be executed on the handheld. The "two button card" and swiping methods are implemented as custom layouts. To invoke the layouts on the smartwatch, the handheld sends a message using the MessageApi to the watch. The watch shows the custom notification and gets the trigger for the voting actions. The smartwatch performs the measurements and sends them back to the handheld. When a vote is registered, the application provides visual feedback to the user confirming the vote.

3   Planned User Study and Conclusion

We plan to conduct a quantitative study to compare the different interaction methods against each other. This shall show how the perception of different interaction methods on the smartwatch differs. The independent variable is the interaction form of the notification: "action buttons", "two button card" and "swiping".

An experimenter explains the testing situation to the participants: "You are trying a new recommender system that will provide you with recommendations where to eat lunch." The experimenter then hands the smartwatch to the participant. In random order, the participants will get three series of recommendations (action buttons, two button card, swipes) consisting of three single notifications for different locations each. After receiving a notification, the participant shall vote the recommendation either up or down. After each series, the participants fill out a questionnaire on user experience (Laugwitz, Held, & Schrepp, 2008). In the end, s/he answers some follow up questions about further interaction forms and the likeliness to give such user ratings in general.

For statistical analysis, the variables interaction form, time, user experience, recommendation and voting are measured for each interaction. An ANOVA shall show whether a difference between the interaction forms exists for execution time and user experience and if the voting (up or down) influences time and user experience. We will control effects originating from single recommendations (e.g. preference of a certain location). We include questions on other interaction forms to evaluate whether further studies have to take gestures or voice actions into consideration.

The user study to be conducted will give insight on the usage of smartwatches. The survey results shall show whether there are differences in the usage and perception of different interaction forms. The findings of the survey can influence how programs for smartwatches will be designed in the future. A preference of the user for one interaction method will allow designers and developers to enrich the overall user experience on smartwatches. For recommender systems this might improve results by gathering more user ratings of recommendations. Planned future work includes more advanced notification and feedback options to investigate in more detail how smartwatches can be used to improve the overall user experience when delivering recommendations.

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