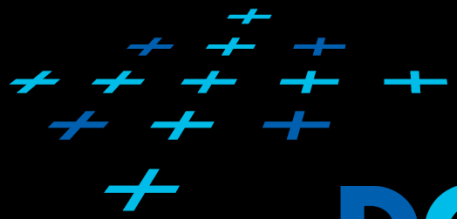


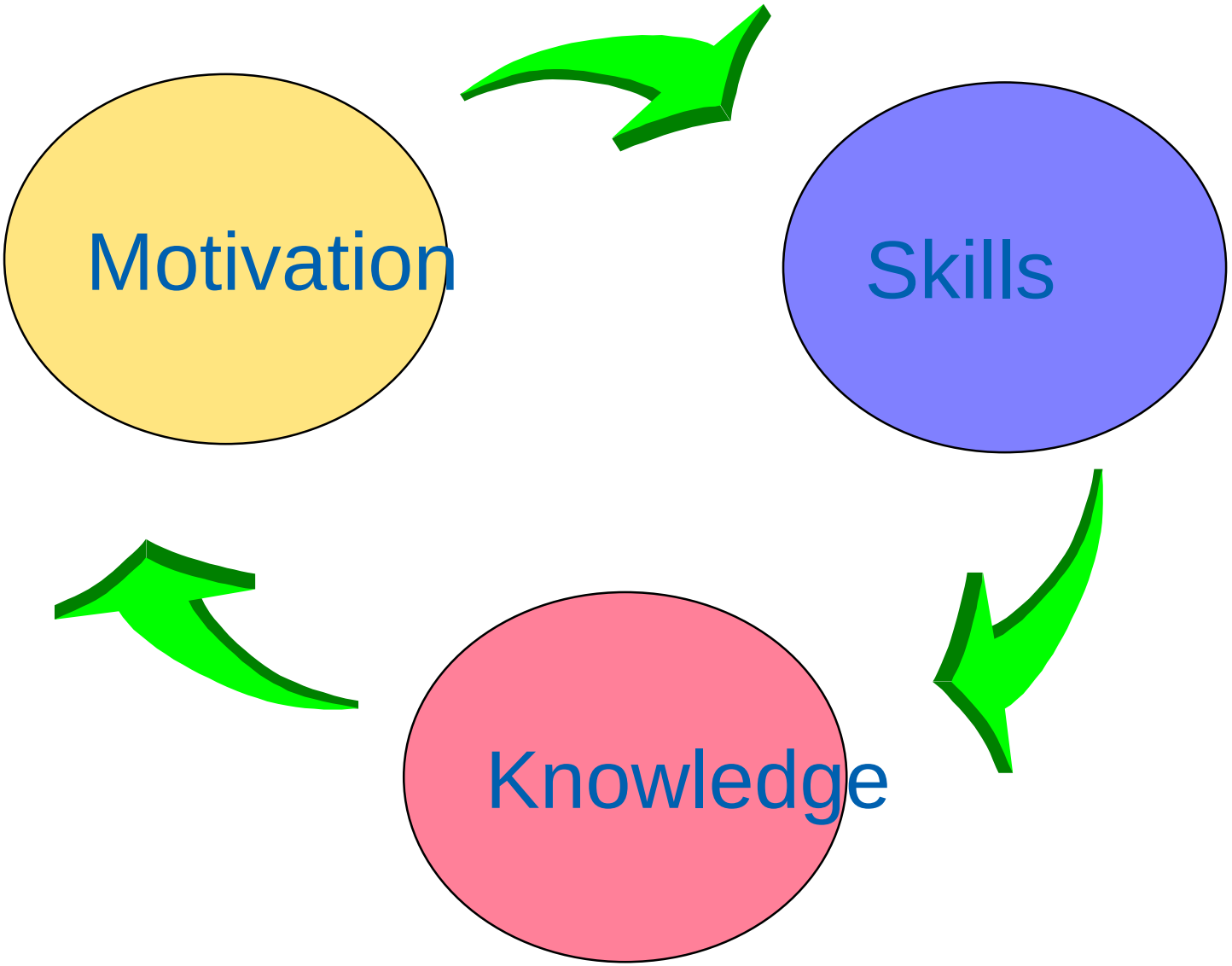
DCGI

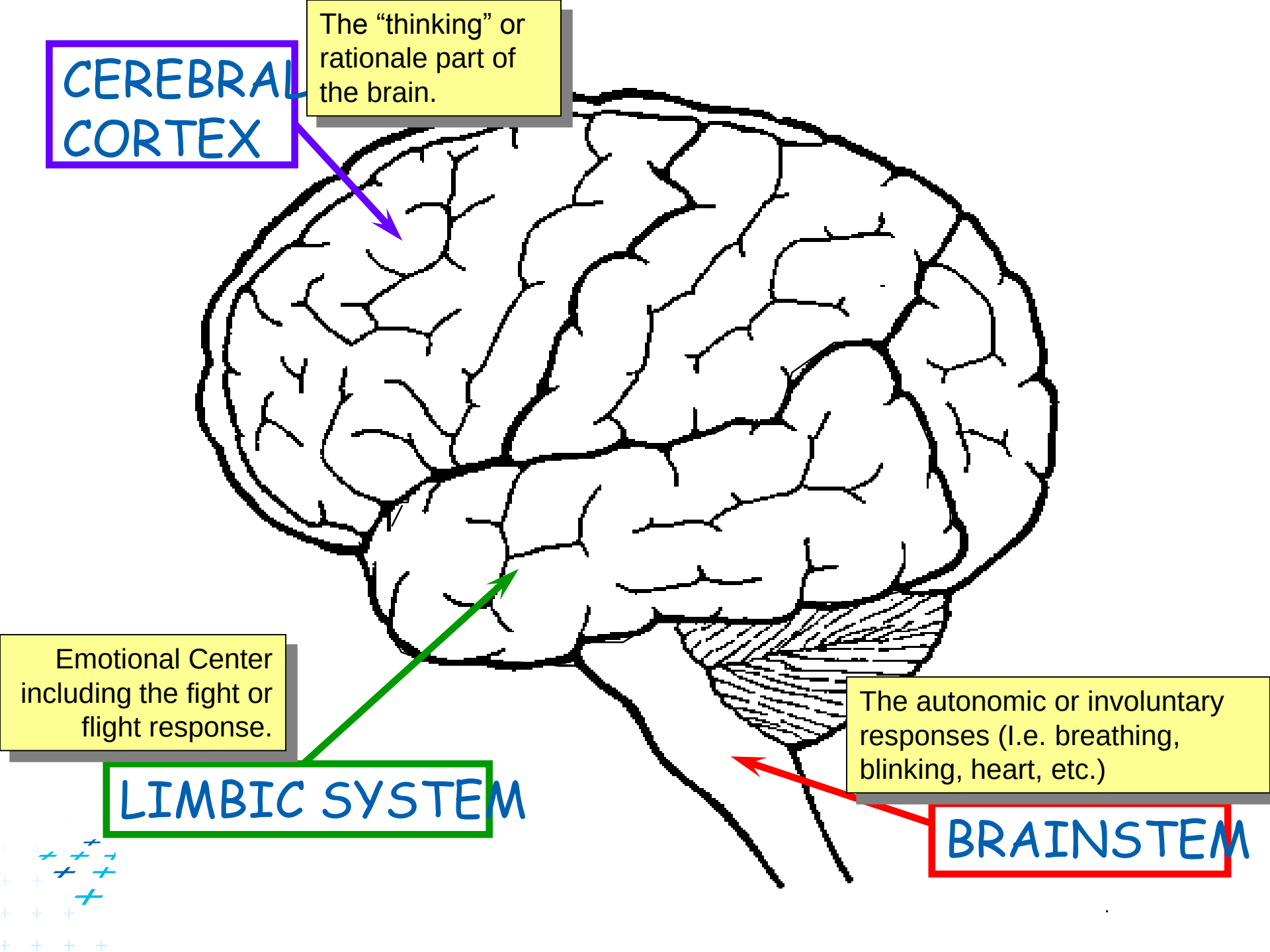
KATEDRA POČÍTAČOVÉ GRAFIKY A INTERAKCE

AST 10

SOME PSYCHOLOGY and RELATED TOPICS

Eliciting a Behavior Change




CEREBRAL CORTEX
The “thinking” or rationale part of the brain.
Emotional Center including the fight or flight response.
LIMBIC SYSTEM
The autonomic or involuntary responses (I.e. breathing, blinking, heart, etc.)
BRAINSTEM

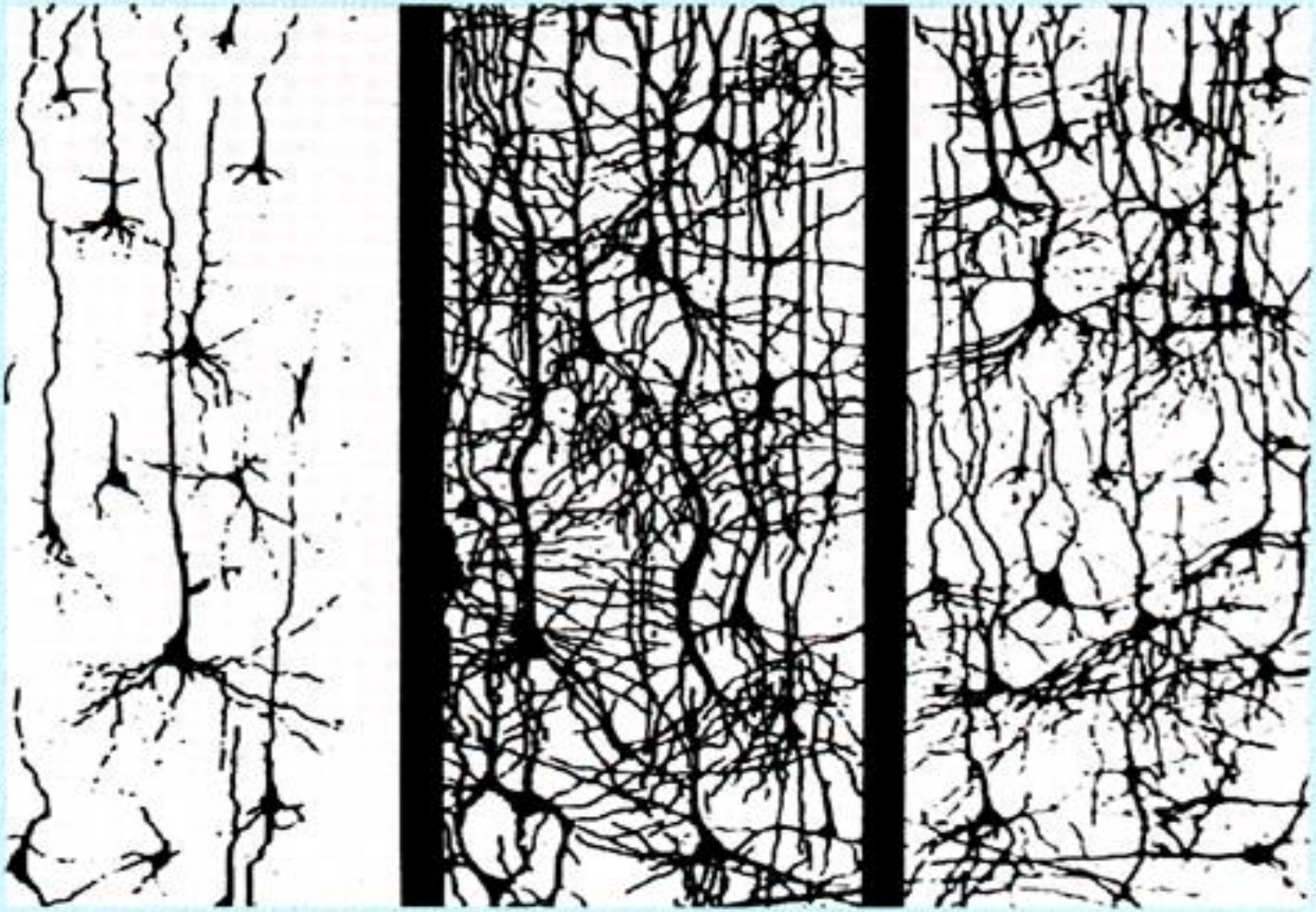
Network

- At birth
  - 50 trillion connections
- Ages 3 to 10
  - 1000 trillion connections
- Age 20
  - 500 trillion connections

At Birth

6 Years Old

14 Years Old



Source: Rima Shore, *"Rethinking the Brain"*, 1997

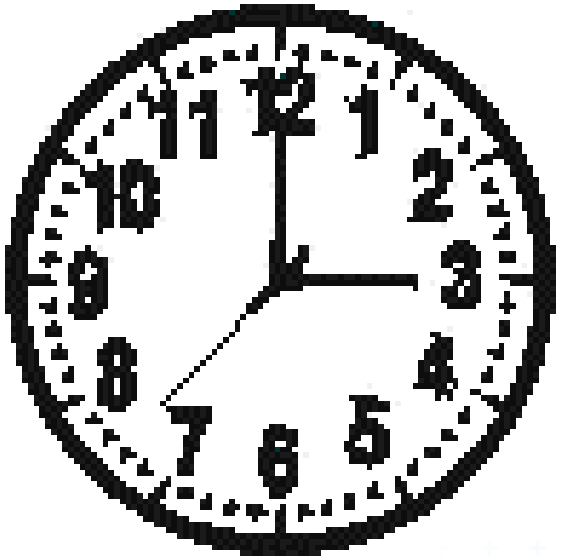
HOW ABOUT ELDERLY PEOPLE?

Assistive technology for old adults and mental disability:
A.T. support: interface and communication

- Interface simplification: understanding and deciding
  - Number of items
  - Legibility
- Interface adaptation (dynamic)
  - Degree of exigency
  - User monitoring (answers, reactions, telemetry…)
- Alternative communication
  - Sign languages
  - Icons, voice messages, simple instructions

Assistive technology for old adults and mental disability:

A.T. support: time orientation



Assistive technology for old adults and mental disability:

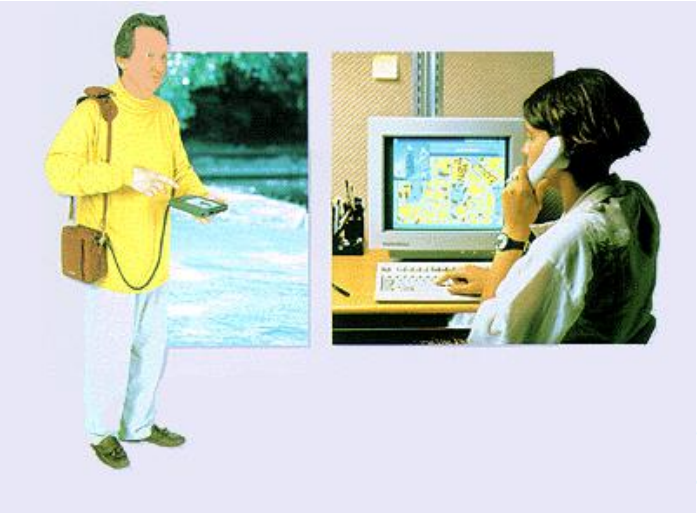
A.T. support: time orientation

- (Re-) education in time-orientation
- Reminding messages (memory – time)
  - Pills, daily tasks, birthdays, dates
- Time orientation
  - Adapted clocks
  - Other ways to pose a rhythm

Assistive technology for old adults and mental disability:

A.T. support: spatial orientation and transport
Use example

- Certec's ISAAC



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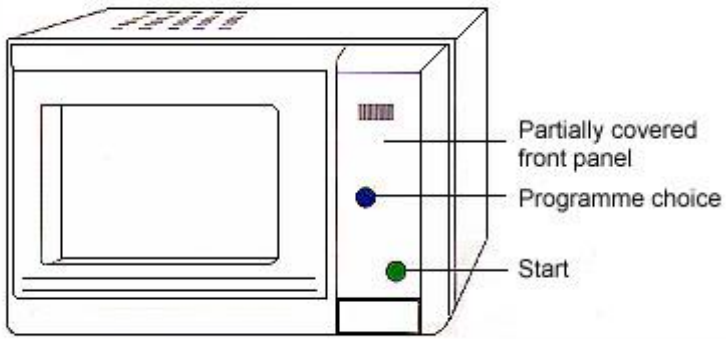
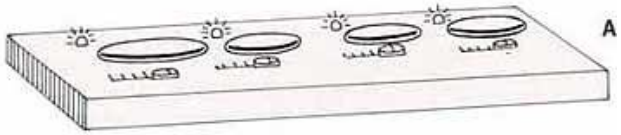
Assistive technology for old adults and mental disability:

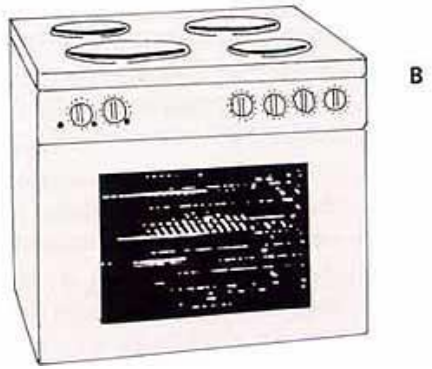
A.T. support: specific task support

Use example

- Certec's cooking adaptation







Ageing and Dementia in Ireland

Irish population is ageing

- 18% of population > 65 within 25 years
- 2021 - 137,305 Irish people aged 80 +
- **Dementia risk increases with age**

but dementia is not a natural part of ageing

- 44,000 people; 50,000 carers; family members
- By 2031: numbers will double
- By 2036: 104,000 people affected

Dementia affects:

- Approx. 1 in 20 people over 65
- 1 in 4 in people over 80
- 4,000 people under 65

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SUPERVISING SYSTEMS

Telecare Project

THE ALZHEIMER SOCIETY of IRELAND

Funding

- Dormant accounts
- Awarded in 2007

Partnership

- Emergency Response
- 65 packages

Aims

- Assess the person with dementia and create a tailor-made telecare package to augment their existing care plan
- Facilitate persons with dementia to manage their risks associated with cognitive disability
- Improve the quality of life for people with dementia

Evaluation

- Qualitative & Quantitative

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Telecare Equipment

Core Package

- Lifeline 4000+ and pendant alarm
- Two flood detectors
- Property exit sensor
- Smoke detector
- Temperature extremes sensor
- Bed occupancy sensor/pressure mat

Optional Extras

- Additional smoke detector
- Bogus caller/panic button
- CO (carbon monoxide) detector
- Fall detector
- Gas detector
- Additional property exit sensor

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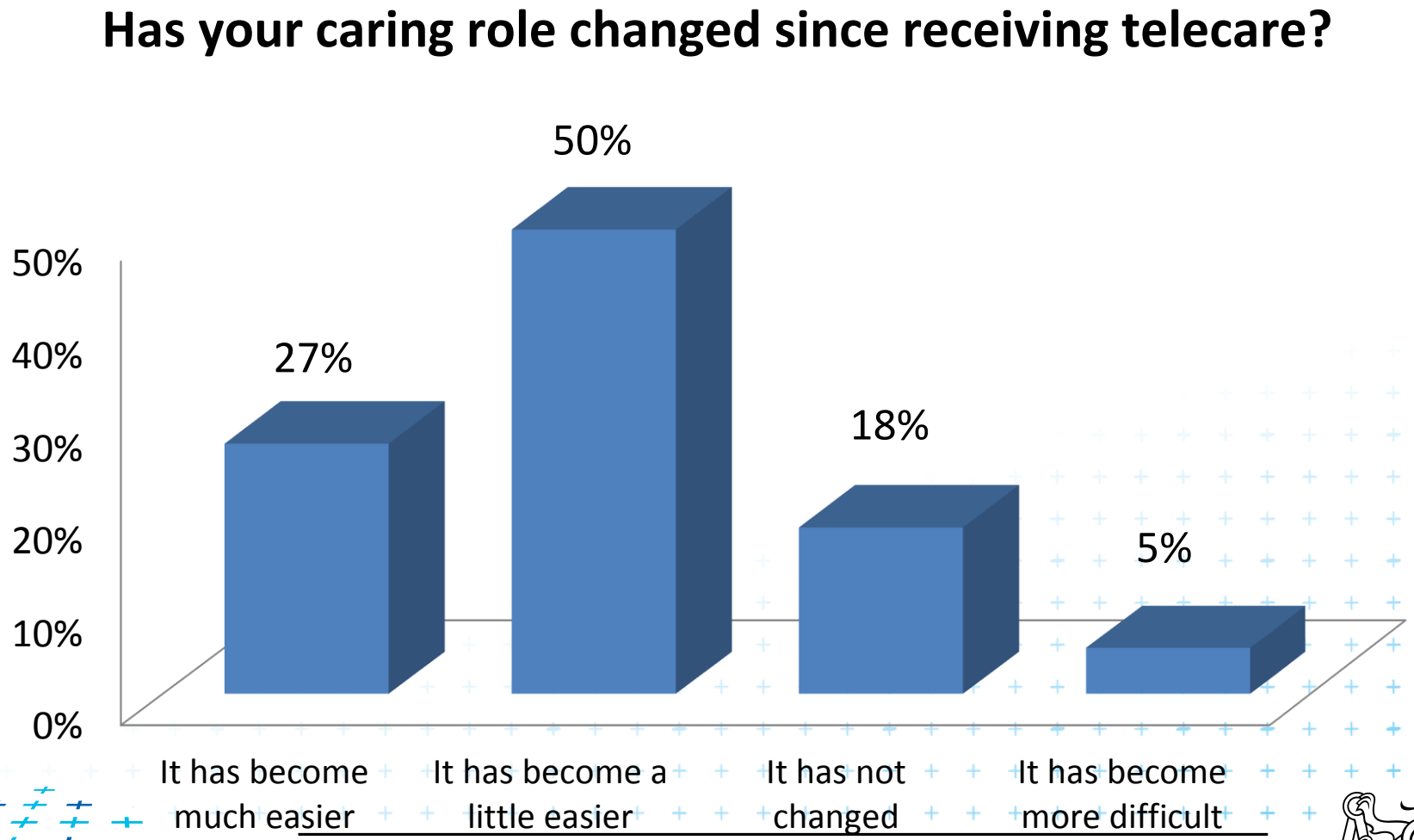
Benefits to Carers

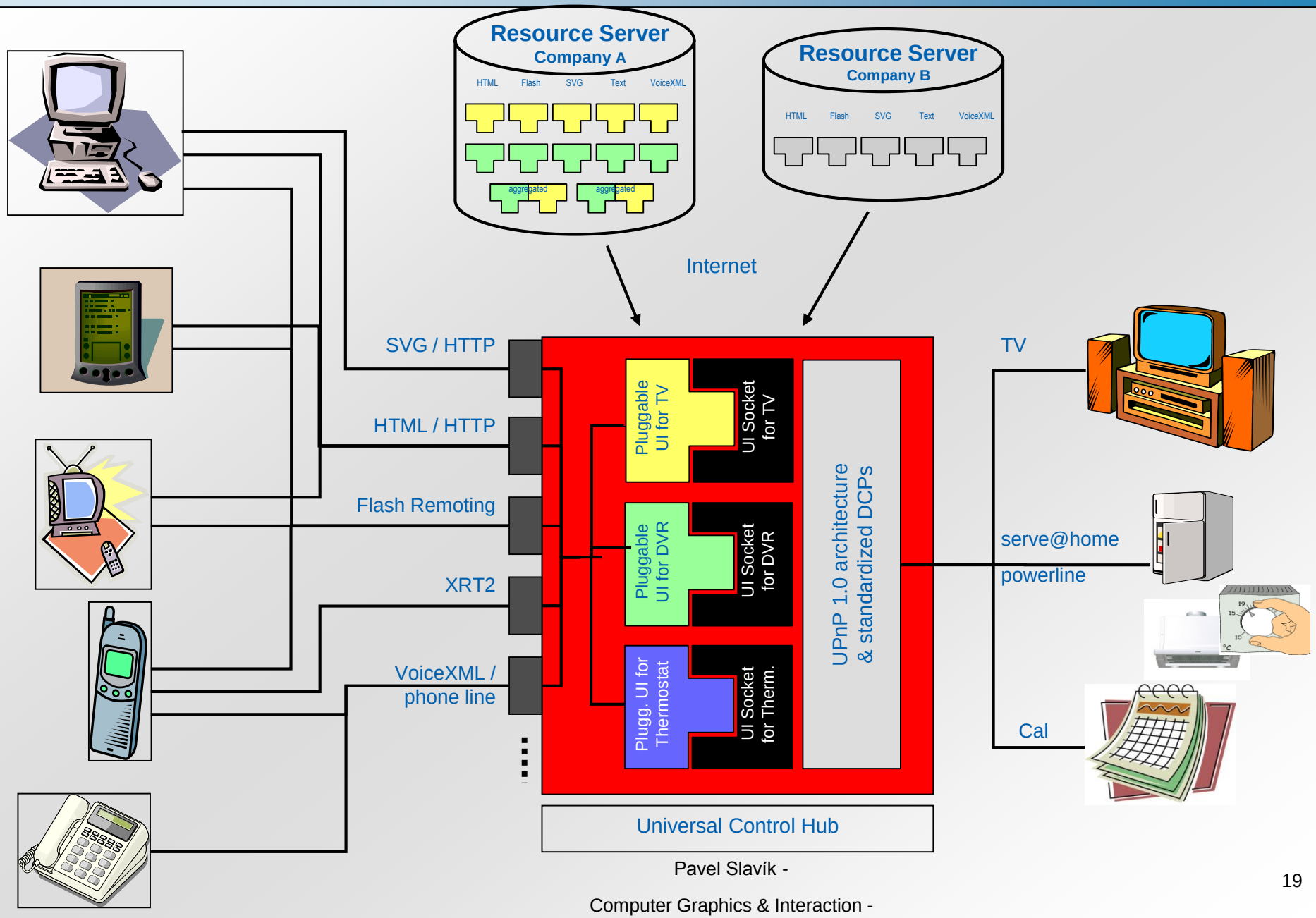


I2home project

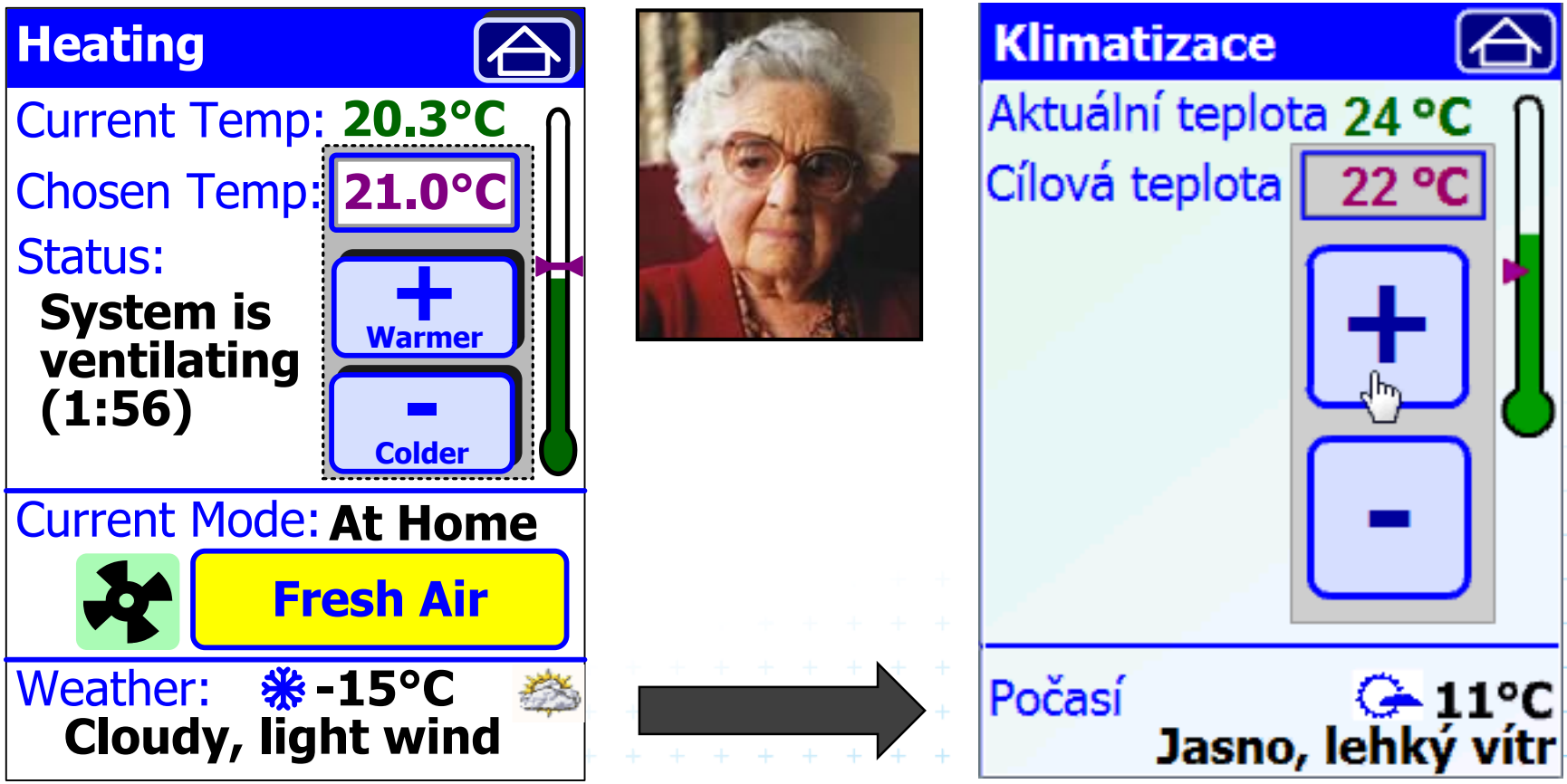
- Controlling of home appliances of the new generation
- Networked
- New means of interaction

Universal Control Hub

The URC Framework—ISO/IEC 24752-{1-5}



Individualized UIs

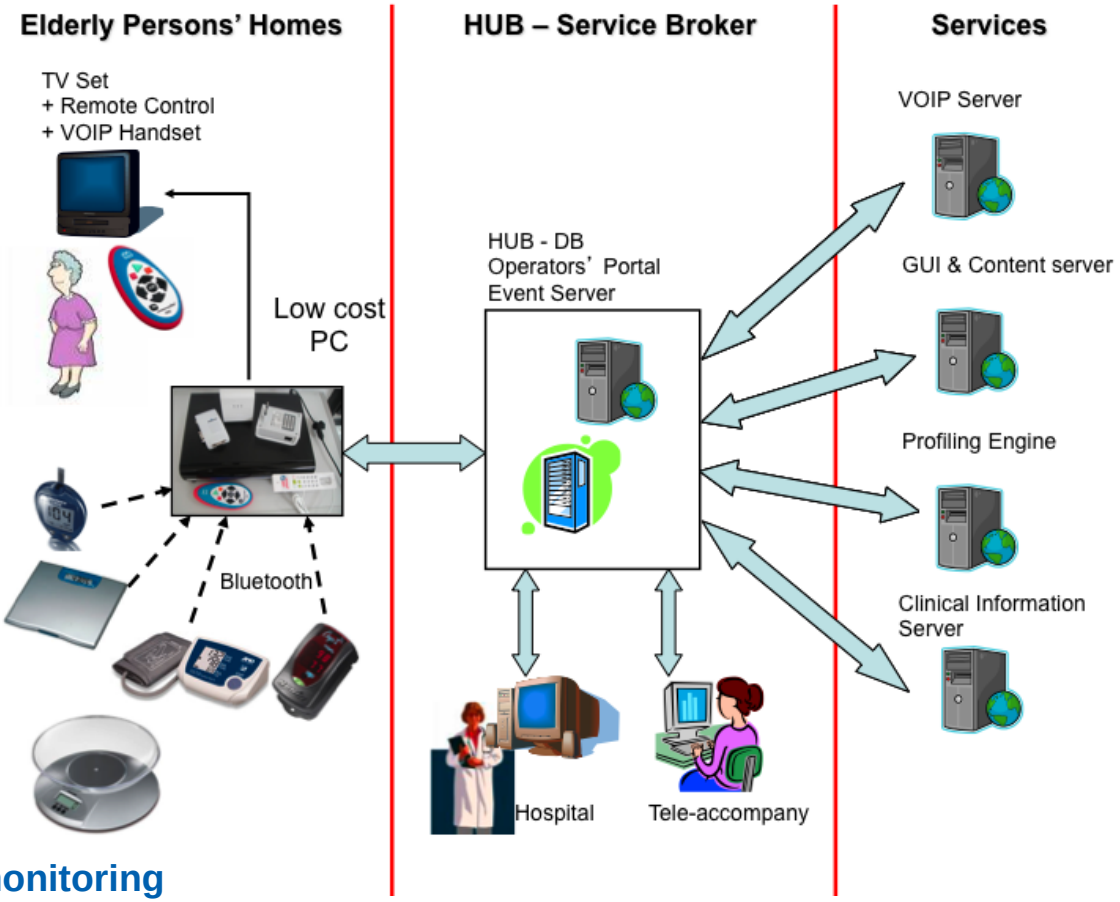


HVAC

Klimatizace
Vypnout
Nastavit časovač
Systém je právě Zap
Skončí v 23:00
Aktuální 24°C
Cílová teplota
28°C
Počasí
11,5°C
Detaily

Klimatizace
Aktuální teplota 24 °C
Cílová teplota
22 °C
Počasí
11°C
Jasno, lehký vítr

Supervising systems – project OLDES

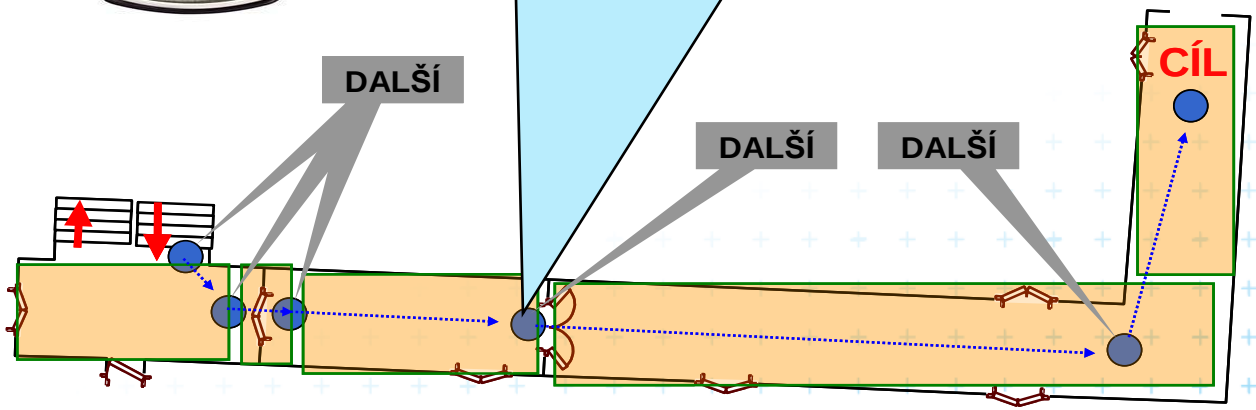


Health monitoring

Navigational systems

POPIS Chodba pokračuje asi 20 metrů. Vlevo jsou okna a nábytek. Vpravo jsou dveře kanceláří. Chodba je na konci zalomená vlevo. Na konci chodby jsou u zdi židle.

AKCE Dojdi k zalomení na konci chodby a otoč se vlevo.



Robots as companions

TESTS + ETHICAL ISSUES

Vulnerable participants

- Potentially vulnerable participants such as children, the elderly, the mentally ill may be incapable of understanding information that would enable them to make an informed decision about study participation.
- Consequently, careful consideration of their situation and needs is required, and extra care must be taken to protect them.
- For example, how will you assess the diminished capacity of an elderly individual, who will be the guardian, and how and when will you involve another individual as guardian in the process?

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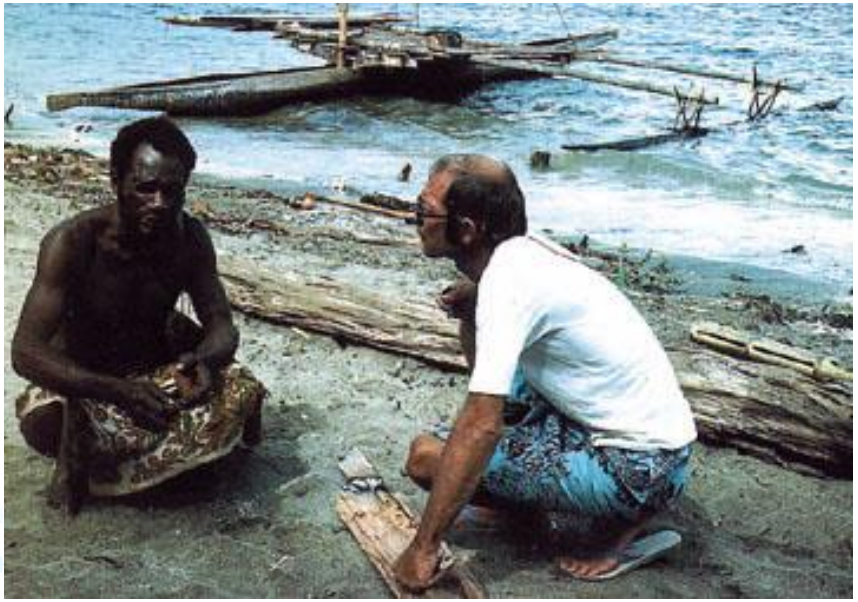
The process of obtaining consent

1. Identify participant population
2. Produce information sheet and consent document
3. Obtain permission from school's ethics committee
4. Present research information to participant and discuss its contents – indicating that withdrawal at any time is possible
5. Answer participants questions
6. Give a copy of the consent document
7. Allow the participant time to consider
8. Meet participant and discuss documents, to answer any more questions and assess participants understanding
9. Obtain appropriate signed consent
10. Start research

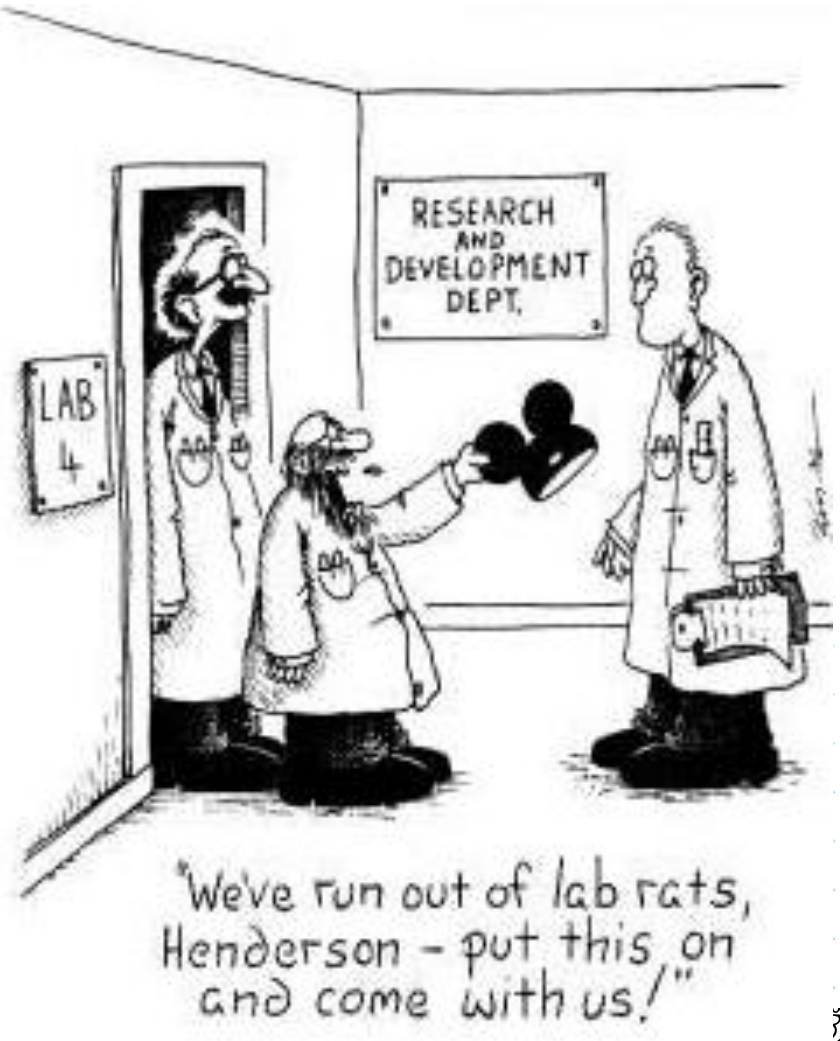
The participants

- The participants may not have the experience or educational background in order to fully understand the implications of the research
- They may be swayed because of their respect of and trust in the researcher who stands as an authority figure
- If they are being paid for their participation they may be swayed by economic considerations from a free judgement of the risks



Peer pressure

- The participants may be subject to social pressure of their peer group
- This is particularly prevalent in research groups



Assessing Participant Understanding

An important part of the process is for the researcher to ensure that the prospective participants understands the research, their role in it, and any risks they may be taking.

During discussion the use of open-ended and nondirective questions (i.e. those that begin with words such as "what," "where," "how often," "when," and "please describe.“) is most effective at doing this .

DCGI

Consent Form

- Might take the following form

I have read the Information Sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I may ask further questions at any time.

I understand I have the right to withdraw from the study at any time and decline to answer any particular questions.

I agree to provide information to the researcher(s) on the understanding that my name will not be used without my permission.

I agree/do not agree to the interview being recorded electronically.

I understand that I have the right to ask for the tape to be turned off at any time during the interview

I agree to participate in this study under the conditions set out in the information sheet

Signature – Name - Date

Confidentiality

- Confidentiality of electronically stored participant information.
- Appropriate selection and use of tools for analysis of the primary data
- Who has access to the data
- Data protection act

DCGI

COGNITIVE PSYCHOLOGY

What is Cognitive Psychology?

- Cognitive psychology is the study of mental processes

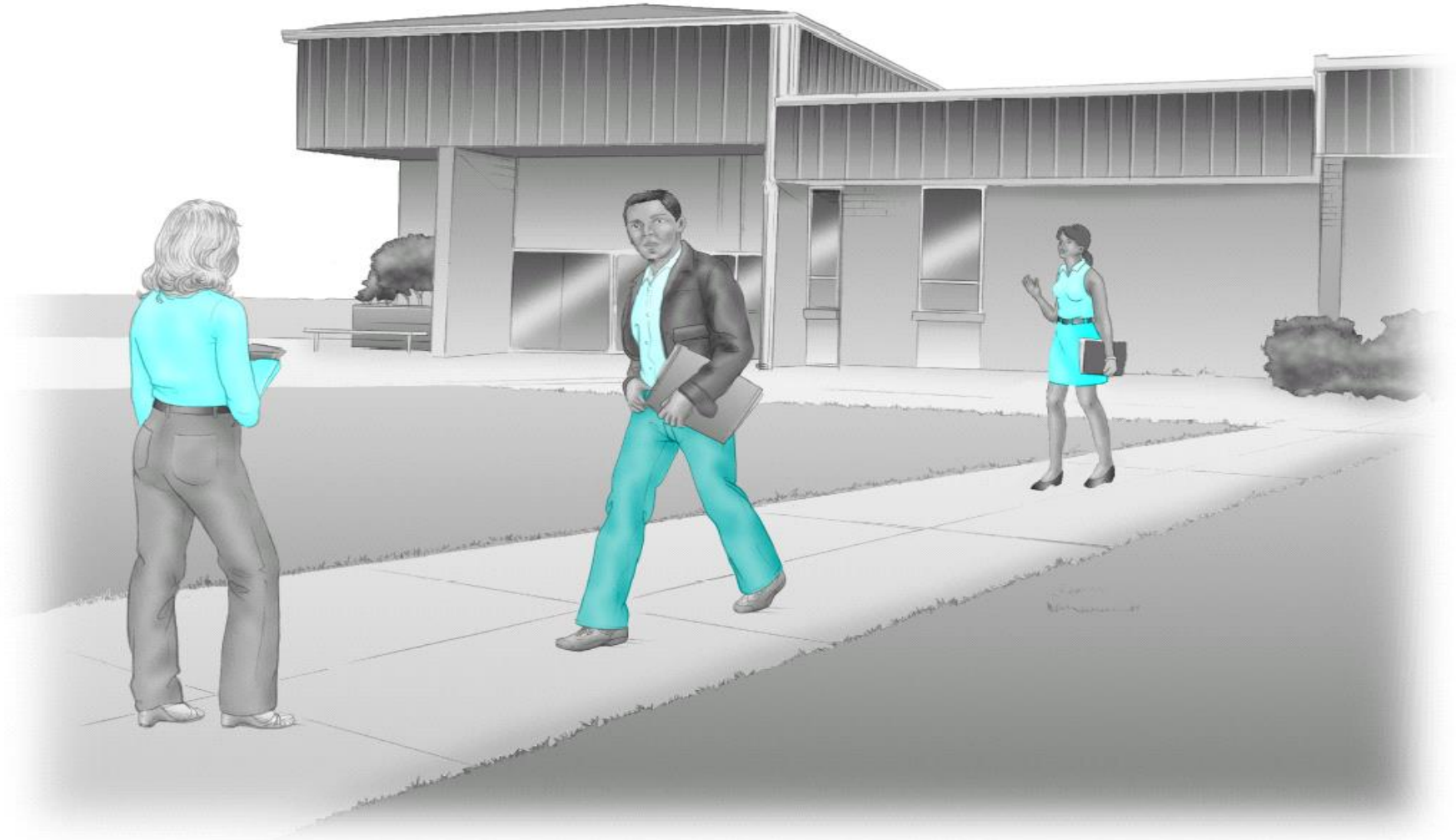
What is Cognitive Psychology?

- Cognitive Psychology versus Neurobiology
  - Neurobiology: how does the brain do it?
  - Cognitive Psych: how does the mind do it?
  - Both can use neurons to describe mind
  - The difference is behavior

What is Cognitive Psychology?

- Cognitive Psychology versus Artificial Intelligence (AI)
  - AI: what's the best way to do this?
  - Cognitive Psych: how do humans do this?
  - Both try to model some form of mind
  - The difference is fidelity
  - Brain is optimal: If AI truly wants to find optimality they should study Cognitive Psychology.

EXAMPLES



Sarah is walking toward her friend, who is waving in the distance. She is aware of her friend, but has little awareness of the stranger who is passing on her right, even though he is much closer.

Complexity of Perception; Expectations

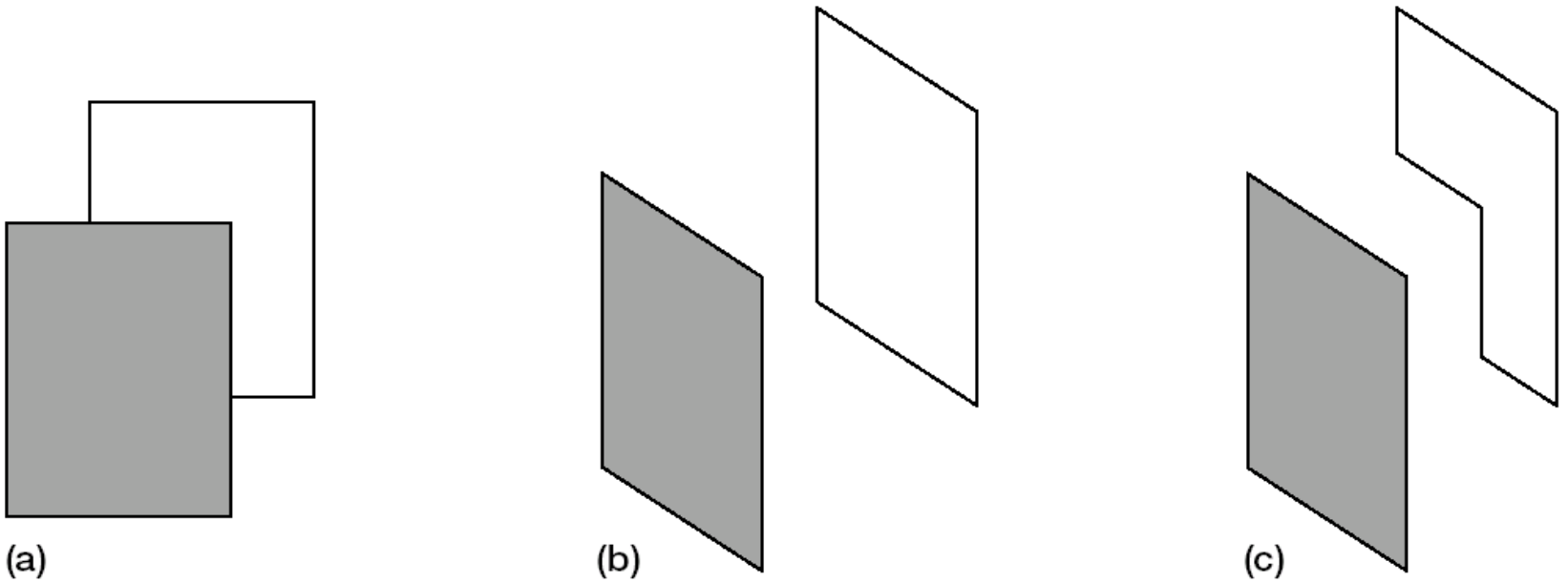
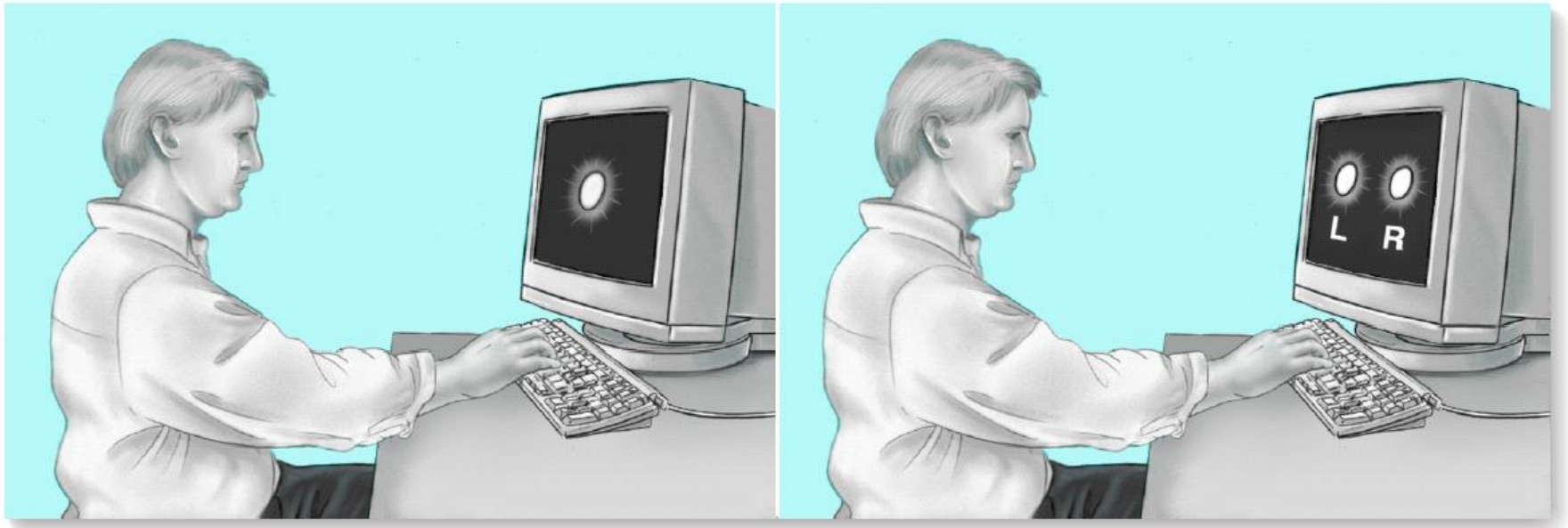


Figure 1.5 (p 8) - Hemholtz's unconcious inference

The display in (a) looks like (b) a gray rectangle in front of a light triangle; but it could be (c) a gray rectangle and a six-sided figure that are lined up appropriately.

How CogPsych is studied

- Donders reaction time experiment



(a) Press *J* when light goes on. (b) Press *J* for left light, *K* for right.

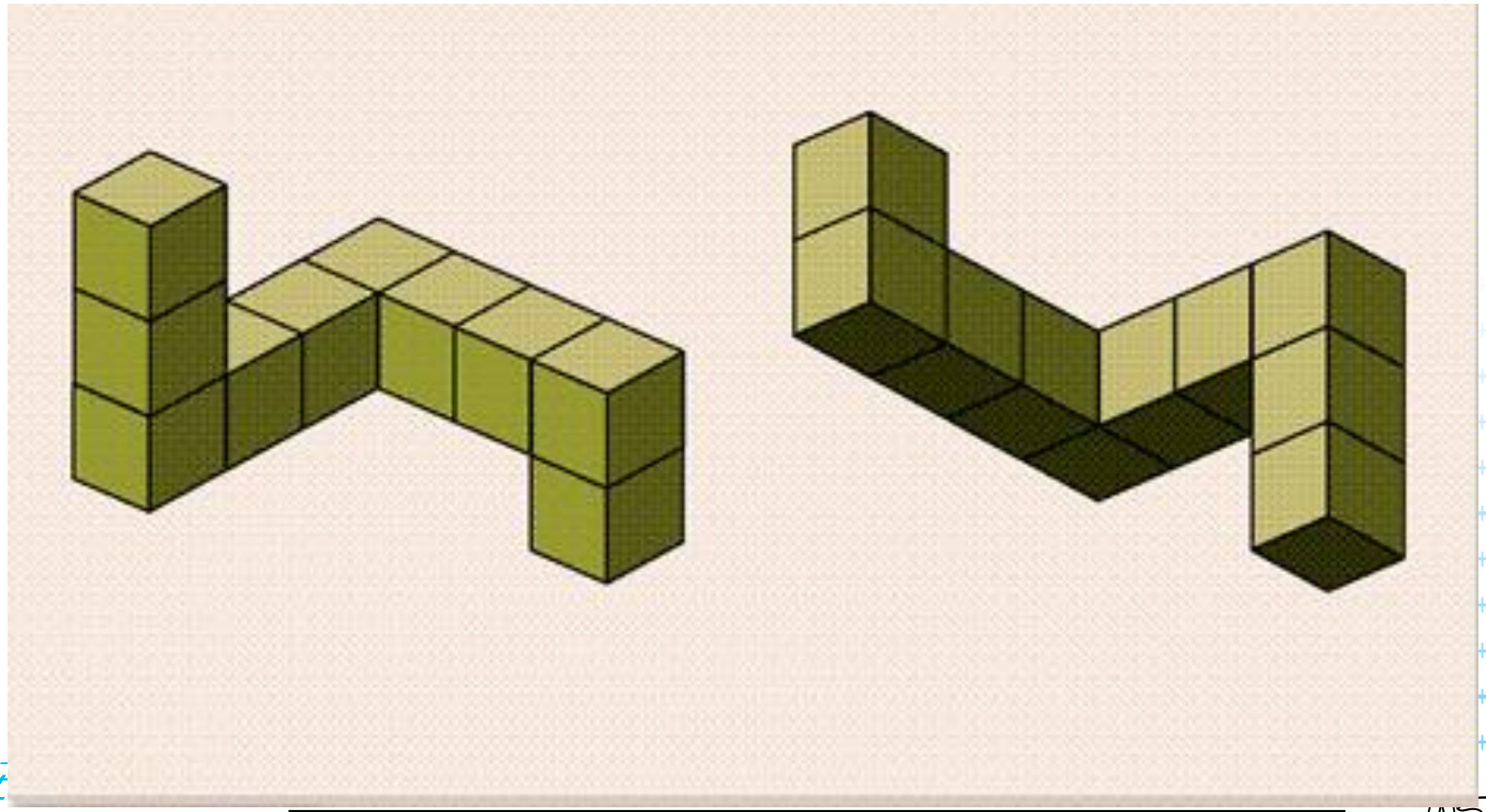
A modern version of Donders' (1868) reaction time experiment. (a) the simple reaction-time task; and (b) the choice reaction-time task. For the simple time reaction text, the participant pushes the J key when the light goes on. For the choice reaction time test the participant pushes the J key if the left light goes on, and the K key if the right light goes on. The purpose of the Donders experiment was to determine the time it took to decide which key to press for the choice reaction time test.

Objective tests of imagery

Shepard & Metzler (1972) developed the mental rotation test

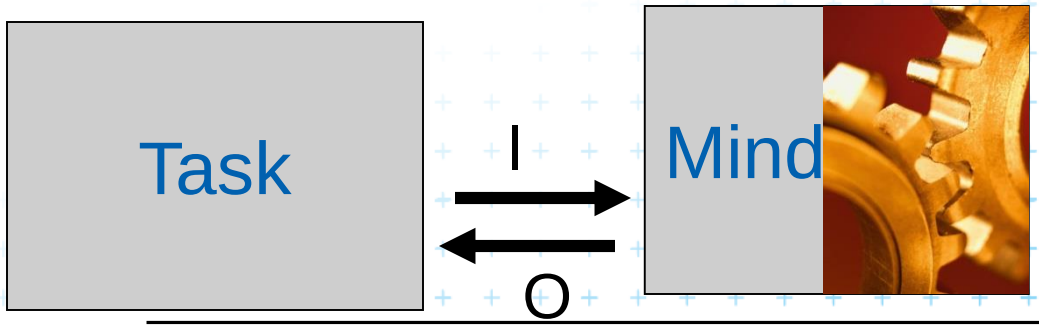
Objective tests of imagery

Shepard & Metzler (1972) developed the mental rotation test

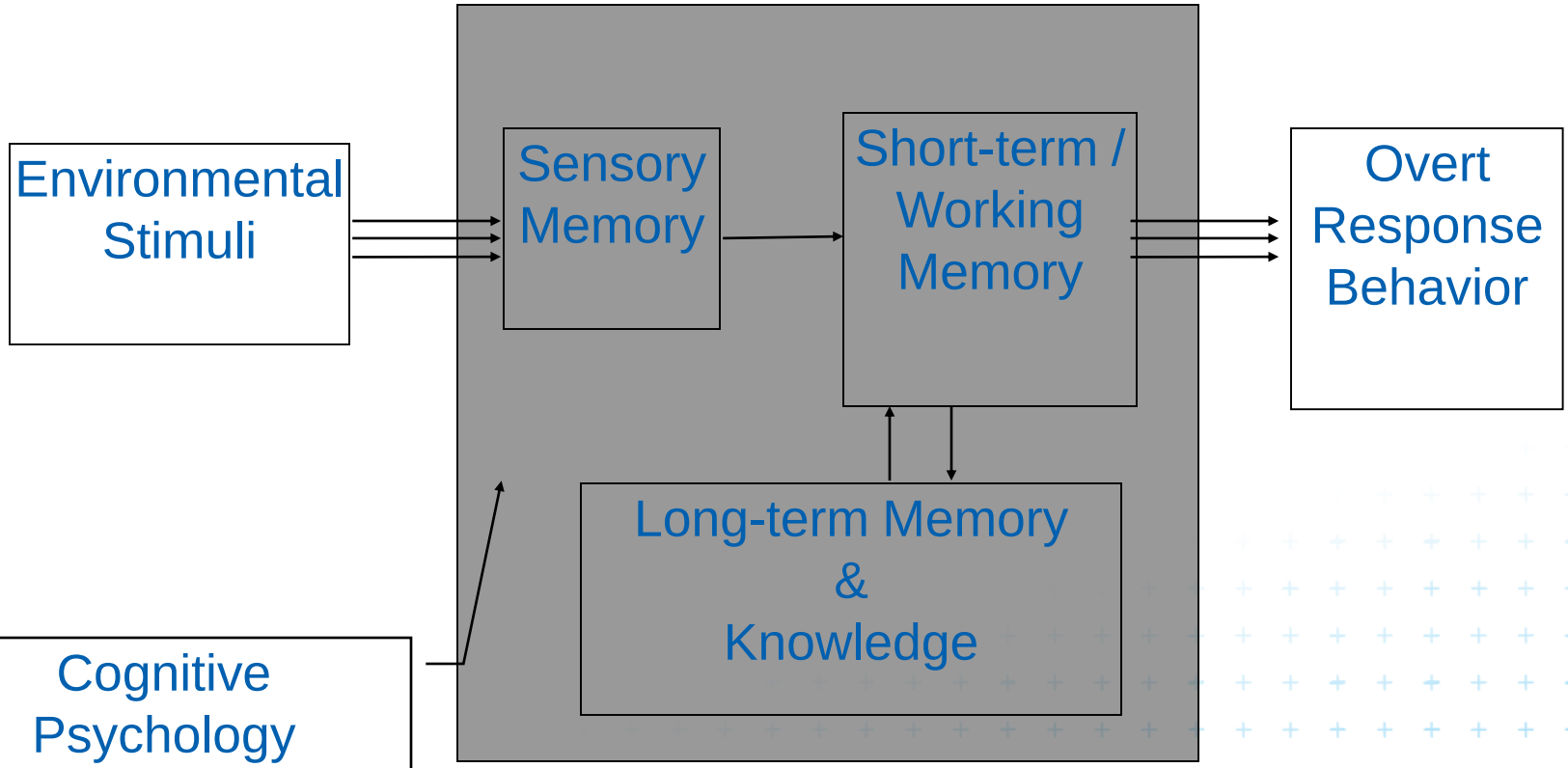


Information Processing Approach

- Mind as a processor of information
  - Input -> Mental Processes -> Output
- To understand it, build it



Info. Processing model



Component of Model

- Sensory memory – input device
  - What info is sent to the processor
- Short-term / Working memory
  - Central processor, actively processes info
- Long-term memory / Knowledge
  - Library of programs, algorithms, data, and experiences that are stored for use

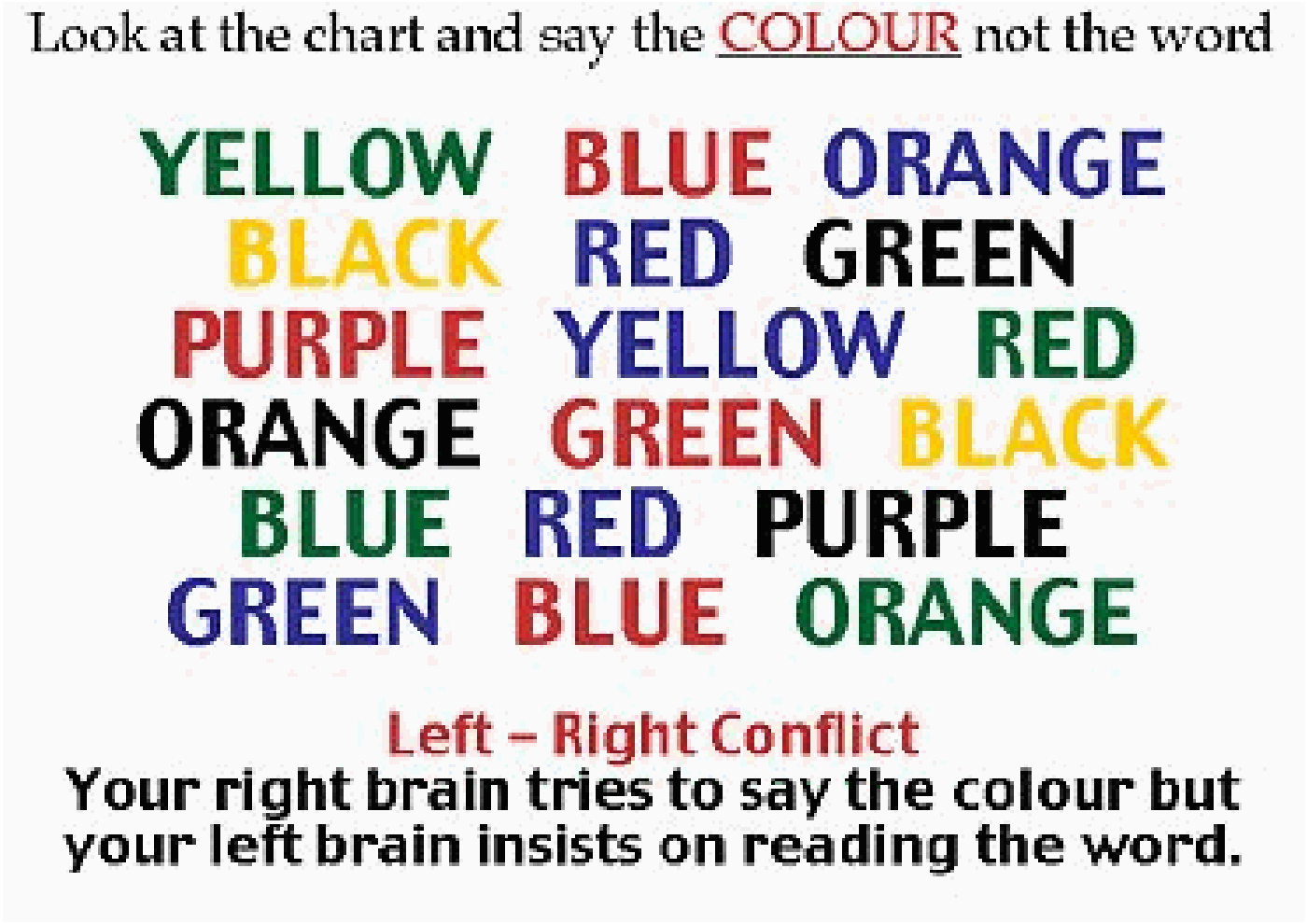
†Note similarities to computer!

SOME EXAMPLES HOW OUR BRAIN WORKS

Think Critically

- Beware cognitive myths
  - We only use 10% of our brain
  - Group brainstorming
  - Left vs right hemisphere
    - Left is an accountant, right is a hippie
  - Phrenology

Verbal visual conflict



Think Critically

- Correlation does not imply causation
  - 100% of people who eat pickles die
  - Therefore, eating pickles is bad for you

QUESTION

- Studies have shown that eyewitness testimony is valid and accurate, especially with highly stressful (i.e., memorable) events.

- False -- Eyewitness testimony is notoriously unreliable, particularly when the observer is in a highly aroused state.

- As of January 7, 2006 **172** wrongly convicted prisoners have been released from death row because they were factually innocent of the crime. Most were committed on the basis of eye witness testimony.

Question

- We use only about 10% of our brain.

- False -- We use all or our brain all the time. Even small brain lesions can result in significant cognitive impairment. The distributed neuronal cell loss with age amounts to up to 25% of the brain volume and accounts for many effects of cognitive aging.

Question

- Studies of divided attention have demonstrated that driving while using a cell phone is not impaired.

- False -- Studies show that using a cell phone significantly interferes with driving. In fact, several studies show that you are more impaired when driving and talking on a cell phone than when you are driving drunk.

Question

- Information can be stored in long-term memory even if you never attended to it.

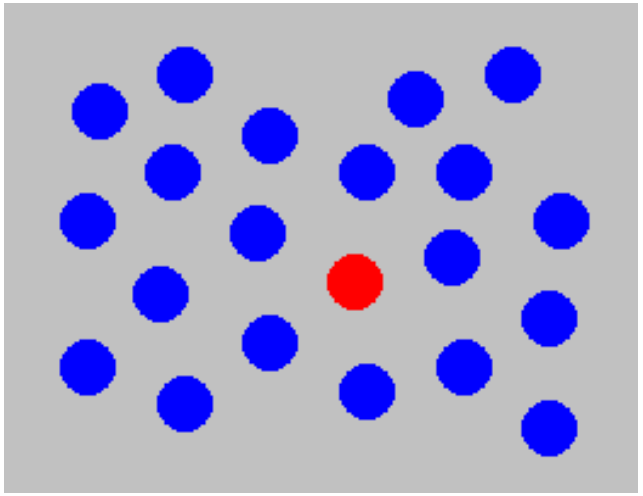
- False -- Attention is necessary for the creation of long-term (and short-term) memories. Information that falls outside of attention is lost.

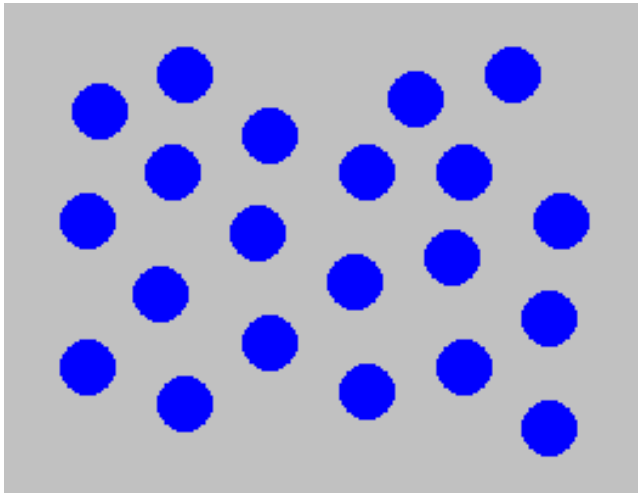
HOW VISUAL INFORMATION IS PERCEIVED

Pre-attentive Processing

- < 200 - 250ms qualifies as pre-attentive
  - eye movements take at least 200ms
  - yet certain processing can be done very quickly, implying low-level processing in parallel
- If a decision takes a fixed amount of time regardless of the number of distractors, it is considered to be preattentive.

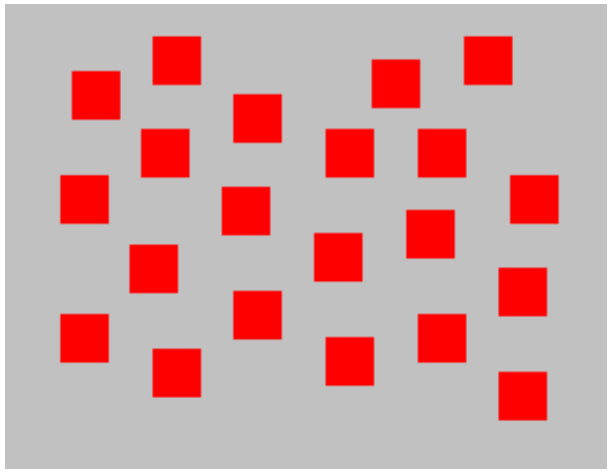
Example: Color Selection

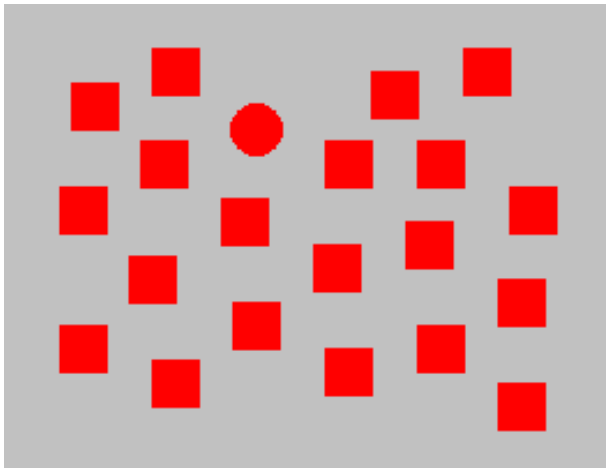




Viewer can rapidly and accurately determine whether the target (red circle) is present or absent. Difference detected in color.

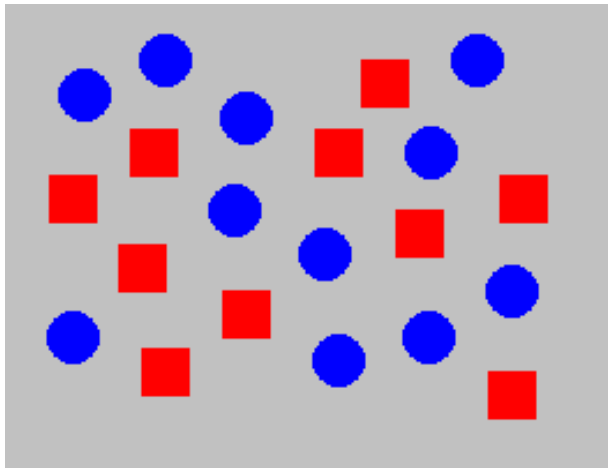
Example: Shape Selection

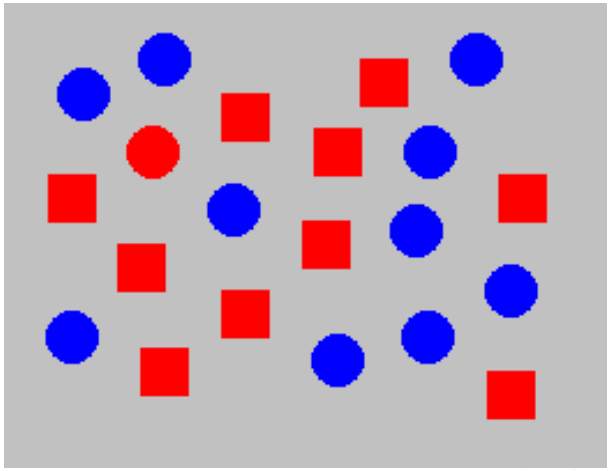




Viewer can rapidly and accurately determine whether the target (red circle) is present or absent. Difference detected in form (curvature)

Example: Conjunction of Features





Viewer *cannot* rapidly and accurately determine whether the target (red circle) is present or absent when target has two or more features, each of which are present in the distractors. Viewer must search sequentially.

All Preattentive Processing figures from Healey 97

http://www.csc.ncsu.edu/faculty/healey/PP/PP.html

Cognitive issues - scrambled words

Aoccdrnig to a rscheearch at an Elingsh uinervtisy, it deosn't mttaer in waht oredr the ltteers in a wrod are, the olny iprmoetnt tihng is taht frist and lsat ltteer is at the rghit pclae. The rset can be a toatl mses and you can sitll raed it wouthit porbelm. Tihs is bcuseae we do not raed ervey lteter by it slef but the wrod as a wlohe

This is because we do not read every letter by itself but the word as a whole

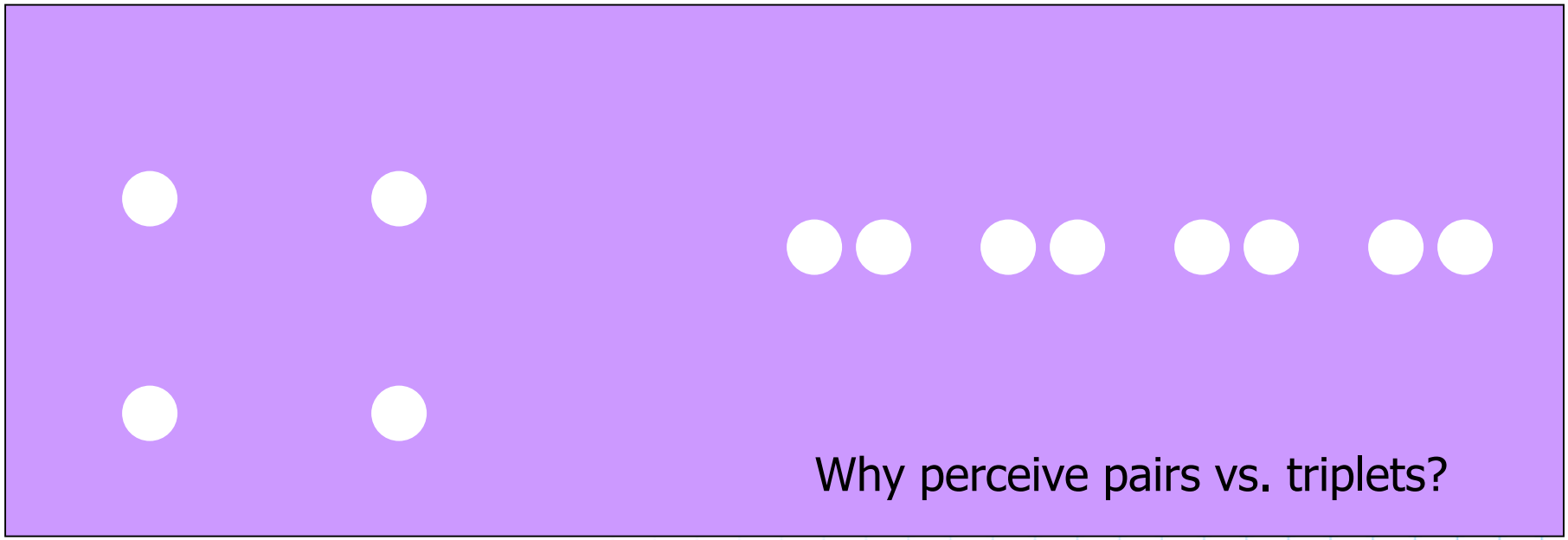
Gestalt Principles

- Idea: forms or patterns transcend the stimuli used to create them.
  - Why do patterns emerge?
  - Under what circumstances?

- Principles of Pattern Recognition
  - “gestalt” German for “pattern” or “form, configuration”
  - Original proposed mechanisms turned out to be wrong
  - Rules themselves are still useful

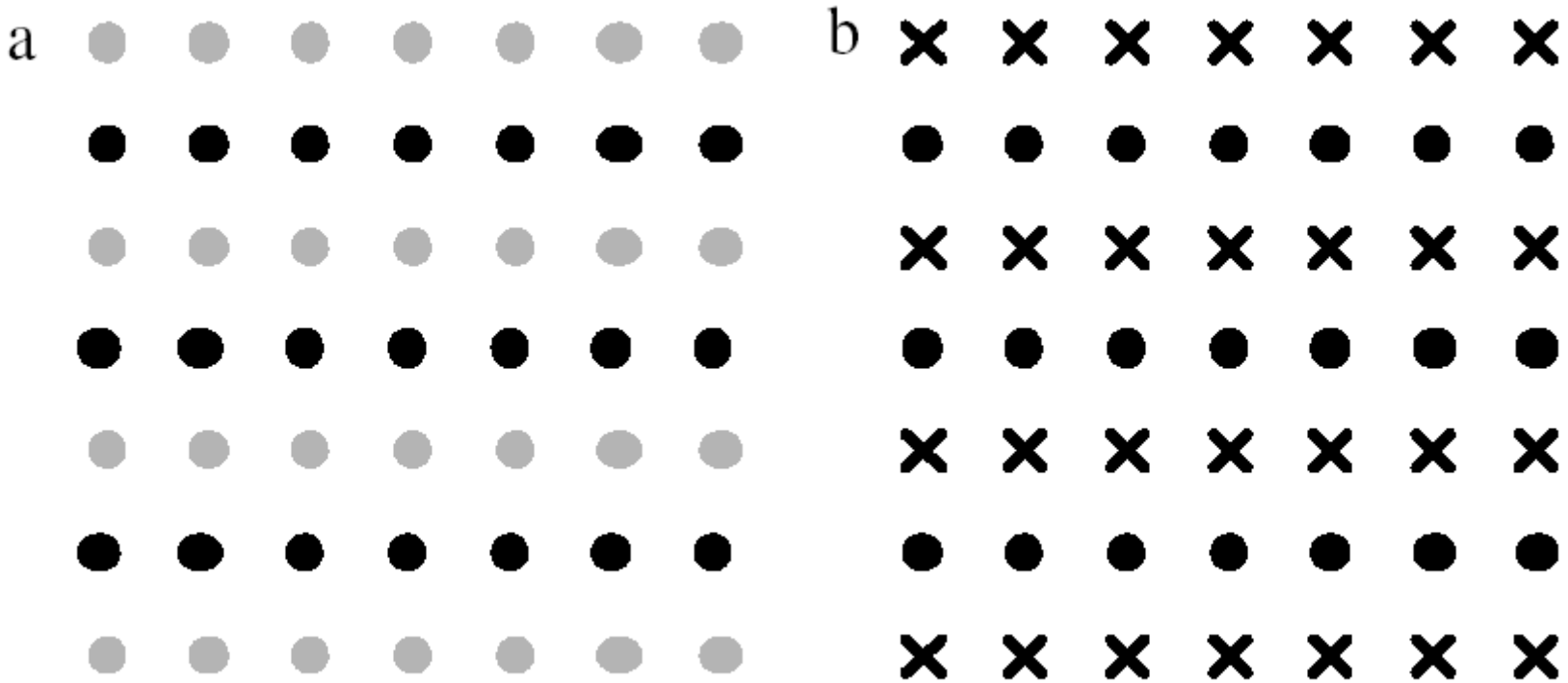
Gestalt Properties

- Proximity



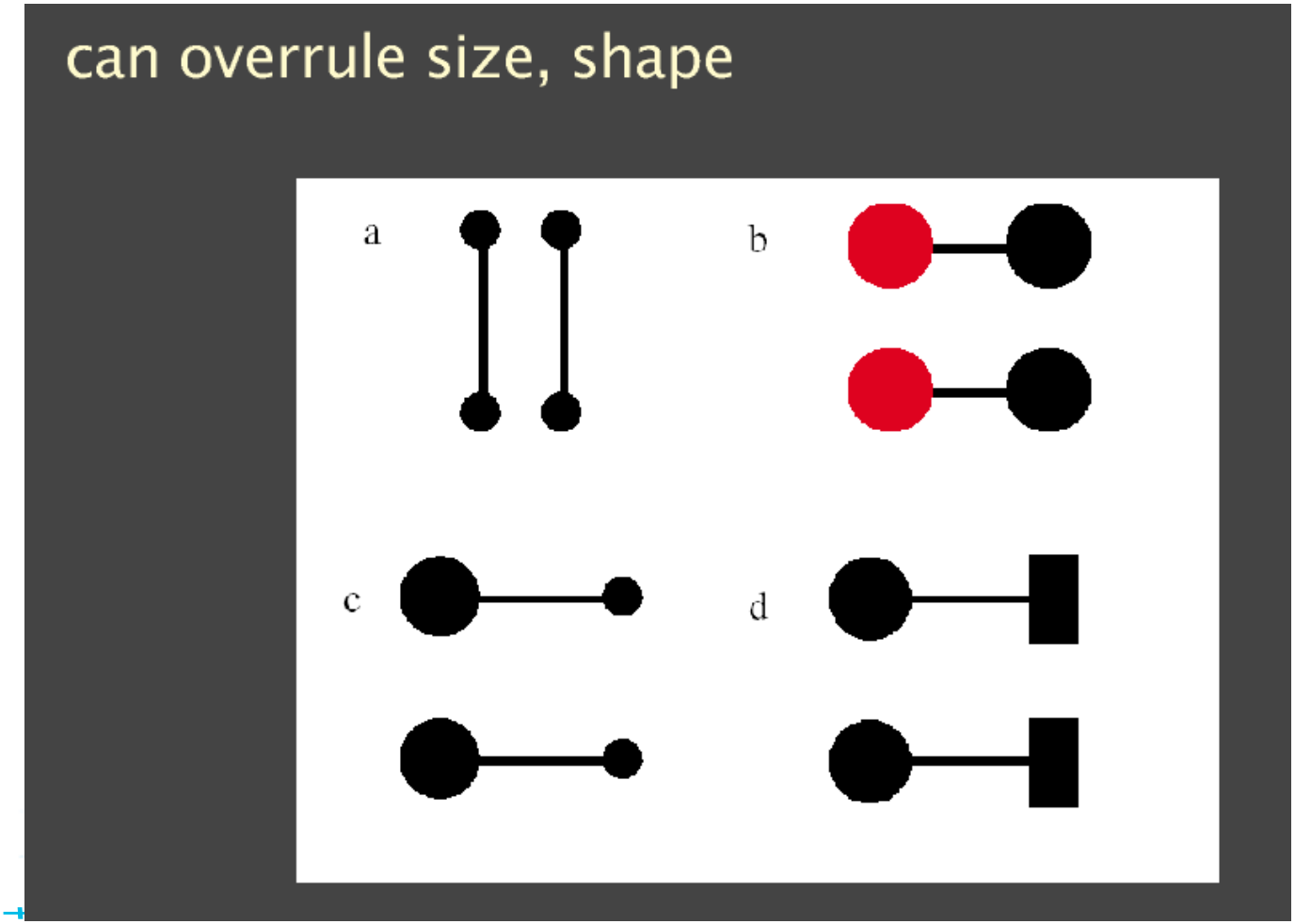
Gestalt Properties

- Similarity



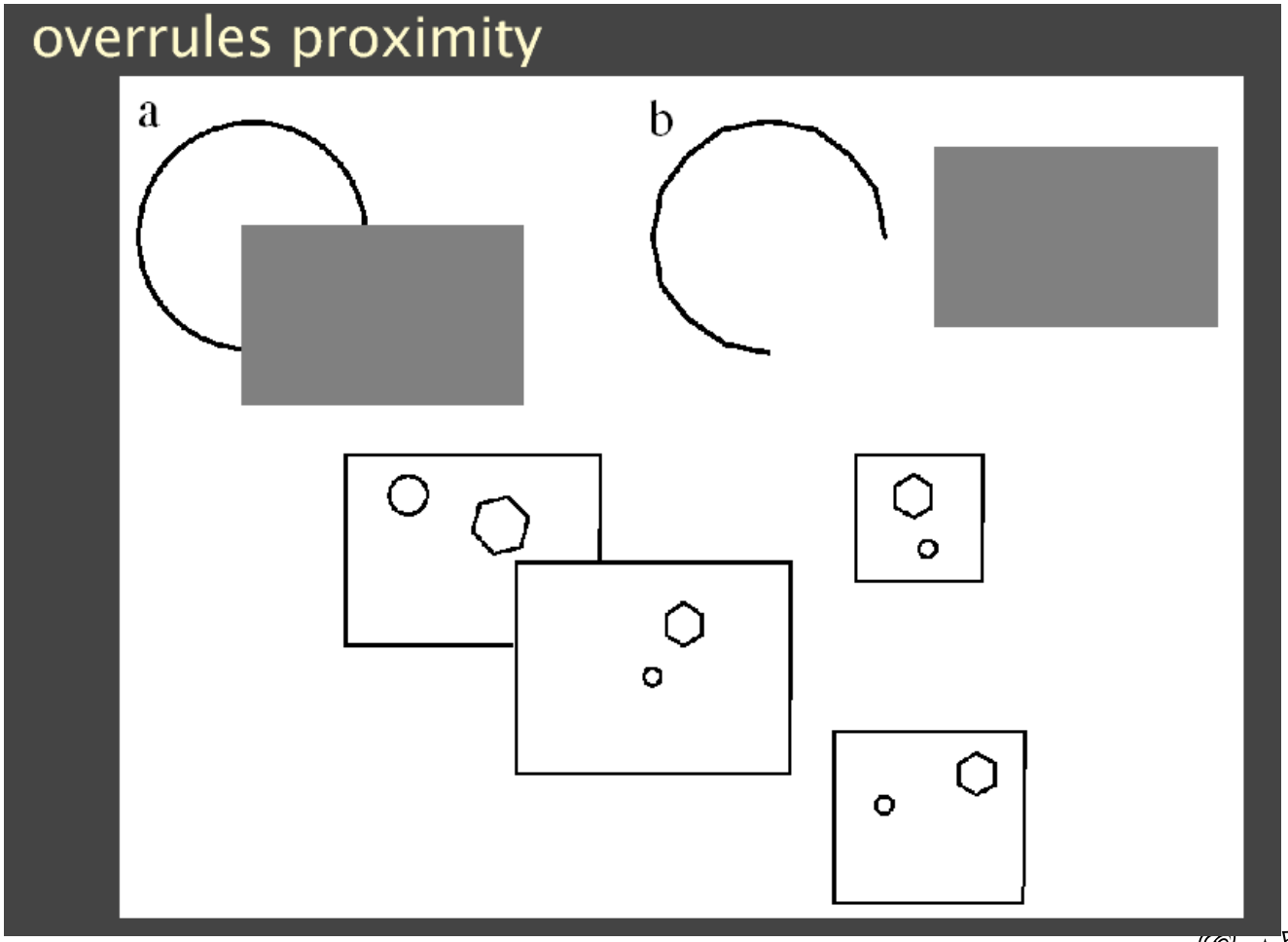
Gestalt Properties

- Connectedness



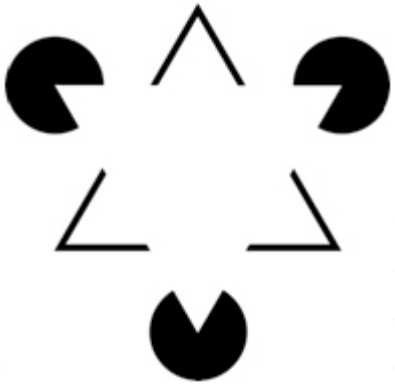
Gestalt Properties

- Closure

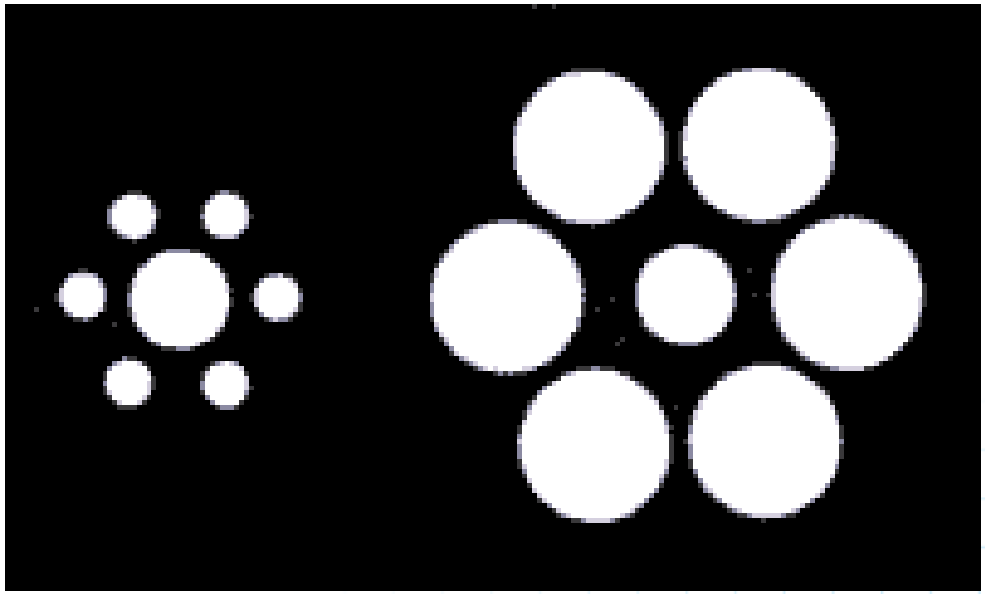


Gestalt Laws of Perceptual Organization

- Figure and Ground
  - Escher illustrations are good examples
  - Vase/Face contrast
- Subjective Contour

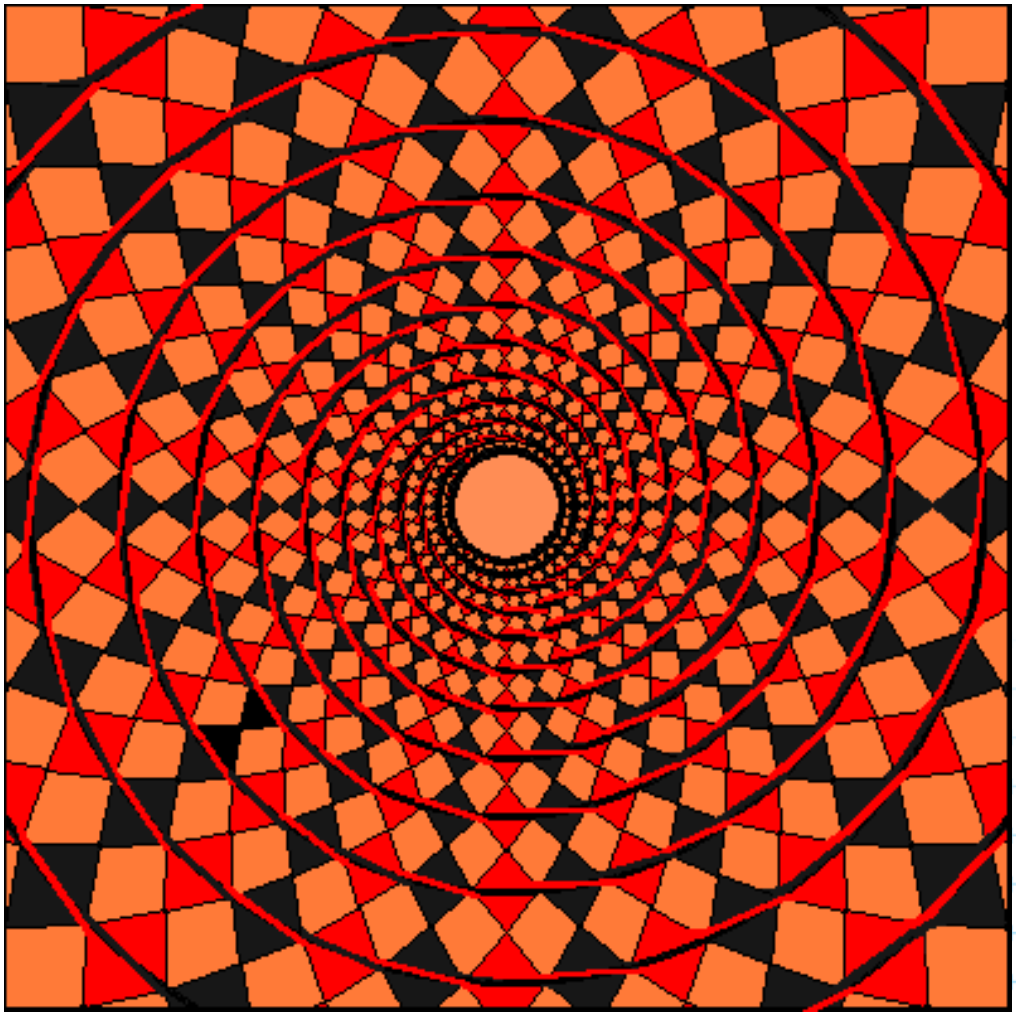


Is the left center circle bigger?



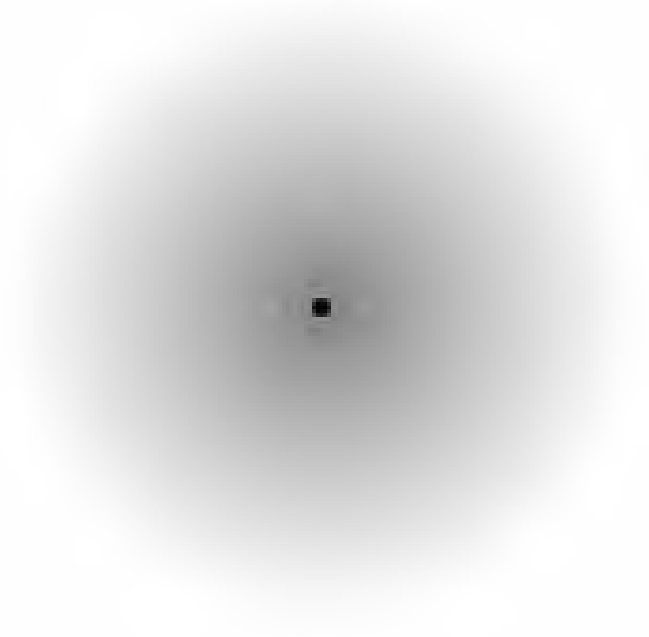
No, they're both the same size

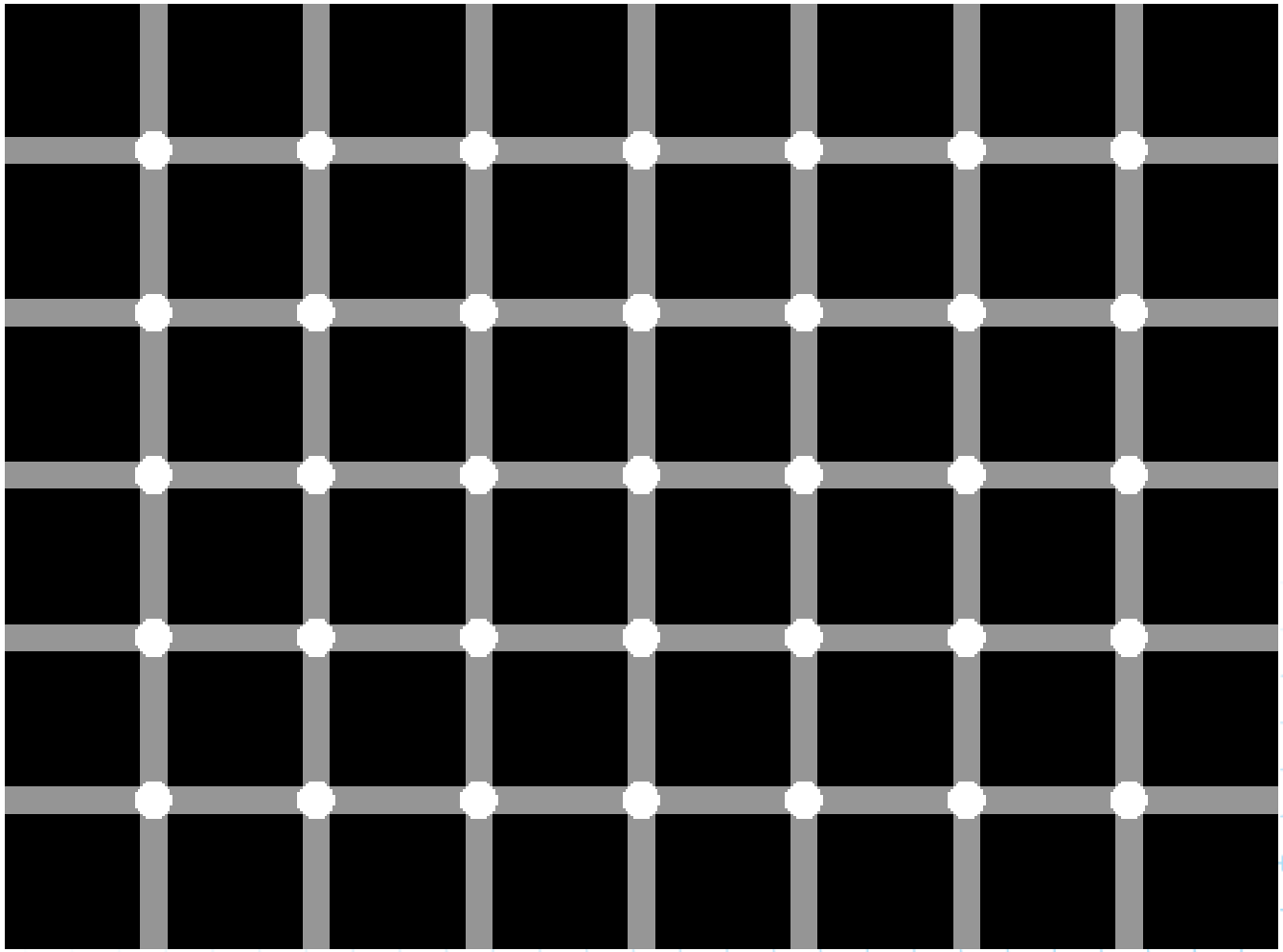
It's a spiral, right?



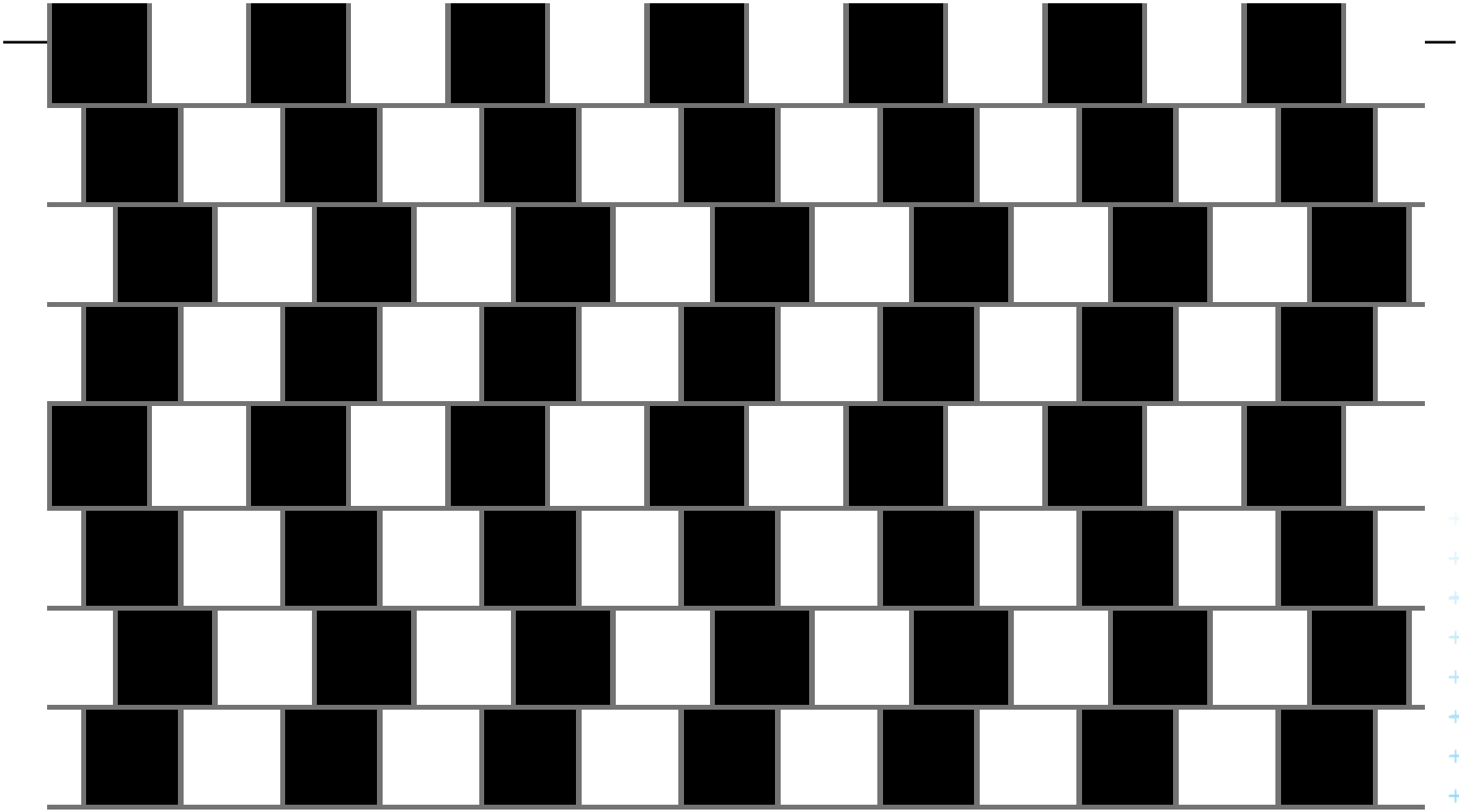
No, these are a bunch of independent circles

Keep staring at the black dot. After a while the gray haze around it will appear to shrink.

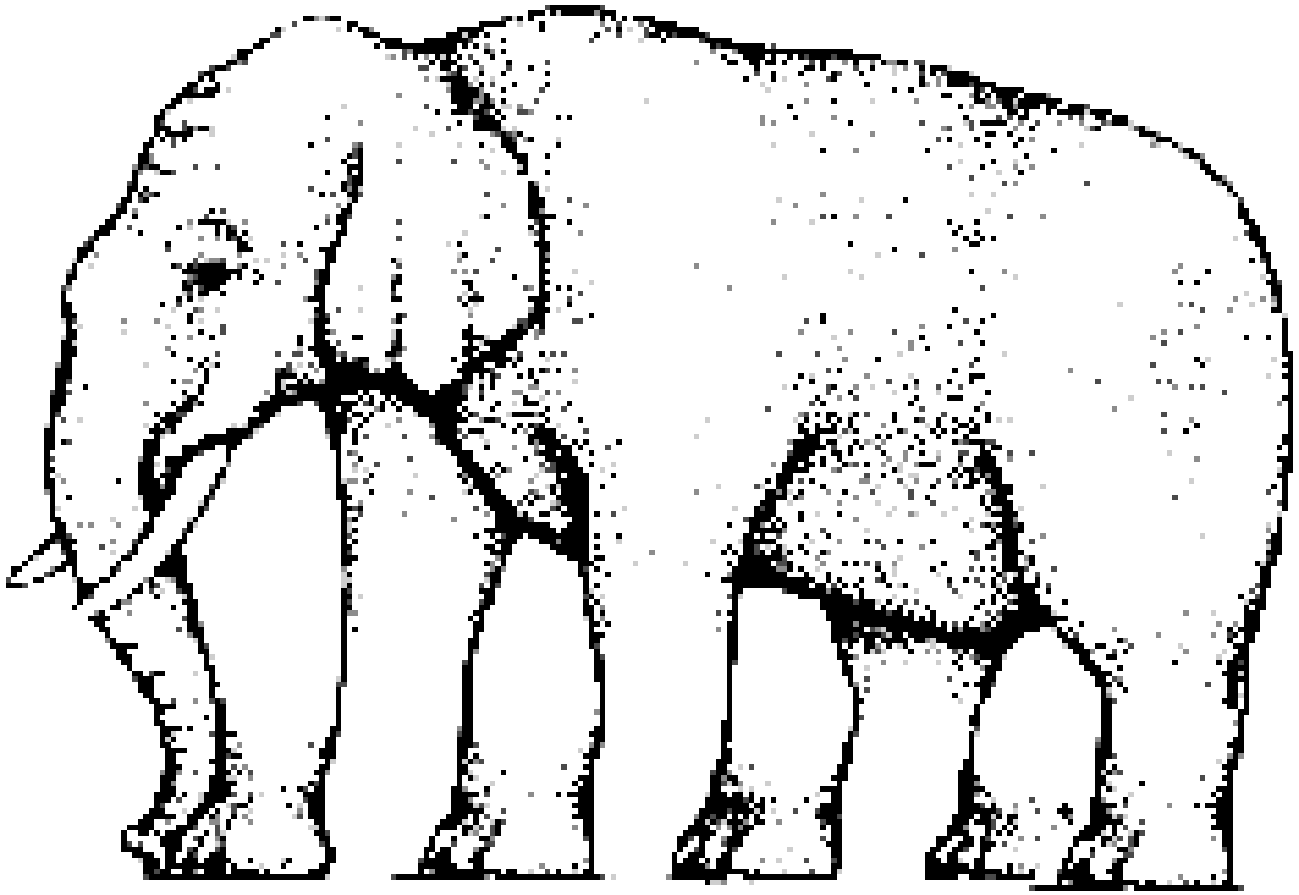




Count the black dots! :o)



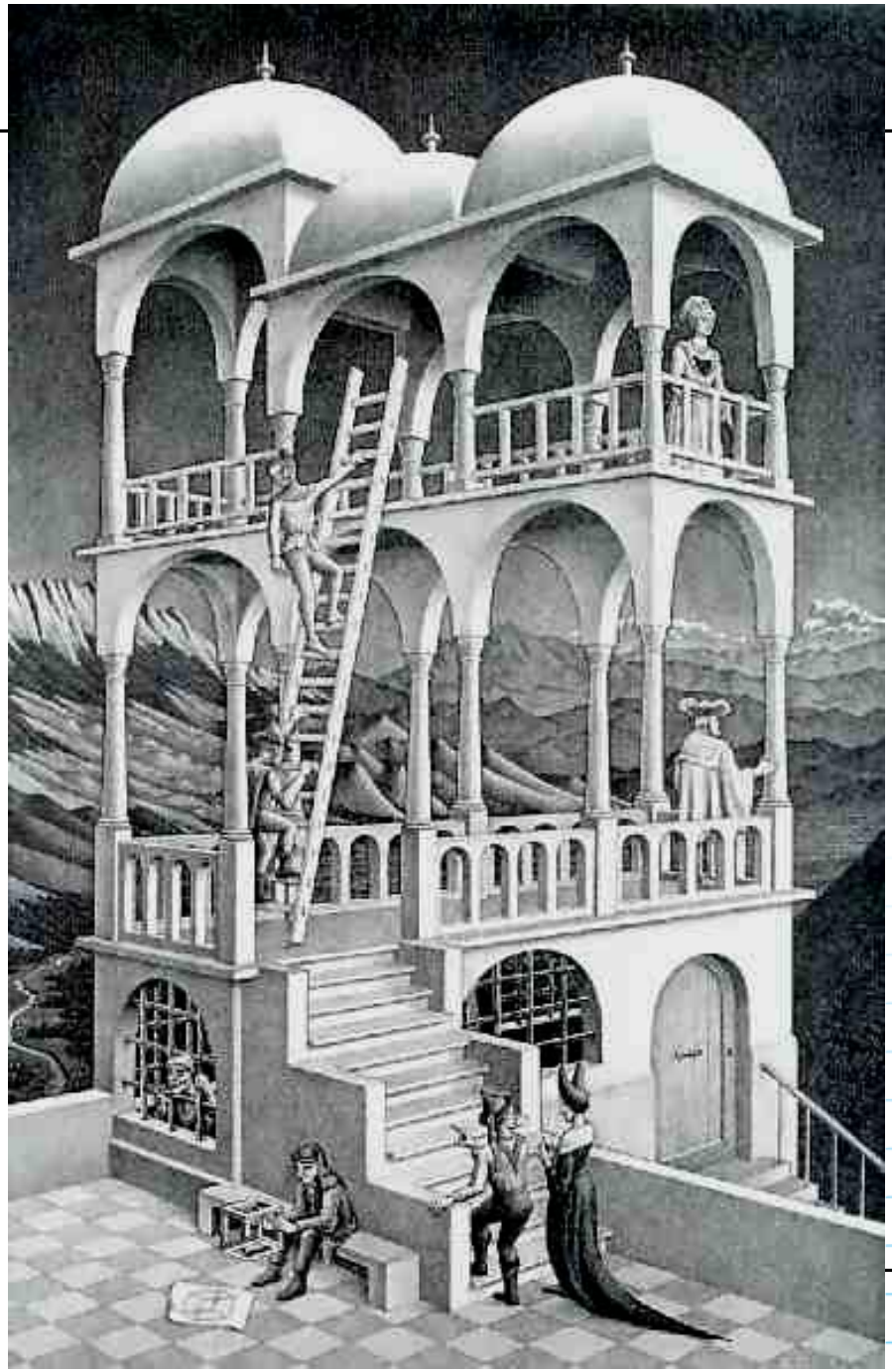
Are the horizontal lines parallel or do they slope?



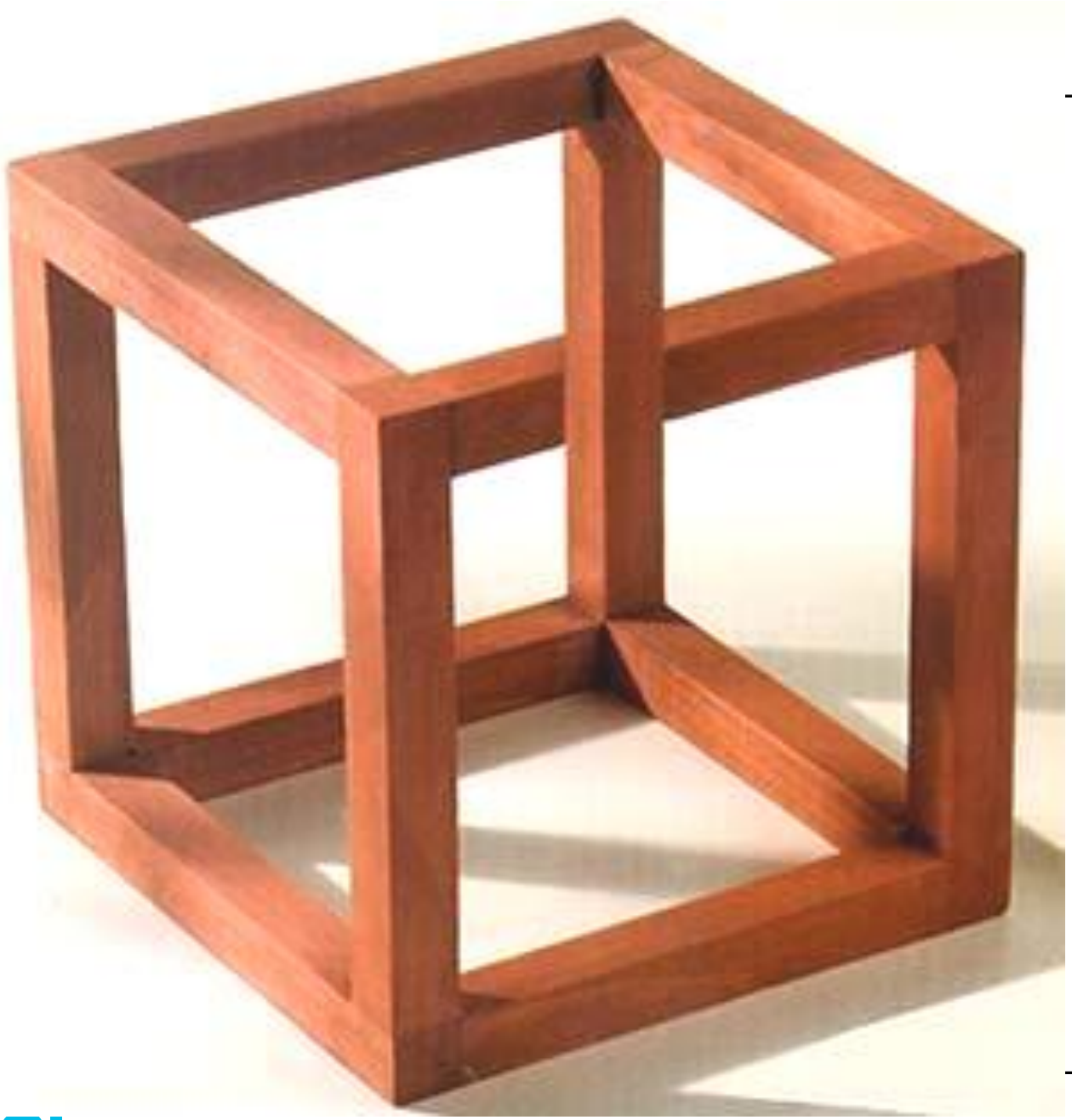
How many legs does this elephant have?

DCGI

Belvédère
M.C. Escher
1958

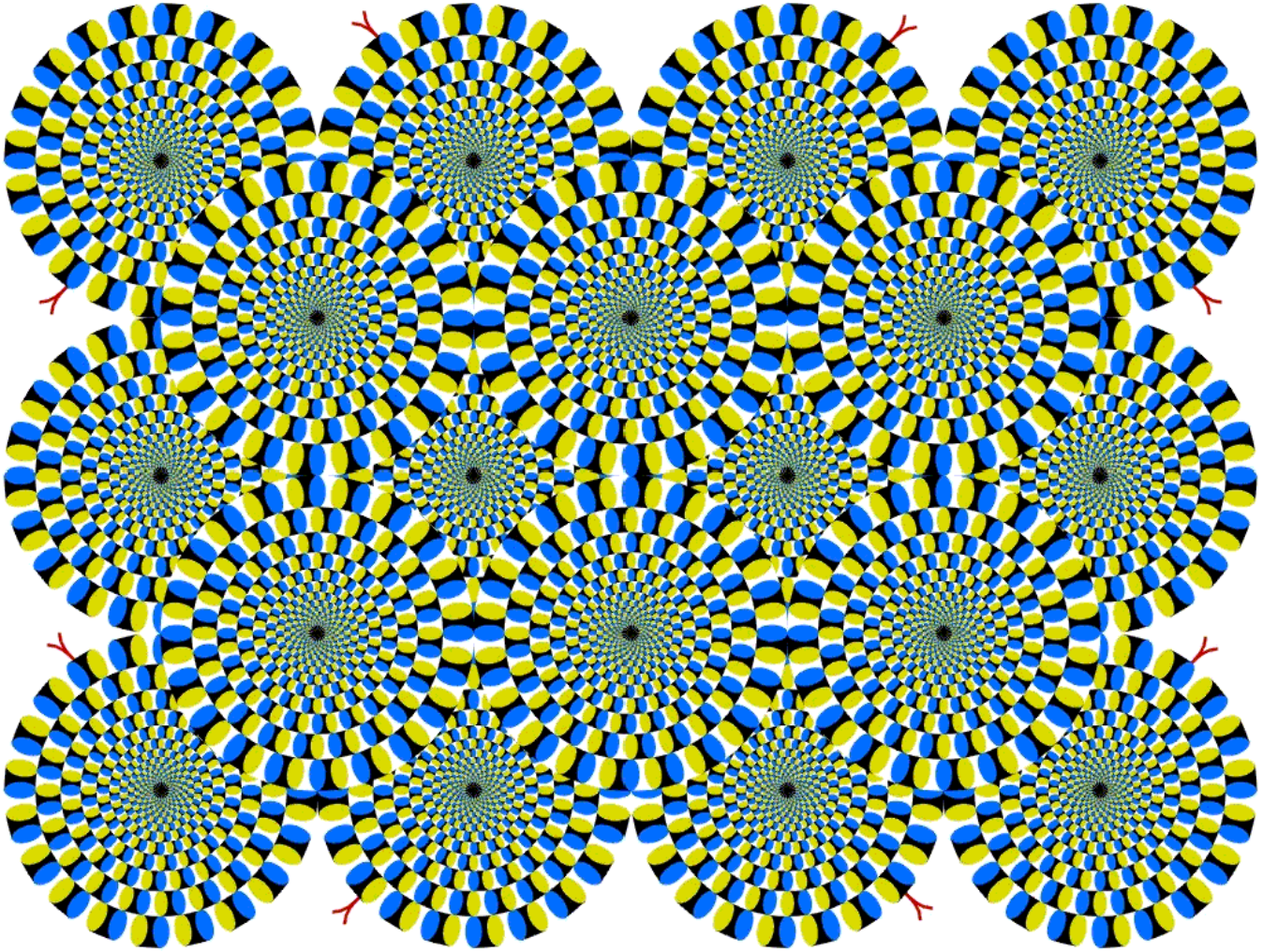


DCGI



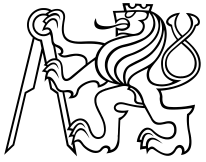
DCGI

Any movement you see is an illusion!



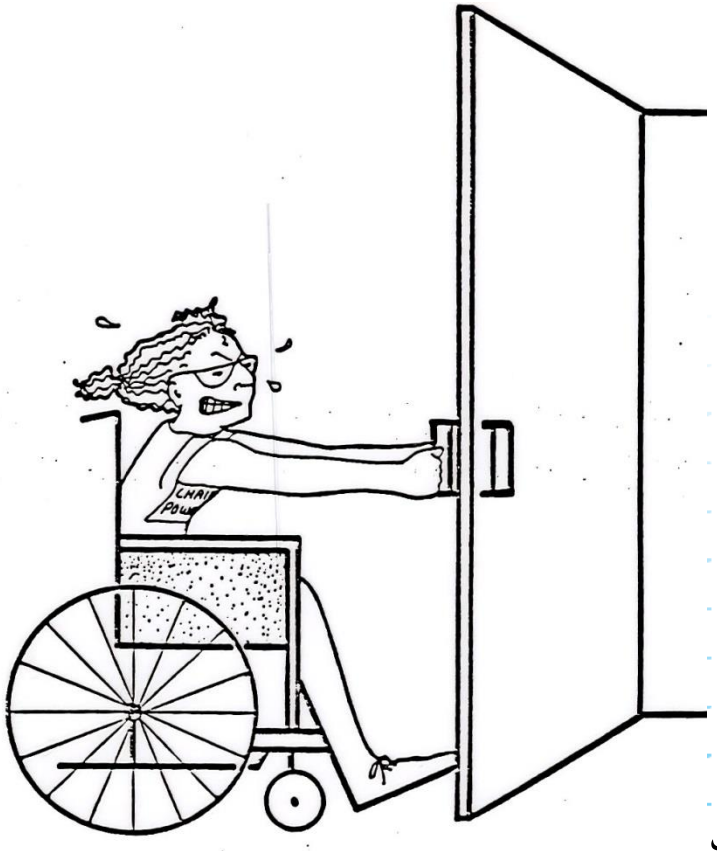
http://psycharts.com/opt_illus.html

STANDARDS FOR ACCESSIBILITY

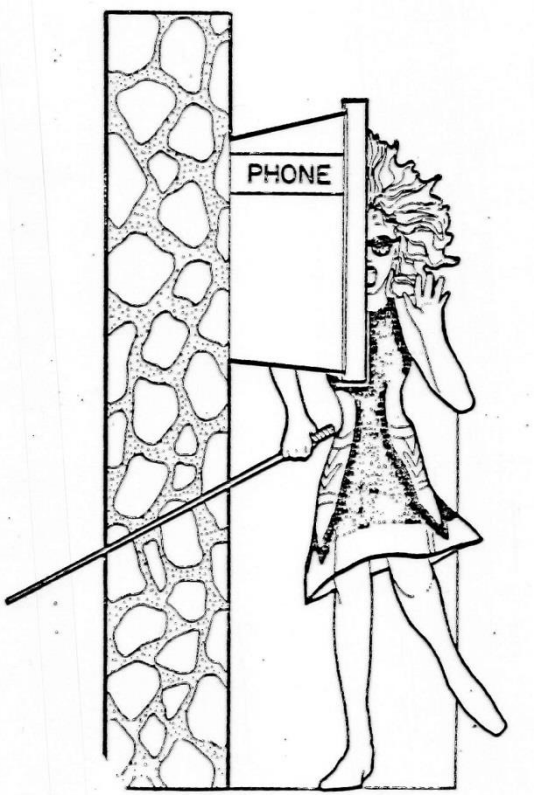


Charitable Model

“ I guess we should let those guys in.”



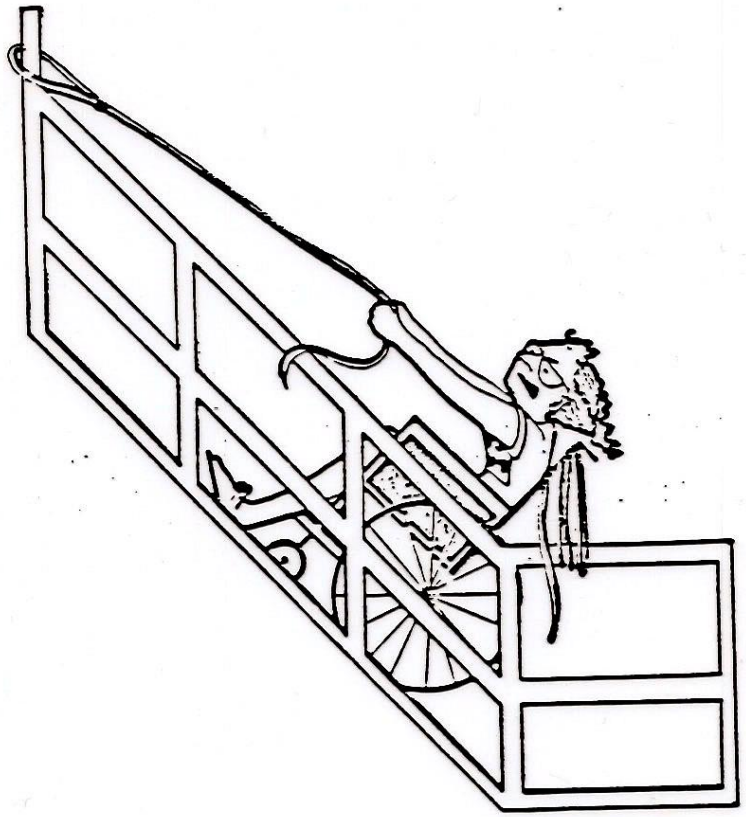
Social Model
- Moving Towards Inclusion



“ I guess we should have Braille for those handicapped deaf people”

Independent Living Model

“ Now we will have to let them join the committee”

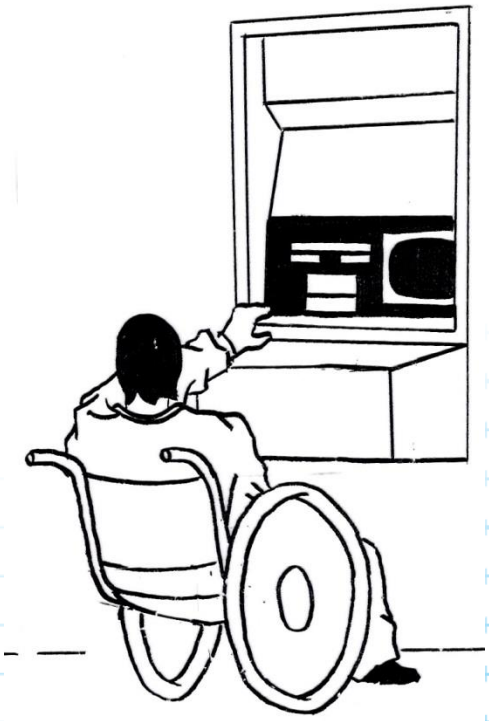


Accessibility As A Human Right

- Right to Access
- Movement towards accessibility as a human right

Human Rights Model - Inclusion

“ Nothing About Us, Without Us.”



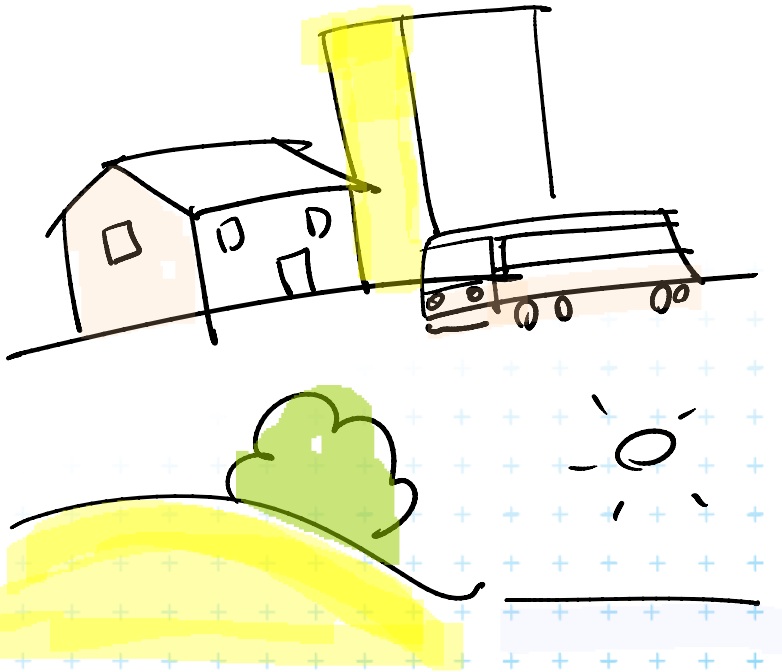
ICTA Global ©
International Commission on Technology and Accessibility

Evolution of Codes & Standards

- Countries working in isolation
- Evolution of Technical Requirements

Accessibility Standards: The Danish Experience

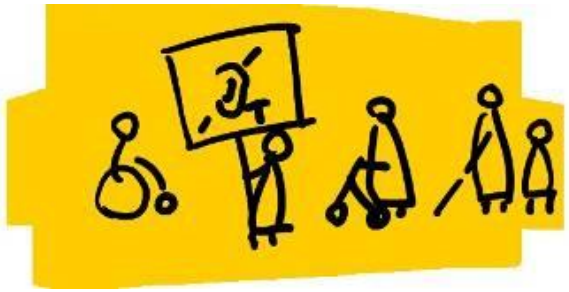
- Søren Ginnerup
- Danish Building Research Institute
  - Danish Centre for Accessibility

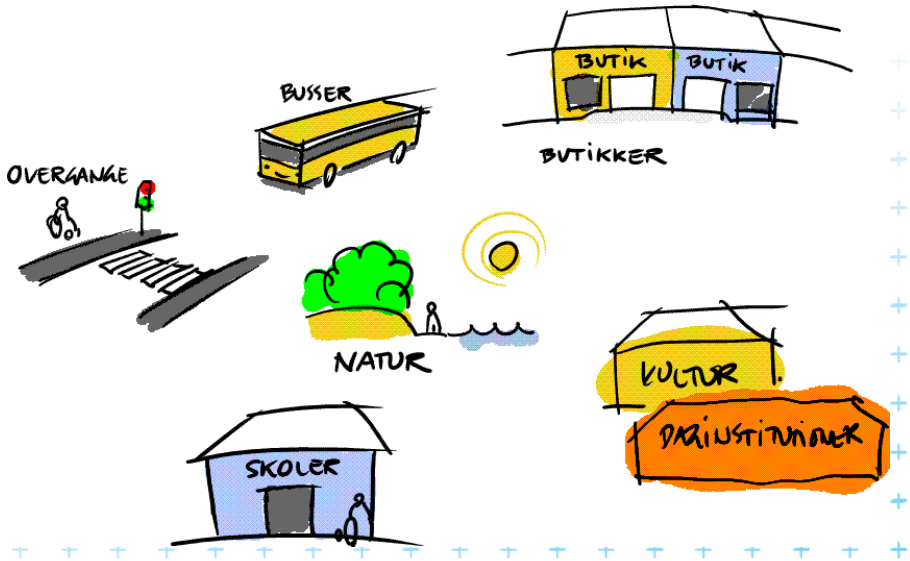


DCGI

DK: characteristics

- Informal approach to accessibility
- Dialogue oriented
- 1996 Centre for Equal Treatment of Disabled
  - Monitoring body
- 1997 Centre for Accessibility and Universal Design
  - Advisory body to planners, architects and designers





DCGI

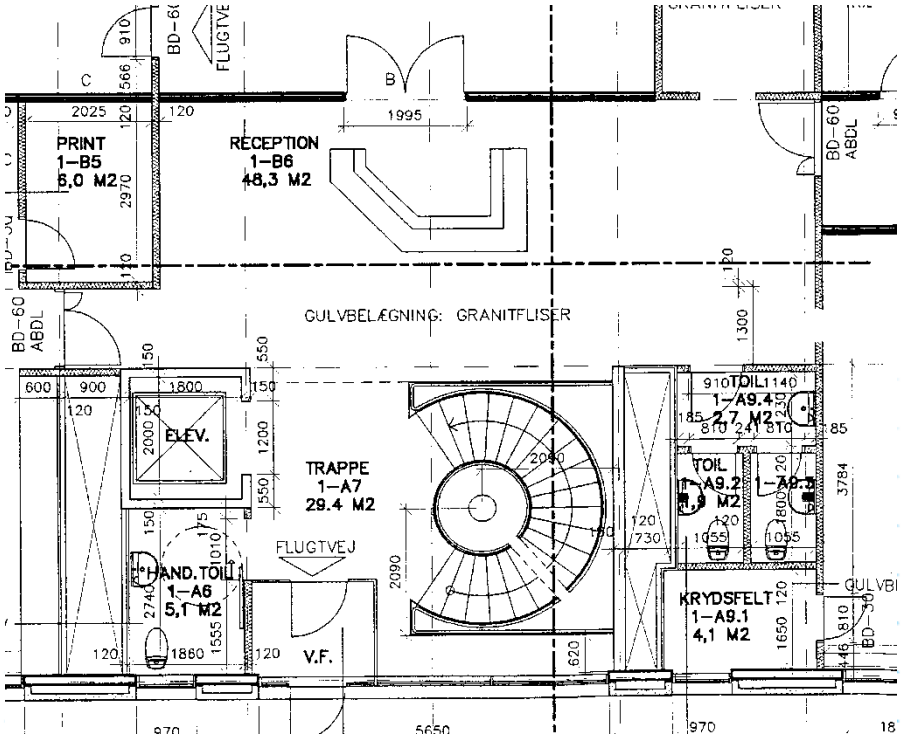
Focus on more user groups

- 2001 Danish Standard for Accessibility for All
  - linking from Building regulations planned
- Design for all approach

DCGI

DS 3028 Main characteristics

- Comprehensive:
  - 6 types of buildings in one standard
    - Public access
    - Private enterprise
    - Housing
    - Care
    - Private houses
    - Summer houses
- Functional and technical requirements
  - Resembles the ISO draft

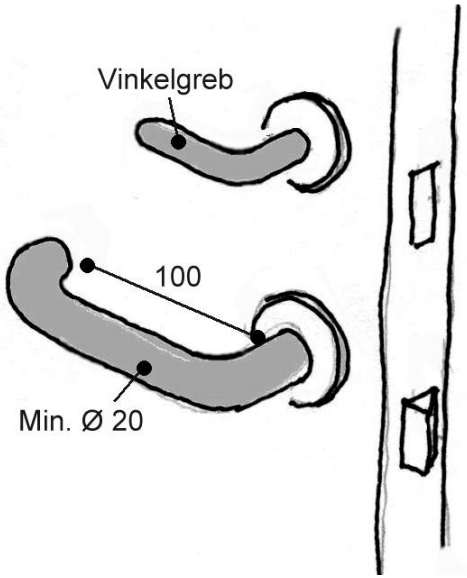


Example: Ramps

- Design for all solutions preferred
- Landscape architect issue

Example: Doors

- DK: 0,77 and 0,87 m
  - Not very wide
  - Operationg force in focus



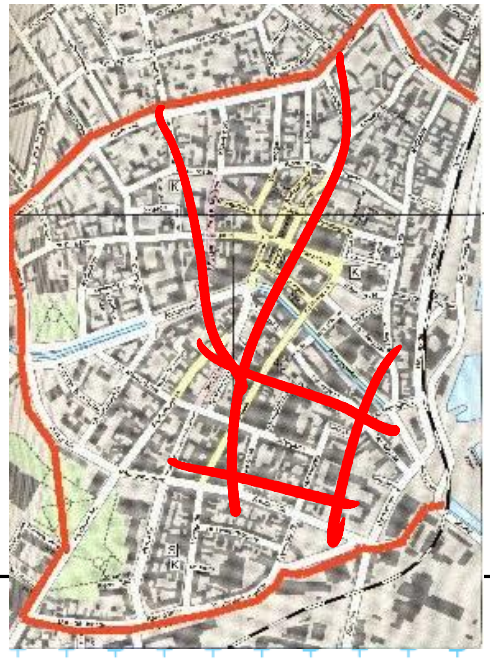
Signage

- Focus on
  - contrast
  - letter size
- Raised letters recommended
  - Easier to read by the majority of blind
- Braille: optional only
  - Very few blind read braille

DCGI

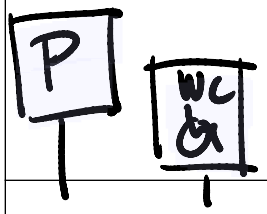
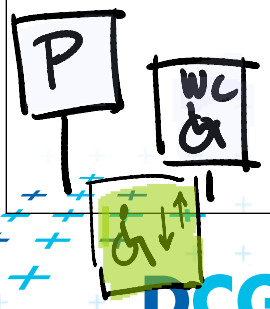
DS 3028 Adoption

- 2003 Adoption of DS 3028 by Association of Architects
- Adoption by several public bodies and major private contractors
- Municipal action plans based on DS 3028
- Accessibility consultant courses
- DS 3028 Training programmes



DCGI

New regulations on existing buildings (2005)

All rebuilding or refurbishing projects		Buildings with public access	Private buildings for service and administration
	No-step entrance	Mandatory	Mandatory
	Accessible parking and toilet	If less than 9 % of total rebuilding costs over two years	If less than 9 % of total rebuilding costs over two years
	Accessible parking, toilet and elevator	If less than 9 % of total rebuilding costs over two years	No requirements

DCGI

U.S. Access Board programs

- **Guidelines and standards development**
  - ABA: Architectural Barriers Act of 1968
  - ADA: Americans with Disabilities Act of 1990
  - Telecommunications Act of 1996 (Section 255)
  - Rehabilitation Act Amendments of 1998 (Section 508)
  - Patient Protection and Affordable Care Act of 2010
- **Technical assistance and training**
- **Research**
- **Compliance and enforcement**

ETSI (EC) Standards

- ETSI TR 102 068 (2002) Requirements for assistive technology devices in ICT.
- ETSI ES 202 076 (2002) Generic spoken command vocabulary for ICT devices and services.
- ETSI EG 202 048 (2002) Guidelines for the multi-modality of icons, symbols and pictograms.
- ETSI EG 202 116 (2002) Guidelines for ICT products and services: “Design for All”.
- ETSI ETR 334 (1996) The implications of human ageing for the design of telephone terminals.

ETSI (EC) Standards

- ETSI ETR 029 (1991) Recommendations for improving and adapting telecommunications terminals and services for people with impairments.
- ETSI EG 202 301 (2004) UCI: Using UCI to enhance communications for disabled, young and elderly people.
- ETSI TR 103 073 (2003) UCI: Improving communications for disabled, young and elderly people.
- ETSI ETR 345 (1997) Characteristics of telephone keypads and keyboards; Requirements of elderly and disabled people.

National standards

Japan

- JIS 8071: 2003, Guidelines for standards developers to address the needs of older persons and persons with disabilities (Japanese version of ISO/IEC Guide 71 and CEN/CENELEC Guide 6).
- JIS 8341: 2004 part 1- Guidelines for older persons and persons with disabilities – Information communication equipment and services Part 1: Common guidelines.
- JIS 8341: 2004 part 2 - Guidelines for older persons and persons with disabilities - Information communication and services - Part 2: Information processing equipment.
- JIS 8341: 2004 part 3 - Guidelines for older persons and persons with disabilities - Information communication and services - Part 3: Web contents.
- JIS 8341: 2005 part 4 - Guidelines for older persons and persons with disabilities - Information communication and services - Part 4: Office equipment.
- JIS 8341: 2005 part 5 - Guidelines for older persons and persons with disabilities - Information communication and services - Part 5: Telecommunications equipment.

Guidance to Standards Developers

- **ISO/IEC TRs 29138** *Information technology — Accessibility considerations for people with disabilities*
  - **Part 1**: 2009 *User needs summary*
    - currently 150 needs identified (with very little duplication)
  - **Part 2**: 2009 *Standards inventory*
    - Currently organized in 6 categories
      - 102 Accessibility Focused
      - 191 Related
  - **Part 3**: 2009 *Guidance on user needs mapping*

    - Updates are currently underway
    - To be published as “information documents” rather than TR’s
    - Information also to be placed in a publicly available database

Standards with broad applicability

- **ISO 9241-20**:2008 *Accessibility guidelines for information/communication technology (ICT) equipment and services*
- **ISO/IEC 13066-1**:2011 *Information Technology — Interoperability with Assistive Technology (AT) Part 1: Requirements and recommendations for interoperability*
- **ISO 9241-171**:2008 *Guidance on software accessibility*
- **ISO/IEC 29136**:(2012) *Accessibility of personal computer hardware*
- **ISO/IEC 24756**: 2009 *Information technology — Framework for specifying a common access profile (CAP) of needs and capabilities of users, systems, and their environments*

Standards with broad applicability

- **ISO/IEC 24751** *Individualized Adaptability and Accessibility in E-learning, Education and Training*
  - **Part 1**: 2008 *Framework and reference model*
  - **Part 2**: 2008 *"Access for all" personal needs and preferences for digital delivery*
  - **Part 3**: 2008 *"Access for all" digital resource description*
  - **Part 9**: NP *"Access for all" personal user interface preferences*
  - **Part 10**: NP *"Access for all" user interface characteristics*
  - **Part 11**: CD *"Access for all" personal needs and preferences for non- digital resources*
  - **Part 12**: CD *"Access for all" non-digital resource description*
  - **Part 13**: CD *"Access for all" personal needs and preferences for LET events*
  - **Part 14**: CD *"Access for all" LET events description*

Component Accessibility

- **ISO/IEC 24786**: 2010 *Accessible user interface for accessibility settings*
- **ISO/IEC 13066 Accessibility API Technical Reports**
  - Current TR's under development:
    - **Part 2**: 2012 *Windows automation framework accessibility API*
    - **Part 3**: 2012 *I-Accessible2 accessibility API*
    - **Part 4**: 2013 *Linux/UNIX graphical environments accessibility API*
    - **Part 6**: 2013 *Java accessibility API*
- **ISO/IEC 20071** *User interface component accessibility*
  - **Part 11**:2012 – *TR Guidance on creating alternative text for images*

Guidance to Standards Developers

- **ISO/IEC Guide 71**:2001 *Guidelines to address the needs of older persons and people with disabilities when developing standards*
  - Identifies areas in need of accessibility consideration
    - Sensory abilities; Physical abilities; Cognitive abilities; Allergies
  - Revision has just started
    - Focus shifting to inclusive design

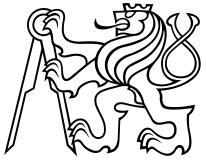
- **ISO TR 22411**:2008 *Ergonomic data and ergonomic guidelines for the application of ISO/IEC Guide 71 to products and services to address the needs of older persons and persons with disabilities*
  - A second version is now under development
    - It needs to coordinate with new version of Guide 71

Accessibility going mainstream

- **Moving from accessibility standard to mainstream standard**
  - **ISO/IEC 19766**: 2007 *Guidelines for the design of icons and symbols to be accessible to all users – Including the elderly and persons with disabilities*

NOTE: ISO/IEC19766 is already replaced and completely incorporated within:

- **ISO/IEC 11581-10**: 2010 *Information Technology — User Interface Icons —Framework and General Guidance*

- **Inclusion in a new mainstream standard**
  - **ISO 9241-129**: 2010 *Guidance on individualization*

Thank you for your attention