Stick, Click n' Call: Self-adhesive Pressure-Activated RFID Tags for Mobile Phones

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ABSTRACT
This paper describes a new interaction concept, which is based on customizable self-adhesive stickers with an integrated button, manufacturable at low cost. By pressing the button, users can execute specialized functionalities on their mobile phones, e.g. dialing phone numbers or accessing URLs. We present three usage scenarios and a proof-of-concept prototype.

ACM Classification: H5.2 [Information interfaces and presentation]: User Interfaces.

Keywords: RFID, button, sticker, mobile phone, URL, phone number, situated interaction
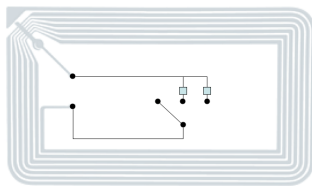

Figure 1: Schematics of the RFID tag with two chips, activated through a two-level-button; chips are using the same antenna.

INTRODUCTION
This project is the result of a research project investigating tangible interaction with mobile phones. Involving the sense of touch seemed to be a promising field of research, as the cognitive load of mobile interaction is currently primarily focused on the visual and auditory sense. A more even distribution of involved senses could eventually lower the required cognitive load and provide less stressful and more natural forms of interaction.

Pressing a key to activate a specific functionality is an established pattern of HCI. In this project, we explored its combination with a new medium – an RFID-enabled sticker.

MOTIVATION
The inspiration for *Stick, Click'n Call* stems from an everyday observation: People tending to carry pictures of their beloved ones with them. Mostly in Asian countries, these images are sometimes special kinds of small stickers, so called *Purikura* [1]: Purikura are decorated sticker-photos, taken in dedicated photo booths. When Japanese teenagers meet, they often go to such a booth and take a souvenir photograph. Interestingly, those Purikura are also stuck on mobile phones – the more intimate of those even hidden on the inside of the battery case [2].

RELATED WORK
The NFC-Forum [3], an industry association promoting RFID-technology for mobile devices, proposes the use of RFID tags for interaction; a scenario described by Nokia proposes the use of RFID tags as representations of phone numbers. [4] However, the proposed system might become complicated especially for elderly users: If there are multiple tags in the reading distance the mobile phone', the user has to go through a selection process, as all of them are active at the same time, using the screen-based interface of the mobile phone.

Selker filed a patent [5] closely related to the concept presented in this paper: "The cardholder may activate the card by applying external pressure to the surface of the card at a predetermined position closing the switch contacts which open again automatically when pressure is removed." It should be noted that the main focus of this patent is the security and privacy of the cardholder: "The present invention helps protect a contactless information storage device, such as an RFID payment card, *from unauthorized misuse*.". Another project worth mentioning is a design study entitled Allmyfriends [6], a concept for a bead bracelet, used as a TUI [7] for phone numbers: Each of the user's friends is represented through a bead. By pressing a bead, the person represented by it is called.

CONCEPT

In this project, we combine an RFID tag with a button that activates it. By pressing this button, the user can access functionalities on his mobile phone.

Through this technically and economically simple extension a new interaction paradigm for RFID tags can be explored: Interaction does not need to take place at the position of the reader, but at the position of the tag. The idea can be expanded to a two-level-button solution: Each level of pressure activates another RFID-chip, using the same antenna (Fig. 1), leading to a "preview → activate" style of interaction.

Scenario 1: Press me, Call me!

This scenario describes the interaction with a phone number: Through pressing the button on the RFID sticker, the number is automatically dialed. If the phone has been keylocked, *Stick, Click'n Call* stickers are disabled as well.
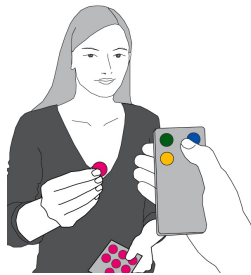
*"Here is my Phone-Number-Sticker; call me
when you want to have a chat."
"Thank you, Angie. I will stick it on the back
of my phone. Talk to you soon!"*

Later: *"I want to talk to Angie. So all I need
to do is to press her sticker…"*

A two-level-button solution displays name and number first and dials only upon pressing the second level of pressure exerted. As *Stick, Click'n Call* stickers could be designed in various forms, shapes and colors; the selection of a particular one from a group of many can be imagined as easy and intuitive.

Scenario 2: Active Business Card

This scenario is based on our observation of the ceremonial importance of business cards. One reason for this might be that business cards tell more than just name, title, phone number and address: They manifest the contact to the person. We suggest enhancing traditional business cards by the proposed technology.

For this scenario, we envision two actions that occur after activating the RFID chip: "Store Contact Data" and "Call Phone Number"; the latter will happen, once the former has been executed at least once before.

Scenario 3: Situated Phone Numbers

The concept of RFID tags enhanced with an activation button can also be applied to location-sensitive information. The user does not need to store or look-up the phone number of the heater repair service or the car repair service in his/her phone book; the number is at the spot, where the user needs it: at his/her central heating unit or in the car.

PROTOTYPE

For the first prototype we used a Nokia 5140i mobile phone with an Xpress-on™ RFID reader shell (CC-197D). Using this setup, we investigated RFID tags in various sizes. These tags were "hacked" and a membrane switch was soldered between chip and antenna, and then attached to a sticker. This enables its user to launch applications by pressing the sticker tag, as well as dialing phone numbers.

CONCLUSION

The technical implementation of the *Stick, Click'n Call*-concept is possible with off-the-shelf components. Within first informal user testing, we received an overall positive feedback, and more usage scenarios were suggested.

OUTLOOK

A situated long term study is needed to reveal how the proposed system will affect user behavior in real life. Trading phone numbers with friends and business partners, locating service numbers where they are needed – these things will be tested in real situations with real people.

We encourage further research in the field of interactively enhanced RFID technology, especially when enabling user interaction away from screen, and rather *in situ*.

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