Analysing Trans-Modal Interface Migration

Renata Bandelloni, Silvia Berti, and Fabio Paternò

ISTI-CNR,
Via G.Moruzzi 1, 56124 Pisa, Italy
{renata.bandelloni, silvia.berti, fabio.paterno}@isti.cnr.it

Abstract. While new solutions for supporting migratory interfaces are emerging, there is still a lack of analysis of their impact on users. In this paper we discuss the design of a solution for trans-modal migratory interfaces in multi-device and results obtained testing it with users. We conducted a study aimed at evaluating the user impact of a migration service applied to platforms supporting different interaction modalities (graphic vs. vocal) in Web environments.

1 Introduction

Migratory interfaces are interfaces able to support device changes and still allow the user to continue the task at hand. Device adaptation, interface usability and task continuity are the main goal. In particular, we are interested in migratory services in multi-device environments, characterised by a variety of devices, both mobile and stationary. Due to the novelty of transmodal interface migration, studies on the resulting usability are lacking. Indeed, no public service currently supports such migration and even at research level there is a lack of sufficiently engineered prototypes for end-user testing. We have designed and implemented an infrastructure for trans-modal migration [2] and performed a first test to better understand the impact on users in terms of disorientation due to interaction modality change and different support for task performance. The goal is to support users in multi-device environments, allowing migration even among different interaction-modality devices (currently graphical and vocal). While other contributions focus on migration through activation of different applications for the same service depending on the current device features [4]; or on distributed user interfaces, where users change interaction resources (such as the screen) but not the device [3], we manage to consider different interaction modalities. A conceptual framework for such issues is presented in [1].

2 The Trans-Modal Migration Service

Our trans-modal migration service is based on a server able to receive requests for migration, identify the target device and activate a specifically adapted user interface, maintaining the state resulting from the user interactions on the source device. This is obtained through logical descriptions of the tasks to support and of the user interfaces, used to perform interface adaption to the target platform, map the state from the source interface to the target one and identify the point where the target interface

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should be activated. In order to facilitate users in continuing the interaction through the vocal platform when migrating from a graphic one, the migration service inserts an initial audio feedback summarising the information already entered. The message is built by collecting all the feedback messages concerning the tasks already performed by users and moving them at the beginning of the vocal interface. The migration service was tested on the "Restaurant" application, which allows users to select a restaurant, accessing its general information and make a reservation. The interfaces of the test application for desktop, PDA and vocal platforms differ both in the number of tasks and their implementation. For example, the date insertion is a text field in the desktop version and a selection object in the PDA version, while the insertion of free comments was removed from the vocal interface.

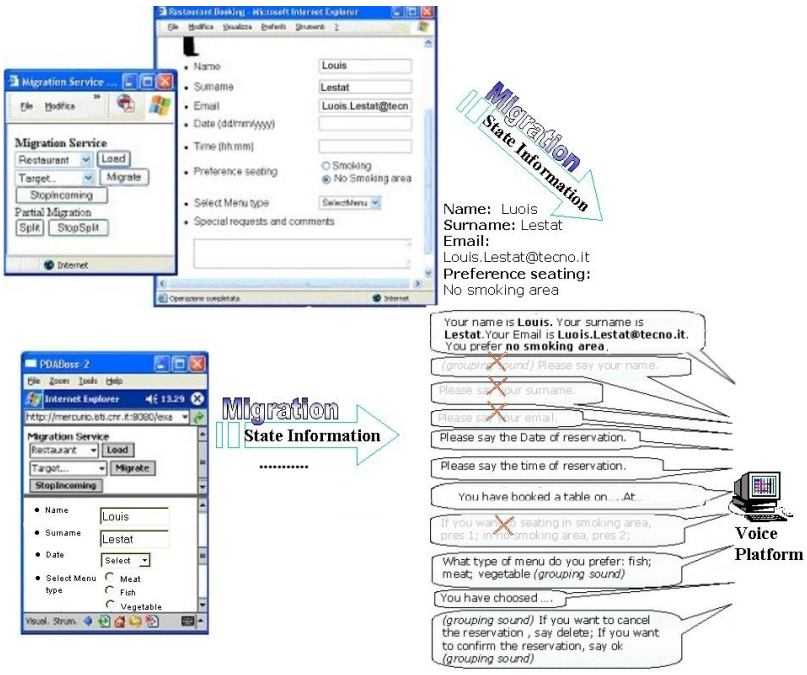

Fig. 1. Restaurant application and migration client interfaces used in the test

Figure 1 shows both the migration client and the "Restaurant" application interface. The migration client allows users to load applications and send migration requests. With the desktop, users could work on two different windows: one for the migration client interface and the other for the "Restaurant" application, while on the PDA they were presented in two frames of the same browser window.

3 The User Test

Since we are interested in considering multi-device environments, both a desktop PC and a PDA were used as graphic source platforms. This is useful for understanding if

the features of the platform can influence the user because of the different interaction resources and, consequently, the different set of tasks supported. The 20 users involved were divided into two groups. The first one started with migration from PDA to vocal platform and repeated the experiment starting with the desktop. The second started with the desktop and repeated the test using the PDA. Users were asked to load the "Restaurant" application on the graphic device and start booking a table at a restaurant. At some point, they had to ask for migration towards the available vocal device and there complete the Restaurant Reservation task. After the session the users filled in the evaluation questionnaire. The average user age was 33.5 years (min 23 - max 68). Thirty percent of them were females, 65% had undergraduate degrees or higher and 55% had previously used a PDA. Users had good experience with graphic interfaces but far less with vocal ones: on a scale of 1 to 5, the average self-rating of graphic interface skill was 4.30 and 2.05 for vocal interfaces. For each migration experiment, users were asked to rate from 1 to 5 the parameters shown in Table 1.

Table 1. User rating for transmodal migration attributes

Parameters	Desktop to vocal	PDA to vocal
Interaction continuity easiness	4.35	4.65
Initial vocal feedback usefulness	4.1	4.2
Vocal feedback usefulness	4.25	4.25

Vocal feedback was provided via both the initial message, recalling the information inserted before migration, and a final message at the end of the session about the information inserted after migration. We chose this solution as the most likely to reduce user memory load. After the test, we asked the users if they would have preferred only total final feedback instead. Finally, we asked whether they noticed any difference between the graphic and vocal interface with the aim of finding out whether they could perceive the different number of supported tasks. The numeric test results were interpreted taking into account the answer justifications and free comments left in the questionnaire and considering user comments while performing the test.

Table 2. User preferences and salience of task differences

Parameters	Desktop to vocal	PDA to vocal
Only final vocal feedback preferred	Yes 20% - No 80%	Yes 20% - No 80%
Noticed different task set	Yes 25% - No 75%	Yes 20% - No 80%

4 Result Discussion and Conclusions

The service in itself was appreciated by users. Many judged it interesting and stimulating. The users had never tried any migration service before and interacted with it more easily in the second experiment, thus, showing it was easy to learn through practise, once the concepts underlying migration were understood. Interaction continuity received a slightly higher score in the PDA-to-vocal case. Indeed, the PDA and the vocal versions were more similar in terms of number of tasks than the desktop and the vocal ones. The difference in ease of continuity between the two platforms is small, thus the interaction continuity ease is influenced, but not compromised. Both

the initial and the overall feedback through the vocal application were judged positively (Table 1). The vocal feedback design was appreciated and 80% of the users would not want to change its style. One concern was the potential user disorientation in continuing interaction, not only by the change in modality, but also in the different range of possible actions to perform. Only 20-25% noticed the difference and it was perceived more in the desktop-to-vocal case (Table 2).
While further empirical work will certainly be needed to investigate usability of migratory interfaces, this first study provides some useful suggestions to keep in mind while designing user interface transmodal migration. The modality change does not cause disorientation but must be well supported by proper user feedback balancing completeness while avoiding boredom. The differences in interaction objects used to support the same task were not noticed at all, while the difference in the number of task supported was. Changing the number of actions that the user can perform can not be avoided due to the different capabilities of the platforms involved. However, this must be well designed in order to reduce as much as possible any sudden disruption in user's expectation. It is worth considering not supporting migration among devices in which the user interfaces implement a high number of different tasks, unless there is a particular need for it. A further interesting study could concern a new version of the migration environment supporting a richer set of modalities and their combinations.

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