

PhotoTacs – An Image-based Cell Phone Interface

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ABSTRACT

As new features have been added to cellular phones, their user interfaces have become increasingly complex, making it difficult for people with cognitive or visual impairments to use them. This paper describes the development and preliminary testing of a simplified, intuitive image-based cell phone interface.

Categories and Subject Descriptors

K.4.2 [Computers and Society]: Social Issues - *Assistive technologies for persons with disabilities*

C.5.3 [Computer System Implementation]: Microcomputers - *Portable devices (e.g., laptops, personal digital assistants)*

General Terms:

Design, Human Factors

Keywords:

Assistive technology, cell phone, phone book, cognitive disabilities, illiteracy, visual impairment

1. INTRODUCTION

Cellular phones are typically more complicated to use than earlier land-line-based telephones, which did not even come with instructions. People who are elderly, or cognitively or visually impaired often express frustration with the complexity of modern cell phones, saying they simply want to make a phone call. Such frustration has now spawned an entirely new cell phone market segment [GreatCall Inc, 2008]. However, these users might employ new features (such as internal phone books) if the user interface was simple and intuitive. It is this challenge that has been undertaken in this research, which includes the development and validation of a simplified image-based cell phone interface that allows people to easily find and dial people in their cell phone's internal phone book.

2. RELATED WORK

2.1 Needs of the Disabled

Dawe [2007] conducted interviews with five people who had cognitive disabilities and their caregivers, finding that they desired or needed phones with (1) larger buttons, and (2) simpler interfaces, and were willing to trade advanced features for ease-of-use (e.g. shorter menus and larger fonts). In another study Dawe [2006] found that simplicity was not only important in function and use, but also in "configuration, documentation, maintenance, and upgrade or replacement".

2.2 Simplified Cell Phones

The LG Migo (offered by Verizon Wireless) is a simplified phone designed for children with five buttons that allows parents to preprogram numbers for four friends plus one emergency

number. While the concept of one-button calling is simple, the Migo's numbered buttons are not a very intuitive. Greatcall, Inc.'s more recent Jitterbug [2008] line of phones make use of large, backlit keys, an easy-to-read display, and a yes/no-based user interface. However, it still employs a text-based phone book that displays the names of phone book contacts in a rather small font.

2.3 Proposed designs for cognitive disabilities

Stock et. al (2004) proposed the Pocket Accessible Communication Enabled (Pocket ACE) software, to provide an image-based phone dialer application for people with cognitive disabilities. However, little information is available, and it is not clear whether this proposed application was ever implemented.

Vanderheiden [2005] proposed a "Cognitive Disabilities" phone, with two modes. In "Flip" mode, merely opening the flip phone dials a single pre-set person, while showing an image of that person on the display. In "Picture" mode, opening the phone displays the images of four people on a touch screen. Pressing on one of these images centers that image on the screen while calling that person. Sesto et. al, [2008] tested Vanderheiden's prototype, showing that the "Picture" mode is usable by the majority of participants with Mini-Mental State Examination [Folstein 1975] scores ranging from 6 to 19 out of 30, with lower scores representing higher levels of dementia or poor cognitive performance. Like the Migo, the Cognitive Disabilities phone is highly constrained by the fact that it can store only four contacts.

3. CONCEPTUAL FRAMEWORK

Before undertaking the development of a simplified phone book interface, it is important to determine those factors that hinder or prevent people with cognitive or visual disabilities from using a standard cell phone. As Dawe [2007] stated, problems with existing cellular phones include complexity and small buttons. A primary design principle for this project was to make the dialing interface as simple as possible by placing configuration options on a separate screen, to be used by a caretaker or family member. To further simplify the dialing interface, the number of buttons on the dialer screen was minimized, and their size was made large enough to ensure visibility and ease of pressing. Because some users might have limited vision or print disabilities, photos and images were used, rather than text. This also eliminates the need to enter a name on a phone keypad, which is a tedious process.

4. METHODOLOGY

Several approaches were explored for the format of the dialer interface, including (1) a scrollable list of images (which proved impractical for performance reasons), (2) the display of multiple images on the screen at once, with scroll buttons (which resulted in images that were too small to see easily), and (3) one image on the screen at a time, with scroll buttons. The third approach was

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eventually implemented in the form of large, easy-to-press up and down scroll buttons above and below the displayed image. **Figure 1** shows this simple dialer interface, as seen on a virtual phone.



Figure 1 The phone dialer interface on a virtual phone

The user navigates through the list of phone contacts by simply pressing the green up or down arrows, with each end of the list wrapping around to the other end. Pressing on either the image of the person or the handset icon calls the person being displayed. Pressing on the *Configure* button at the bottom of the screen displays the configuration screen, which is shown in **Figure 2**.

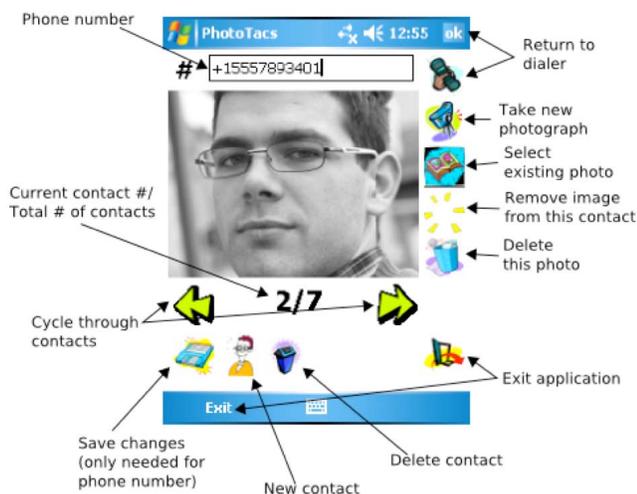


Figure 2 The configuration screen

The configuration screen allows the user to review the list of contacts, as well as add, remove, or edit the phone numbers and images. Images may be imported from the phone's existing image directory, or can be captured by the phone's camera.

5. RESULTS AND DISCUSSION

The current implementation is only a first prototype. However, we felt it was important to get early feedback. To support a pilot study, the application was installed onto a cell phone and demonstrated to several volunteers, including one senior citizen. These volunteers interacted with the phone, and were then asked 12 questions regarding their own cell phone use and what they thought of the proposed dialing interface. All felt that navigating through the contact list with the up/down arrows and dialing by tapping the screen was intuitive and easily understood. However, some thought that only pressing either the phone icon or the picture would dial, while some tried both. One complaint voiced by all testers was the need to manually close the actual phone application after the

conclusion of a call – all said that the phone should return to the dialer screen automatically.

Unlike the dialer screen, all participants were overwhelmed by the complexity of the configuration screen. Only the function of the camera icon, for taking a new image, was obvious to all participants. All but one participant figured out that the arrows served the same function as on the dialer screen. The rest of the interface required explanation.

6. FUTURE WORK

Several interface improvements are planned. The current implementation does not return to the photo dialer screen upon completion of a call, requiring the user to press a small *x* in the top right of the call screen. Several approaches could be employed to simplify configuration. One suggestion was to eliminate the configuration screen by simply providing a blank contact at the end of the list of contacts. Pressing on the blank image would take a photo with the cell phone camera. A large on-screen numeric keyboard could then be used to enter a phone number. The pilot study shows the need for some other improvements and simplifications. These will be implemented and then tested with people who are visually and/or cognitively impaired, as well as with senior citizens. This will involve more formal testing, including timed studies and long-term use of the phone and the application. Testing of the configuration screen with caregivers or family members of the primary users is also being considered.

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