Using motion to guide the focus of gaze during eye typing

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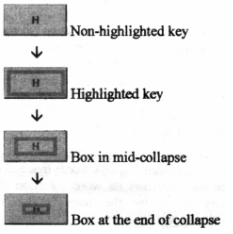
Contents

Introduction

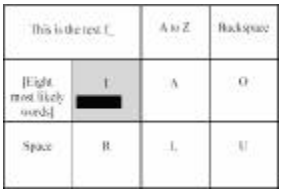
- Eye typing means using gaze direction to produce text
- Motivation
  - For people with severe disabilities eyes may be the only means for communication
  - There is little research on design issues on eye typing
- Goal
  - To study how animated visual feedback affects eye typing
  - How to facilitate the tedious task
- A follow-up study
  - Previous research shows that the type of feedback impacts typing speed, error rate, and gaze behavior

Related work

- Motion has been used to encode information and guide attention
  - e.g. progress bars
- Motion in gaze input
  - Feedback on dwell time progress
    - EyeCon
    - ERICA
    - GazeTalk
  - Motion should not attract the user to look away from the primary target
  - If dynamic recalibration is used, it helps if the user looks at the center of the key



ERICA by Hutchinson et al.



GazeTalk by Hansen et al.

EyeCon by Risø National Research Laboratory

Tested Feedback Modes

Feedback mode	While focused	When selected
No shrinking 	none 	red letter, key down, “click” 
Shrinking mode 	shrinking letter 	red letter, key down, ”click” 

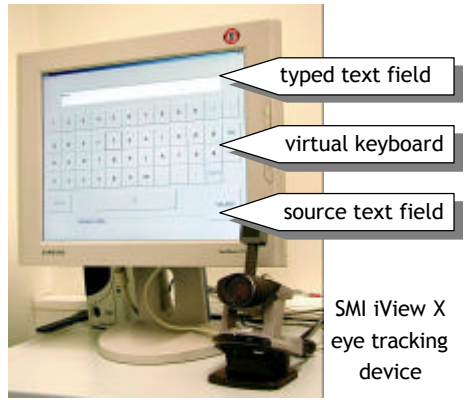
Constant dwell time for all modes

- 400 ms before focus + 500 ms dwell time (=tot. 900 ms)

Setup and Procedure

- SMI iView X eye tracker
  - remote
  - 50 Hz, 1.0 deg.
- Virtual keyboard
- Procedure
  - Read source text
  - Focus on letter
  - Selection by dwell time

  → Letter appears in typed text field

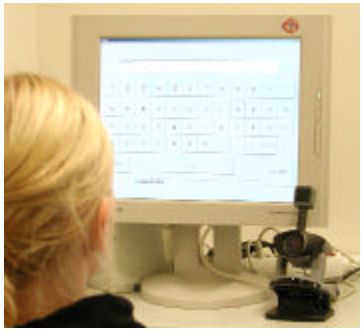


SMI iView X eye tracking device

Experimental Software

Method

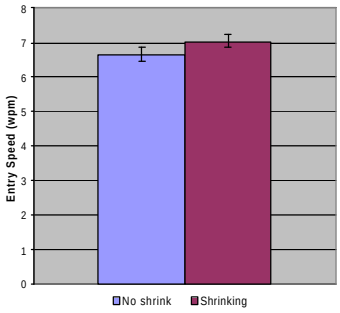
- 20 participants
  - 11 male, 9 female
  - mean age 27
  - normal or corrected to normal vision
- Repeated measures design
  - 2 feedback modes
  - order counter-balanced
  - 2*5*20 phrases (in Finnish)
- Log files
- Interview



Results$_1$ - Speed

Studied: speed, error rate, KSPC, number of fixations, gaze behavior

- Significant effect on text entry speed
  - Grand mean 6.83 wpm
  - With shrinking 7.02 wpm, without 6.65 wpm
  - Entry rate will increase with a shorter dwell duration



(t=2.94, df=17, p<.01)

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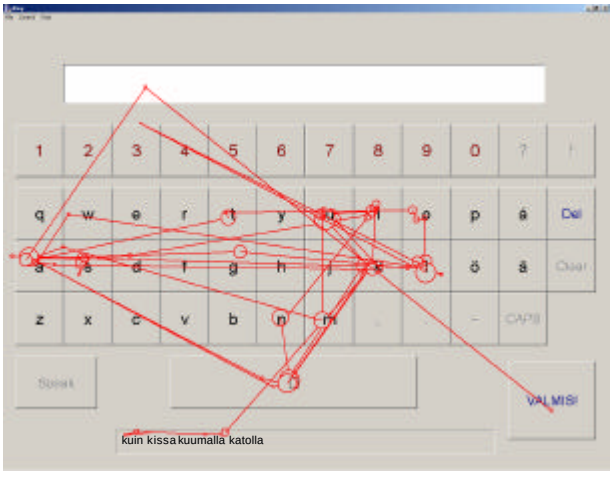
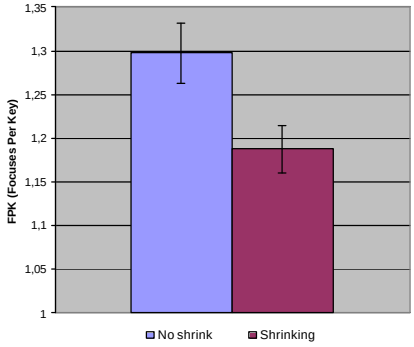
Results$_2$ – Gaze Behavior



Results$_2$ – Gaze Behavior: (Re-)Focuses

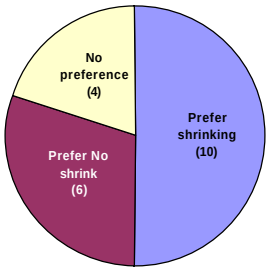
- Focuses Per Key (FPK)
  - normally 1 per key
- Significant effect on how many times the user (unnecessarily) re-focused on the same key
- Shrinking seemed to help to keep the focus on (the center of) the key



(t=4.56, df=19, p<.001)

Results$_3$ – Subjective Satisfaction

- Some participants did not notice the difference between modes
- 13 of the participants thought shrinking helps (novices) and 10 preferred the shrinking mode
  - *"Shrinking helps to understand how dwell time proceeds"*
  - *"Shrinking enforces the feeling of tl key going down"*
  - *"Shrinking supports typing rhythm"*
- 2 participants felt that shrinking disturbs
  - *"Shrinking may be disturbing and tiring in the long run"*



Conclusions and Future Work

- Shrinking
  - provides feedback on dwell time progress
  - may increase the typing speed (novices)
  - ”draws attention in”, helps the user to concentrate on the center of the key
    - enables recalibration on the center of the key
- Probably best for novices, with long dwell times
- Future work: Follow-up studies
  - with short dwell times
  - with experienced users

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Thank you for your attention!

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http://www.cs.uta.fi/hci/gaze/