Safe Call: A Tangible Smartphone Interface That Supports Safe and Easy Phone Calls and Contacts Management for Older People

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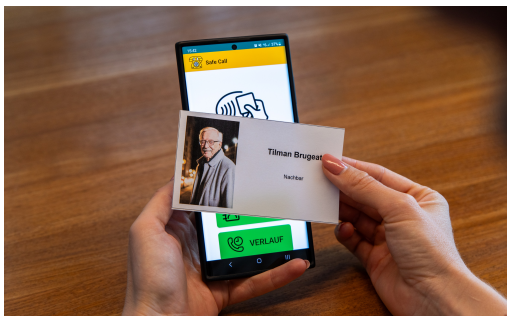Munich, Germany
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Figure 1: *Safe Call* consists of physical contact cards and a smartphone app. The NFC-based contact cards allow users to save contacts and call them with a tap. To indicate potential scams, the app adds a warning to incoming calls from unfamiliar callers.

ABSTRACT

Using a smartphone can be challenging for older people. Basic tasks like managing contacts and making phone calls might be intimidating. Moreover, the rise of scam calls increases the potential dangers of using a smartphone. To address these issues, we introduce *Safe Call*, a tangible smartphone interface that involves physical contact cards with NFC tags and an accompanying app. The contact cards simplify initiating calls, while the app enhances safety by distinguishing known and unknown callers. *Safe Call* supports digital accessibility for older people, encourages smartphone adoption, and reduces vulnerability to scams.

CCS CONCEPTS

• **Security and privacy** → **Usability in security and privacy**; • **Human-centered computing** → *Interaction devices*.

KEYWORDS

tangible security, contact management, older, scam prevention

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1 INTRODUCTION

Smartphones have become an indispensable part of our lives. However, older people might struggle to use these devices due to usability and accessibility barriers. Even basic tasks like making a simple phone call can become a daily struggle. Reasons for this range from visual impairments to a lack of interest and familiarity with such technology [2, 4, 6]. Moreover, older people might also be more at risk when it comes to fraudulent calls [6].

We present *Safe Call* a prototype that addresses two essential aspects of phone calls. Our prototype simplifies making a call, by using tangible cards that physically represent contacts. *Safe Call* further includes an app that streamlines the entire calling and contact management experience, making it more straightforward and intuitive. Secondly, we support users in recognizing potential scam calls by differentiating between known callers, marked as safe, and unfamiliar ones, potentially categorized as dangerous. With *Safe Call*, we ensure a safer and less complex calling experience for older people using smartphones.

(a) Creating a new contact.   (b) Contact list and contact details.   (c) Call history.
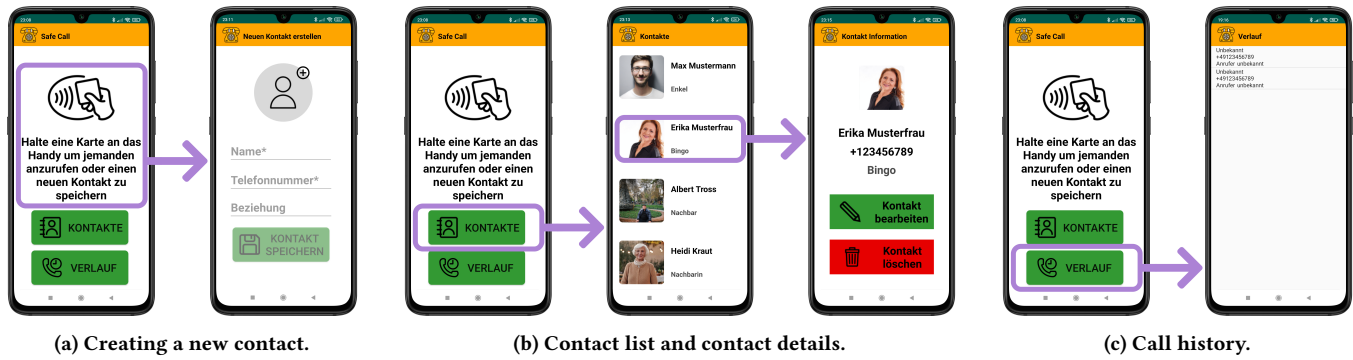
Figure 2: Screenshots of the Safe Call app that highlight how users can (a) create new contacts, (b) access the contact list and (c) see the call history. All texts are in German.

Our design is inspired by existing solutions like the "enna Dock" [3], AT&T ActiveArmor mobile security app [1] and the T-Mobile Scam Shield [8]. The "enna Dock" provides physical cards to perform actions on a tablet just like our system. However, the "enna Dock" requires a connection to a docking station, restricting portability and mobility. Apps like the AT&T ActiveArmor mobile security app [1] or the T-Mobile Scam Shield [8] aim to protect the users from spam calls. However, these apps often have a lot of different settings, making them complex to use for people with limited expertise. Therefore we aim to provide a user interface that is both easy and safe to use. *Safe Call* enables older people to perform calls on their own and at the same time feel safe when being called by others. Guided by heuristics for user interfaces for older people [2], we avoided providing too many options or small font sizes [7]. We used NFC tags to trigger actions as they were found very useful to make interactions easier for older people [4, 5].

2 THE SAFE CALL PROTOYTPE

2.1 Contact Cards

Safe Call imitates actions older people are already used to when making a phone call. Therefore, we use physical cards representing contacts that can be sorted in any kind of phone book, Rolodex, or pinboard (see Figure 2a). The cards are crafted from paper and, are easy to customize e.g., by sticking photos to them or labeling them with a pen. They incorporate an NFC tag, which enables communication between the cards, the user's phone, and our application. Empty cards are used to save new contacts and automatically get connected to the newly saved contact. After that, the cards can be used to trigger a call. Hence, users can effortlessly save contacts and initiate calls with just a tap. Moreover, any NFC tag that contains plain text will automatically open the *Safe Call* app.

2.2 Application

Upon launching the app, the main page is shown and informs the user how to initiate a call and save new contacts. Two buttons allow to access the contact overview and the call history. When a contact card is presented to the system, the app distinguishes whether there is a contact connected to the presented NFC tag or not. If there is no

contact connected, a screen that allows adding a new contact opens (Figure 2a). The user can store a name, a phone number, a photo, and a relationship for each contact. To save the number on the card, the user has to present the card to the system one more time. If a card that is already connected to a contact is presented, the app automatically initializes the telephone app with the corresponding phone number. The user can then start the call.

When tapping on the "Contacts" button on the main page a list of all saved contacts is displayed (see Figure 2b). In addition to reviewing all saved contacts, the user can also edit each contact. When the user is called, the incoming phone number is compared with all saved contacts. If the caller is not saved as a contact, a red warning is displayed to inform the user that the caller might not be trustworthy. The user can then decide whether they want to answer the call or not. Finally, all incoming and outgoing calls are listed in the call history (see Figure 2c).

3 DEMO SETUP

Through our demonstration, participants at the MUM conference have the opportunity to fully experience every feature of our system. They can initiate the process of adding new contacts by simply presenting blank NFC tags, and subsequently utilize the newly encoded tag to initiate a phone call. Additionally, attendees can gain insight into the user experience when receiving calls, whether they are from existing contacts or unknown sources. Finally, they can explore various facets of our application, including the contact list, detailed contact view, and call history.

4 FUTURE WORK

In the future, we plan to conduct a user study to evaluate our prototype and inform future iterations. In particular, we aim to investigate the trade-off between security interventions supported by *Safe Call* and their effect on the autonomy of users. The current app triggers a warning pop-up when a call from an unknown person is detected. We are planning to evaluate whether users find this warning to be helpful. Moreover, as a more restrictive alternative approach, we will compare this to an additional version of the app where potentially "unsafe" calls are automatically redirected to trusted third parties (e.g., caregivers, friends, or family) or blocked.

5 CONCLUSION

In this paper, we present *Safe Call*, a tangible smartphone interface that supports older people in managing contacts, and making phone calls. It also warns users about potential phone scams. *Safe Call* consists of physical contact cards and an app. The cards can be used to store a contact and initiate calls with a tap. This tangible approach specifically supports people who are more used to a hands-on system like phone books than smartphones. The app, on the other hand, checks every incoming call to see if the caller is saved as a contact, and shows a corresponding warning. The user can then decide whether or not to answer the call.

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REFERENCES

[1] Inc. AT&T Services. 2023. Google Play. AT&T ActiveArmor. https://play.google.com/store/apps/details?id=com.att.mobilesecurity last accessed on October 8, 2023.

[2] Stefan Carmien and Ainara Garzo Manzanares. 2014. Elders using smartphones– a set of research based heuristic guidelines for designers. In *Universal Access in Human-Computer Interaction. Universal Access to Information and Knowledge: 8th International Conference, UAHCI 2014, Held as Part of HCI International 2014, Heraklion, Crete, Greece, June 22-27, 2014, Proceedings, Part II 8*. Springer, 26–37.

[3] enna systems GmbH. 2023. Das Internet für alle. https://enna.care/ last accessed on October 8, 2023.

[4] Juha Häikiö, Arto Wallin, Minna Isomursu, Heikki Ailisto, Tapio Matinmikko, and Tua Huomo. 2007. Touch-based user interface for elderly users. In *Proceedings of the 9th international conference on Human computer interaction with mobile devices and services*. 289–296.

[5] Rosa Iglesias, Jorge Parra, Cristina Cruces, and Nuria Gómez de Segura. 2009. Experiencing NFC-based touch for home healthcare. In *Proceedings of the 2nd international conference on pervasive technologies related to assistive environments*. 1–4.

[6] Hazwani Mohd Mohadisdudis and Nazlena Mohamad Ali. 2014. A study of smartphone usage and barriers among the elderly. In *2014 3rd international conference on user science and engineering (i-USEr)*. IEEE, 109–114.

[7] Suziah Sulaiman and Intan Suriany Sohaimi. 2010. An investigation to obtain a simple mobile phone interface for older adults. In *2010 International Conference on Intelligent and Advanced Systems*. IEEE, 1–4.

[8] T-Mobile USA. 2023. Google Play. T-Mobile Scam Shield. https://play.google.com/store/apps/details?id=com.tmobile.services.nameid last accessed on October 8, 2023.