A gaze-contingent, acuity-adjusted mouse cursor

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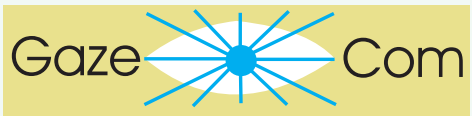


Gaze-based interfaces

- Gaze-based interfaces still haven't reached the mainstream yet
- Chicken-egg problem: small deployment numbers mean few applications mean small deployment
- Tailoring individual applications to gaze control still is a very time-consuming task
- "Killer application" still missing

Two approaches to incorporate gaze information

- Control the interface with gaze
- Adapt to user's perception

Gaze-contingent displays

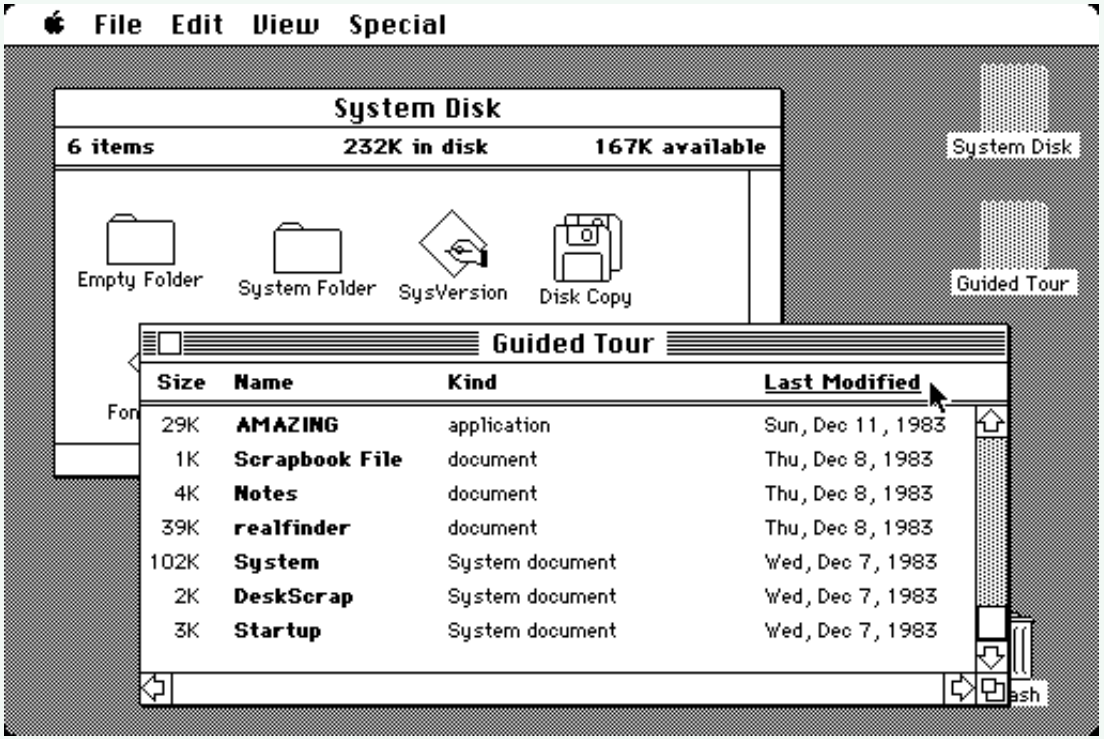
- Visual acuity high only in the centre of the visual field
- Resolution of peripheral display can be degraded
- Applications in reading research, VR rendering, movie compression, gaze guidance, ...

Gaze-contingent displays: demo

Going back one step ...

- We propose to start out with using gaze as an assistive measure only
- Make mouse cursor size a function of visual eccentricity to keep visibility constant

Mouse cursor back then ...



... and mouse cursor today

Problem

- User moves mouse somewhere
- User moves their eyes away, types, ...
- User needs mouse again, cannot find it
- Often-used solution: wiggle mouse to make it catch attention

(however: “Cursor Hider helps you to work more productively. It removes mouse pointer from a working place [...] Only $19.95!”)

Use eye tracking to infer visibility of cursor and ...

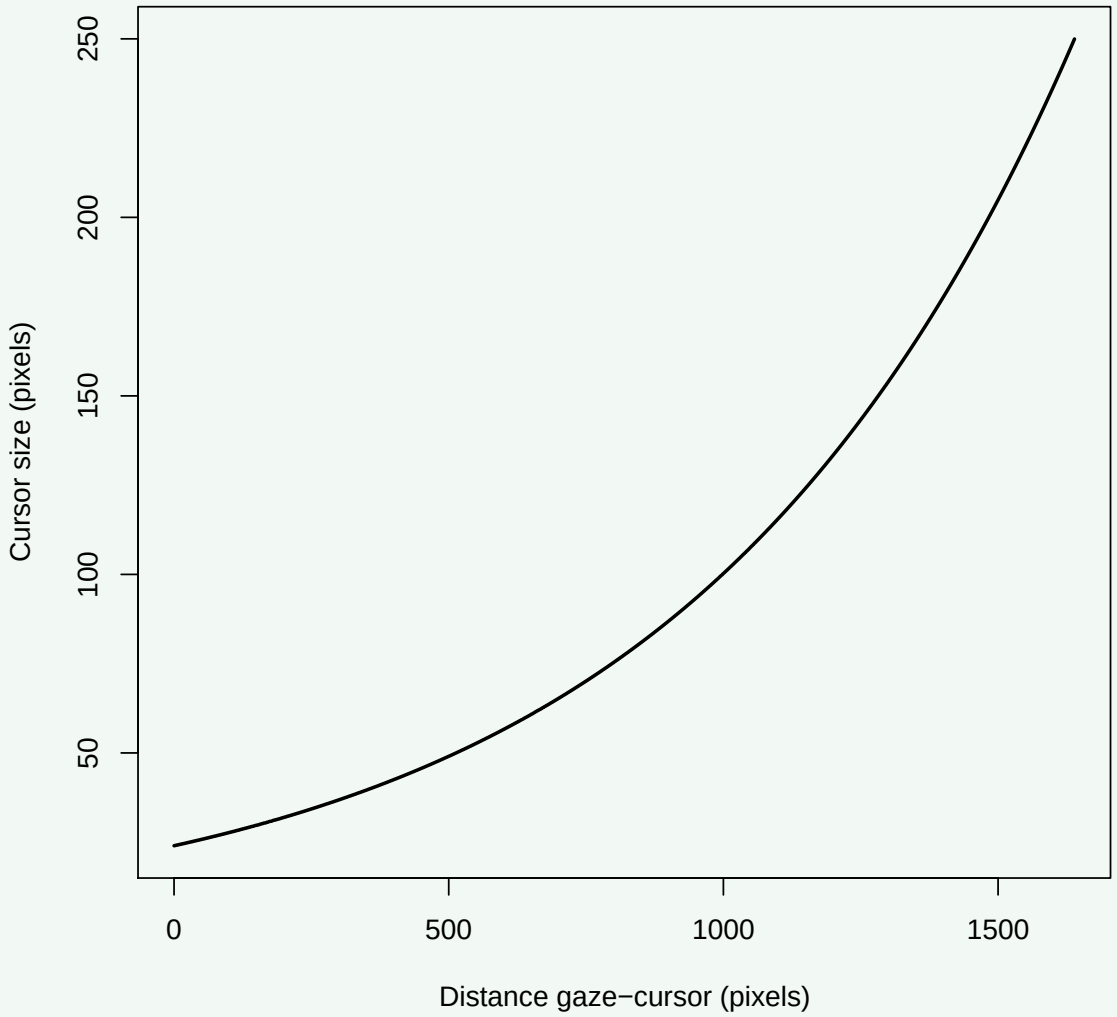
- Show small cursor when user looks at it (do not cover screen)
- Show large cursor when in the periphery

Implementation

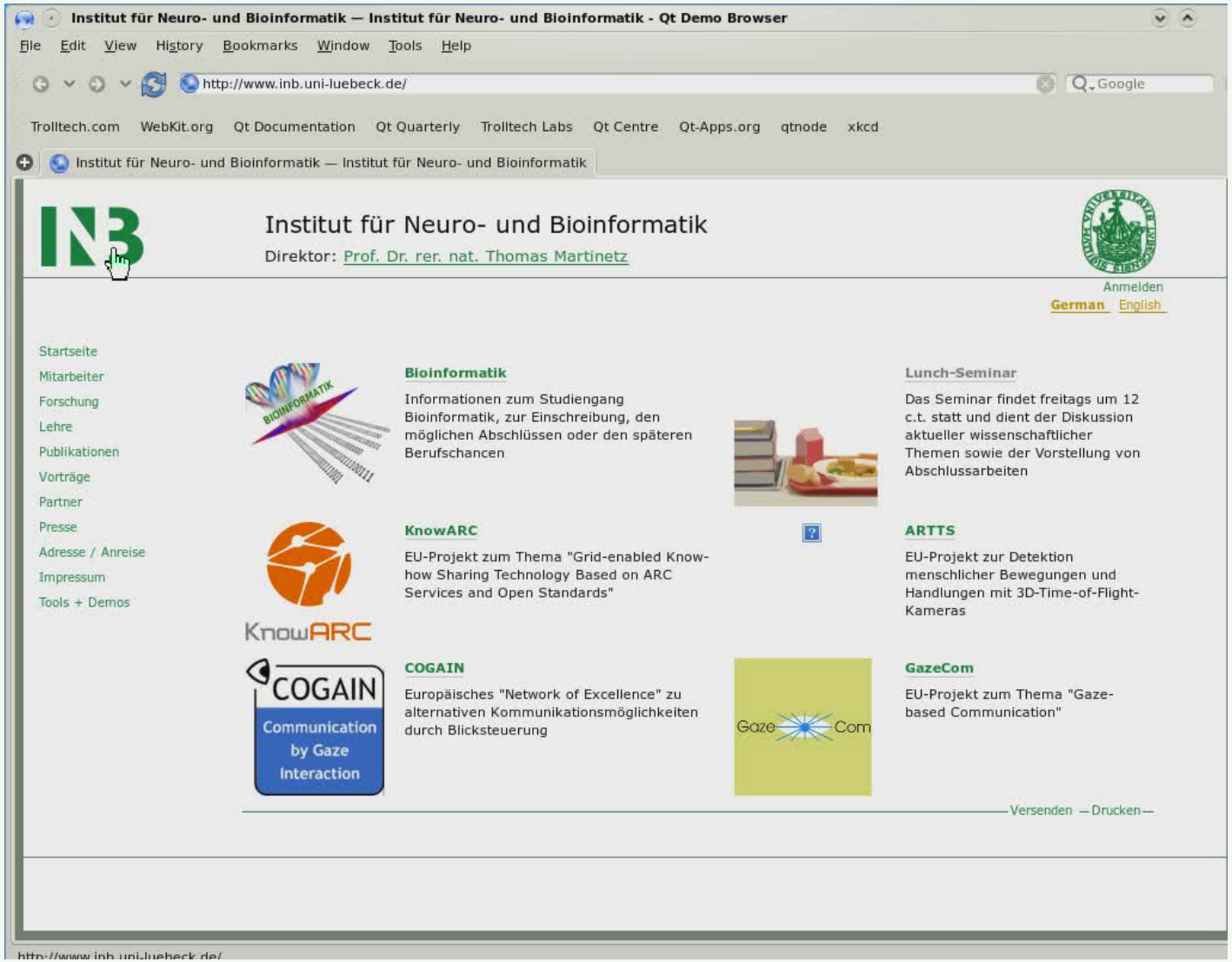
- Qt toolkit basis of wide variety of open-source software (including the KDE desktop environment)
- Only one modification required ($\approx$ 300 lines of code), can be used in many applications
- GNU General Public License, patch available upon request

- Web browsing one of today's key applications
- Unfortunately, both *konqueror* and *WebKit* use their own pointer handling (*... and do not document it!*)

Size function



Demo


Institut für Neuro- und Bioinformatik — Institut für Neuro- und Bioinformatik - Qt Demo Browser
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Bioinformatik
Informationen zum Studiengang Bioinformatik, zur Einschreibung, den möglichen Abschlüssen oder den späteren Berufschancen
Lunch-Seminar
Das Seminar findet freitags um 12 c.t. statt und dient der Diskussion aktueller wissenschaftlicher Themen sowie der Vorstellung von Abschlussarbeiten
KnowARC
EU-Projekt zum Thema "Grid-enabled Know-how Sharing Technology Based on ARC Services and Open Standards"
ARTTS
EU-Projekt zur Detektion menschlicher Bewegungen und Handlungen mit 3D-Time-of-Flight-Kameras
COGAIN
Europäisches "Network of Excellence" zu alternativen Kommunikationsmöglichkeiten durch Blicksteuerung
GazeCom
EU-Projekt zum Thema "Gaze-based Communication"
Versenden — Drucken —
http://www.inb.uni-luebeck.de/

User evaluation

- 10 minute evaluation
- 4 subjects were asked to perform “typical” web browsing activities (route planning, shopping, Wikipedia, ...)
- Gaze recorded using SMI iView X RED remote tracker, 50 Hz
- Linux/WebKit GUI on 19” screen, 1280x1024 pixels

Results

- Scale from -5 (very annoying) to +5 (very helpful)
- 1 subject: no rating (did not notice anything unusual)
- 2 subjects: +1
- 1 subject: +4

- No clear result, but definitely not annoying
- Objective performance evaluation needed

Summary

- We have presented a gaze-contingent cursor that changes in size to maintain visibility even in the visual periphery
- Users liked it!

Outlook

- Objective performance evaluation (click throughput, number of “wiggles”)
- Hopefully, more gaze-controlled applications based on *Qt*

... thank you for your attention!