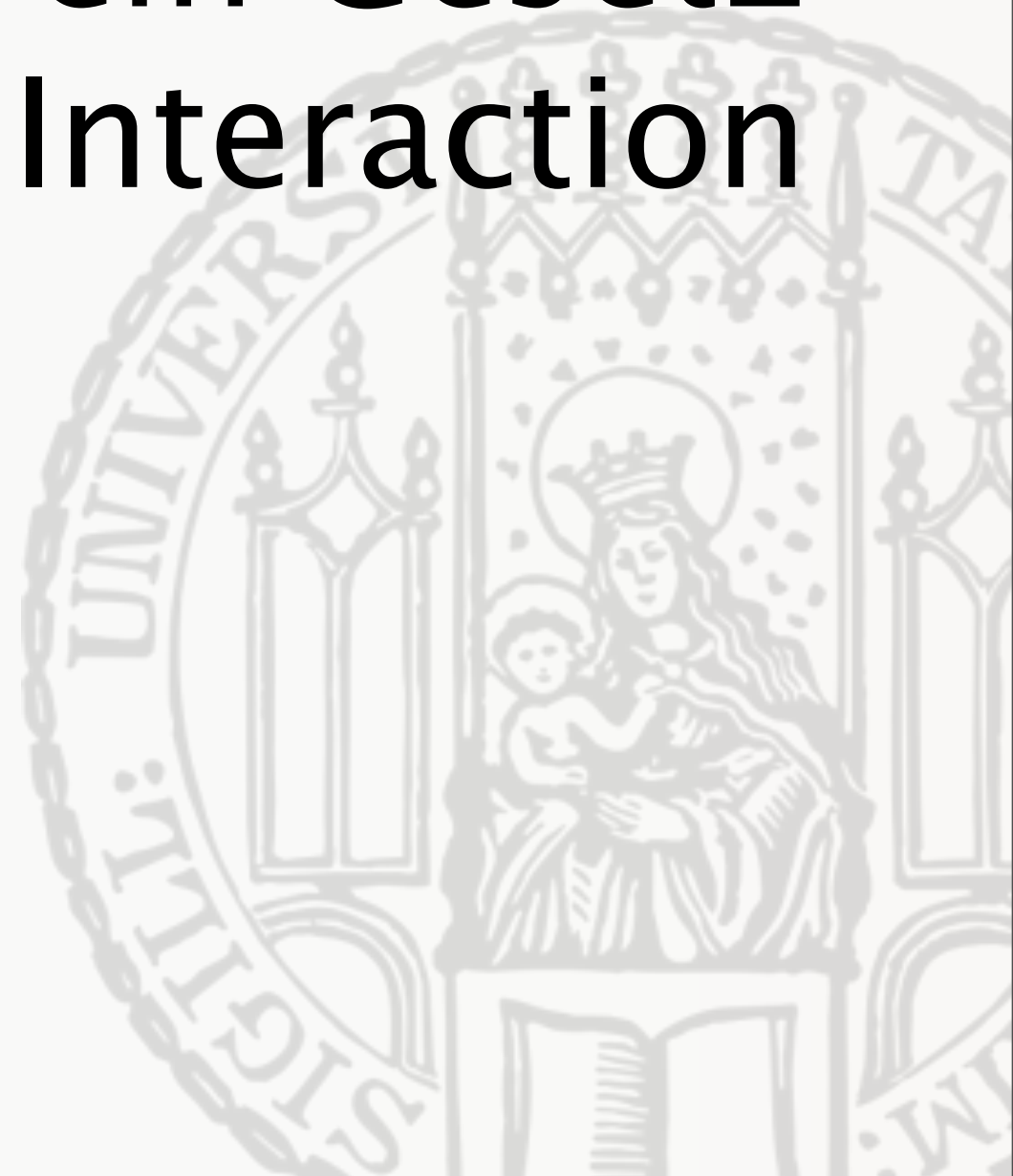


Fitts' law: ein Gesetz inspiriert Interaction

Dr. Julie Wagner





Enchantée!

- Aufgewachsen in Braunschweig
 - Abitur mit Leistungsfächer Mathe + Physik
- Informatik (Diplom), RWTH-Aachen
- PhD, Université Paris Sud
- Post-doc Télécom ParisTech
- Post-doc (LMU)



Warum ist es so schwer zu erklären was wir machen?

- Einigen fällt es leicht...
 - “ich bin Anwalt”
 - “ich bin Pilot”
 - “ich bin Arzt”
- und Anderen...nicht
 - ich bin ‘interaction designer’
 - ich bin ‘information architect’
 - ich bin ‘human factors engineer’
 - ich bin ‘usability specialist’

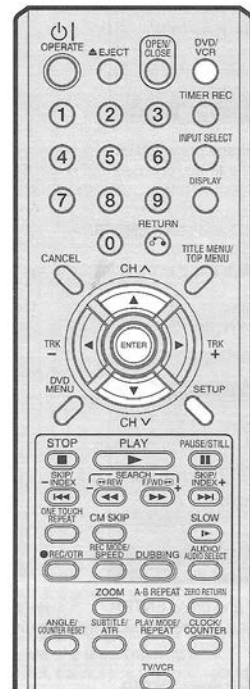
<http://whatisusability.com>

Was ist Usability?

Timer recording



The timer recording system allows you to select the date, time and channel and record the desired programs. Up to 8 timer programs within a month can be stored in this unit.



NOTE:
In the event of a power failure the data of the automatic recording will be maintained in the built-in memory for about 30 minutes. Also, the clock will continue to run for this period of time. Thereafter the data will be deleted. When the power resumes, the time display will change to "0:00" that the timer setting will have to be set.

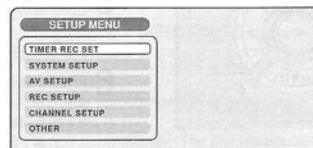
Setting timer recording

Preparation:

- Turn ON the TV and select its AV channel (this may be labelled EX / AUX etc.)
- Load a recordable DVD or video tape.
- Press DVD/VCR to select the appropriate mode.
- Confirm that the clock is indicating the correct time.

Example: Set the recording mode to LP and record on DVD; the T program is on channel 1 starting at 20:00 and stopping at 23:00 on date of 20th.

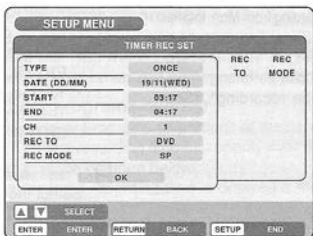
- 1 Press **SETUP**.
The SETUP MENU screen appears.



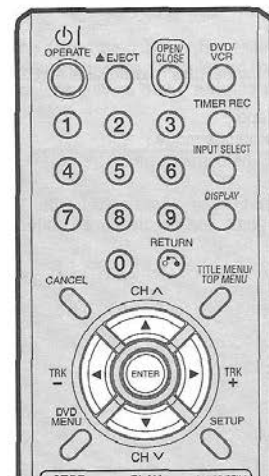
- 2 Press **▲** or **▼** to select "TIMER REC SET" and press **ENTER**.
The TIMER REC SET screen will appear.



- 3 Press **▲** or **▼** to select "NEW" and press **ENTER**.
The program screen will appear.



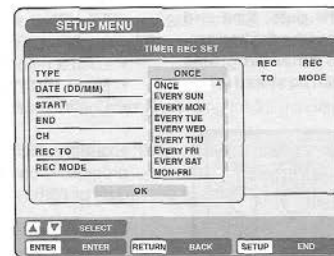
Timer recording



NOTES:

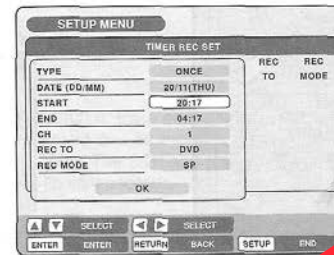
- If you select timer recording on a specified date only one time, select "ONCE" in the "TYPE" for recording. You can record same days of every week or from Monday to Friday using the item "TYPE". The items you can select are as follows:
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EVERY MON: Recording every Mon.
EVERY TUE: Recording every Tue.
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MON-FRI: Recording from Mon. to Fri.
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EVERY DAY: Recording everyday.
- The initial setting of "REC TO" and "REC MODE" can be changed using "Setting the recording". (See page 24.)

- 4 Press **▲** or **▼** to select "TYPE" and press **ENTER**.
Press **▲** or **▼** to select "ONCE" from the list and press **ENTER**.



- 5 Press **▲** or **▼** to select "DATE" and press **ENTER**.
Press **▲** or **▼** to select the date to be recorded and press **ENTER**.

- 6 Press **▲** or **▼** to select "START" and press **ENTER**.
Set the time when the recording is started.
- To switch over the selection item (hour or minute), press **◀** or **▶**, then press **ENTER**.
 - Press **▲** or **▼** to adjust the time.
 - After setting the time, press **ENTER**.

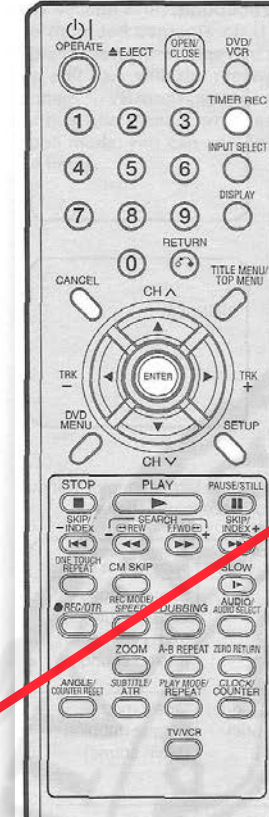


- 7 Press **▲** or **▼** to select "END" and press **ENTER**.
Set the stopping time in the same manner for setting the starting time of timer recording.

- 8 Press **▲** or **▼** to select "CH" and press **ENTER**.
- Press **▲** or **▼** to select the channel to be recorded and press **ENTER**.
 - You can select the external input setting mode by pressing **▶**. Then press **▲** or **▼** to select "AV1", "AV2" or "AV3" and press **ENTER**.

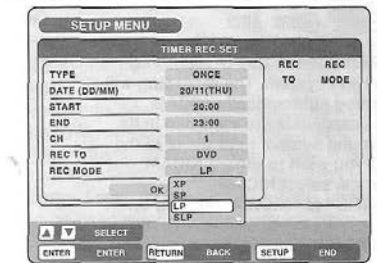
- 9 Press **▲** or **▼** to select "REC TO" and press **ENTER**.
Select the media (DVD or VCR) to be recorded from the list and press **ENTER**.

Timer recording



NOTES:

- Recording starts a few seconds before the preset starting time.
- You cannot use the timer recording for the both DVD and VCR at the same time.
- You can playback the DVD during the VCR timer recording, and you can playback the VCR during the DVD timer recording.
- If the clock symbol (⌚) blinks when the timer recording ended, the TV program has not been completely



- 11 Select "OK" and press **ENTER**. The timer program is determined and the TIMER REC SET screen appears again.
- 12 When you enter the other program for the timer recording, repeat the steps 3 to 11.
- 13 Press **SETUP**. The TIMER REC SET screen disappears and the display will return to the normal screen.
- 14 Press **TIMER REC**. The timer indicator "⌚" will appear on the display and the unit stands by for recording.

- If the program is DVD recording only, the unit will change to VCR mode automatically. (The DVD mode cannot be selected.)
- If the program is VCR recording only, the unit will change to DVD mode automatically. (The VCR mode cannot be selected.)
- If the programs are DVD and VCR recording, the unit will turn off. If you want to use the unit, press **TIMER REC** again to deactivate the timer.
- If the clock symbol (⌚) blinks in the display in spite of the pressing of **TIMER REC**, the cassette may not have been loaded yet. (see page 42)
- If the cassette is ejected in spite of the pressing of **TIMER REC**, the erase prevention tab of the cassette may have been removed. (see page 42)

Checking or changing the timer recording

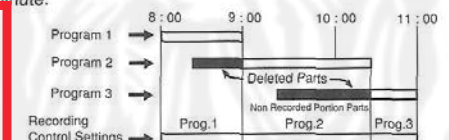
When you want to check the selected timer recording, follow the steps 1 and 2 of "Setting timer recording" and display the TIMER REC SET screen. To change the timer recording, select the program to be changed and press **ENTER**. The changing method is the same as that for the recording a program for the first time.

Cancelling the timer recording

Display the TIMER REC SET screen. Select the program you want to cancel and press **CANCEL**, then the selected program will be erased from the timer recording list.

In case Timer programs-overlap

Do not overlap timer programs as portions of the conflicting programs will be lost. The first recording time has priority over the next recording time as shown in the diagram below. In this case, the next recording time is delayed a maximum of about 1 minute.



- 14 Press **TIMER REC**. The timer indicator "⌚" will appear on the display and the unit stands by for recording.

Kann etwas noch schneller und einfacher benutzt werden?



Kann etwas noch schneller und
einfacher benutzt werden?

... so einfach ist das!

Kann etwas noch schneller und einfacher benutzt werden?

... so einfach ist das!

... oder vielleicht nicht?

Kann etwas noch schneller und
einfacher benutzt werden?

... so einfach ist das!

... oder vielleicht nicht?

Mensch–Machine Interaktion

- ein alltägliches Beispiel...

small talk

- eine Gesetz inspiriert Interaktions–design...

Studium

- pointing techniques

- menu techniques

- eine Zukunftsvision...

Forschung



Interface Design...

- ...beginnt schon mit alltäglichen Dingen
- ...spart Zeit, Geld und **Leben**



<http://www.doctordisruption.com/>

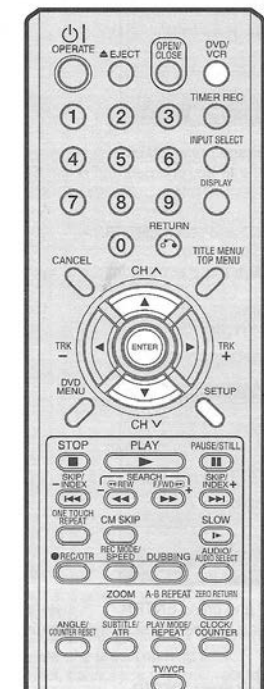
<http://blogs.evergreen.edu/brookewalsh/files/2013/04/DSCN2108.jpg>

Anleitungen

Timer recording



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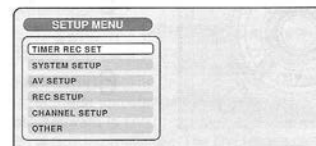
Setting timer recording

Preparation:

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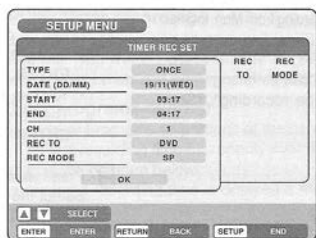
- 1 Press **SETUP**. The SETUP MENU screen appears.



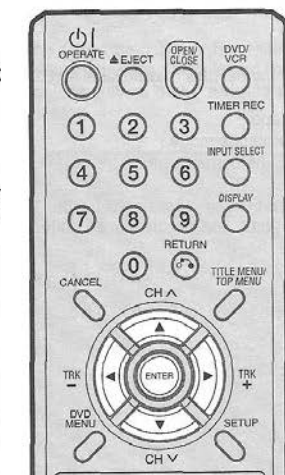
- 2 Press $\blacktriangle$ or $\blacktriangledown$ to select "TIMER REC SET" and press **ENTER**. The TIMER REC SET screen will appear.



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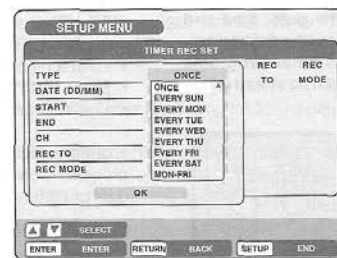
Timer recording



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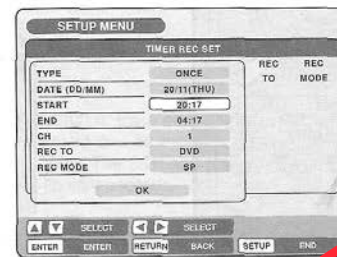
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 - Press $\blacktriangle$ or $\blacktriangledown$ to select the channel to be recorded and press **ENTER**.
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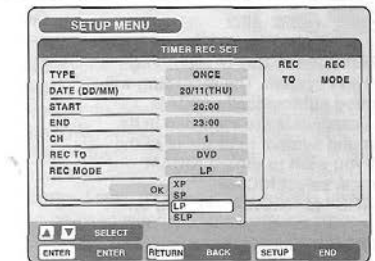
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Checking or changing the timer recording

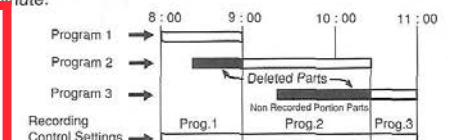
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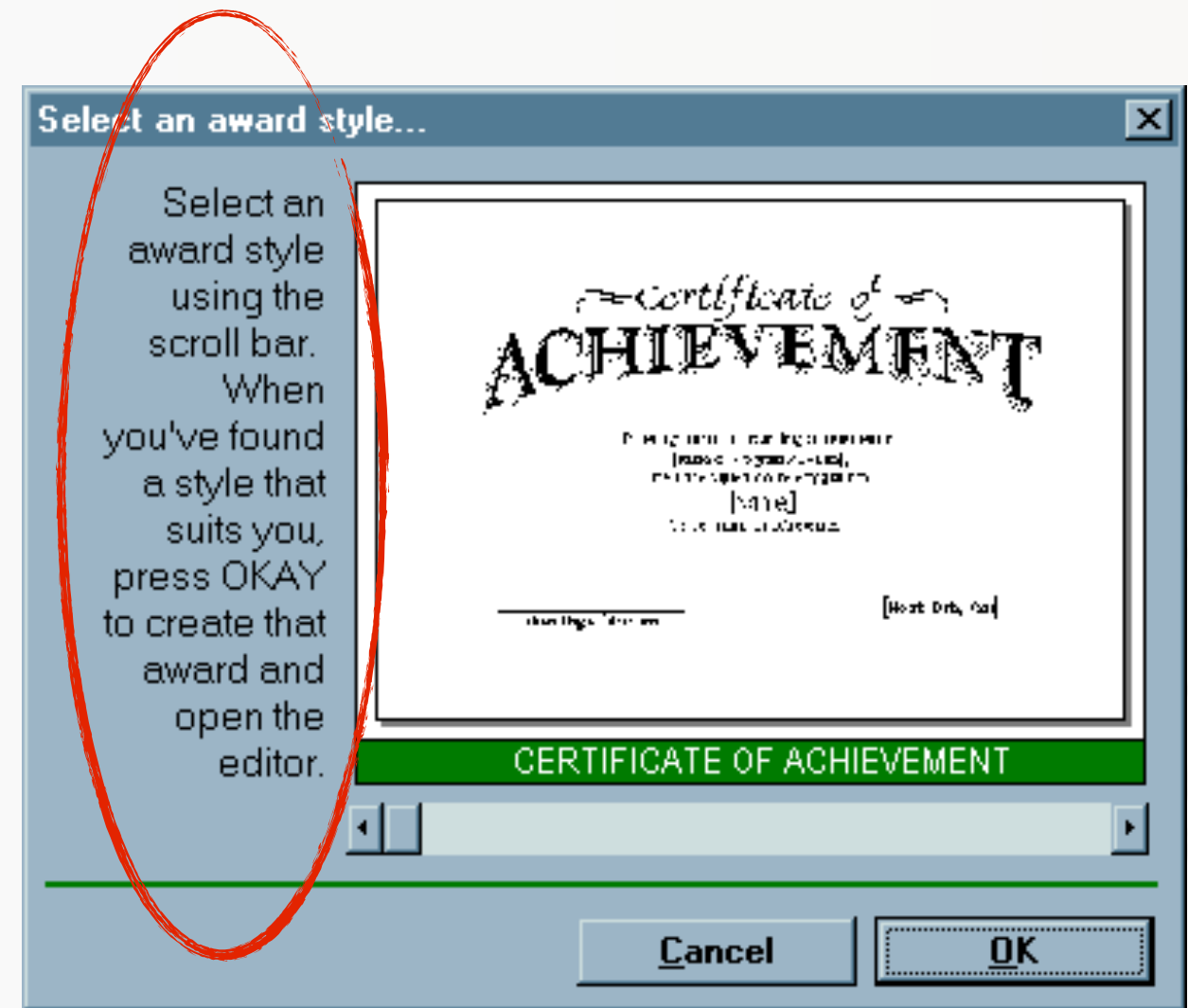
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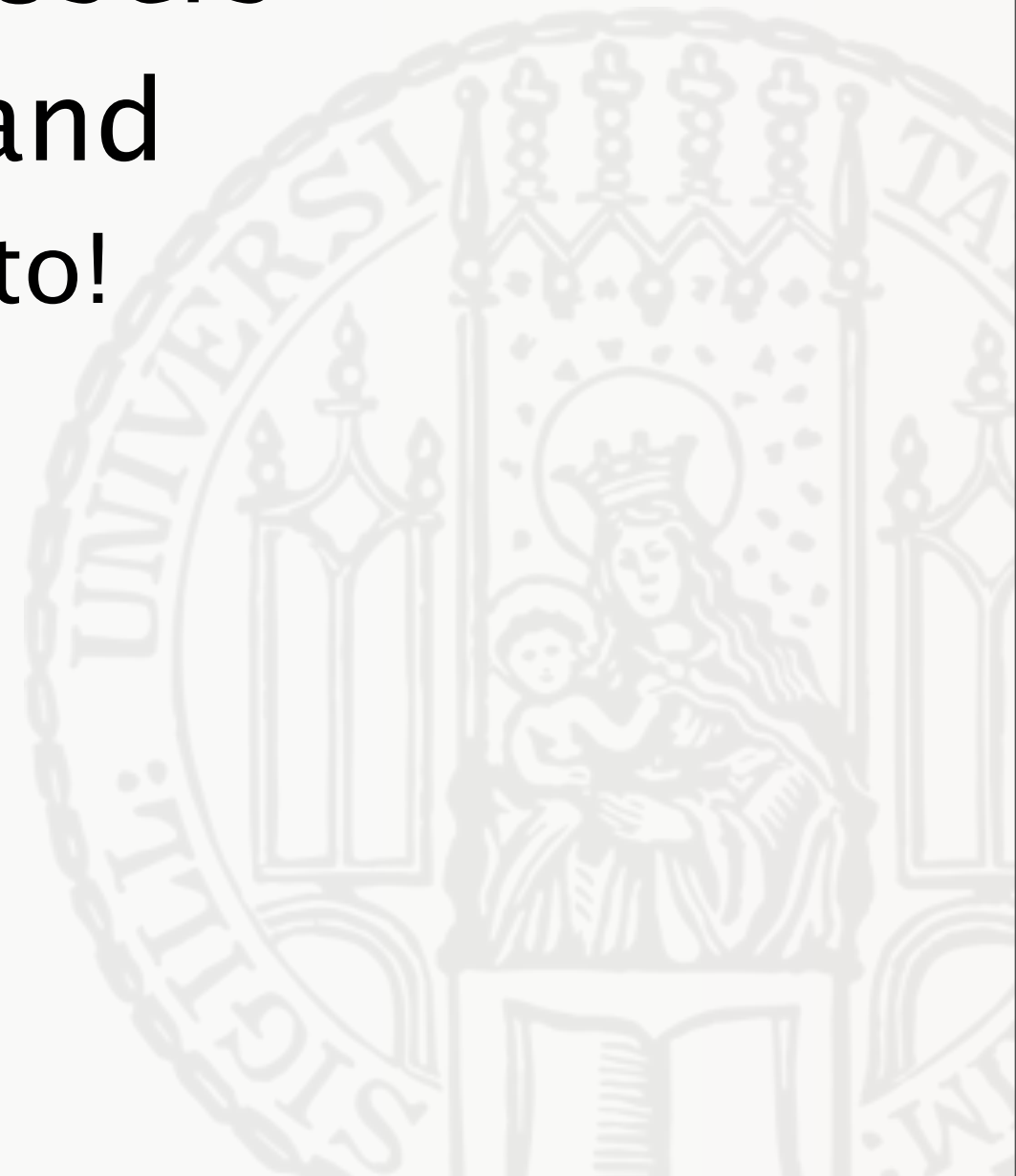
Anleitungen

- Wenige Benutzer lesen Anleitungen
- Falls Anleitungen notwendig sind, beginnt unsere Arbeit



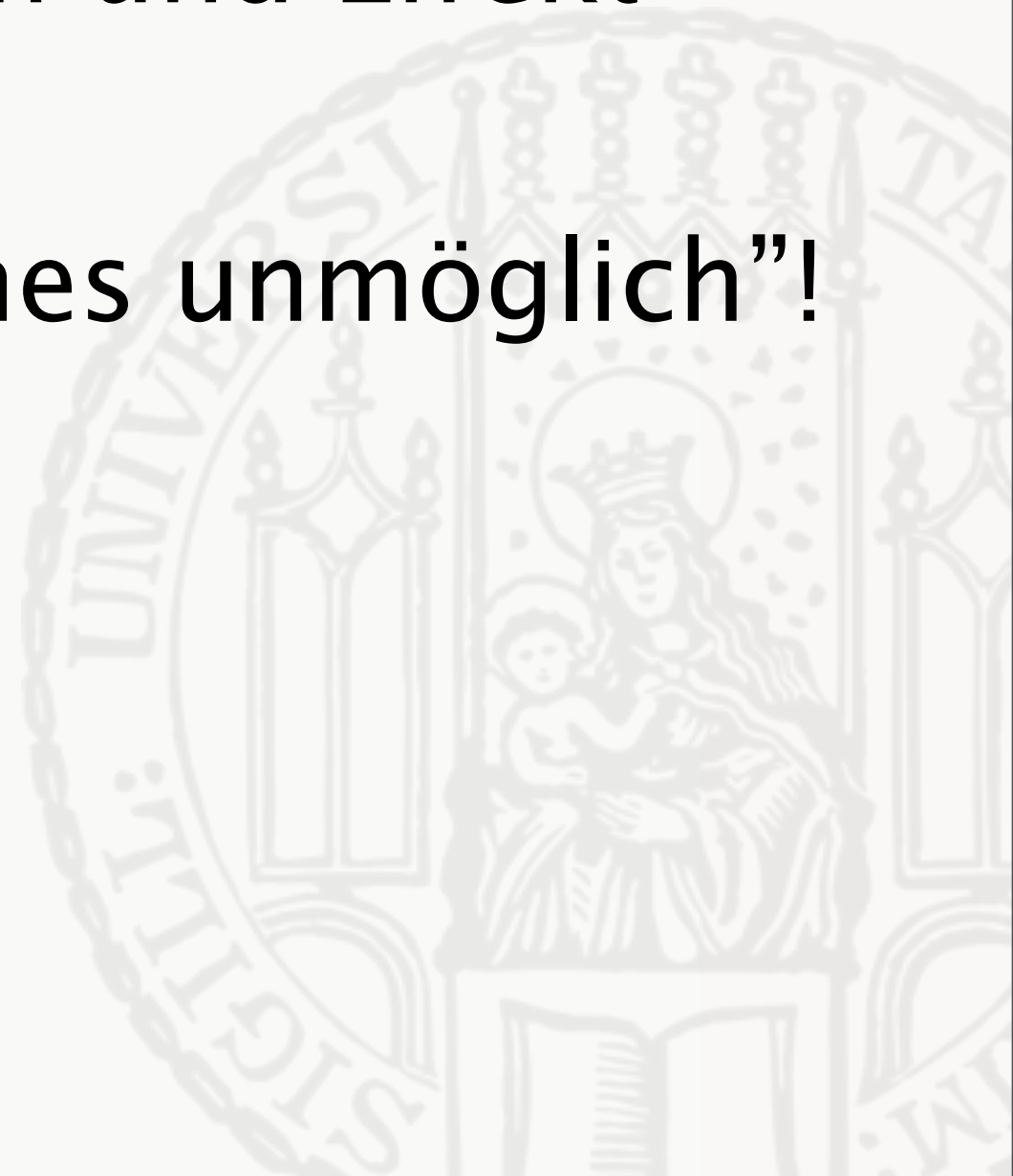
MMI Ziele

- schnelle und einfache Erlernbarkeit
- schnelleres Erledigen der Aufgabe
- subjektive Präferenz des Users
- geringer kognitiver Aufwand
 - user interface design im Auto!



Beachte im Design...

- Visibility
- Feedback
- Mapping zwischen “Aktion und Effekt”
- Affordance
- Constraints, “mach Falsches unmöglich”!



Visibility



- Versuch in den 2.Stock zu fahren:
 - Ziehe deine Karte erst durch den Schlitz
 - zähle von unten das Stockwerk ab (starte bei '0')
 - drücke den Knopf und hoffe es war richtig.

<http://www.baddesigns.com/elcard.html>

Feedback

- Anschalten einer Helmkamera
 - ‘ist die an?’, kein visuelles feedback
 - auditives feedback:
 - 1 x Piepsen heisst ‘Kamera an’, 2 x Piepsen recording, 3 x Piepsen....
 - visuelles Feedback
 - auf dem smart phone
 - Display in Brille?



Visibility + Feedback



<http://www.olivierbau.com/octopocus.php>

Mappings



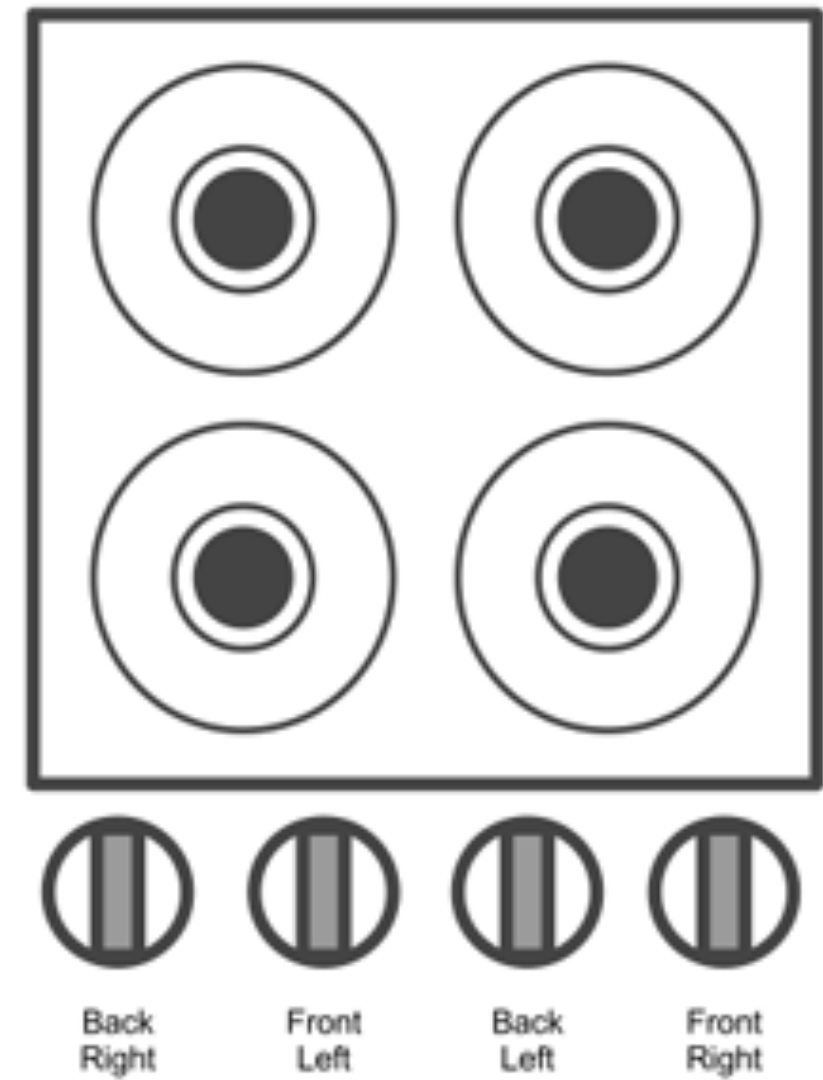
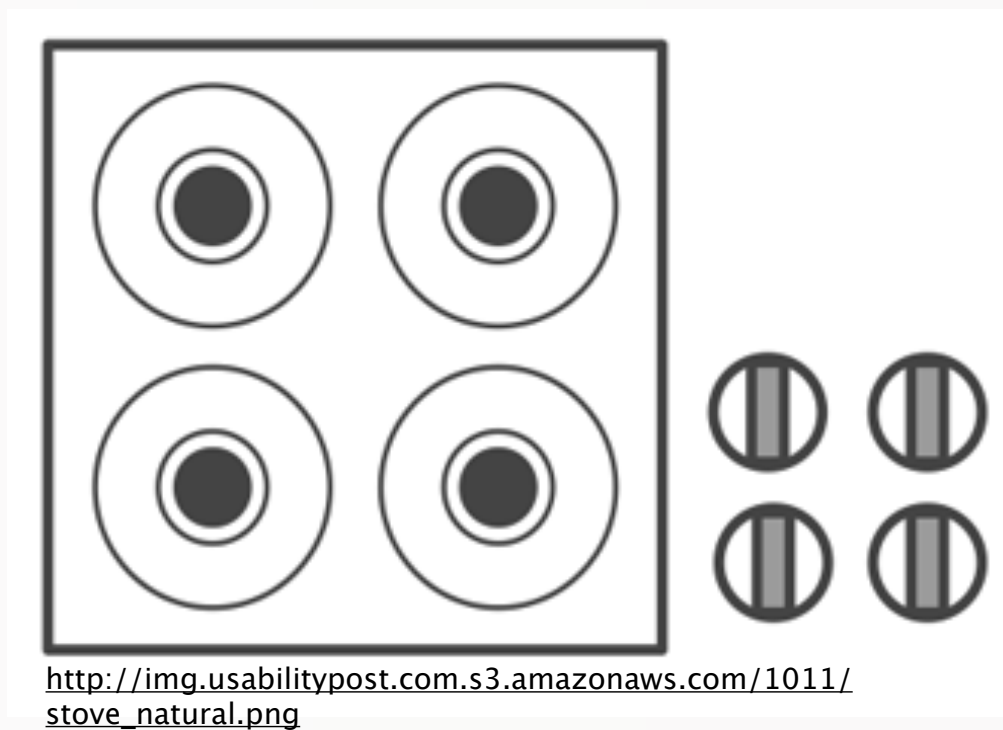
- direkte Zuordnung zwischen Icon und Anschluss



- ‘Um’s Eck denken’, farb-
assoziation zu Label

<http://www.baddesigns.com/mouseconnector.html>

Mappings



Affordances



Constraints

- Constraints anzuwenden ist eine Entscheidung beim UI Design
 - Praktische Möglichkeit zur Fehlervermeidung!
- Physikalische constraints
 - einfache mechanische Einschränkungen
 - hebel kann nicht gedrückt werden
- Kulturelle constraints
 - Einschränkungen, die durch den kulturellen Kontext vorgegeben sind
 - links = warmes Wasser

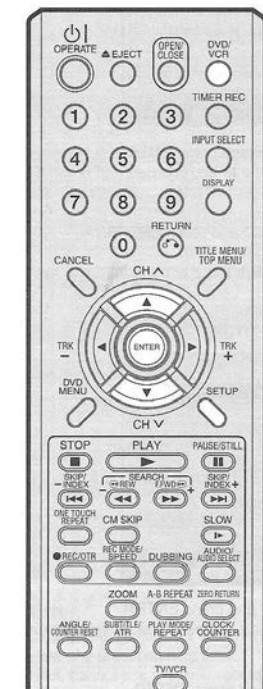


noch einmal zur Fernbedienung

Timer recording



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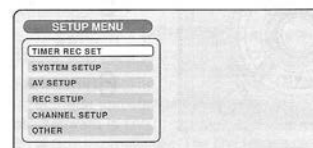
Setting timer recording

Preparation:

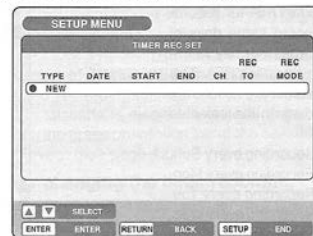
- Turn ON the TV and select its AV channel (this may be labelled EX / AUX etc.)
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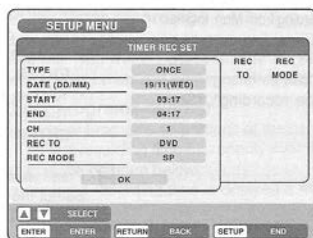
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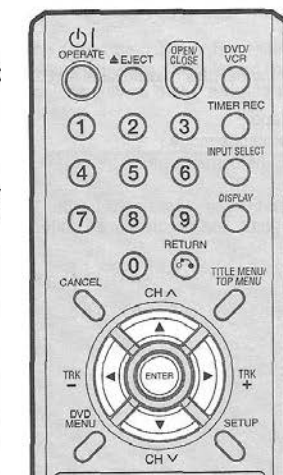
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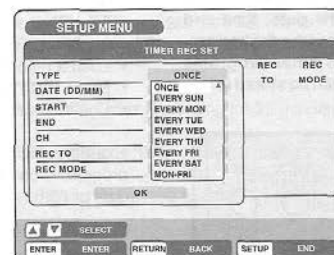
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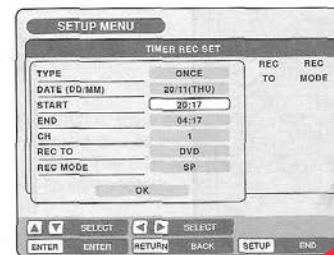
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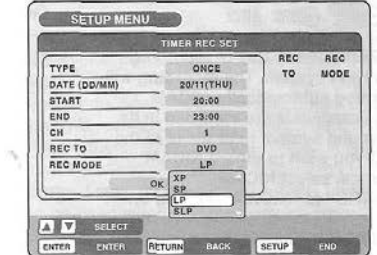
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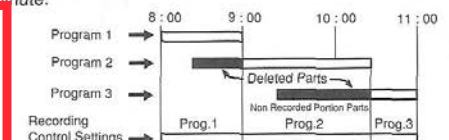
When you want to check the selected timer recording, follow the steps 1 and 2 of "Setting timer recording" and display the TIMER REC SET screen. To change the timer recording, select the program to be changed and press **ENTER**. The changing method is the same as that for the recording a program for the first time.

Cancelling the timer recording

Display the TIMER REC SET screen. Select the program you want to cancel and press **CANCEL**, then the selected program will be erased from the timer recording list.

In case Timer programs-overlap

Do not overlap timer programs as portions of the conflicting programs will be lost. The first recording time has priority over the next recording time as shown in the diagram below. In this case, the next recording time is delayed a maximum of about 1 minute.



- 14 Press **TIMER REC**. The timer indicator "⌚" will appear on the display and the unit stands by for recording.

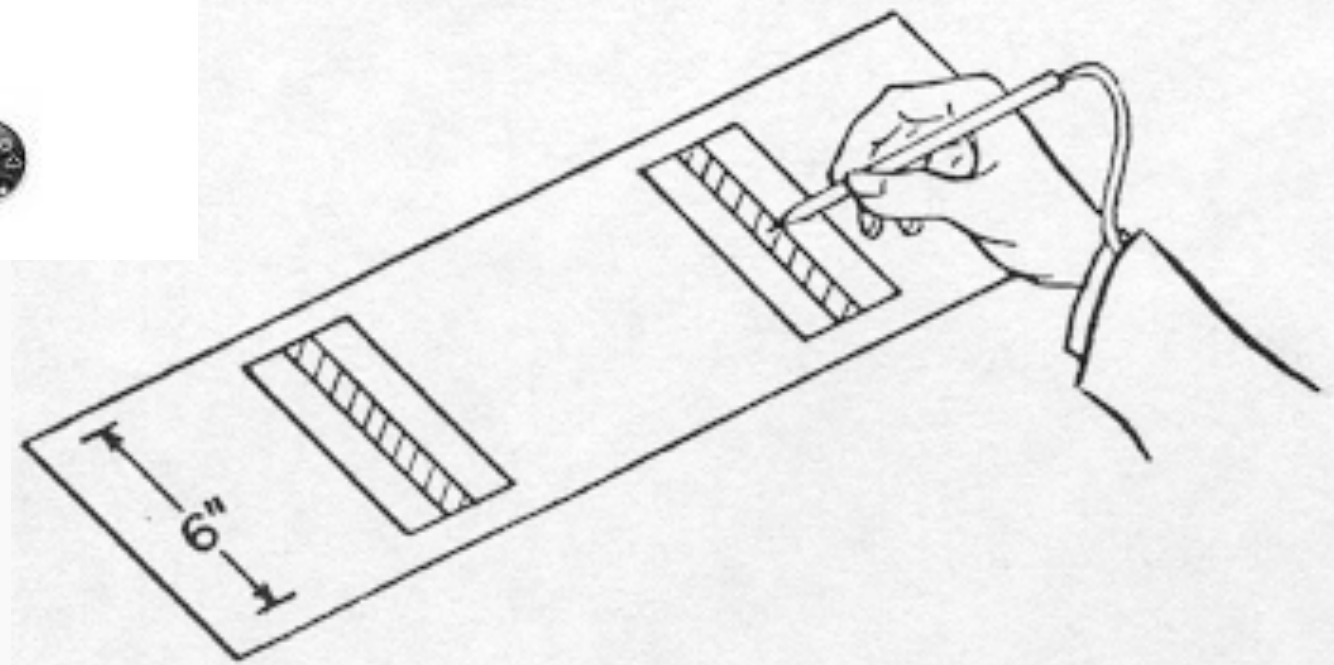
Take-away Message

- Mensch–Maschine Interaktion:
 - viel ‘Intuition’
 - junge Wissenschaft (science of the artificial)
 - Werkzeuge und Techniken zur systematischen Erforschung von Interaktion
 - Guidelines für die Industrie





<http://maxcdn.webappers.com/img/2008/03/fish-eye-dock-menu.png>

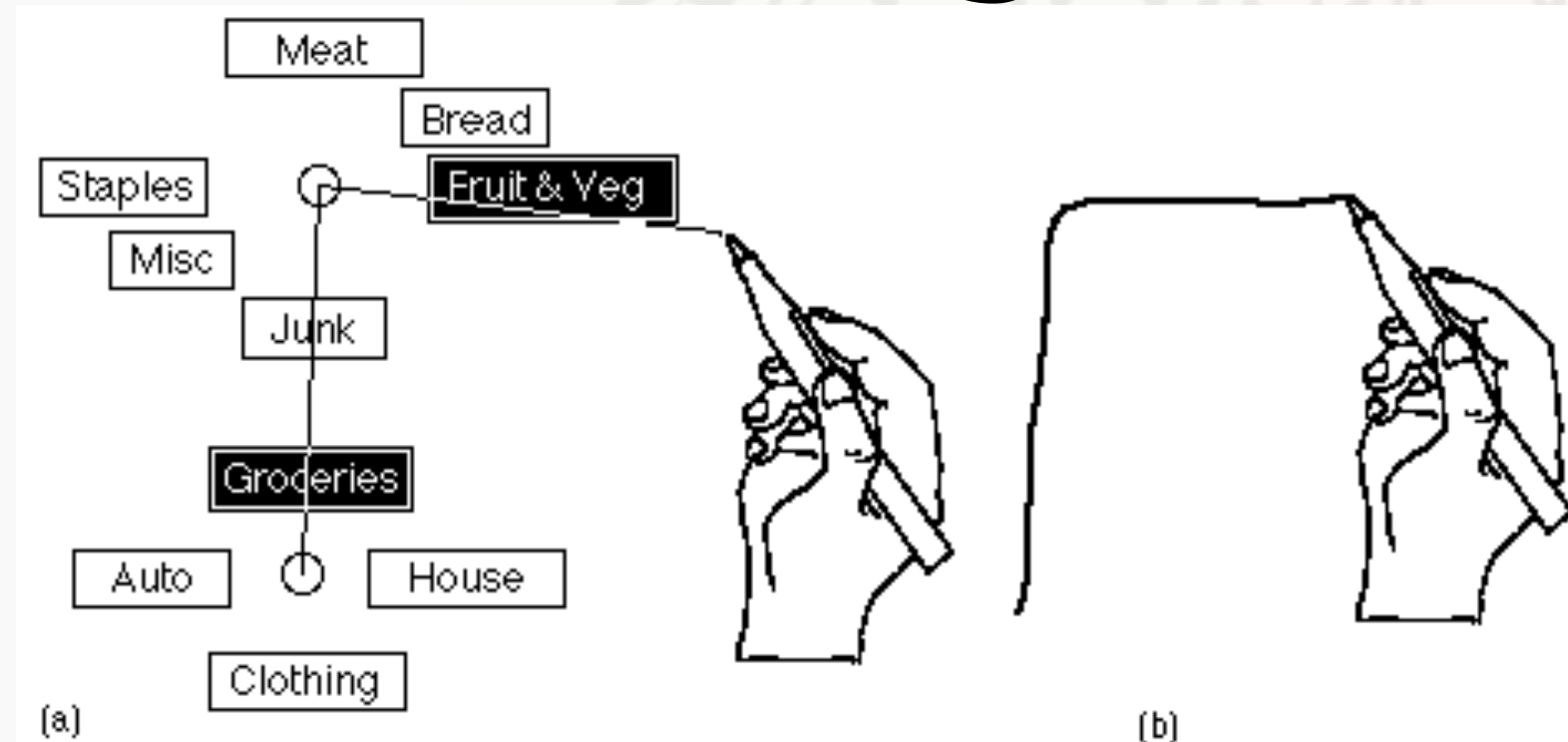


<http://www.tele-actor.net/fitts/tapping.gif>

eine Gesetz inspiriert interaktions-design....

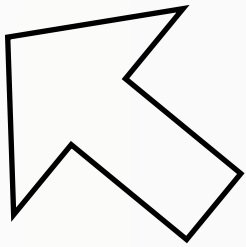


<http://patrickbaudisch.com/projects/dragandpop/>



http://www.billbuxton.com/MMExpert_CHI1.gif

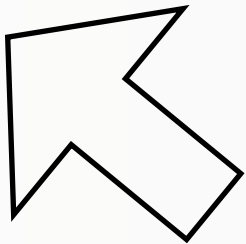
Bewegungszeit



Target

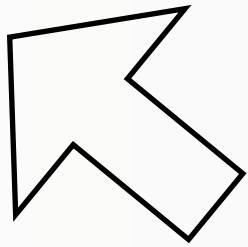


Bewegungszeit

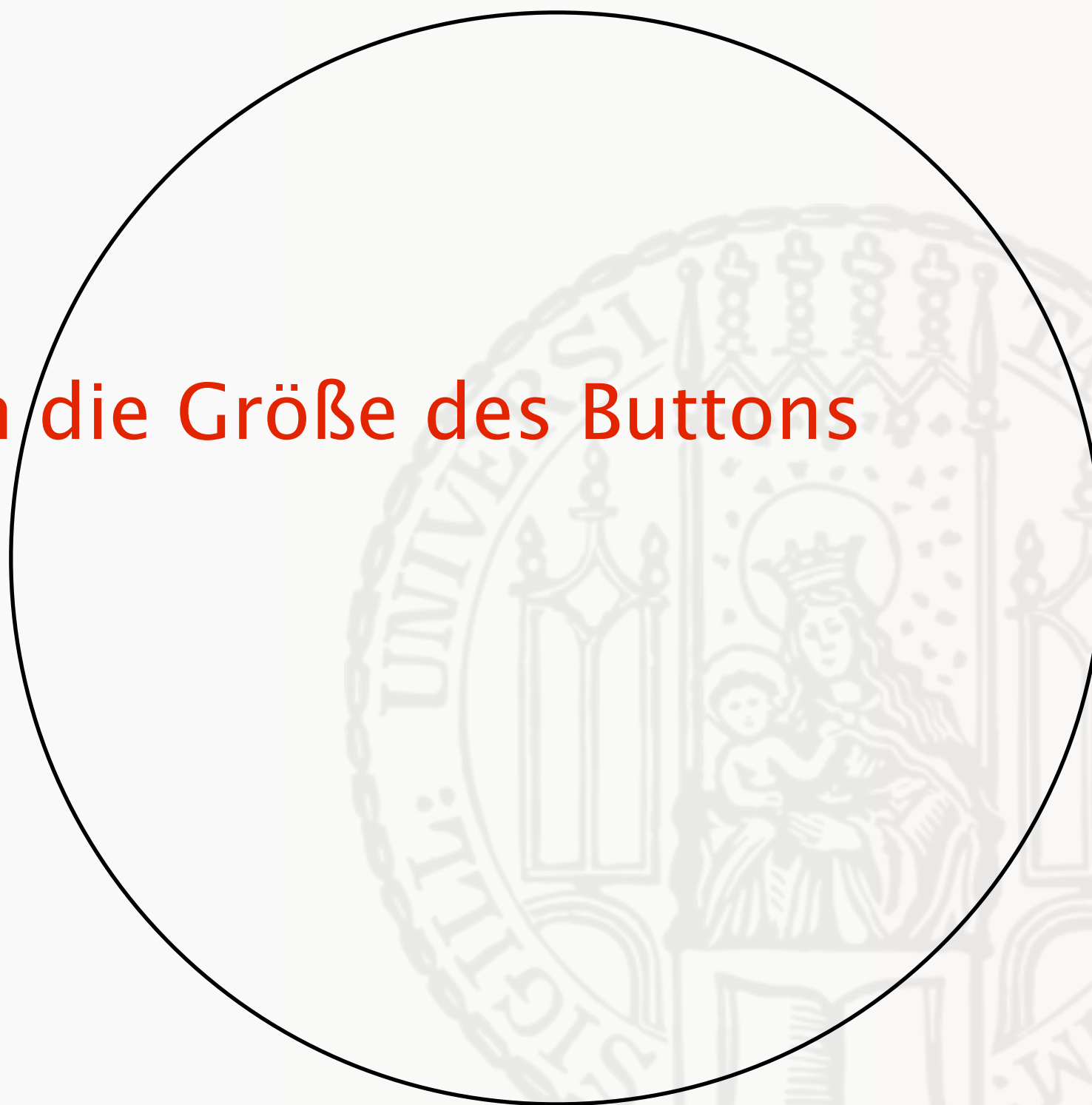


Target

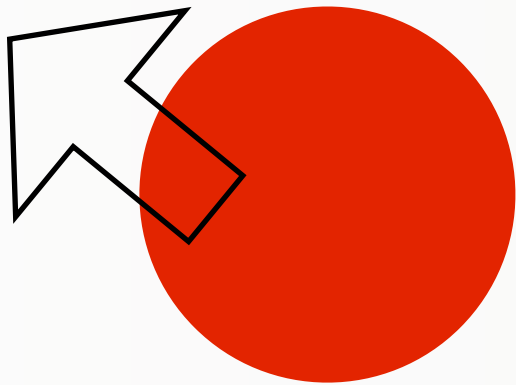
Bewegungszeit



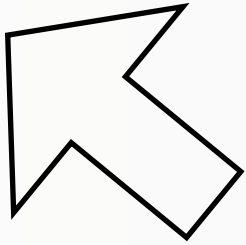
beeinflusst durch die Größe des Buttons



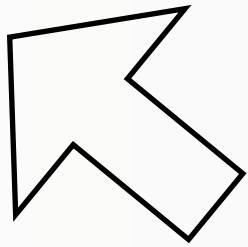
Bewegungszeit



Bewegungszeit

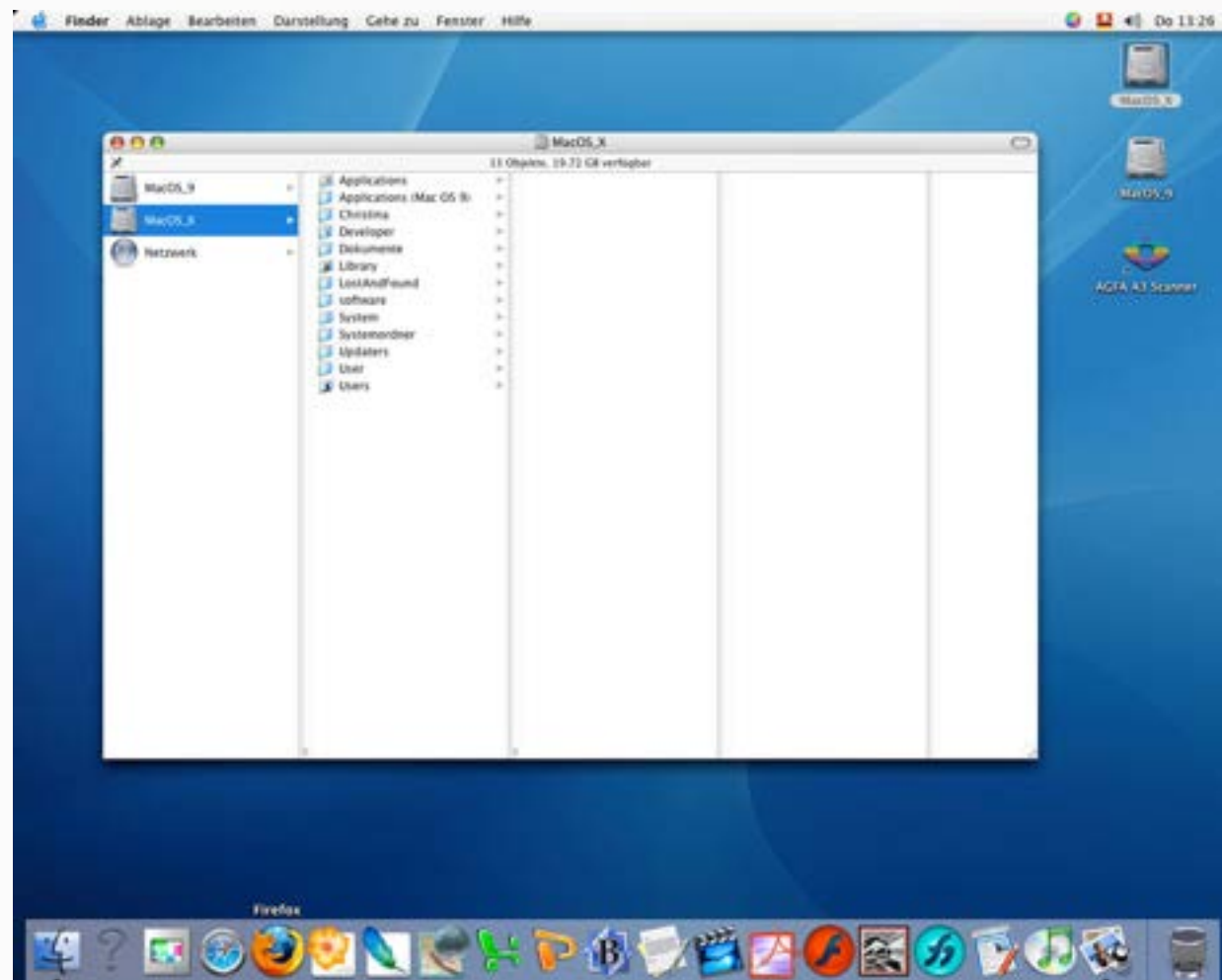


Bewegungszeit

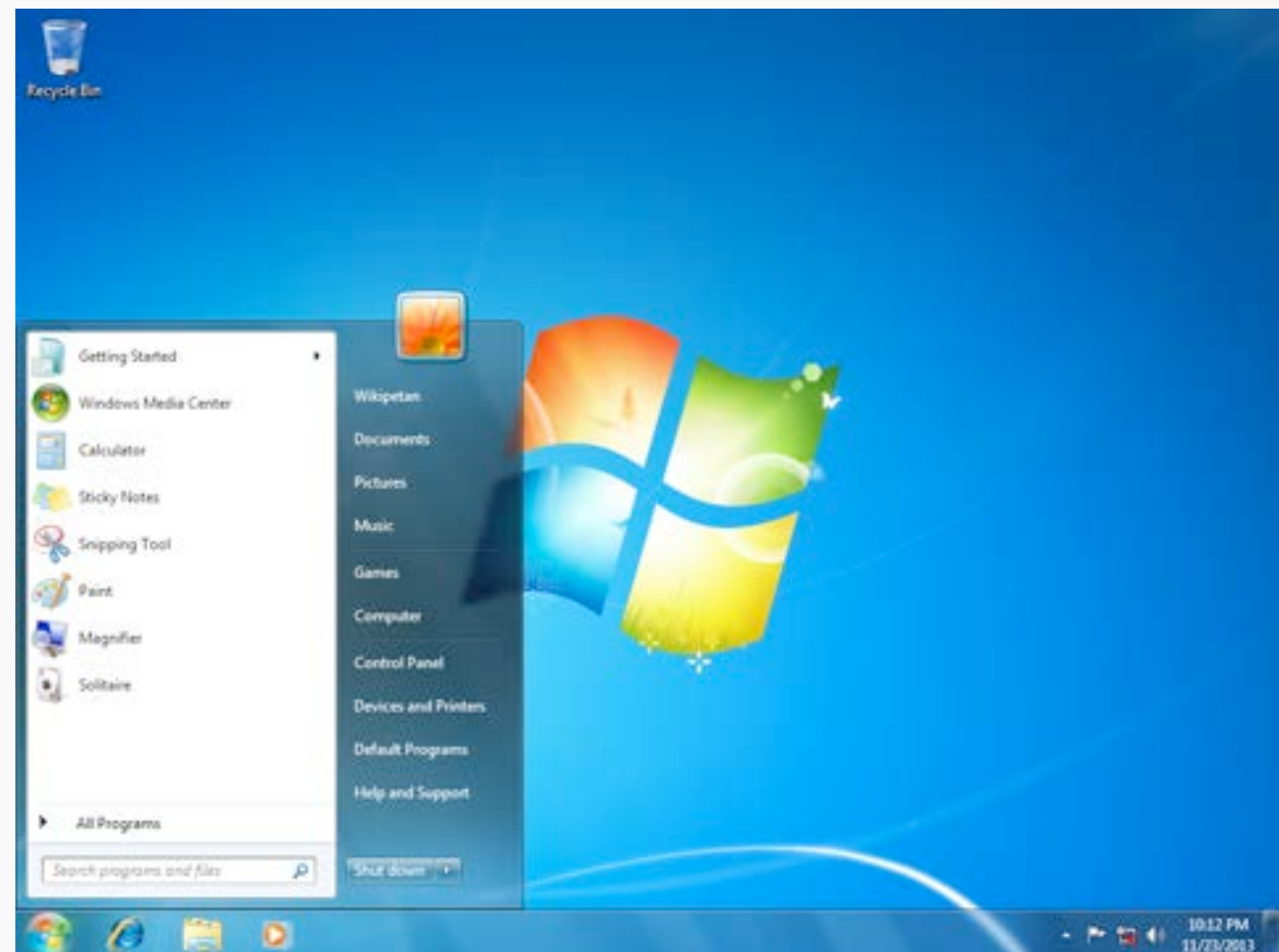


beeinflusst durch die Distanz zum Button

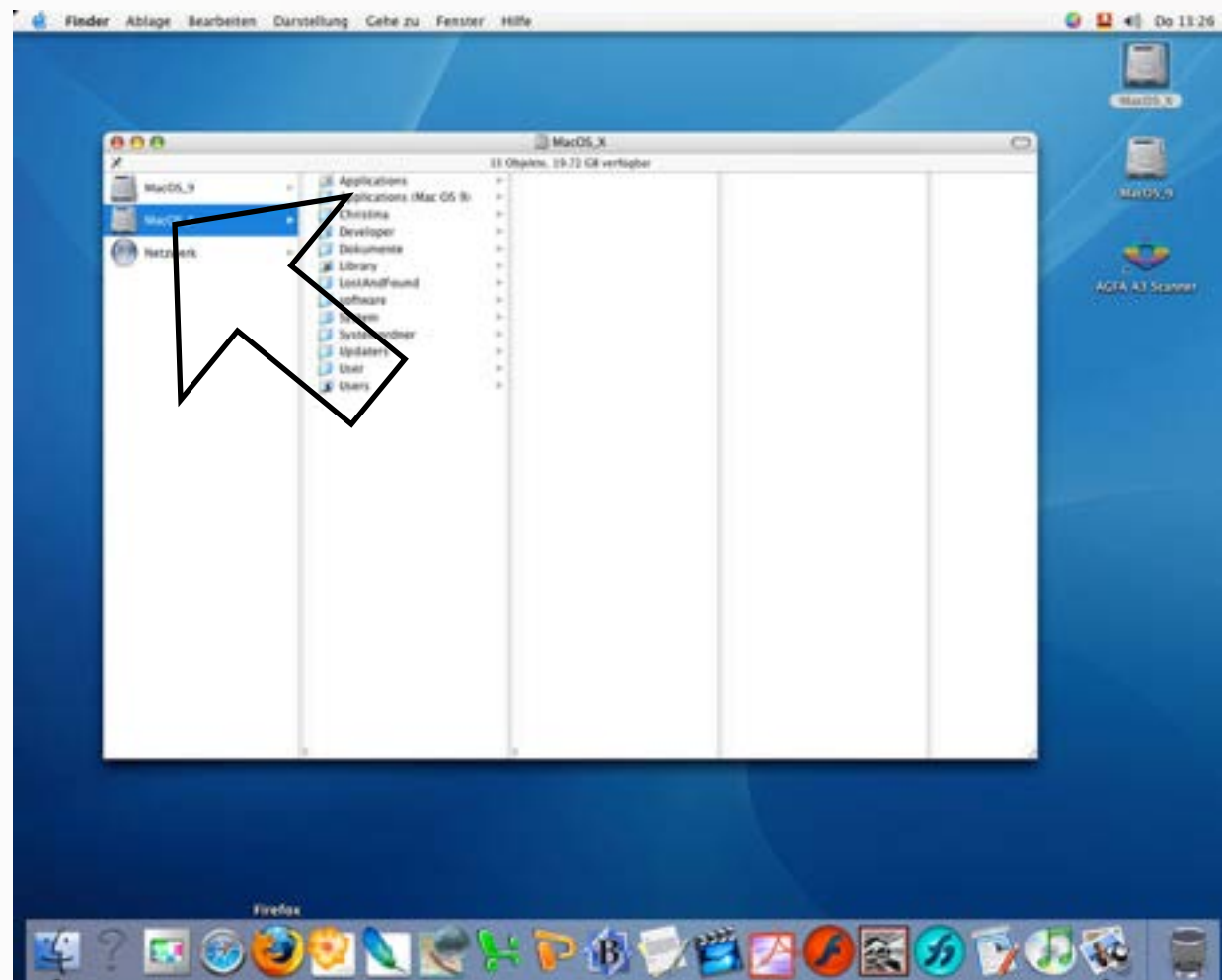




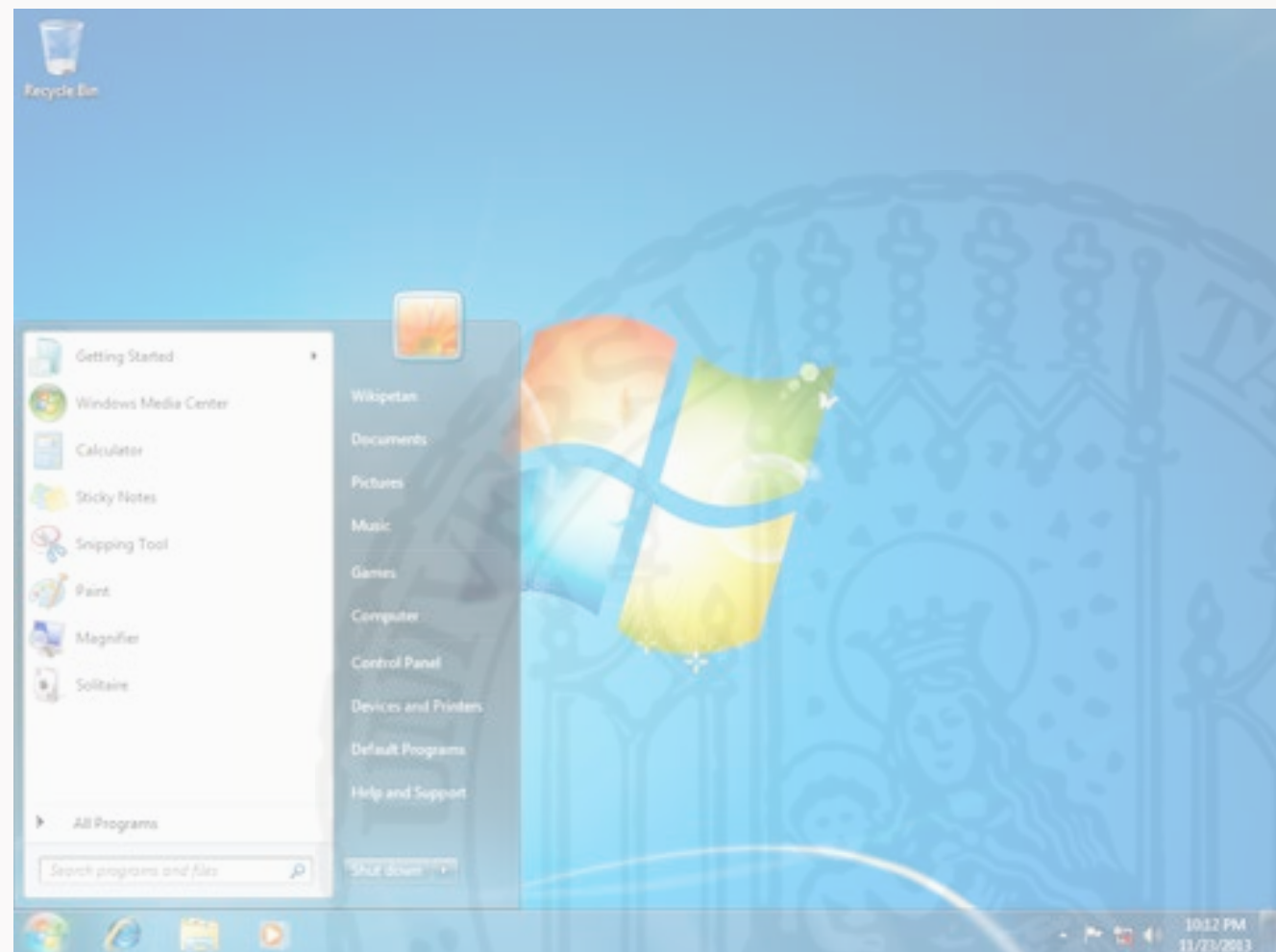
http://www.e-cartouche.ch/content_reg/cartouche/ui_access/en/image/gui_hist/gui_mac.jpg



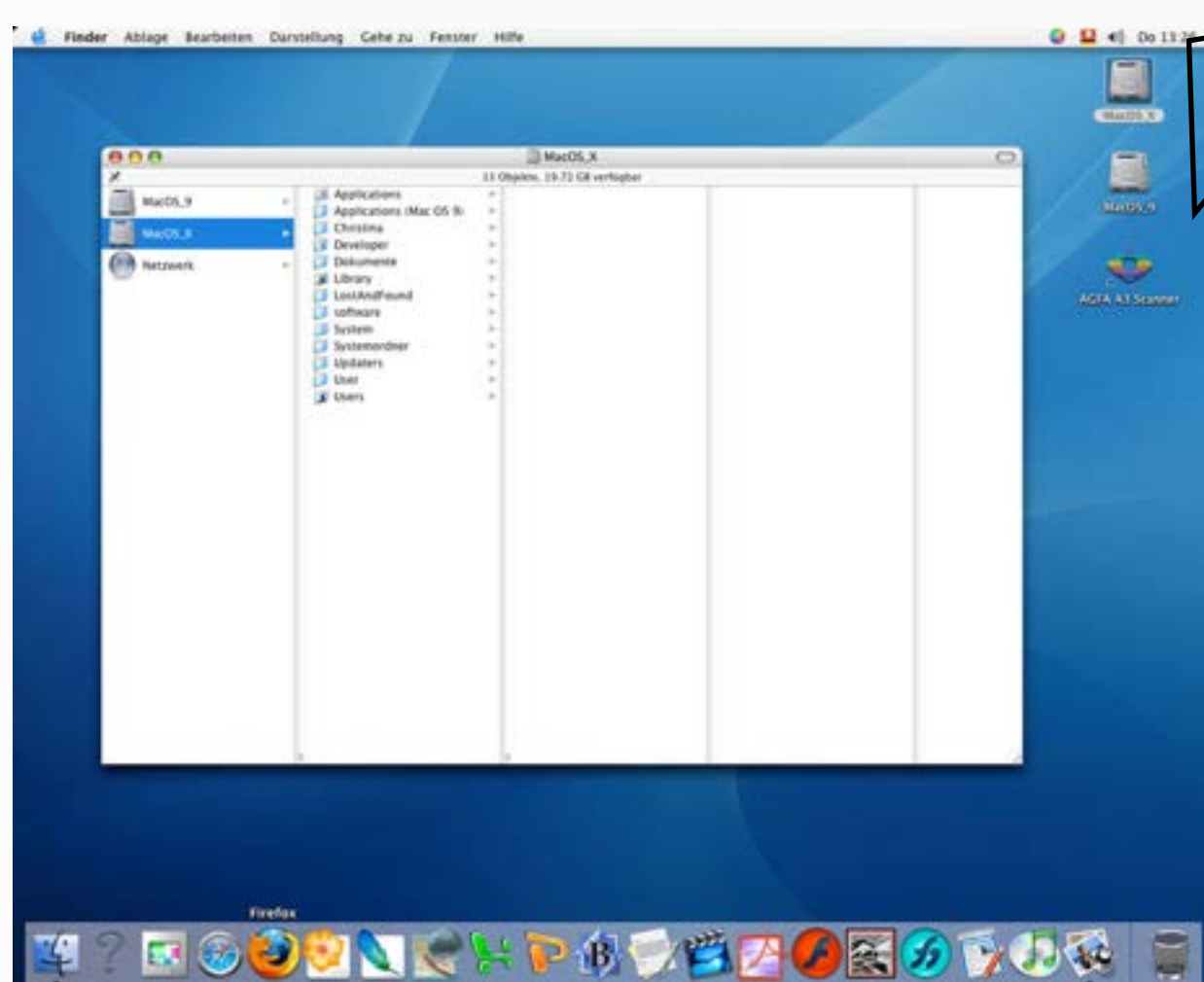
http://upload.wikimedia.org/wikipedia/en/b/bd/Windows_7.png



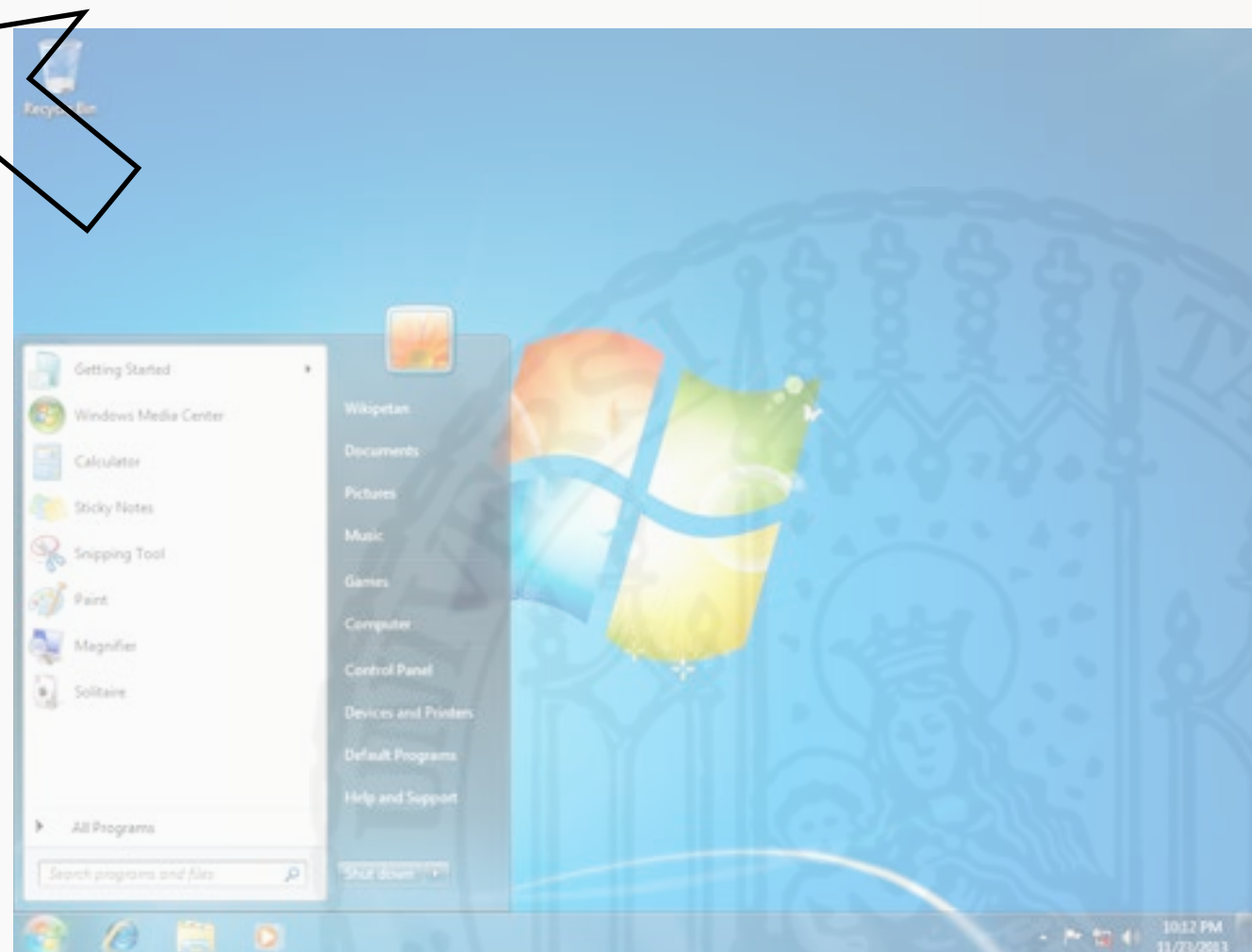
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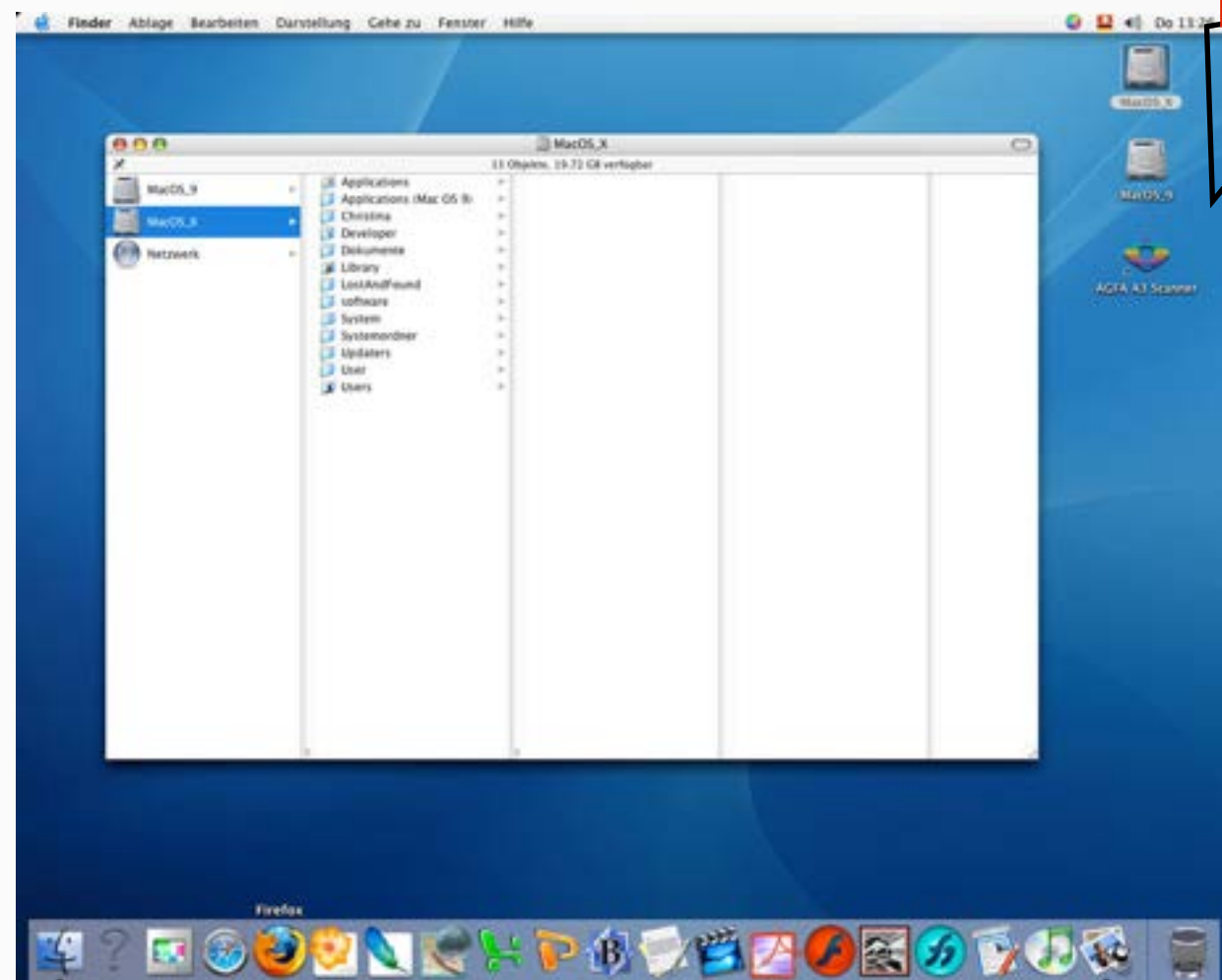
http://upload.wikimedia.org/wikipedia/en/b/bd/Windows_7.png



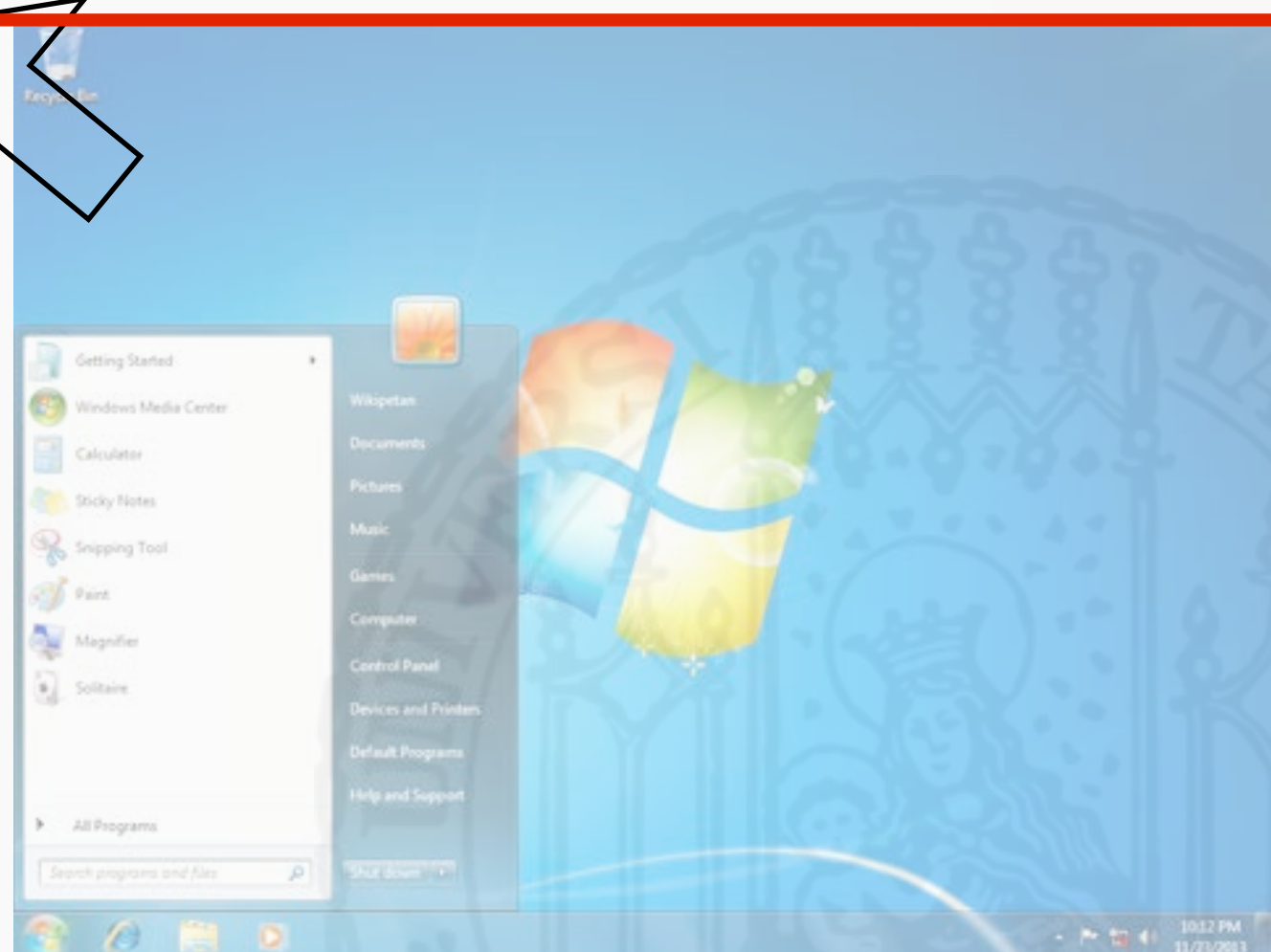
http://www.e-cartouche.ch/content_reg/cartouche/ui_access/en/image/gui_hist/gui_mac.jpg



http://upload.wikimedia.org/wikipedia/en/b/bd/Windows_7.png



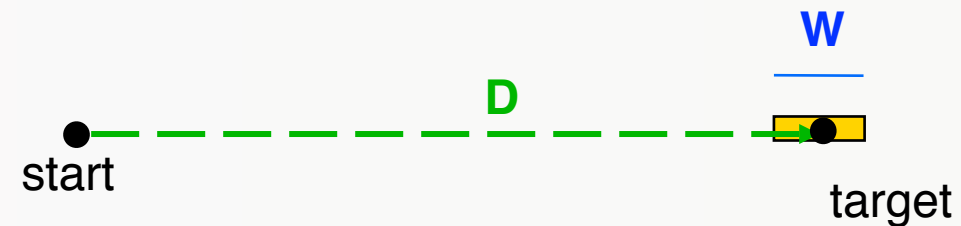
http://www.e-cartouche.ch/content_reg/cartouche/ui_access/en/image/gui_hist/gui_mac.jpg



http://upload.wikimedia.org/wikipedia/en/b/bd/Windows_7.png

Fitts' law

$$MT = a + b \log_2 \left(1 + \frac{D}{W} \right)$$



- **MT**: Bewegungszeit
- **a und b**: Konstanten, die abhängig vom 'pointing system' (user/input device)
- **D**: Distanz zum Zielobjekt
- **W**: Größe des Zielobjektes

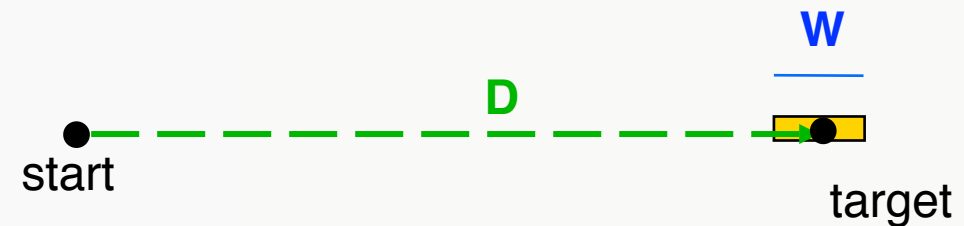
Fitts' law

$$MT = a + b \log_2 \left(1 + \frac{D}{W} \right)$$

- **D/W tradeoff zwischen Distanz und Grösse eines Zielobjektes**
- **index-of-difficulty = D/W**
 - unabhängig von Benutzer oder Eingabegerätes
 - Schwierigkeit einer Zeigeaufgabe

Wie kann ich MT optimieren?

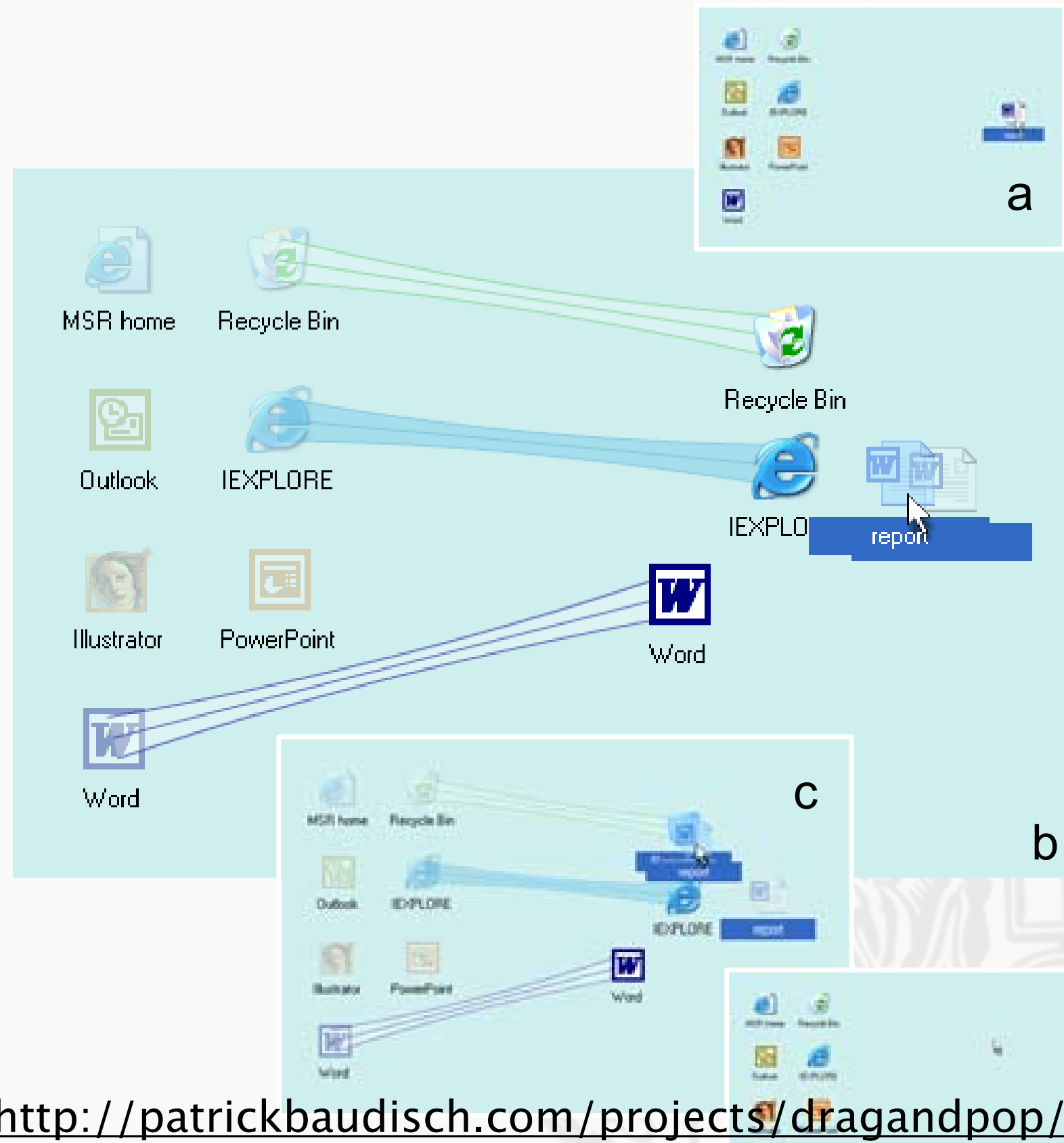
$$MT = a + b \log_2 \left(1 + \frac{D}{W} \right)$$



- **Zeige- and Menutechniken**
 - minimiere D
 - maximiere W
 - minimiere both

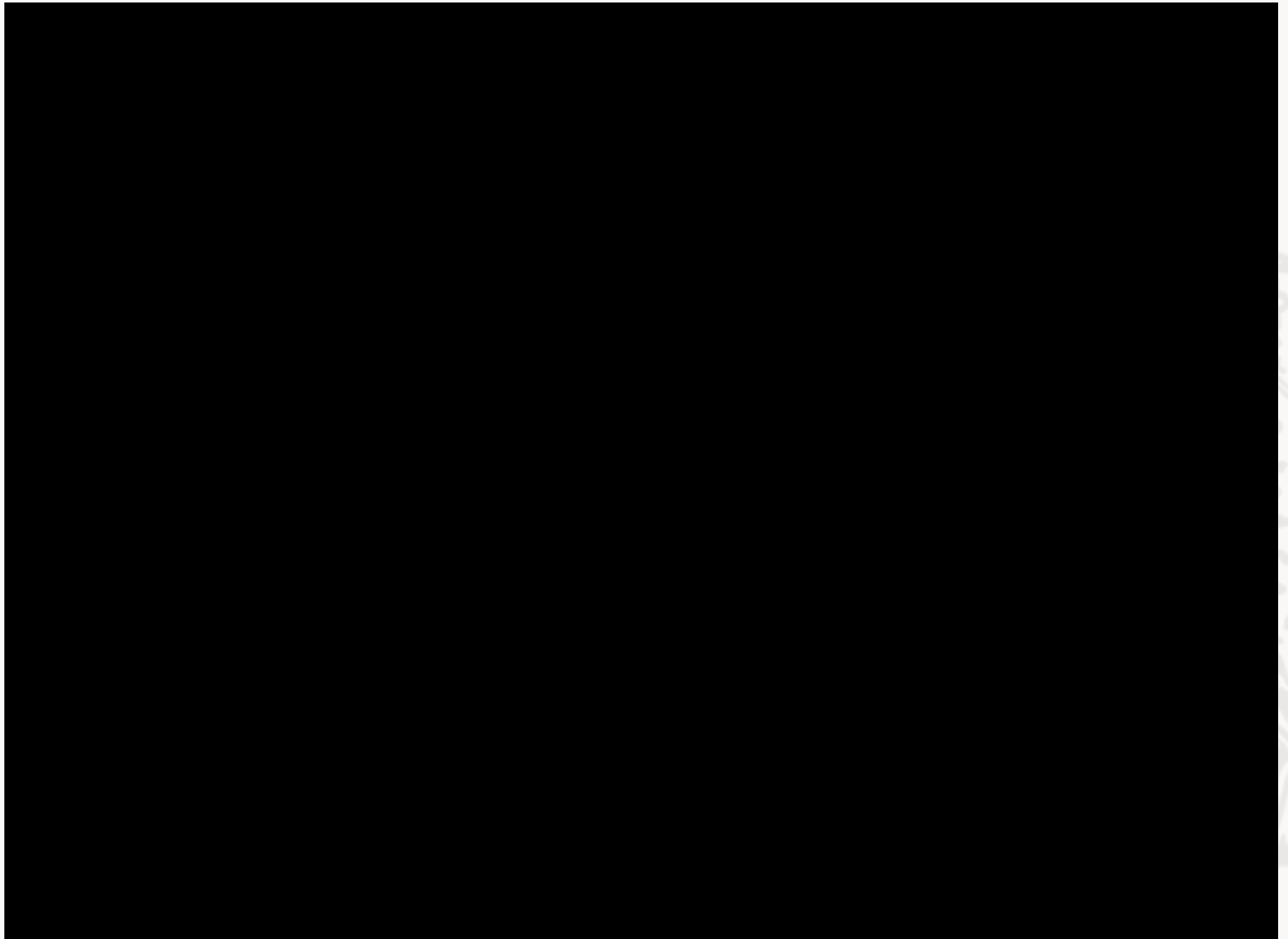


Drag-and-pop 'decrease D'



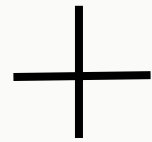
<http://patrickbaudisch.com/projects/dragandpop/>

Drag-and-pop 'decrease D'

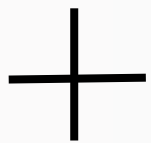
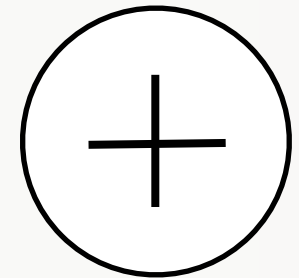


Bubble Cursor 'increase W'

pixel cursor

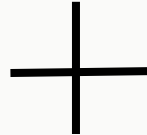


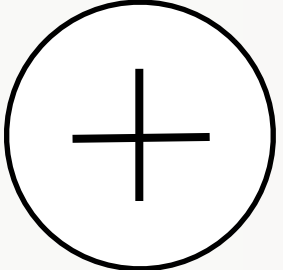
bubble cursor

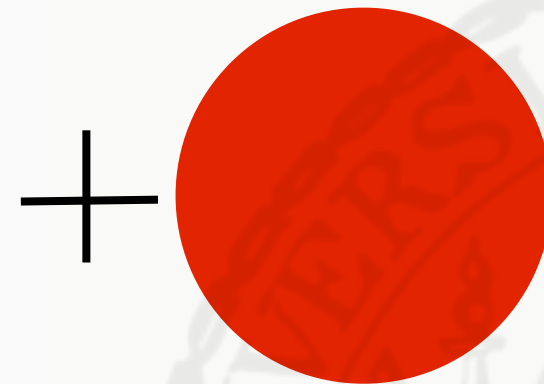


Literature: Kabbash et al., "The Prince Technique: Fitts' Law and Selection Using Area Cursor". CHI'95

Bubble Cursor 'increase W'

pixel cursor 

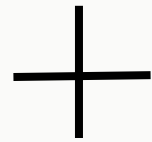
bubble cursor 



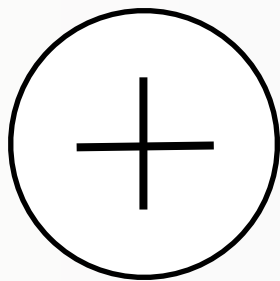
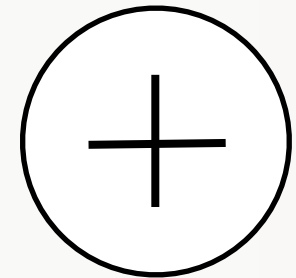
Literature: Kabbash et al., "The Prince Technique: Fitts' Law and Selection Using Area Cursor". CHI'95

Bubble Cursor 'increase W'

pixel cursor

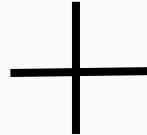


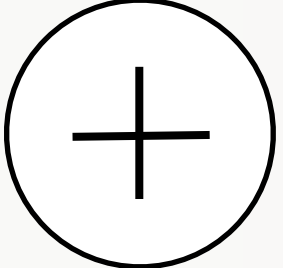
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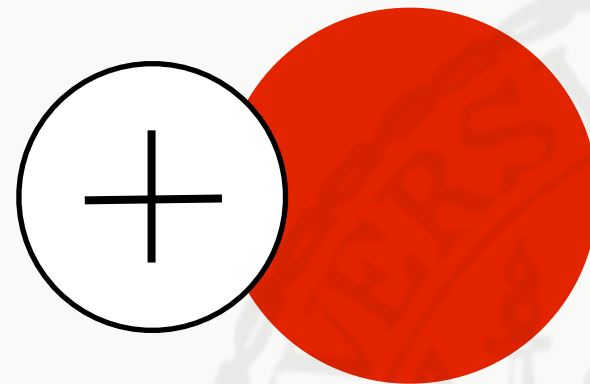


Literature: Kabbash et al., "The Prince Technique: Fitts' Law and Selection Using Area Cursor". CHI'95

Bubble Cursor 'increase W'

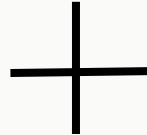
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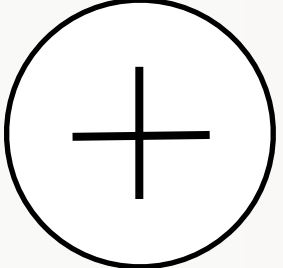
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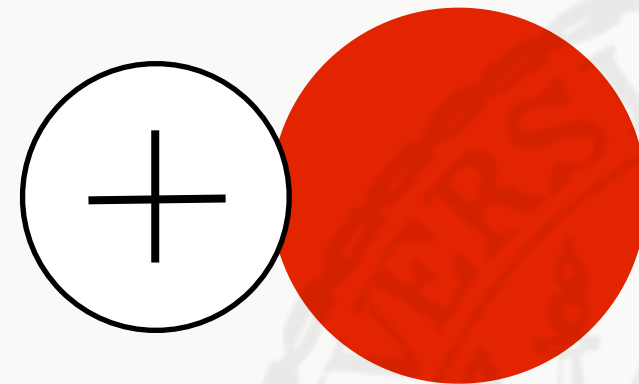


Literature: Kabbash et al., "The Prince Technique: Fitts' Law and Selection Using Area Cursor". CHI'95

Bubble Cursor 'increase W'

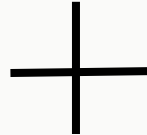
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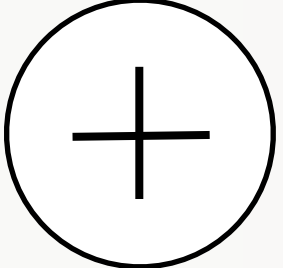
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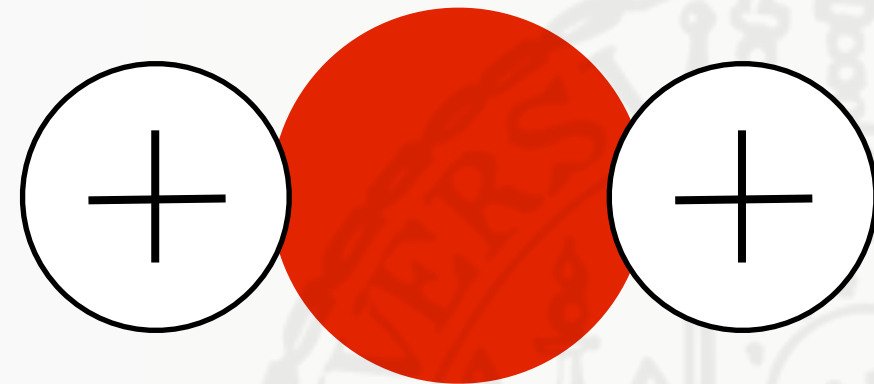


Literature: Kabbash et al., "The Prince Technique: Fitts' Law and Selection Using Area Cursor". CHI'95

Bubble Cursor 'increase W'

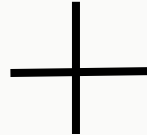
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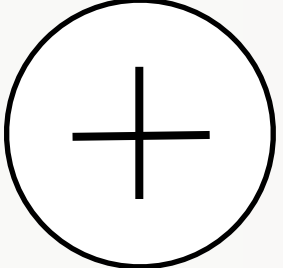
bubble cursor 

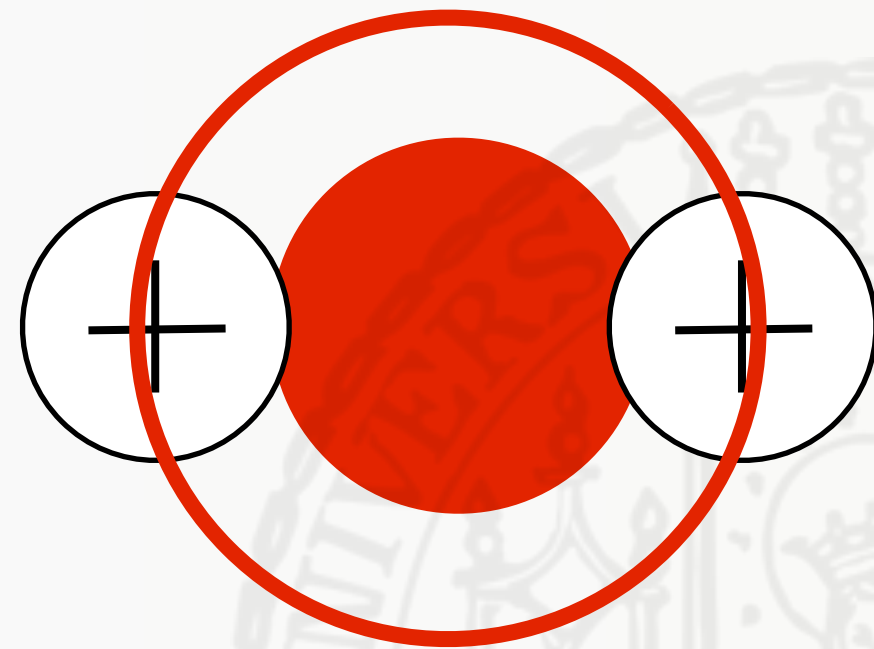


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Bubble Cursor 'increase W'

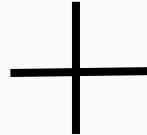
pixel cursor 

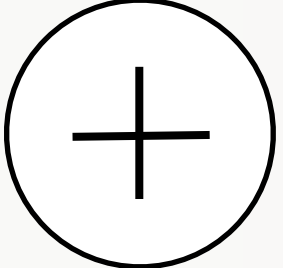
bubble cursor 

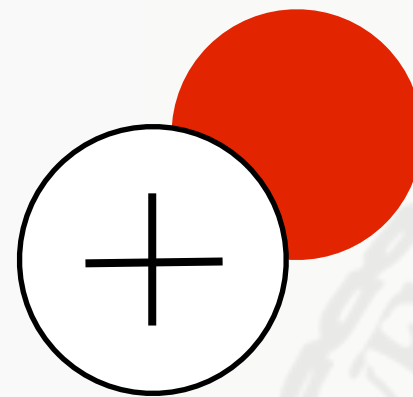


Literature: Kabbash et al., "The Prince Technique: Fitts' Law and Selection Using Area Cursor". CHI'95

Bubble Cursor 'increase W'

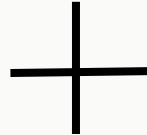
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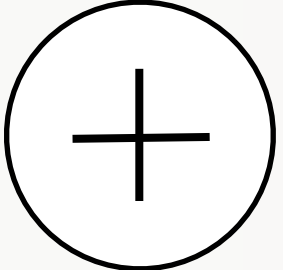
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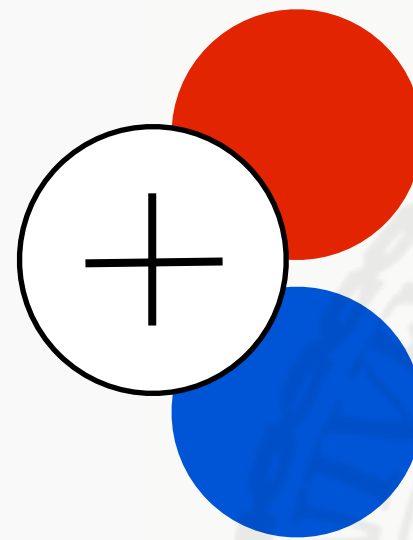


Literature: Kabbash et al., "The Prince Technique: Fitts' Law and Selection Using Area Cursor". CHI'95

Bubble Cursor 'increase W'

pixel cursor 

bubble cursor 



Literature: Kabbash et al., "The Prince Technique: Fitts' Law and Selection Using Area Cursor". CHI'95

Bubble Cursor 'increase W'

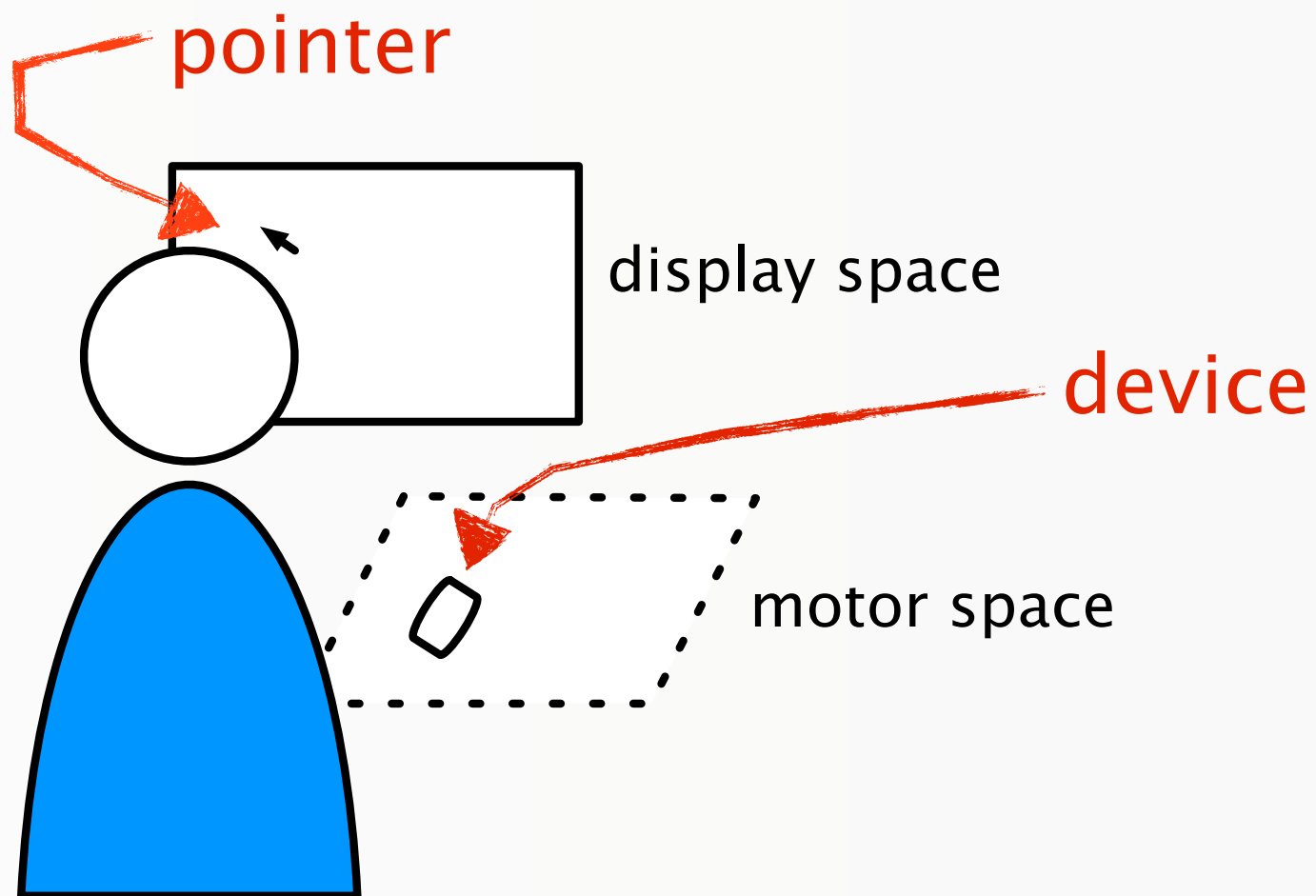
The Bubble Cursor:
Enhancing Target Acquisition by
Dynamic Resizing of the
Cursor's Activation Area

Tovi Grossman
Ravin Balakrishnan

Dynamic Graphics Project Lab
Department of Computer Science
University of Toronto
www.dgp.toronto.edu



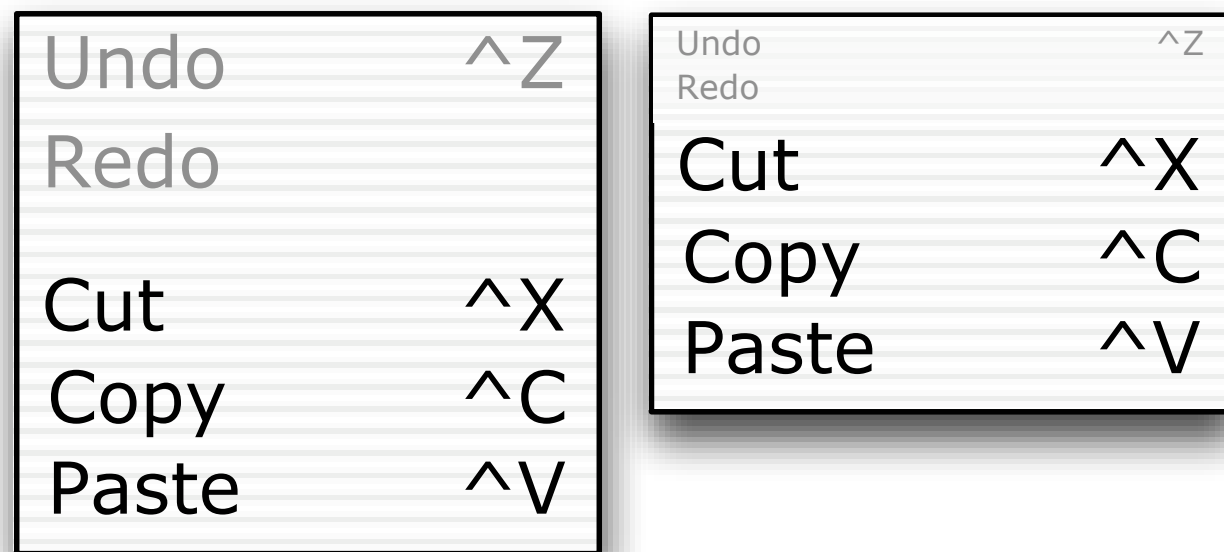
Mausbeschleunigungstechniken



$$CDgain = \frac{V_{pointer}}{V_{device}}$$

Semantic Pointing – “decrease D” + “increase W”

- Dynamisches Anpassen des CD-gain je nach ‘Wichtigkeit’ des Zielobjektes.



(a) unchanged visual version (b) motor space version

Figure 13: Menu redesign



Figure 14: Button redesign

(a) unchanged visual version (b) motor space version

Zeigetechniken

- minimiere D
- minimiere W
- minimiere Beides

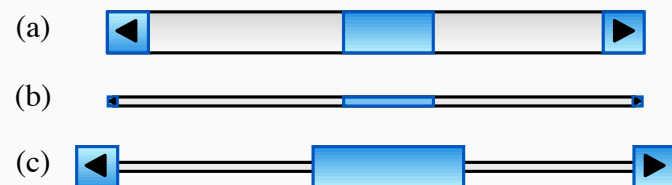
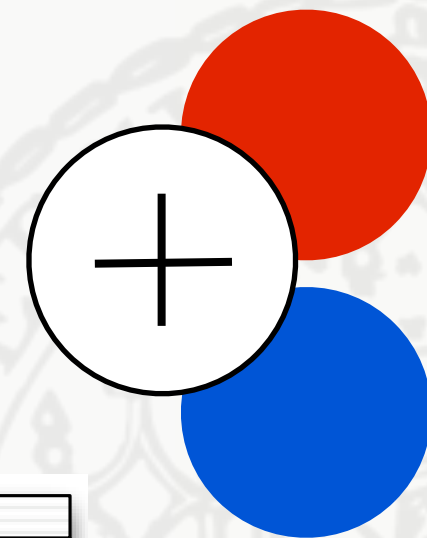
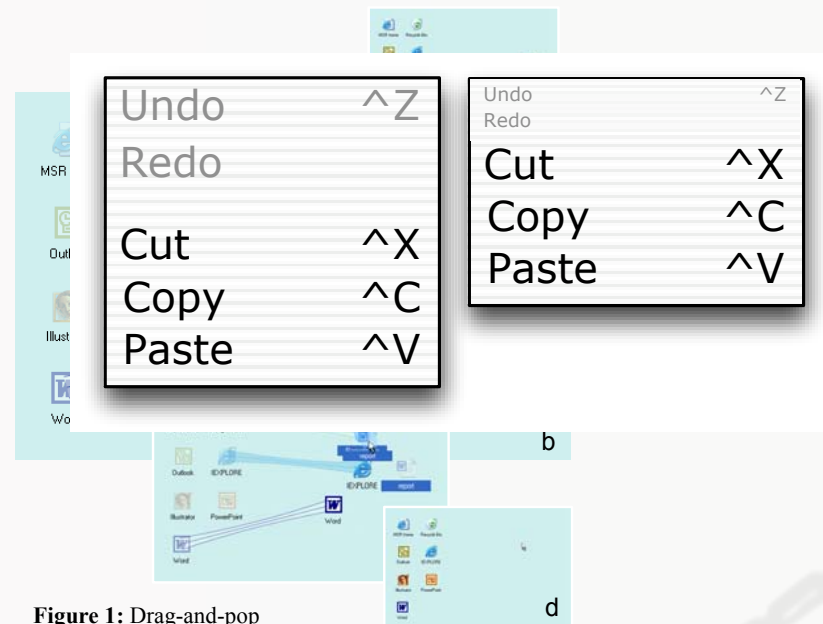
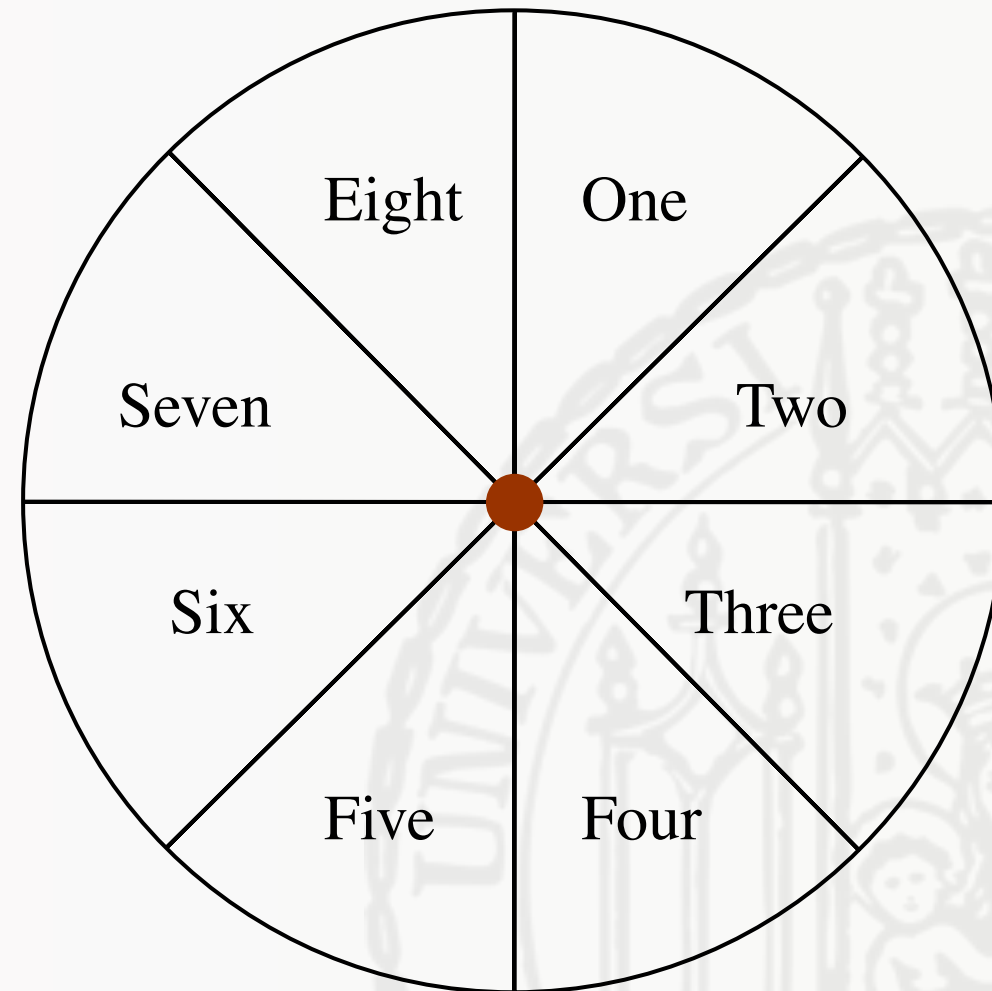


Figure 14: Button redesign
(a) unchanged visual version (b) motor space version

Menutechniken

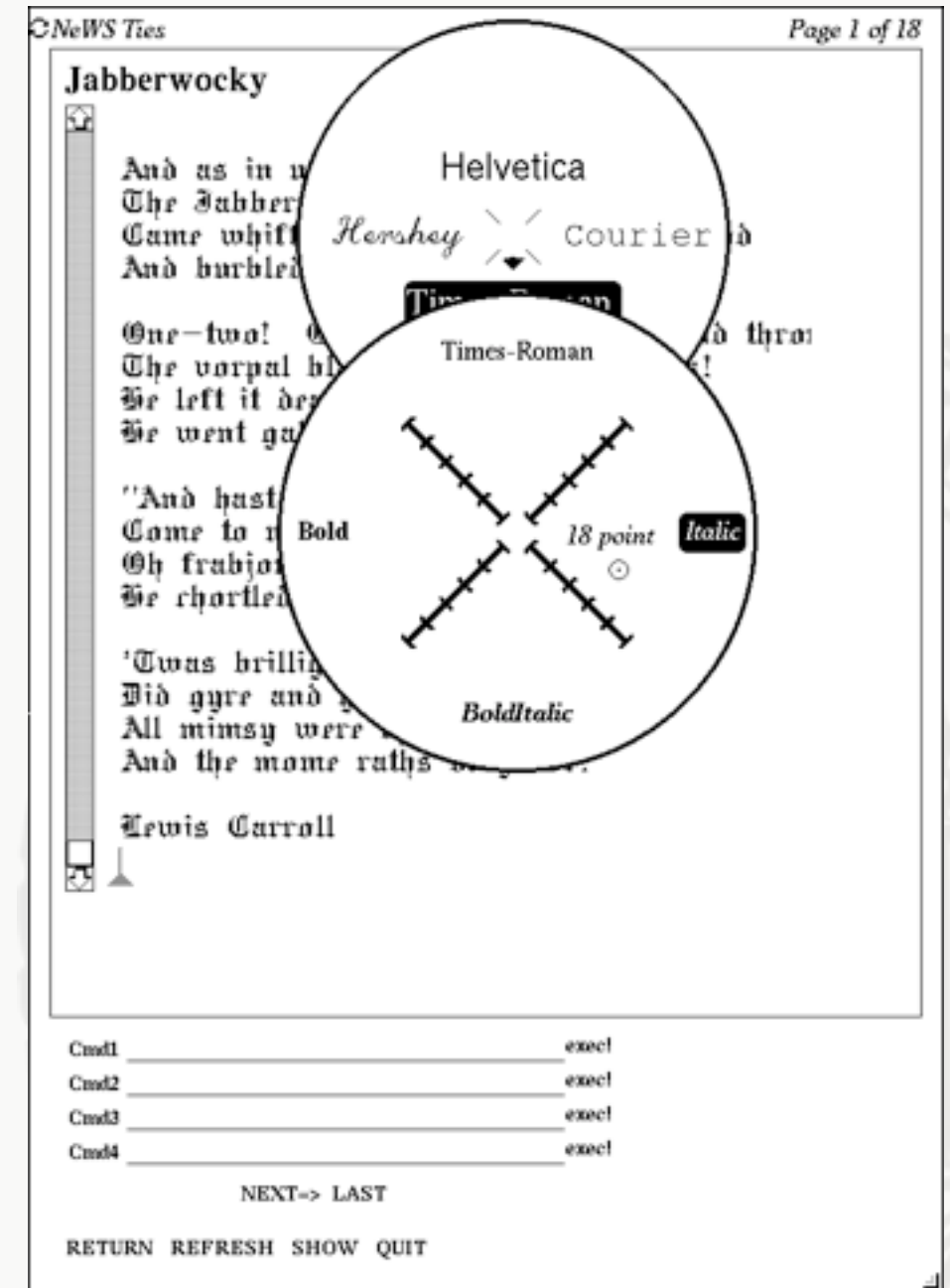
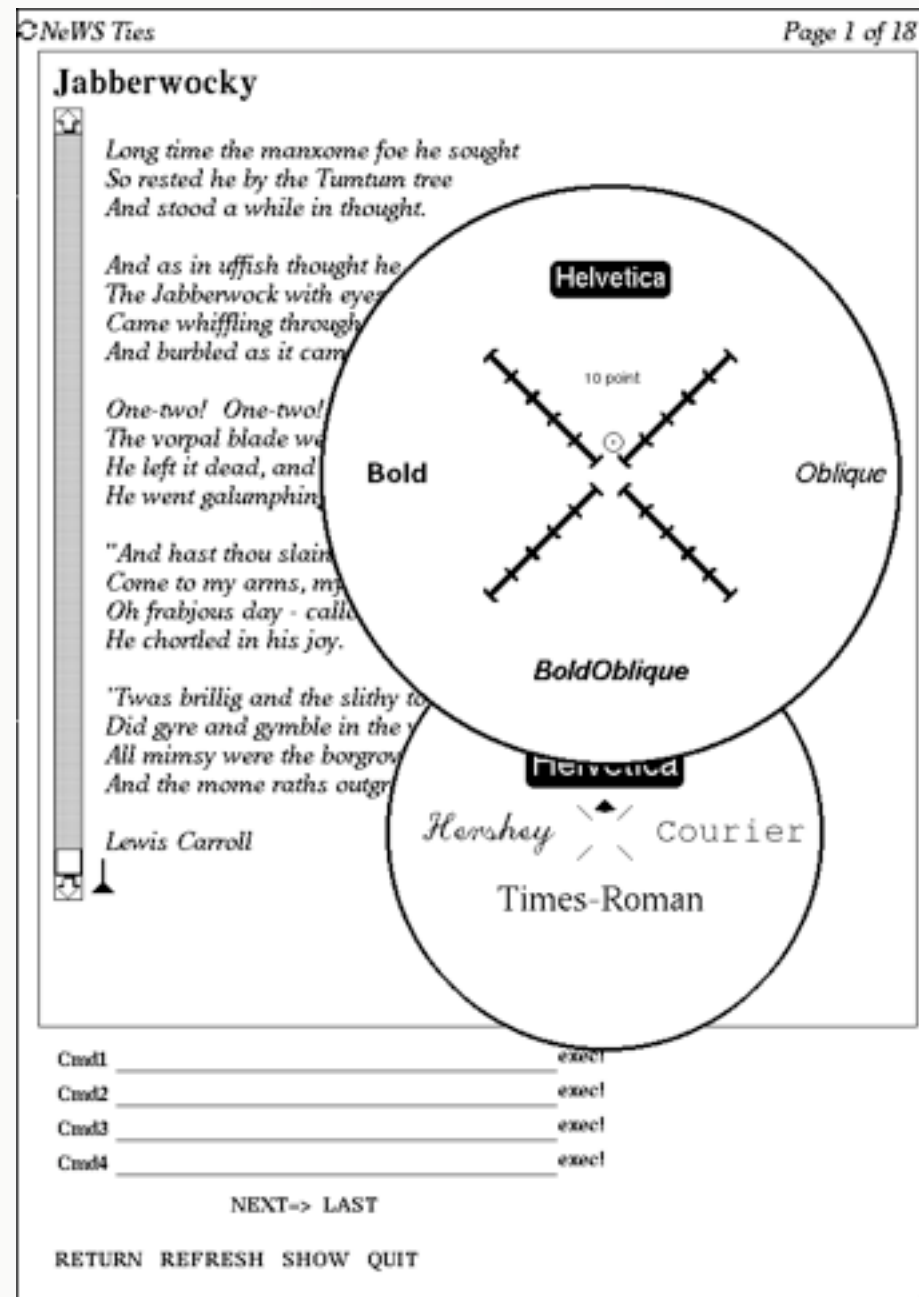


One
Two
Three
Four
Five
Six
Seven
Eight



<http://dl.acm.org/citation.cfm?id=1056159>

Don Hopkins' Pie Menu examples



<http://www.donhopkins.com/drupal/node/94>

Marking Menu

- Pie Menu + Gestenerkennung
 - Skalierungsunabhängig
 - Transition von Newbie zu Experte



eine Zukunftsvision



<http://insitu.lri.fr/Projects/WILD>

WILD: Wall-sized interaction with large datasets



<http://insitu.lri.fr/Projects/WILD>

- 5.5m breit x 1.8m hoch
- 32 30-zoll displays in einer 8 x 4 Matrix
- 131 million pixel
- cluster von 16 computer
- 3D motion capture system

WILD: Wall-sized interaction with large datasets



Participatory Design



<http://insitu.lri.fr/Projects/WILD>

Participatory Design



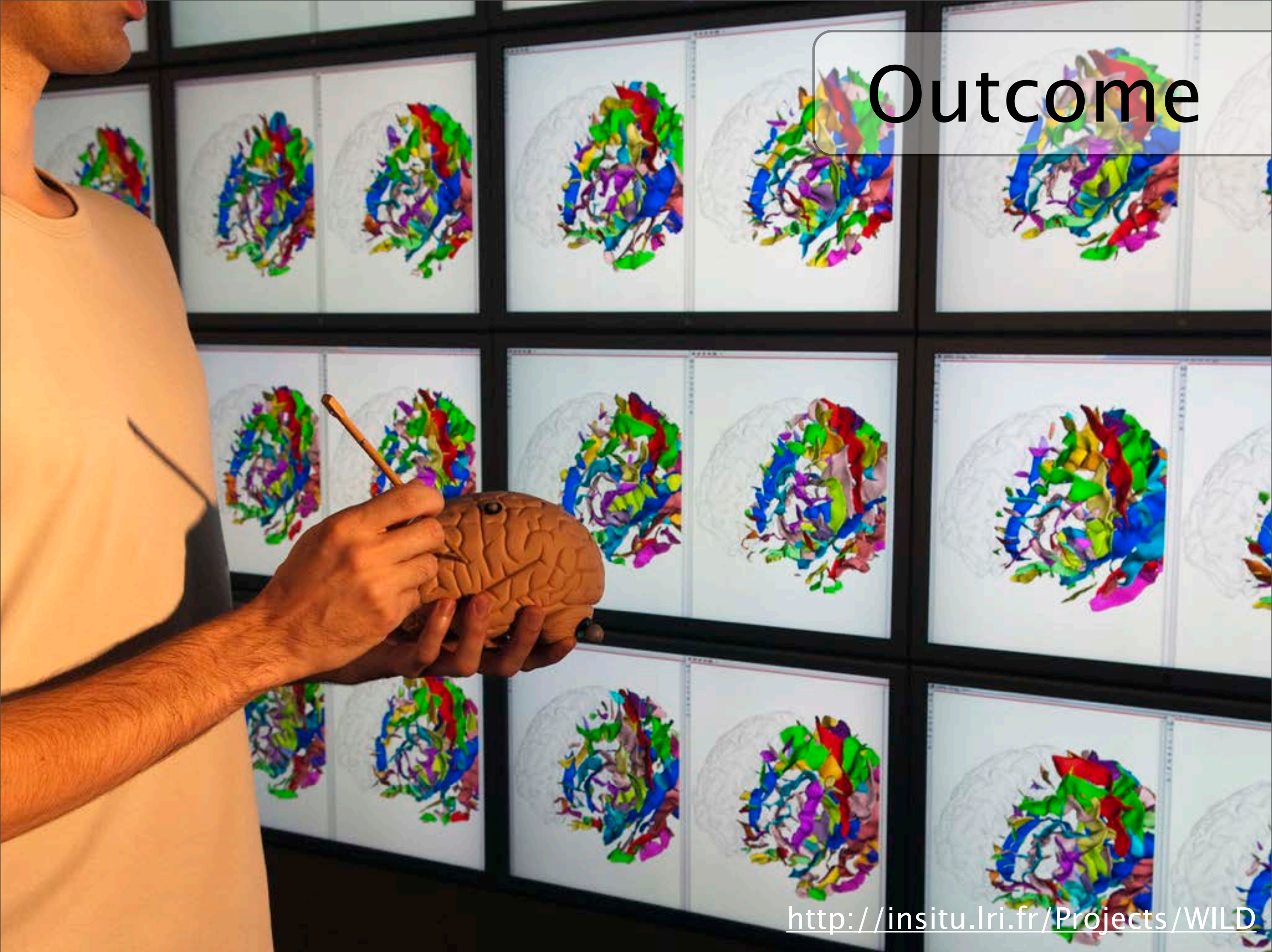
<http://insitu.lri.fr/Projects/WILD>

Participatory Design



<http://insitu.lri.fr/Projects/WILD>

Outcome



<http://insitu.lri.fr/Projects/WILD>

Multisurface Interaction in the WILD room

Video supplement
IEEE Computer, April 2012

© |in|situ| 2012

Any Questions?



<http://insitu.lri.fr/Projects/WILD>