Photo: Gold&Co, Goldankauf Wien, Handel mit Edelmetallen

Eight Golden Rules

according to Ben Shneiderman

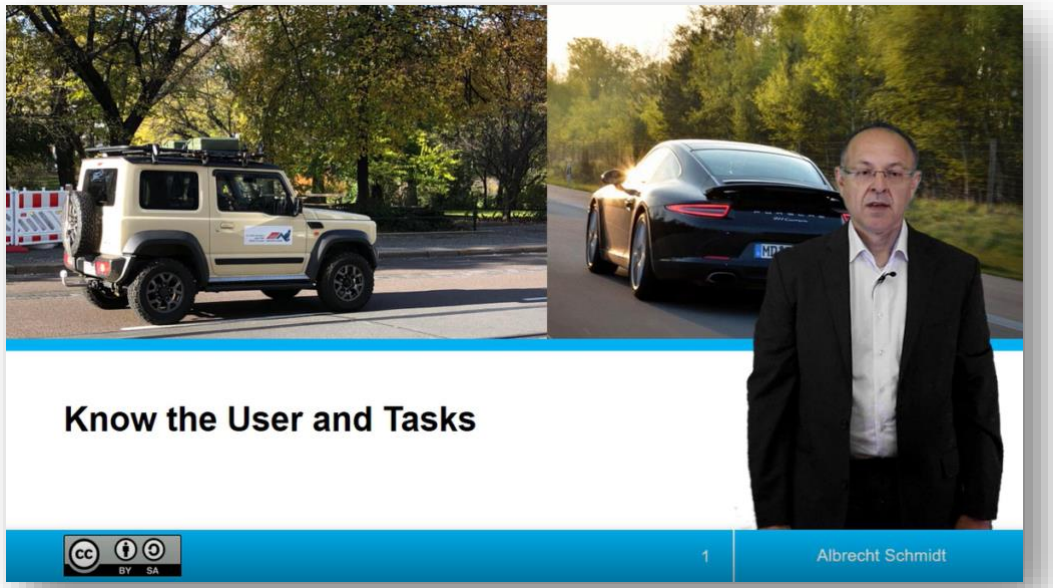
Learning Goals

- Know the Golden Rules according to B. Sheiderman
- Understand …
  - The meaning of the Golden Rules
  - How these Golden Rules help to improve the quality of user interfaces
- Be able to …
  - explain the Golden Rules and give examples
  - discuss user interface designs with regard to these Golden Rules

Principles for UI-Design

By by Ben Shneiderman et al.

- **Principle 1: Recognize User Diversity**
- Principle 2: Follow the Eight Golden Rules
- Principle 3: Prevent Errors



Principles for UI-Design

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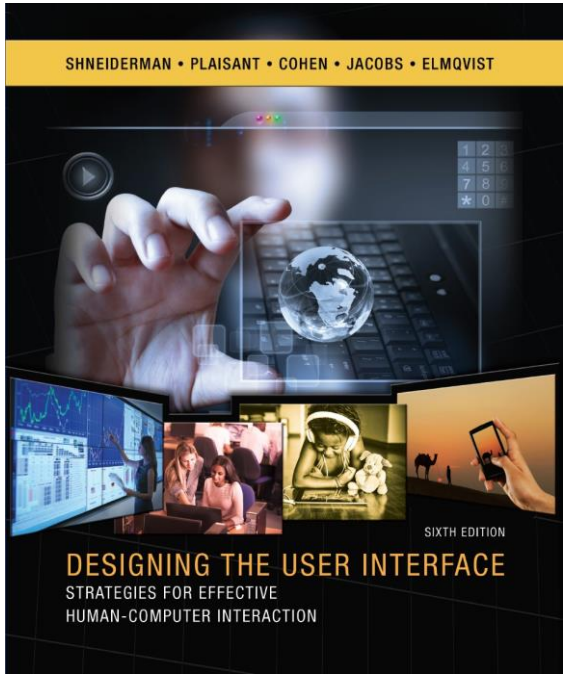

Shneiderman, B., Plaisant, C., Cohen, M., Jacobs, S., Elmqvist, N., & Diakopoulos, N. (2016). Designing the user interface: strategies for effective human-computer interaction. Pearson. http://www.cs.umd.edu/hcil/DTUI6/

Follow the 8 Golden Rules*

[*we list 9 here, there are different versions]

1. Strive for consistency
2. Seek universal usability
3. Offer informative feedback
4. Design dialogues to yield closure
5. Prevent Errors
6. Permit easy reversal of actions
7. Keep users in control
8. Reduce short-term memory load

- Enable frequent users to use shortcuts (was 2.)

https://www.cs.umd.edu/~ben/goldenrules.html

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Strive for consistency

- “Consistent **sequences of actions** should be required in similar situations;
- identical **terminology** should be used in prompts, menus, and help screens;
- and consistent **color, layout, capitalization**, fonts, and so on, should be employed throughout.
- **Exceptions**, such as required confirmation of the delete command or no echoing of passwords, should be comprehensible and limited in number”

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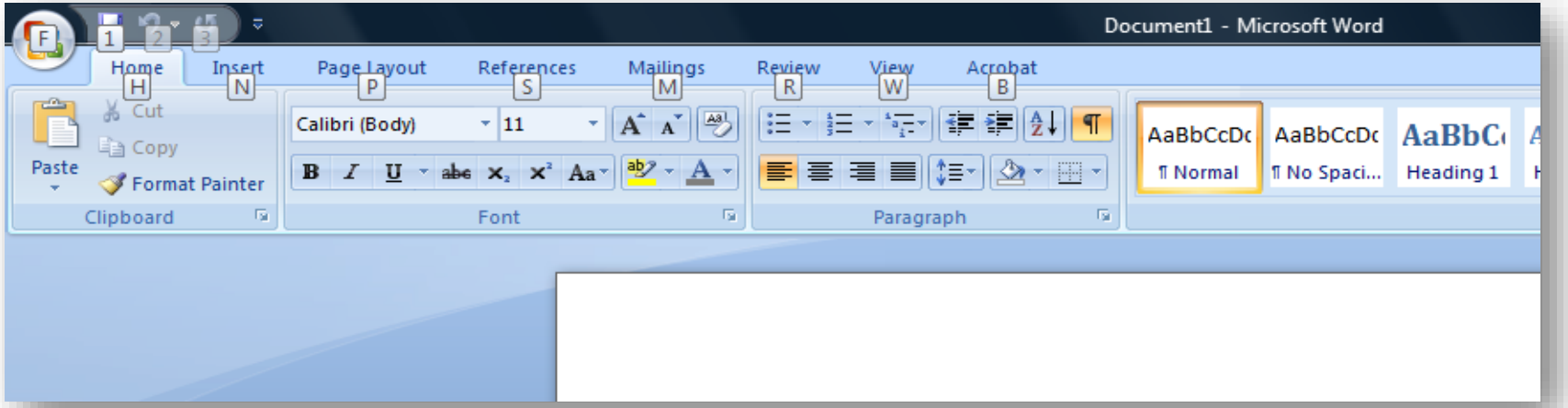
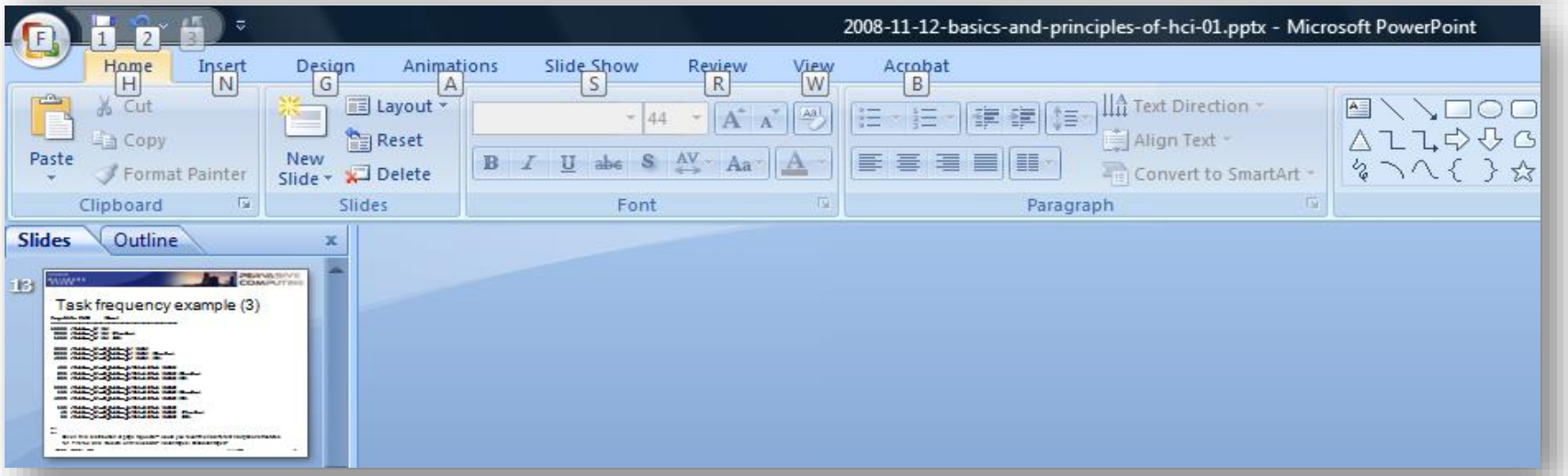
Strive for consistency

Example: Consistency across applications

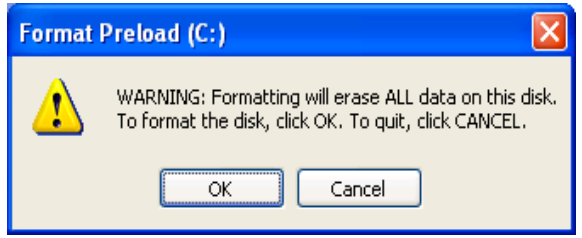


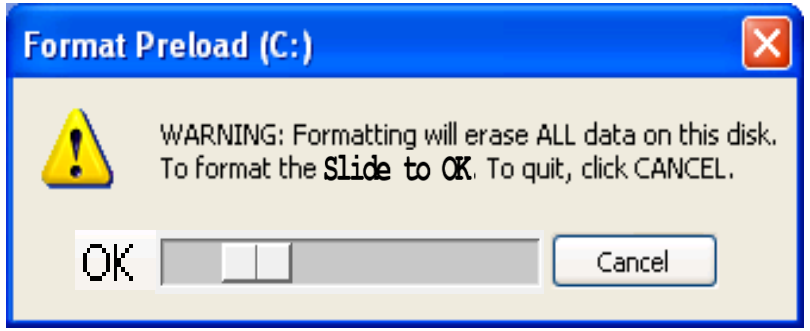


Inconsistencies

Always strive for consistency?

- Dragging file operations?
  - folder on same disk vs. folder on different disk
  - file to trash can vs. disk to trash can
- Fitts' Law suggests bigger buttons for more often used operations
- Inconsistency across platforms, e.g.
  - MacOS vs. Windows
  - Websites on different platforms
  - Mobile device vs. TV vs. PC
- Inconsistency could be used for getting attention
  - Mock-up example





Seek universal usability

… see Principle 1

- “Recognize the needs of **diverse users** and design for plasticity, facilitating **transformation of content**.
  - **Novice to expert** differences,
  - **age** ranges, **disabilities**, **international** variations,
  - **technological** diversity
- […] **spectrum of requirements** that guides design.”

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Offer informative feedback

- “For **every user action**, there should be an **interface feedback**.
- For **frequent** and **minor** actions, the response can be **modest**, whereas
- for **infrequent** and **major** actions, the response should be more **substantial**.”

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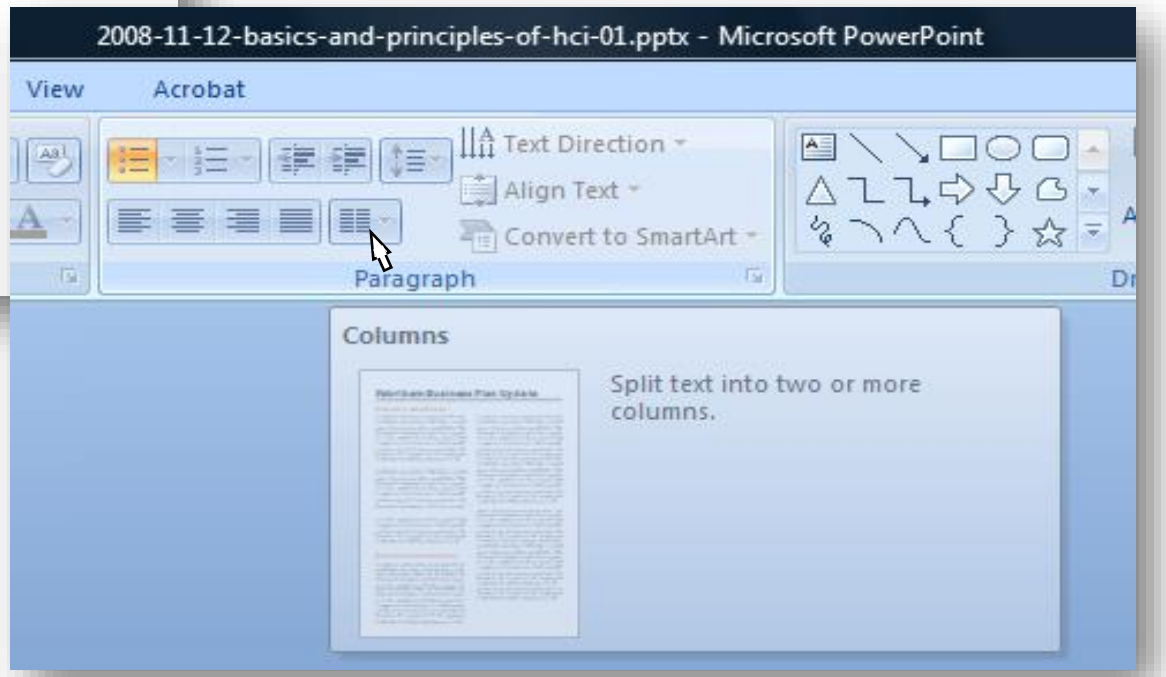
Offer informative feedback

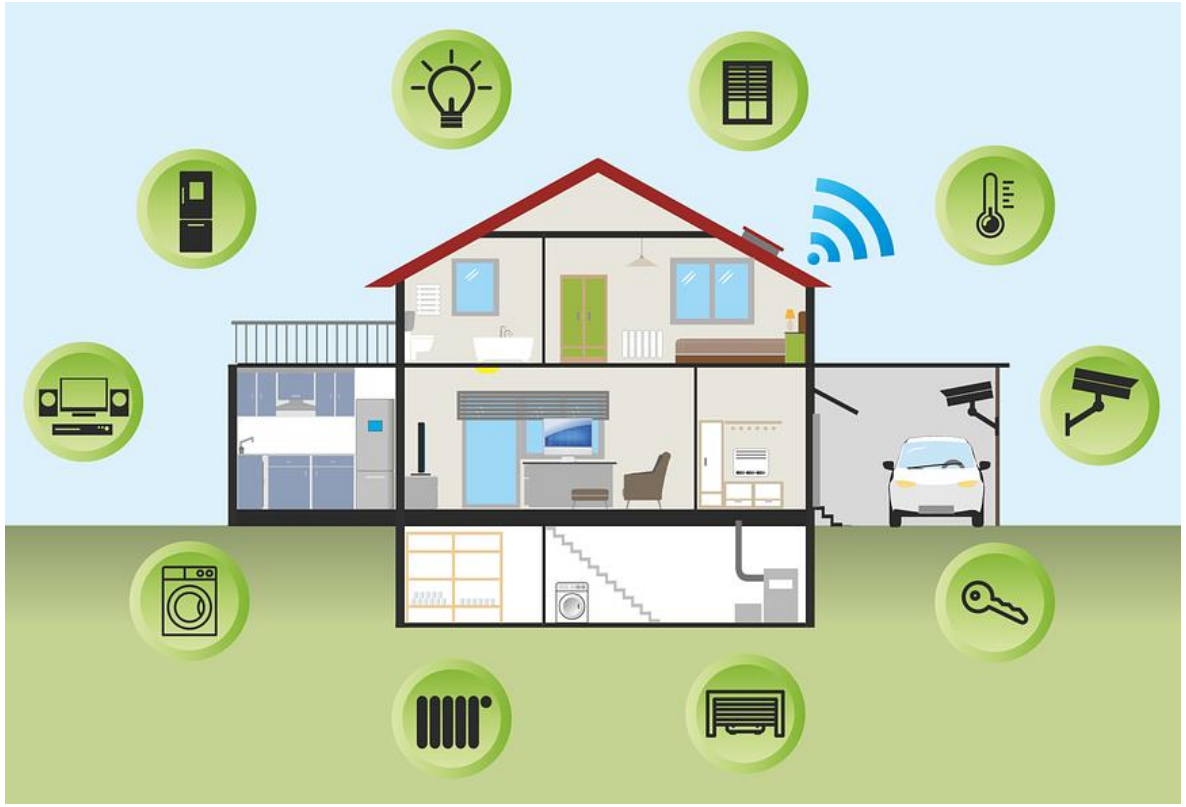
```
// Verilog code for Multiplexer implementation in dataflow level.
// by Harsha Perla for http://electrosofts.com
// harsha@electrosofts.com
// Available at http://electrosofts.com/verilog

module mux6( select, d, q );

input[1:0] select;
input[3:0] d;
output q;

reg q;
wire[1:0] select;
wire[3:0] d;

always @( select or d)
begin
    q =       ( ~select[0] & ~select[1] & d[0] )
            | (  select[0] & ~select[1] & d[1] )
            | ( ~select[0] &  select[1] & d[2] )
            | (  select[0] &  select[1] & d[3] );
end

endmodule
```



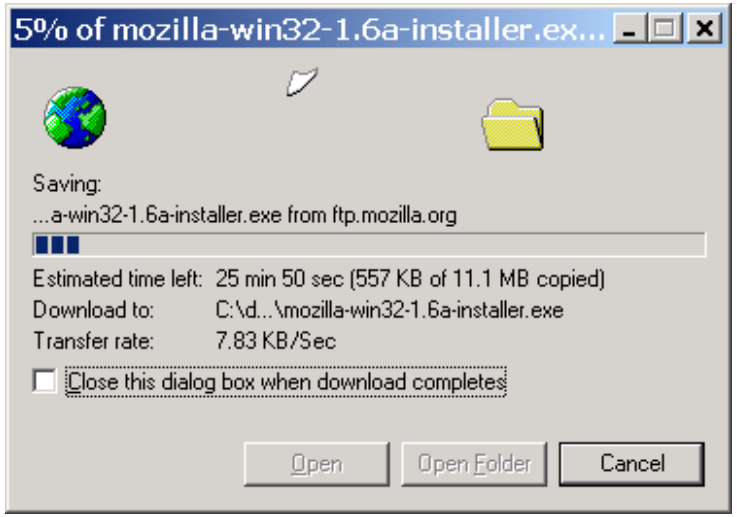
Offer informative feedback

Will ubiquitous computing change this?

Feedback vs. Calm Computing



Design dialogues to yield closure



- "**Sequences of actions** should be organized into groups with a **beginning**, **middle**, and **end**.
- Informative **feedback at the completion** of a group of actions gives users the satisfaction of accomplishment, a sense of relief […]
- For example, e-commerce websites move users from selecting products to the checkout, ending with a clear confirmation page that completes the transaction."
- Important for actions that are **not immediate** and span over a longer time or multiple steps

https://www.cs.umd.edu/~ben/goldenrules.html

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Prevent Errors

- As much as possible, **design** the interface so that **users cannot make serious errors** […]
- If users make an error, the interface should offer simple, constructive, and specific instructions for **recovery**“
- Detecting errors
- Different options how to handle it:
  - Involve the user with dialogs (current practice)
  - Prevent the error **or its consequences on system level** (e.g. create backups/versions when a file is overwritten, keep all files that have been created by the user)

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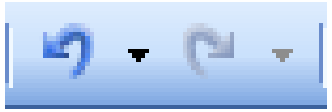
Permit easy reversal of actions

- As much as possible, **actions should be reversible**.
- This feature **relieves anxiety**, since users know that errors can be undone, and **encourages exploration** […]
- The units of reversibility may be a single action, a data-entry task, or a complete group of actions”
- Providing **UNDO functions**
  - Possibly with infinite depth
  - Over sessions
- Not trivial (conceptually as well as technically)
  - *write a text, copy it into the clipboard, undo the writing, the text is still in the clipboard…*



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Permit easy reversal of actions

Discussion: Why is this not simple?

- What is the cost?
  - Memory?
  - Complexity?
- Why is UNDO sometimes not easy to implement and it may be even impossible?

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Permit easy reversal of actions

In Ubiquitous Computing?

- As a basic rule – all actions should be reversible
- When is this not possible?
  - Communication applications (e.g. email)
  - Smart environments
  - Machines
  - Cars
- In certain settings processes and basic **physical laws prevent reversal of actions**. Here an interaction layer (buffering user interaction) may be possible – but not always (e.g. breaks, emergency stop)

Keep users in control

- “Experienced users strongly desire the sense that they are **in charge of the interface** and that the interface responds to their actions.
- They **don’t want surprises** or changes in familiar behavior”
- Avoid non-causality
- The system should be predictable
- Current developments (AI, Ubicomp) are in contrast:
  - Intelligent agents
  - Smart environments

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Or just feeling in control

Keep users in control

- People have to complete tasks under noisy conditions
  - Group A can switch off the noise (remark: if the switch is used, the study results cannot be used)
  - Group B has no influence over the noise

- What happens?

Urban Stress: Experiments on Noise and Social Stressors. DC Glass, JE Singer - 1972 - Academic Press

Or just feeling in control

Keep users in control

- People have to complete tasks under noisy conditions
  - Group A can switch off the noise (remark: if the switch is used, the study results cannot be used)
  - Group B has no influence over the noise

- What happens?
  - Group A performed significantly better than the group B
  - Feeling in control helps

Urban Stress: Experiments on Noise and Social Stressors. DC Glass, JE Singer - 1972 - Academic Press

Reduce short-term memory load

- “Humans’ **limited capacity for information processing** in short-term memory requires that designers avoid interfaces in which users must remember information from one display and then use that information on another display.”
- “rule of thumb is that people can remember ‘**seven plus or minus two chunks**’ of information”
- The system should remember, not the user
  - Make information that is required visible
  - Recognition is easier than recall, use memory aids (visual or audio)

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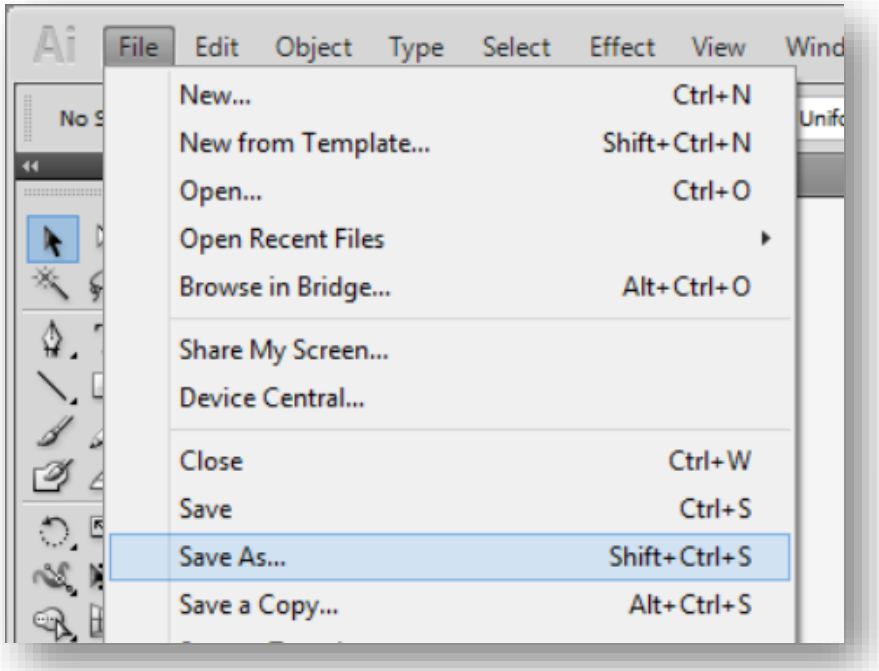
Enable frequent users to use shortcuts

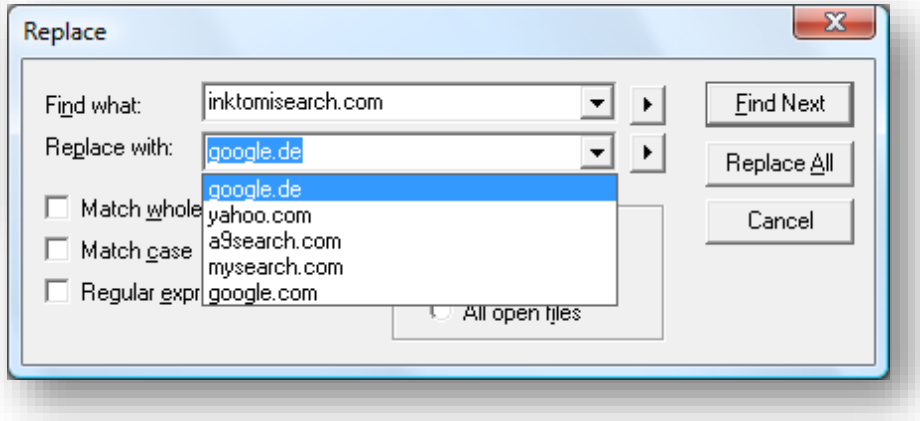
- Improves **speed** for **experienced users**
- Shortcuts on different levels
  - Access to **single commands**, e.g. CTRL+S or toolbar
  - **Customizing** of commands and environments, e.g. printer pre-set (duplex, A4, …)
  - **Reusing actions** performed, e.g. history in command lines, macro functionality
- Shortcuts to single commands are related to consistency
  - CTRL+X, CTRL+C, CTRL+V in Microsoft applications for cut, copy and paste
  - However CTRL+S (saving a document) is only implemented in some applications…

https://www.interaction-design.org/literature/article/shneiderman-s-eight-golden-rules-will-help-you-design-better-interfaces

Keyboard shortcuts and History

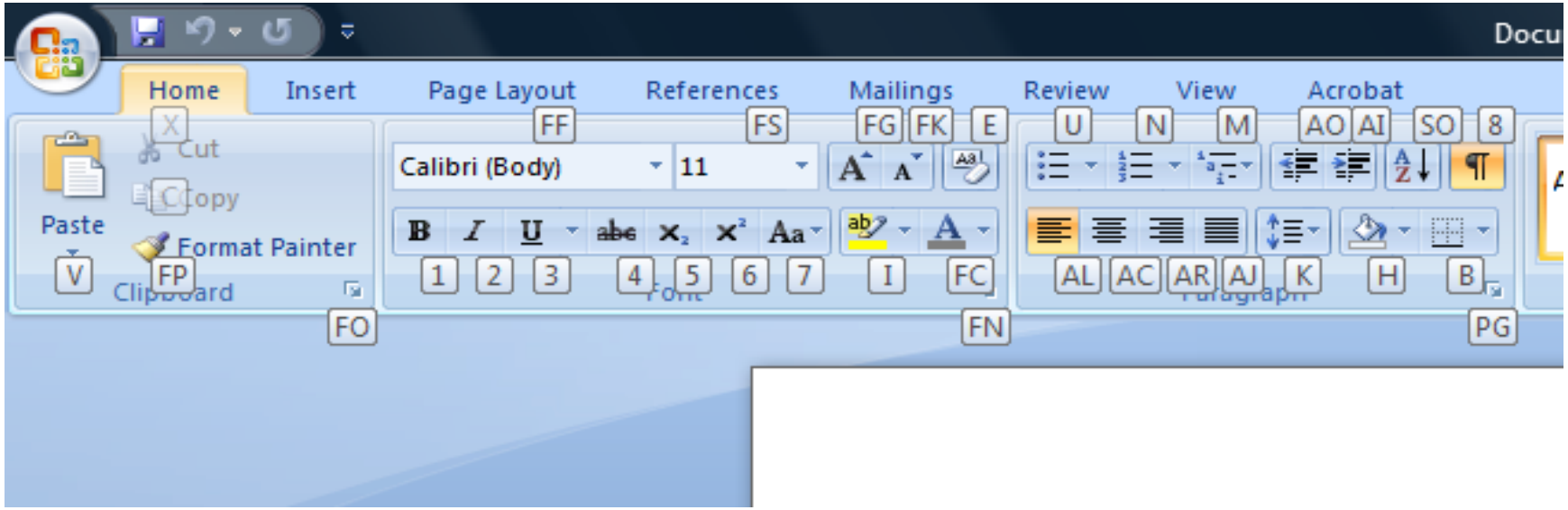
Example: Enable frequent users to use shortcuts

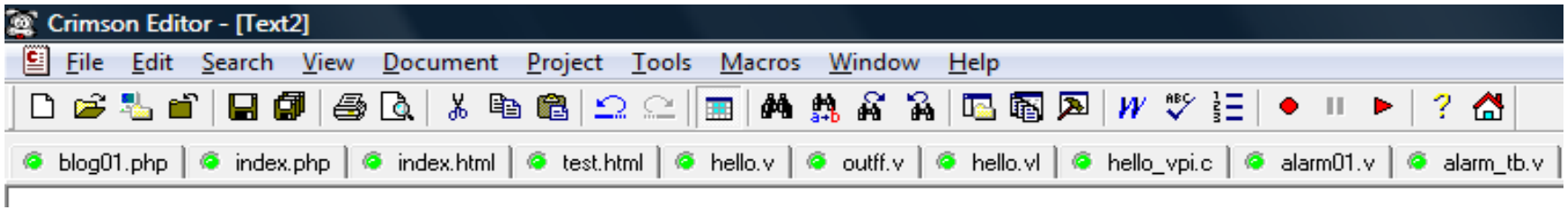




Keyboard shortcuts and Toolbars

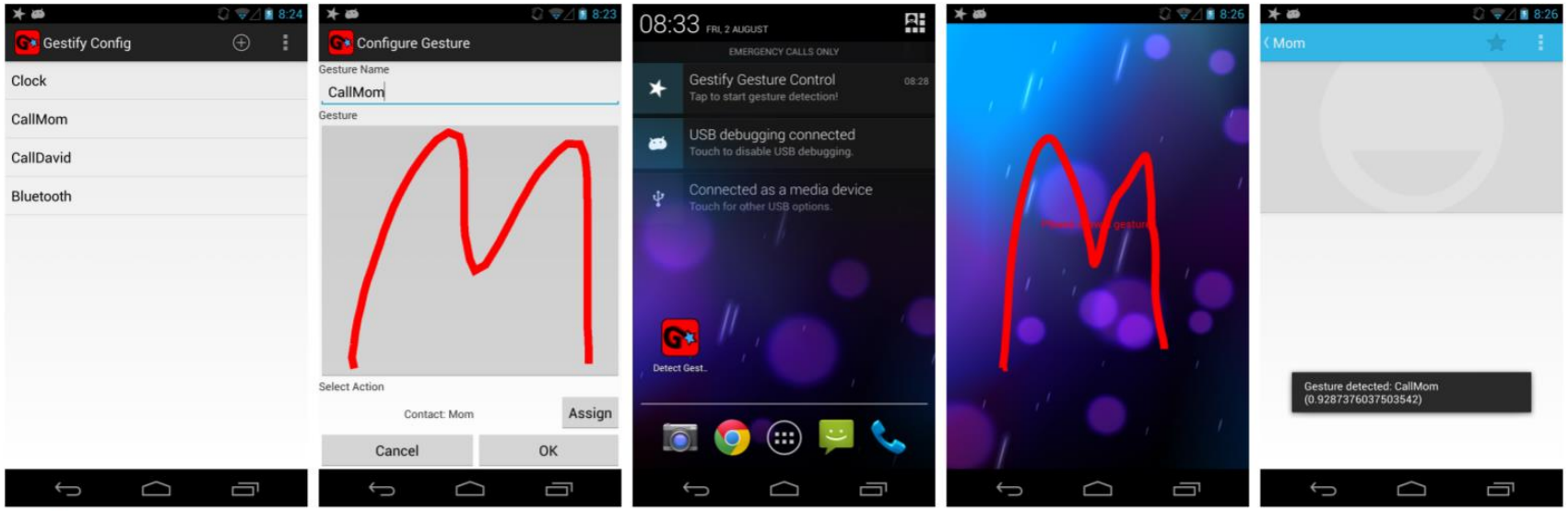
Example: Enable frequent users to use shortcuts





Shortcut Gestures on Smartphones

Example: Enable frequent users to use shortcuts



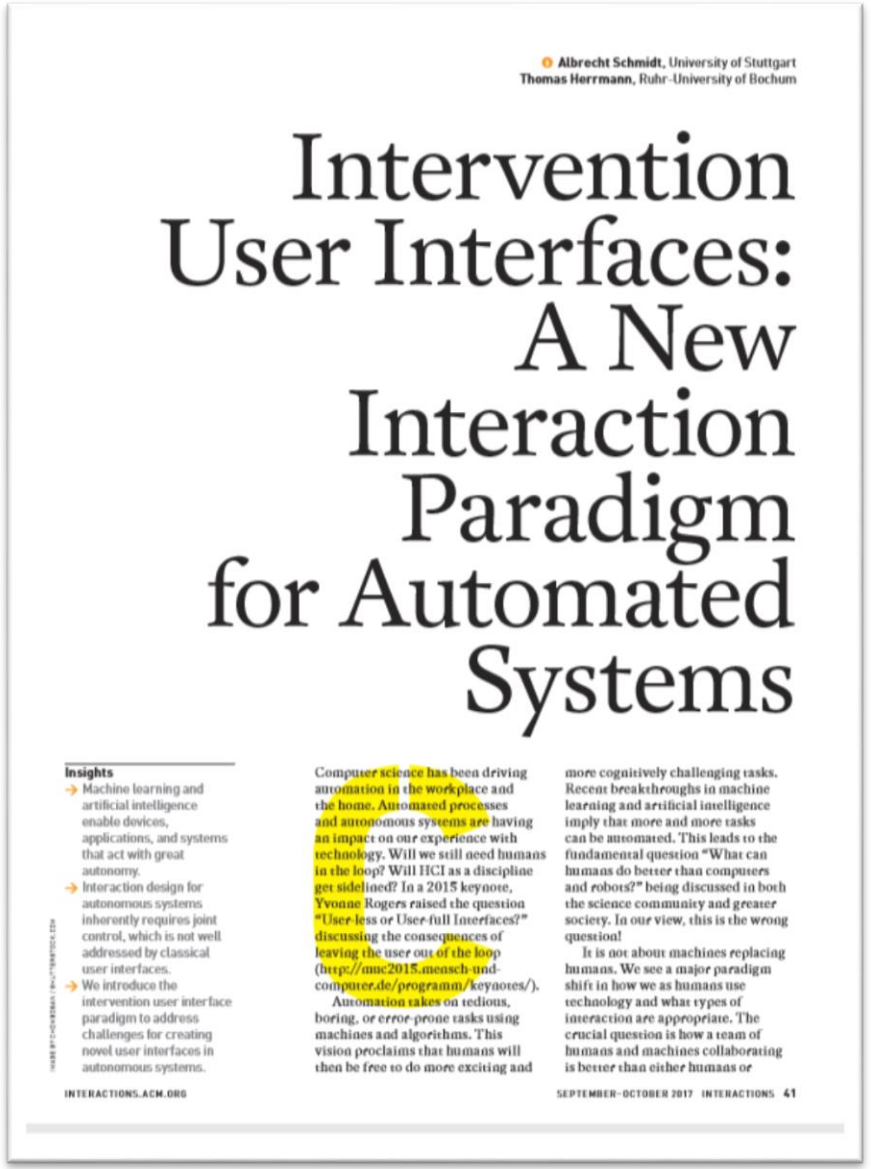
(a) List of existing gestures. (b) Add a new gesture. (c) Trigger detection through one of the provided activators, e.g., notification bar. (d) Draw gesture in recognition activity. (e) A pop-up indicates that the gesture is detected.

Figure 1. Gestify is an Android application that allows users to define and execute their own shortcut gestures. If gestures were trained to the system they can be recognized via different activators, i.e., through the lock screen, the notification bar, the wallpaper, and through a separate activity. If a gesture is detected, a toast is shown and the linked action is executed.

Poppinga, B., Sahami Shirazi, A., Henze, N., Heuten, W., & Boll, S. (2014, September). Understanding shortcut gestures on mobile touch devices. In Proc. of the 16th int. conf. on Human-computer interaction with mobile devices & services (pp. 173-182). ACM.

How can humans stay in control?

- “In the future, we believe that a large class of **automated and autonomous systems** allow for **joint control**, where the majority of decisions are automated but **where users can intervene.**



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Intervention User Interfaces: A New Interaction Paradigm for Automated Systems

Insights

- Machine learning and artificial intelligence enable devices, applications, and systems that act with great autonomy.
- Interaction design for autonomous systems inherently requires joint control, which is not well addressed by classical user interfaces.
- We introduce the intervention user interface paradigm to address challenges for creating novel user interfaces in autonomous systems.

Computer science has been driving automation in the workplace and the home. Automated processes and autonomous systems are having an impact on our experience with technology. Will we still need humans in the loop? Will HCI as a discipline get sidelined? In a 2015 keynote, Yvonne Rogers raised the question "User-less or User-full Interfaces?" discussing the consequences of leaving the user out of the loop (http://muc2015.mensch-und-computer.de/programm/keynotes/).

Automation takes on tedious, boring, or error-prone tasks using machines and algorithms. This vision proclaims that humans will then be free to do more exciting and more cognitively challenging tasks. Recent breakthroughs in machine learning and artificial intelligence imply that more and more tasks can be automated. This leads to the fundamental question "What can humans do better than computers and robots?" being discussed in both the science community and greater society. In our view, this is the wrong question!

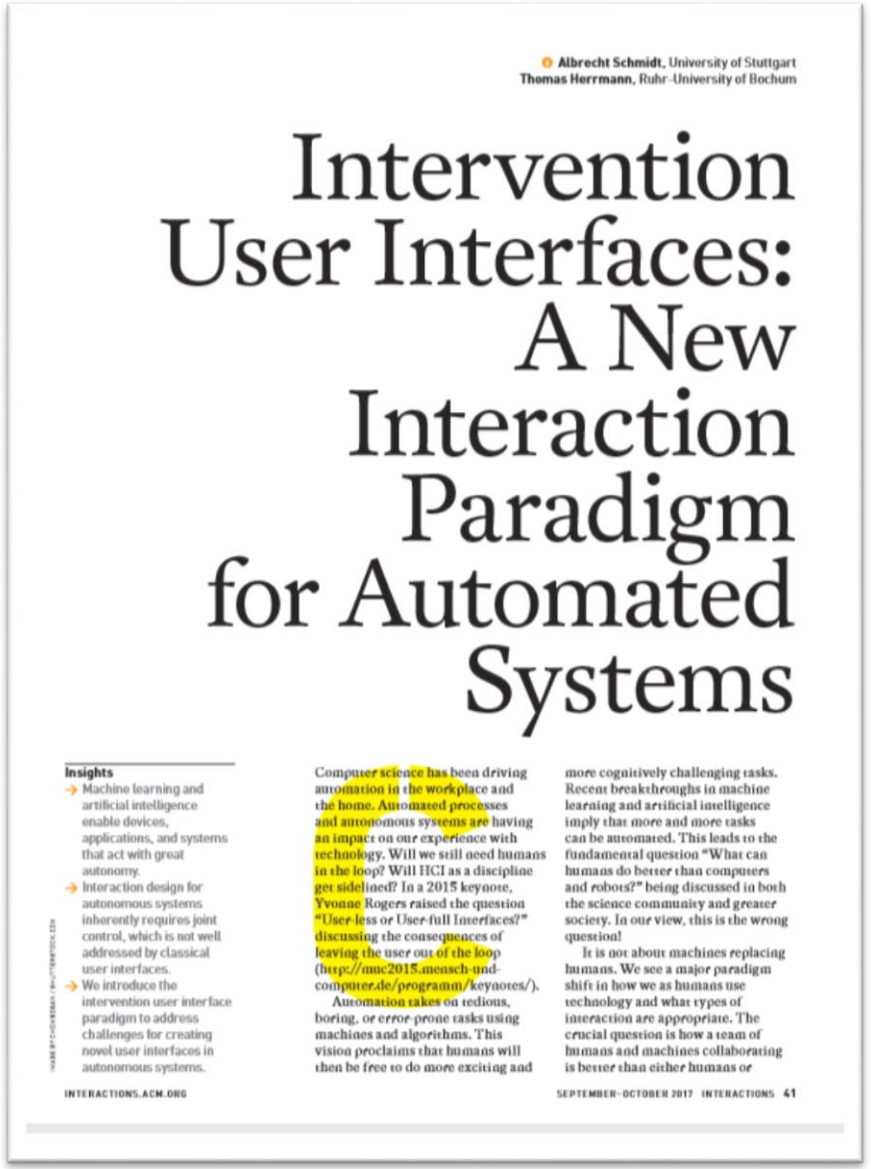
It is not about machines replacing humans. We see a major paradigm shift in how we as humans use technology and what types of interaction are appropriate. The crucial question is how a team of humans and machines collaborating is better than either humans or

Schmidt, A., & Herrmann, T. (2017). Intervention user interfaces: a new interaction paradigm for automated systems. *interactions*, *24*(5), 40-45.

How can humans stay in control?

Design Principles for Intervention user interfaces

- Ensure expectability and predictability.
- Communicate options for interventions.
- Allow easy exploration of interventions.
- Easy reversal of automated and intervention actions.
- Minimize required attention.
- Communicate how control is shared.



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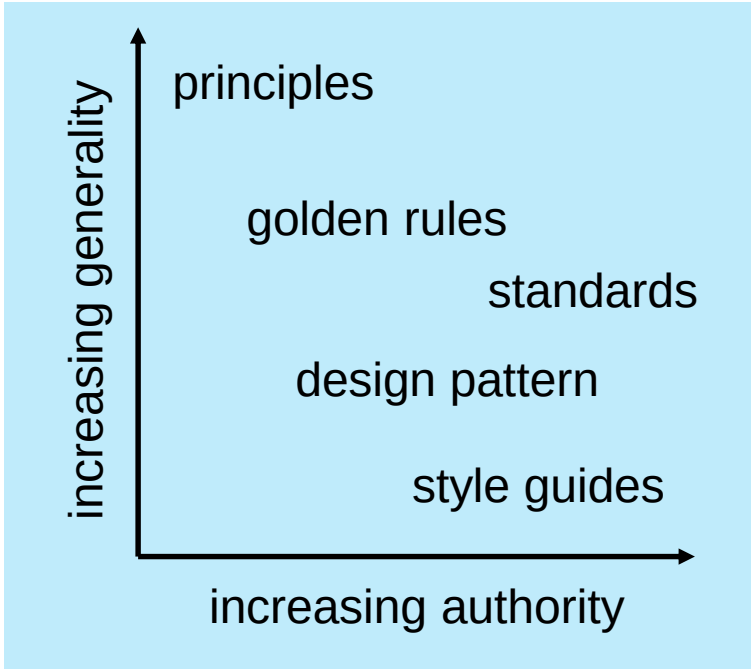
Types of Design Rules

- **Principles**
  - abstract design rules
- **Golden rules and heuristics**
  - more concrete than principles
- **Standards**
  - (very) detailed design rules
- **Design patterns**
  - generic solution for a specific problem
- **Style guides**
  - provided for devices, operating systems, widget libraries



- **Authority**: whether or not a rule must be followed or whether it is just suggested
- **Generality**: applied to many design situations or focused on specific application situation.

Did you understand this block?

Can you answer these questions?

- Name the Eight Golden Rules?
- Give an example for offering informative feedback.
- In which contexts may offering feedback be problematic?
- Where is easy reversal of action on principle not possible?
- How can consistency help with the learnability of systems?
- Name three areas in the design of user interfaces where consistency should be realized?

Reference

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