
Apps with habits: Adaptive Interfaces for News Apps

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Abstract

Reading the news on smartphones has become a significant activity for users. It is also a highly individual experience with marked differences in the way people read and access news. This work explores novel methods of 'smart personalisation' of news apps. It is investigating smartphone users' news reading behaviour. It is developing a prototype news app able to recognise particular kinds of news reading behaviour and adapt its display and interaction methods, i.e. an app that forms 'habits'. A longitudinal evaluation of the deployed app is being conducted.

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CHI'15 Extended Abstracts, Apr 18-23, 2015, Seoul, Republic of Korea ACM 978-1-4503-3146-3/15/04.

<http://dx.doi.org/10.1145/2702613.2702622>

Author Keywords

News reading; News apps; Personalisation; Adaptive mobile user interfaces;

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Research Situation

I am a second year PhD student in the Dept. of Computer Science at University College London. I have completed my first-year assessment, I expect my upgrade viva in June 2015 and I anticipate finishing my research work late 2016. My previous work in relation to HCI aspects inspired me to pursue this program. My research topic is on adaptive mobile user interfaces with a particular focus on news apps. The aim of my research is to investigate the mechanisms needed to apply adaptation for smartphone UIs and explore the effects of those adaptations on users' interactions in the context of news.

Context and Motivation

News reading on smartphones is now amongst the most popular activities mobile users perform on a daily basis. Two in every three users of tablets and smartphones in the US and UK regularly use them to access news [1]. Smartphone users are likely to be

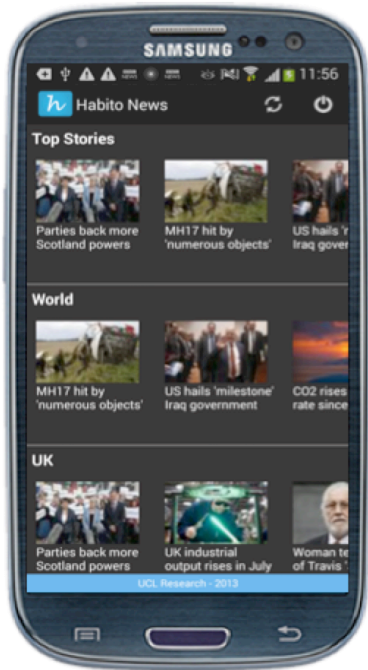


Figure 1 HabitoNews mobile app

highly individual in the way they manage their access to and reading of news, for example how much a person chooses to read of news items or how they view and select news items to read. Moreover smartphone users are likely to exhibit characteristic patterns for accessing and reading news. Apps that adapt their display and interaction behaviour in response to recurrent patterns of user's behaviour are an opportunity to personalise the way people access and read news.

Background and Related Work

Over the years researchers have mainly proposed adaptive systems in different contexts for desktop environments. Following Oppermann's terminology [2], an adaptable system relies on user's intervention, the user is in charge of manually customising the interface based on his needs, whereas an adaptive system adapts itself automatically based on knowledge about that user. Horvitz et al. [3] have proposed an adaptive assistant on top of the Microsoft Excel application using Bayesian probabilistic models to infer user's goals and needs. Gajos et al. [4] designed and implemented three adaptive graphical interfaces along with a non-adaptive baseline to understand the aspects of an Adaptive User Interface (AUI) success or failure. The predictive accuracy and the frequency of adaptation of an AUI, which have significant impact on user performance, were among their findings. Further, predictability of the AUI increases user satisfaction and leads to higher utilisation of the adaptive interface as they reported later in another study [5].

To date, research on adaptation for the mobile environment and especially in the news domain is mostly limited to what content users access. News

content personalisation, adaptive news navigation, contextual news access and news aggregation are areas that have already been studied and applied [6]. However, to the best of our knowledge, how the content is accessed and interacted with has not been studied yet. The different ways in which different users read and access news lead to the need for more personalised interaction on mobile news access.

Personalisation on news apps relies on creating and exploiting individual user profiles. A user profile is a collection of data associated with the user and system's assumptions about all aspects of the user [7]. User profile construction can be achieved by experience sampling either explicit or implicit. Explicit sampling provides reliable data but the intrusion into the user's activity is a serious issue, even the use of more sophisticated techniques [8] that can minimize the disruption and annoyance to the user, is something that users might not keen to take on. On the other hand, implicit sampling seems to be harder to perform since it requires unobtrusive and automatic monitoring of user's behaviour and activity, but it will not bother users. User profile construction by implicit sampling has been used in numerous studies. Oulasvirta et al. [9] reported that smartphone usage happens on a habitual basis based on logging studies. Their studies have shown that people tend to develop the checking habit, which involves short and frequent interactions during the day. Likewise, R. Carreira et al. [10] developed a prototype that collects user's reading behaviour (e.g. reading time, number of lines read, reading speed, etc.) with the aim to deliver articles of interest to a specific user based on his user profile constructed from his interaction log.

Clusters Factors	A (Frequent)	B (Daily)	C (Occasional)
Frequency (Usually)	Many times a day	Once a day	Less than once a day
Total daily reading	5-10 min	10+ min	0-5 min
Browsing strategy	Both	Through all sections	Particular section
Reading style	Skimming	Detailed reading	Scanning
Location	Public Transport	Home	Home

Table 1 Smartphone news reader types

Problem, Research goals and Methods

My research aims to address the following questions:

1. How do people vary in accessing and reading news on smartphones? What are the stereotypical news readers profiles?
2. How can smartphone news apps learn individual user's patterns of interaction?
3. How can a smartphone news app exploit a reader profile to adapt the interface and the interaction?
4. What are the effects of adaptive smartphones UIs on users interaction?

An exploratory approach has been followed with main focus on user studies and also on development of a working prototype of an adaptive news app.

Goal 1: Understanding news reading behaviour on smartphones

Methods: (1) Conduct an online survey to understand the individual preferences and behaviour. (2) Analysing the survey will identify readers stereotypical patterns of behaviour and thus we can define readers types.

Goal 2: Develop a news mobile app that is capable of monitoring user's patterns of interaction and recognizing its users types from their interaction logs.

Methods: (1) Implement a dedicated mobile app, which is capable of logging user's interaction. Goal 1 will guide the choice of the logged interaction data. (2) Deploy the app, data collection and analysis. (3) Predict user reader type from its interaction log (Figure 2)

Goal 3: Exploit user profile to adapt the interface and the interaction

Methods: (1) Design custom interfaces for each reader type found by Goal 1. (2) Decide what elements of the user interface should be adapted and how.

Goal 4: Evaluate the effects of adaptation on users' interaction

Methods: (1) Conduct user studies to examine in which extent the applied adaptation is beneficial on users' interaction.

Dissertation Status

An online survey has already been conducted with 140 people with the aim of identifying stereotypical patterns of reading behaviour on smartphones. Respondents mainly reported that they read news once a day with total daily reading between 10 and 30 minutes, preferably mornings at their homes. In addition to the descriptive statistical analysis, three homogeneity news readers types were revealed by a hierarchical clustering (Table 1), characterised by five factors: frequency, reading duration, browsing strategy, reading style and location.

A dedicated mobile news app is being developed as the research tool. The app is implemented using the Android platform and mimics the BBC news app (Figure 1). It is also capable of logging users' reading behaviour. The logged interaction data consists of high-level (e.g. reading duration, frequency of reading, location, etc.), navigational and reading (refer to navigation and reading behaviour respectively such as swipe direction, scroll usage, etc.). The app was downloaded from Google Play and used by 24 users for two weeks. The logged data then were used along with the reader types as input of a Naive Bayes Classifier to predict the user profile.

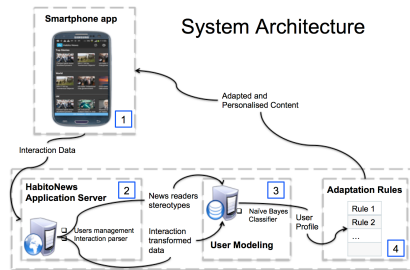


Figure 2 HabitoNews Architecture

The next objective is to exploit the user profile and modify UI elements tailored to the news reader type. A tentative application can be applied on browsing the news headlines, for example the items of each category can be reduced based on how many items the user has browsed or even more an assistance widget can be created in each category to assist those who browse through all news stories to speed up their browsing.

Expected Contributions

The outcome of this research will inform the design of more personalised smartphone UIs. The proposed adaptive news app gives evidence that apps should be more personal and smart enough to recognise their users in terms of who they are and what they do with their devices.

A summary of my contribution:

- A concept demonstrator of an adaptive smartphone app, namely "Habito News".
- The mechanisms to achieve UI adaptation consist of a generic architecture.
- A method for monitoring user's activity and user's interaction for smartphones
- A method for modelling and inferring UI adaptation
- Evaluation results from studies

Acknowledgements

This work is supported by the EPSRC (EP/J50225X/1) and is in collaboration with France Telecom R&D UK.

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