an evaluation
of the influence of external factors on
authentication performance and memorability

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Diploma Thesis
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External Factors

ATM:

- Position of the ATM
- Audio / visual signals
- Haptic feedback
- Color coding
- Input device
- Arrangement of the controls

Fig. 1

Fig. 2

Fig. 3

Fig. 4

PinPad - Designs

Phone-Layout Fig. 4

Calculator-Layout Fig. 5

Line-Layout Fig. 6

How to memorize numbers

Different strategies:

- Learn by heart
- Learn visual patterns
- Learn motoric patterns
- Association to given knowledge

Fig. 7

Visual memory [1]:
- our mind's eye
- Used in the T-Com spot „11833"

Motor memory [2]:
- repeatedly trained movement
- Used in touch typing

Fig. 8

User Study

Goal:

➢ Performance-Test of motorically and visually trained users on different numpad layouts.

Method:

- 66 participants in 2 groups
- Long-term study (2 months)
- 2 phases:
  - Training (group 1)
  - Test (group 1 + 2)

- Test runs at 2-3 Days a week
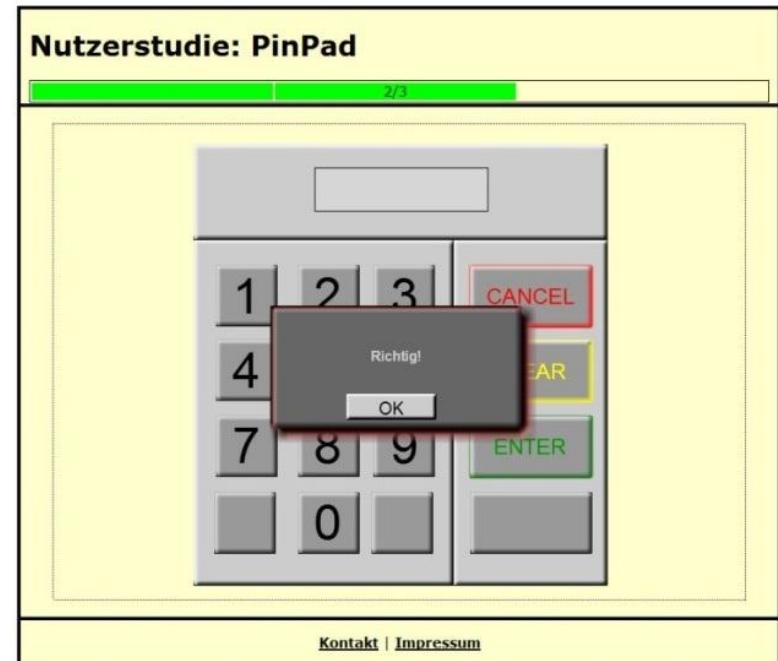
Fig. 9

User Study II

Testcases:

- Phone-Layout
- Calculator-Layout
- Random-Layout
- Line-Layout
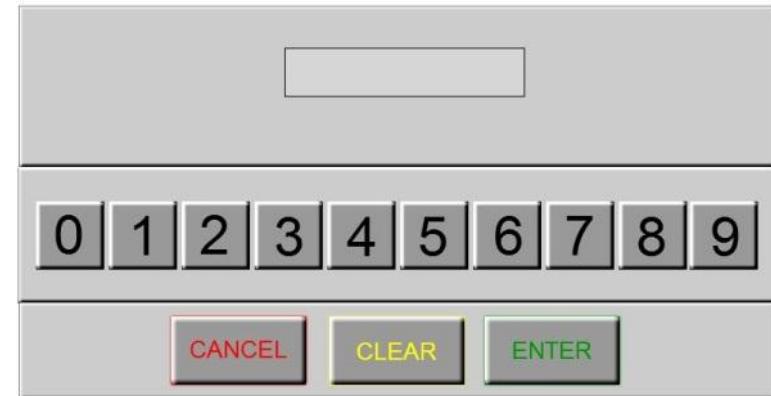

Fig. 11

Hypotheses:

- Users are motorically and visually trained to the phone layout:

  ➢ Best performance for phone layout
  ➢ Worst performance for random layout
 ➢ Line and calculator layout in between

Fig. 13

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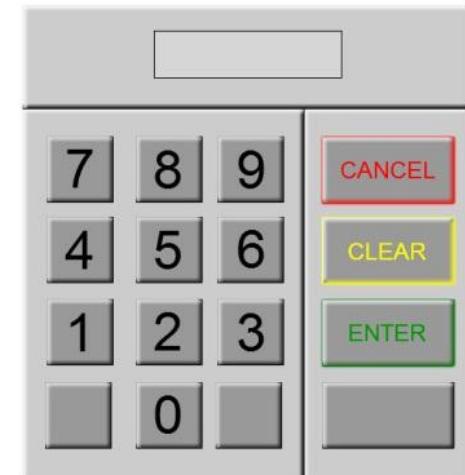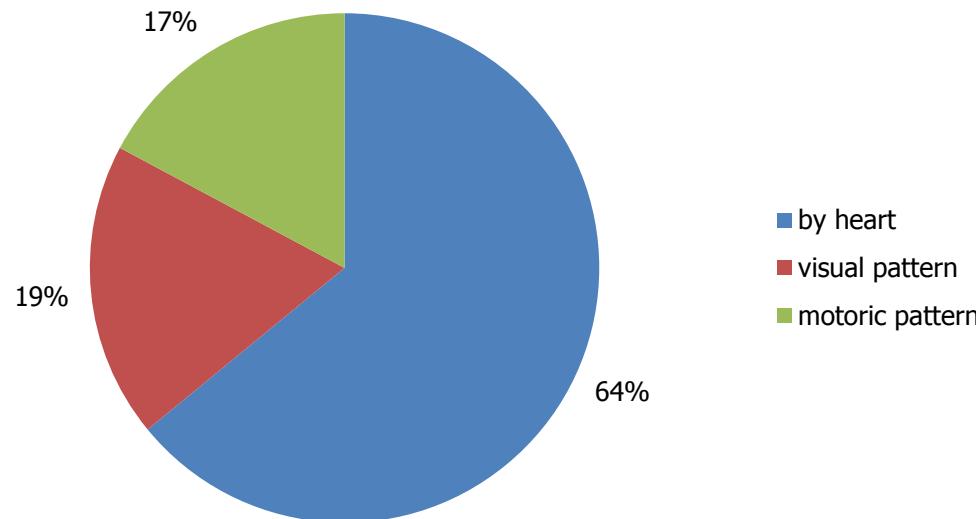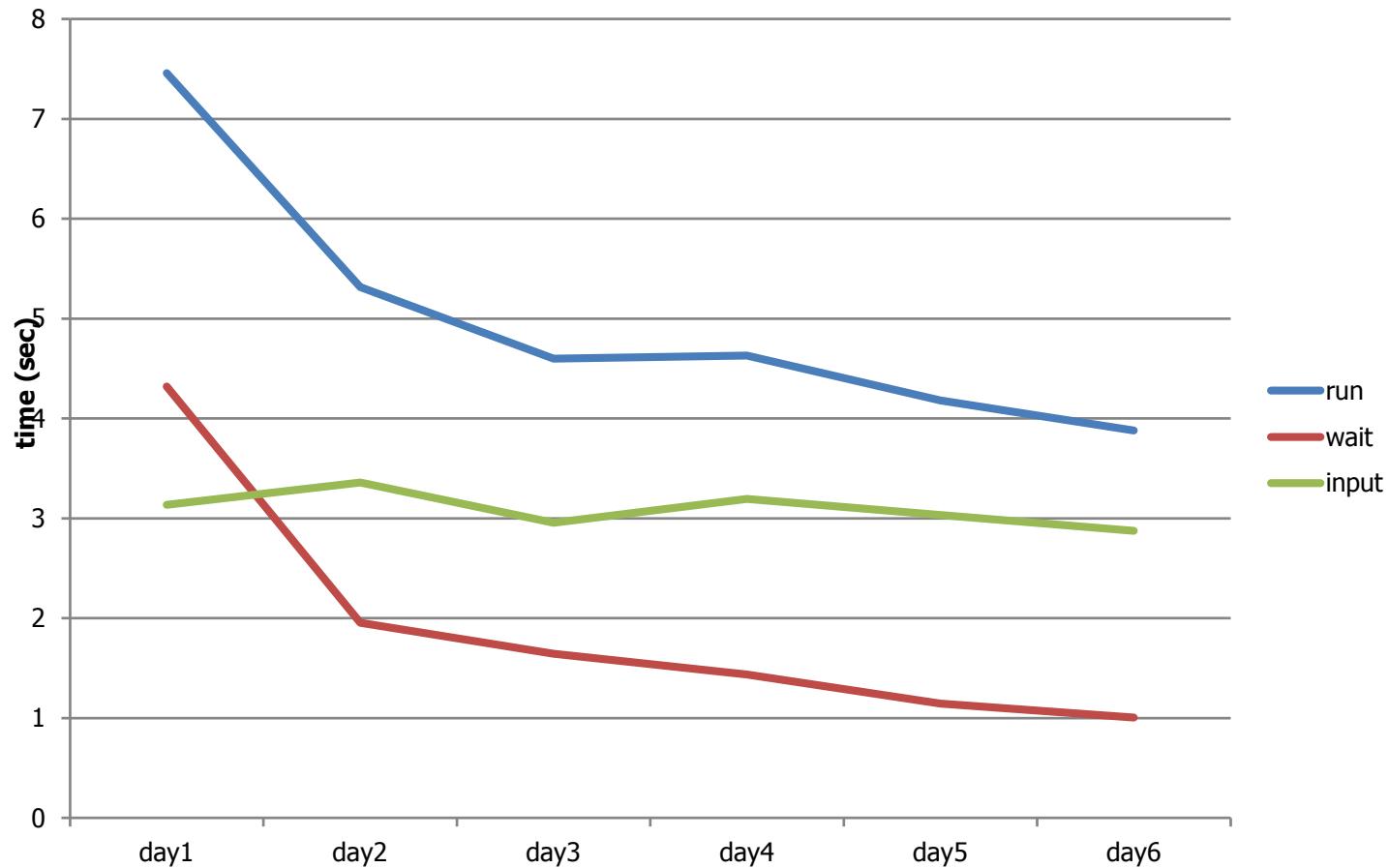
First Results - Survey

How do you memorize your pin?

Legend:
- by heart — 64%
- visual pattern — 19%
- motoric pattern — 17%
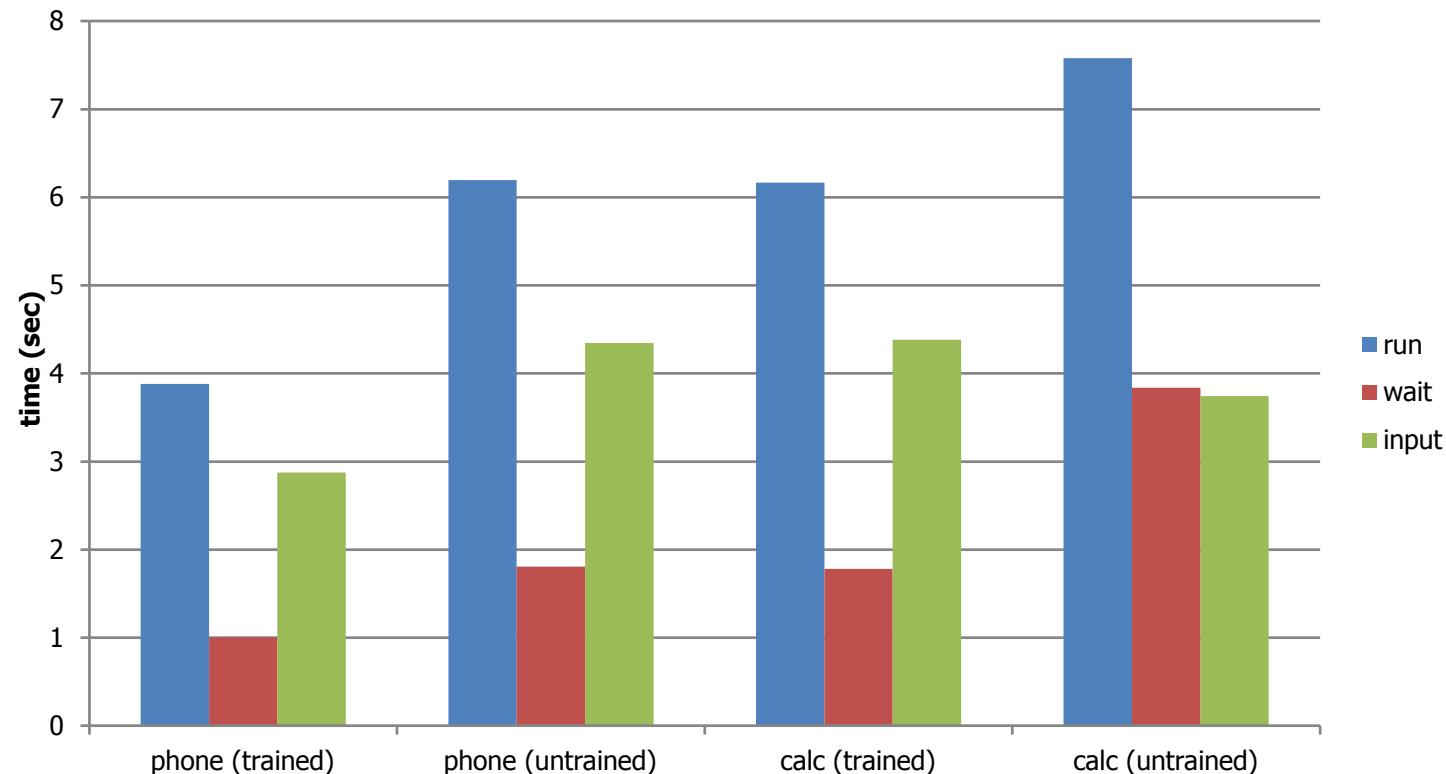
- 30%: „Numpads and pinpads look the same"
- 9%:   „789 in the first row"
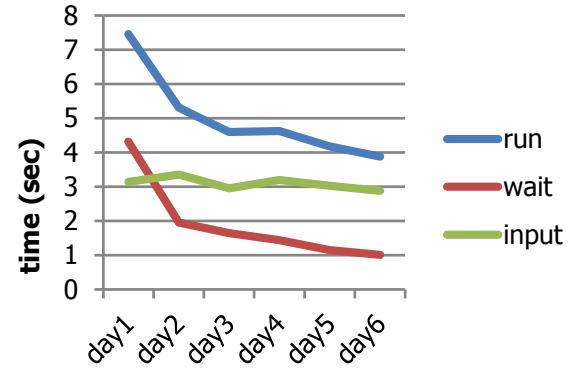
First Results - Training
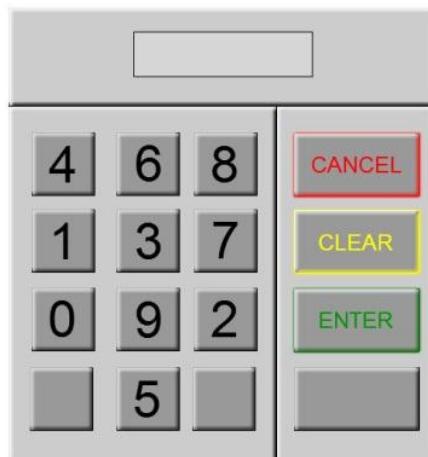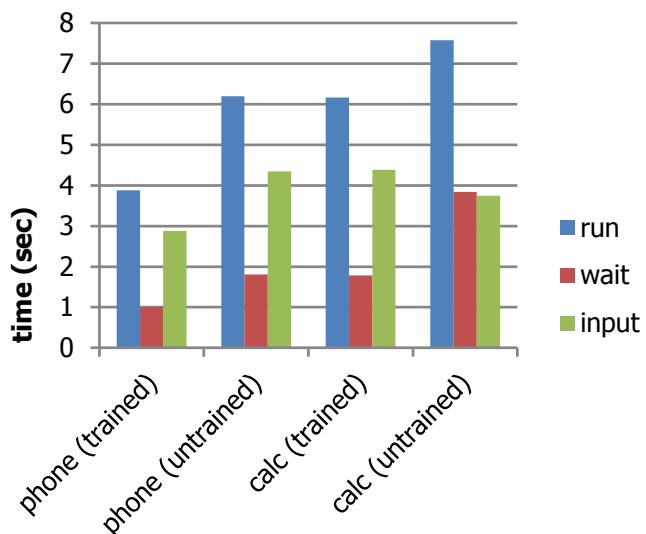
➢ Training affects waiting time

First Results - Performance

any questions?

Sources: Figures

Fig. 1: http://hackedgadgets.com/2006/12/01/atm-pin-numbers-hacked/
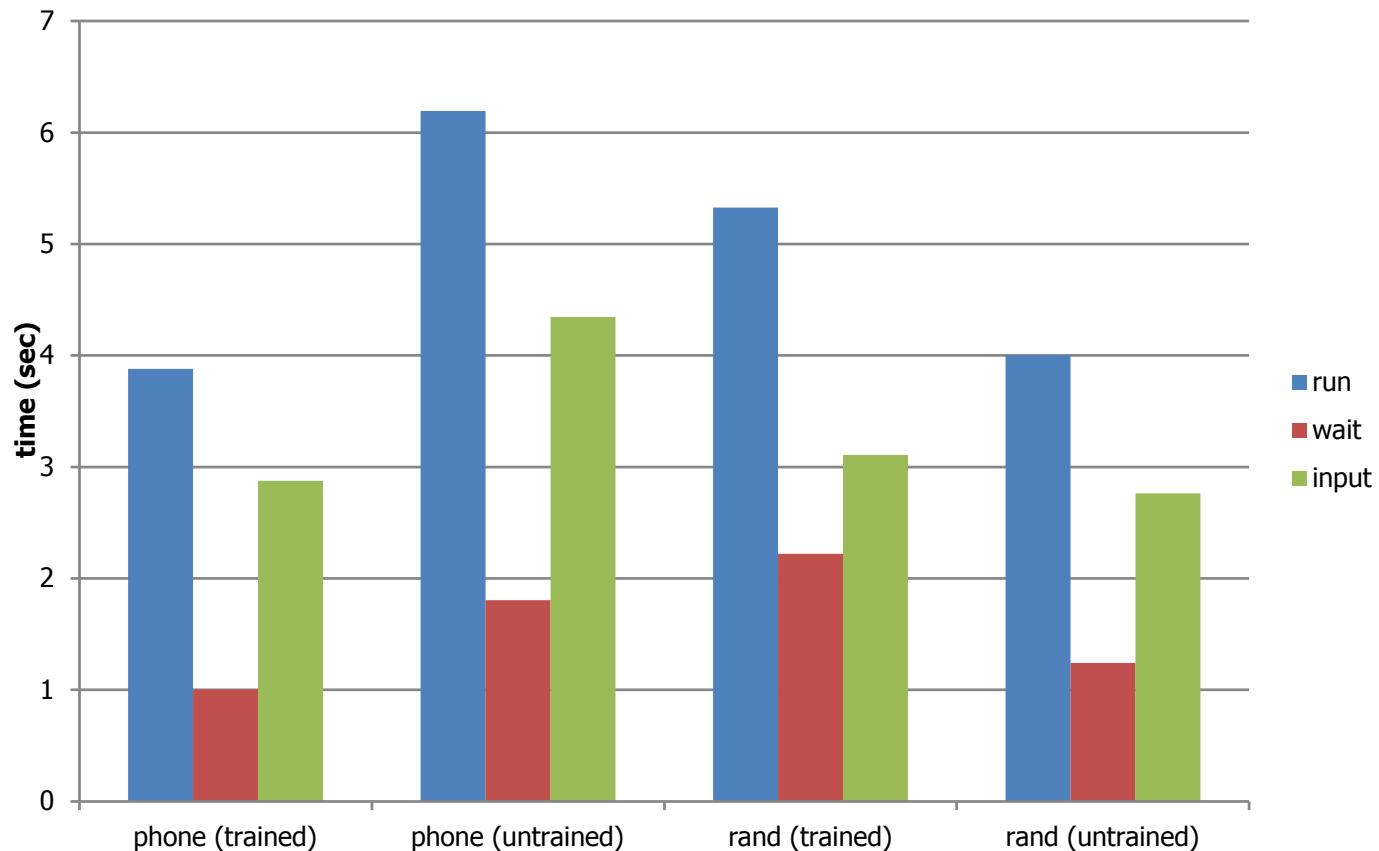
Fig. 2: http://commons.wikimedia.org/wiki/File:Japanese_ATM_Palm_Scanner.jpg

Fig. 3: http://www.electronicsweekly.com/blogs/engineering-design-problems/2008/08/an-extremely-inconvenient-atm.html

Fig. 4: http://commons.wikimedia.org/wiki/File:ATM_pinpad_in_german.jpg

Fig. 5: http://www.co-opcreditunion.com/pix/atm_keypad.jpg

Fig. 6: http://www.flickr.com/photos/chocogato/3850825632/

Fig. 7: http://commons.wikimedia.org/wiki/File:Telefon_t-sinus-700.jpg

Fig. 8: http://www.edelweissair.ch/d/shop/smstool/

Background / related work

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[3] De Luca, A., von Zezschwitz, E., Hußmann, H. 2009. Vibrapass: secure authentication based on shared lies. In: Proceedings of the 27th international conference on Human factors in computing systems, 913-916.

[4] Manzke, J.M. 1999. Public Terminals für Blinde und Sehbehinderte.

[5] Anderson, Allison M., Mirka, Gary A., Joines, Sharon M.B. 2008. Learning rate Analysis of Alternative Keyboards. I´n: Human Factors and Ergonomics Society Annual Meeting Proceedings, pp. 874-878(5)

[6] http://www.tiresias.org/research/guidelines/keys.htm

[7] http://www.bankers.asn.au/articledocuments/atm%20standard.htm#_Keypad

First Results – Backup

First Results – Backup