

Human Computer Interaction

CS449 – CS549

Week 7

Psychology of HCI

KÜRSAT ÇAĞILTAY

Today

- Automatic vs Controlled Processes
- Mental Models
- Gestalt Psychology

LONG-TERM MEMORY

$$\delta_{LTM} = \infty$$

$$\mu_{LTM} = \infty$$

κ_{LTM} = semantic

WORKING MEMORY

VISUAL IMAGE STORE

$\delta_{VIS} = 200$ [70~1000] msec
 $\mu_{VIS} = 17$ [7~17] letters
 κ_{VIS} = Physical

AUDITORY IMAGE STORE

$\delta_{AIS} = 1500$ [900~3500] msec
 $\mu_{AIS} = 5$ [4.4~6.2] letters
 κ_{AIS} = Physical

$$\mu_{WM} = 3$$
 [2.5~4.1] chunks

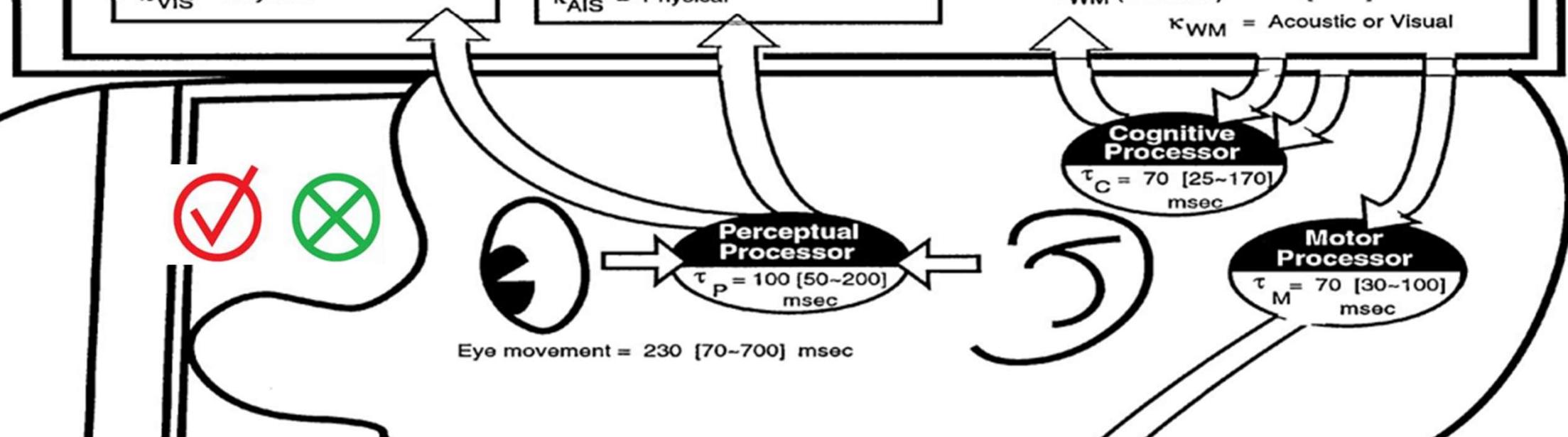
$$\mu_{WM^*} = 7$$
 [5~9] chunks

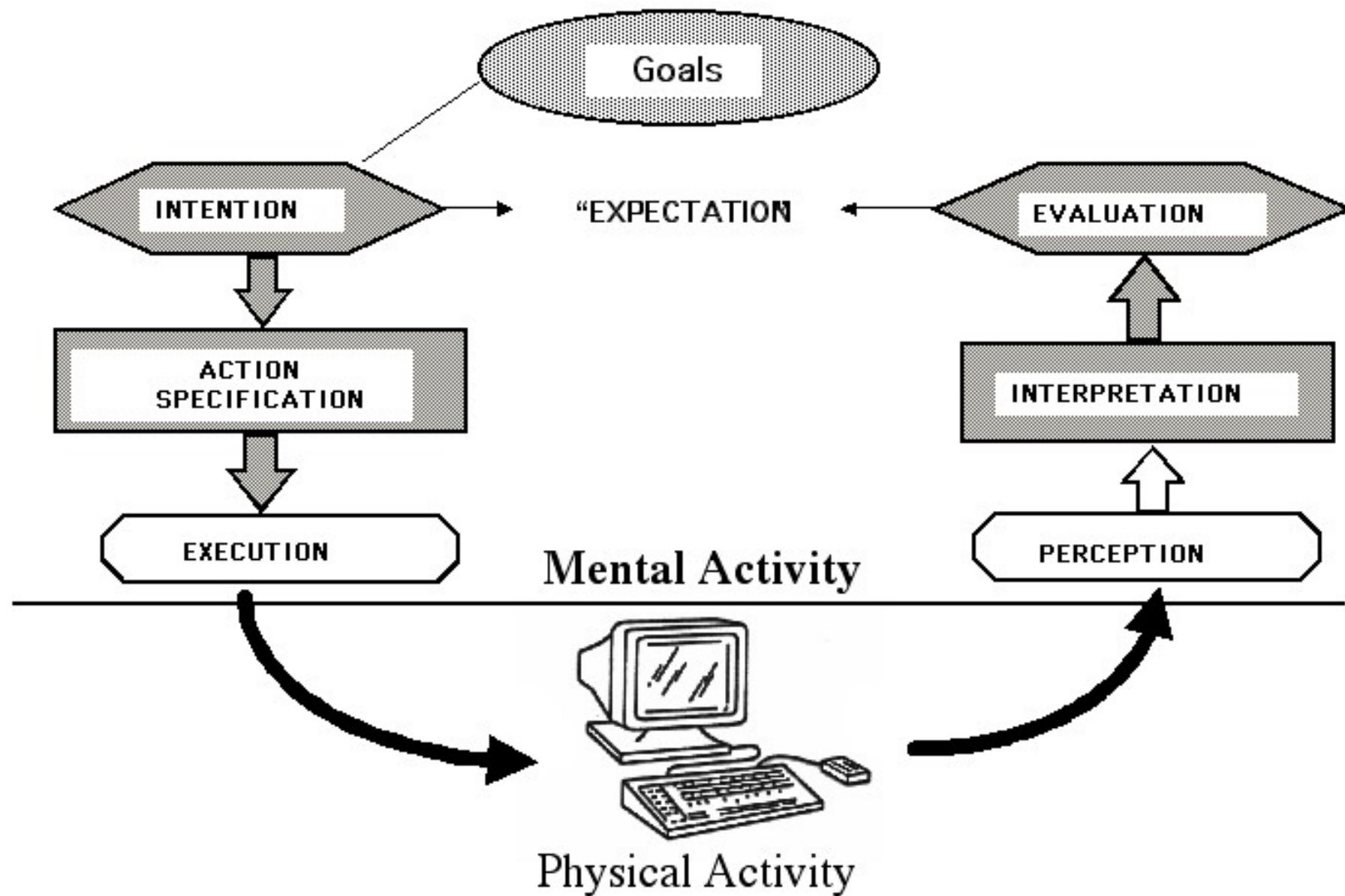
$$\delta_{WM} = 7$$
 [5~226] sec

$$\delta_{WM} (1 \text{ chunk}) = 73$$
 [73~226] sec

$$\delta_{WM} (3 \text{ chunks}) = 7$$
 [5~34] sec

κ_{WM} = Acoustic or Visual





Seven stages of user activities involved in task performance
Don Norman *The Design of Everyday Things*.

Two types of cognitive processes

(Shiffrin & Schneider 1977)

- Controlled
 - when you must think about what you are doing or how you are responding or reacting
- Automatic
 - when you don't!

Controlled processing

- Requires attention
 - focus on relevant stimuli
 - ignore irrelevant ones
- Under conscious control
 - human is self-aware of effort
- Subject to limits of cognitive system
 - slows pace of processing



Automatic processing

- Minimal demands on attention
 - Action responses freely occur
- Unavailable to consciousness
- Fast
 - No decision making stage involved
- Difficult to unlearn (My driving experience in US)

Where should I stop?



From controlled to automatic

- Most learned behaviors represent this shift
 - driving a car
 - learning to write/ type
 - routine activities of predictable form
- Except
 - If task is infrequently performed
 - Consequences of error are perceived to be costly (driving in the US or Turkey)
 - Or high knowledge-based task

So Practice Works?

- Depends on task type:
 - Skill-based
 - High potential for automaticity
 - Rule-based
 - Can be automated with extensive training
 - Knowledge-based
 - Not automated

Experiment: controlled vs automatic

Any volunteer?

- Stroop test- Read the colors of the words

abcde

fghxyz

Ready?

- I will Keep time

ZYP
QLEF
SUWRG
XCIDB
WOPR
ZYP
QLEKF
XCIB
SUWRG
ZYP
XCIDB
QLEKF
WOPR
QLEKS

Ready?

- Read the colors of the words
- I will Keep time

SARI

MAVI

SIYAH

YESIL

SARI

KIRMIZI

SIYAH

PORTAKAL

YESIL

KIRMIZI

MAVI

SARI

YESIL

KIRMIZI

What happens?

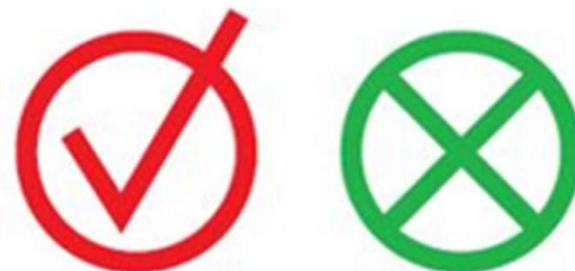
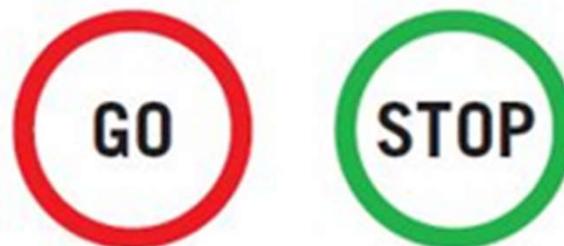
- Reading words is automatic
- Naming colors is also automatic
- Two automatic processes in competition slow processing or increase errors
- Complex input cause problems
 - Cognitive load
 - Long processing time
- Remember the case: USS Vincennes in Persian gulf (1988)

Stroop Test with Eye Tracking

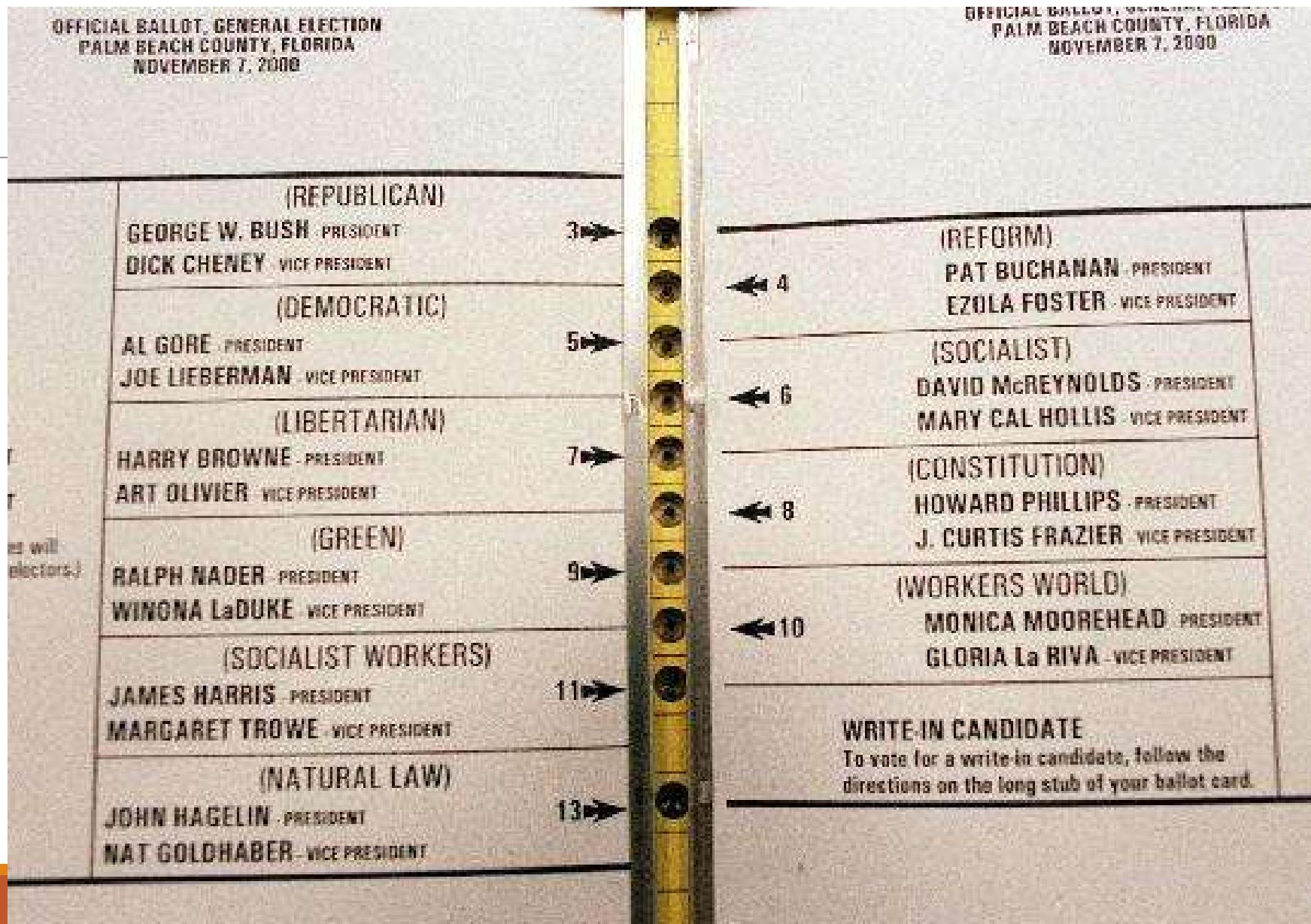
**Bir sonraki slayttaki renk
isimlerini soldan sağa sesli olarak
okuyunuz, okudukan sonra space
tuşuna basınız**

Space tuşuna basınız

Implications on Interaction



US elections - Palm Beach County



1
OFFICIAL BALLOT, GENERAL ELECTION
PALM BEACH COUNTY, FLORIDA
NOVEMBER 7, 2000

ELECTORS
FOR PRESIDENT
AND
VICE PRESIDENT

(A vote for the candidates will
actually be a vote for their electors.)

(Vote for Group)

(REPUBLICAN)

GEORGE W. BUSH - PRESIDENT

DICK CHENEY - VICE PRESIDENT

3 →

(DEMOCRATIC)

AL GORE - PRESIDENT

JOE LIEBERMAN

5 →

**Where people
voted for Al Gore**

HARRY BROWN
ART OLIVIER - VICE PRESIDENT

(GREEN)

RALPH NADER - PRESIDENT

WINONA LaDUKE - VICE PRESIDENT

9 →

(SOCIALIST WORKERS)

JAMES HARRIS - PRESIDENT

MARGARET TROWE - VICE PRESIDENT

11 →

(NATURAL LAW)

JOHN HAGELIN - PRESIDENT

NAT GOLDHABER - VICE PRESIDENT

13 →

A

OFFICIAL BALLOT, GENERAL ELECTION
PALM BEACH COUNTY, FLORIDA
NOVEMBER 7, 2000

(REFORM)
PAT BUCHANAN - PRESIDENT

**Where people
were supposed to
vote for Al Gore**

HOWARD PHILLIPS - PRESIDENT
J. CURTIS FRAZIER - VICE PRESIDENT

(WORKERS WORLD)

MONICA MOOREHEAD - PRESIDENT

GLORIA La RIVA - VICE PRESIDENT

WRITE-IN CANDIDATE

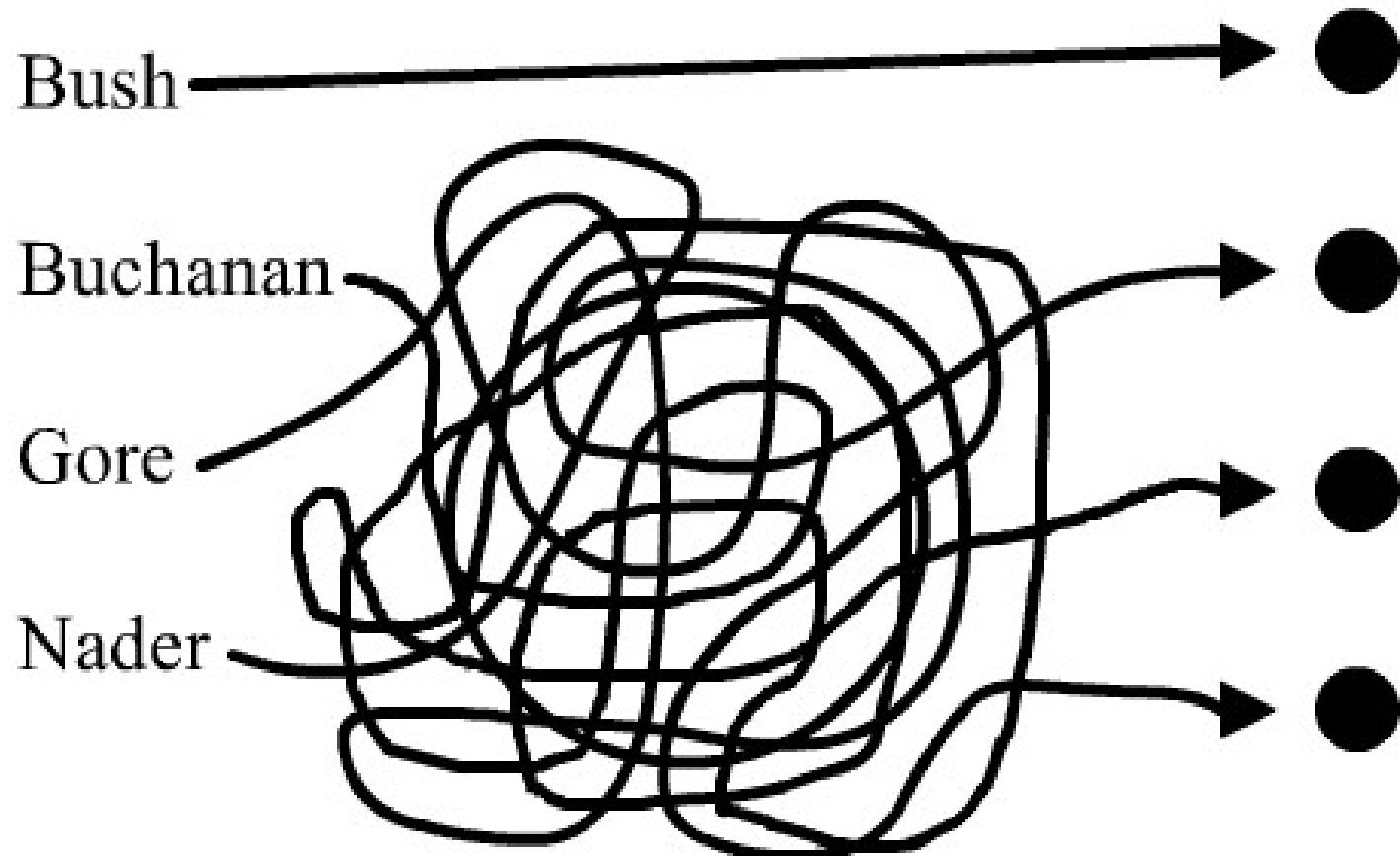
To vote for a write-in candidate, follow the
directions on the long stub of your ballot card.

Ballot problems

- Al Gore and Joe Lieberman are the second names on the ballot, but the third hole to punch
- Alignment of the text in each column
- The layout of double pages with punch holes in between was novel & unfamiliar. Ballots in previous elections had used only a single column with punch holes on the right.
- Confusing arrows and numbers
- Stress induced by the voting process
- “It was so hard to tell who and what you were voting for. I couldn’t figure it out, and I have a doctorate,” voter Eileen Klasfeld said.
- <http://danbricklin.com/log/ballotusability.htm>
- <http://www.humanfactors.com/library/election.asp>

Official Florida Presidential Ballot

Follow the arrow and Punch the appropriate dot.



Mental Model

- user's understanding and conceptualization of how a system works
-

Abstract Model



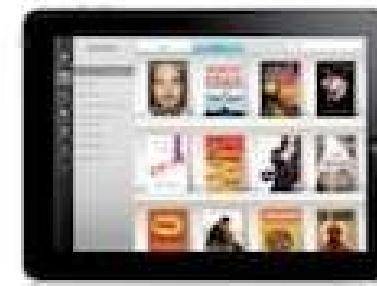
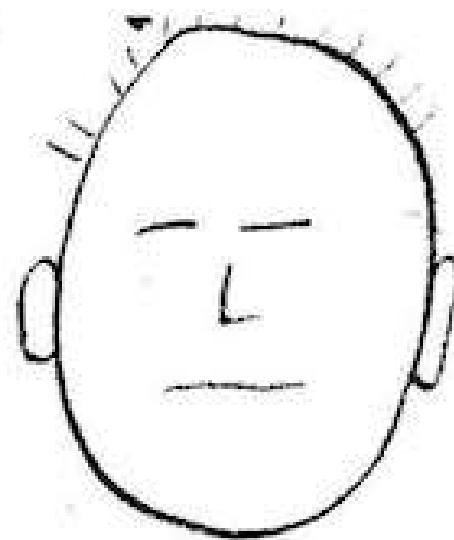
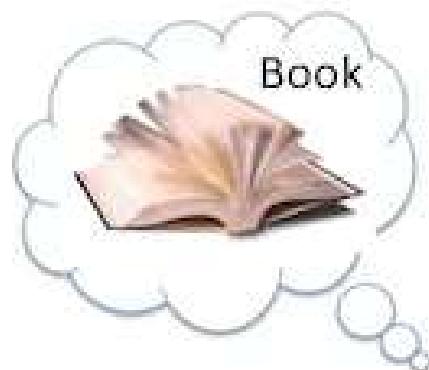
Complex Reality



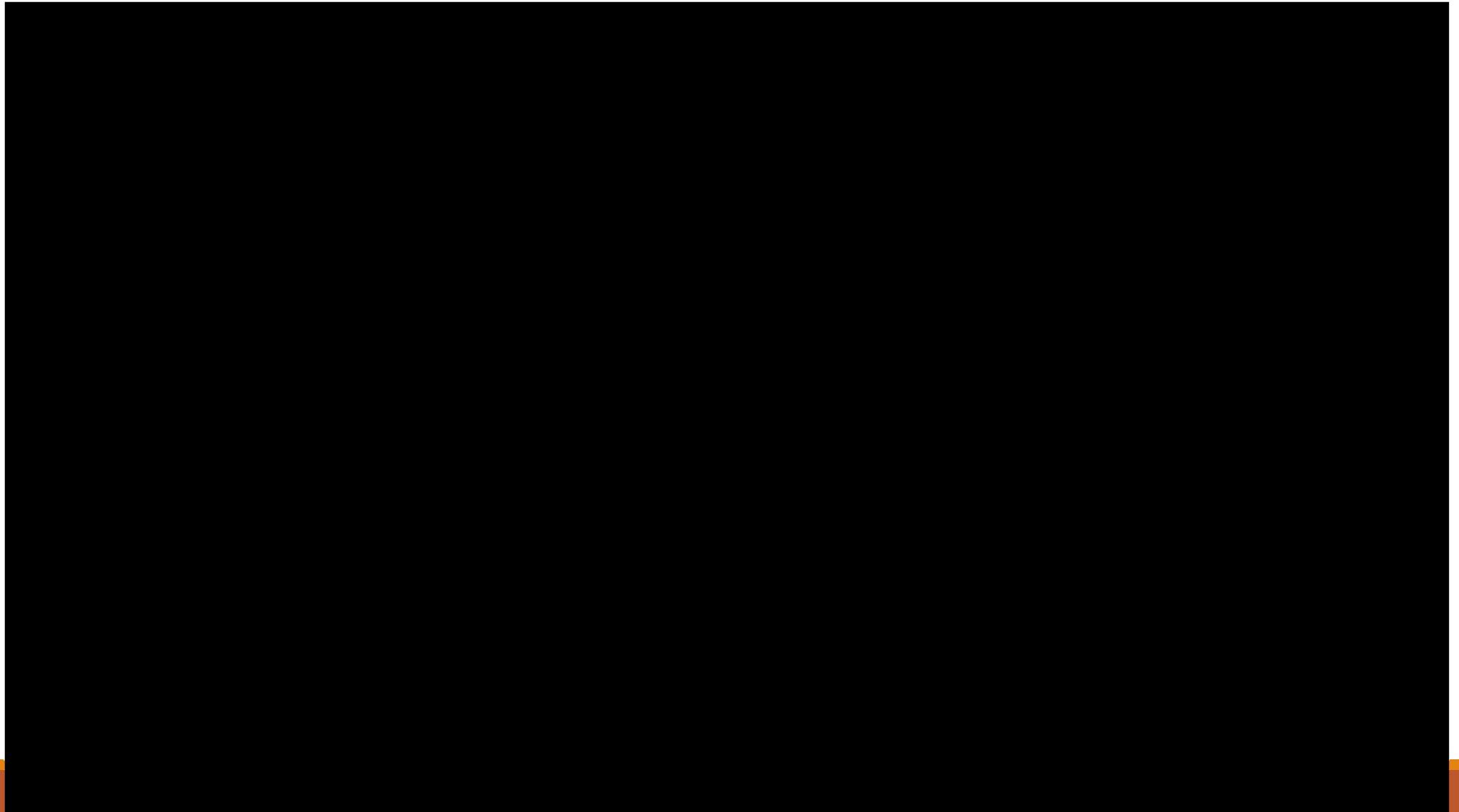
Mental Model

- Organizing incoming information into cognitive representations
- Users build their own mental model
- Experience with the system can change the model
- Users update their mental models based on stimuli from elsewhere (from other users or systems)
- Design must guide users form reasonably accurate (and thus useful) mental models

Mental Model of A Book



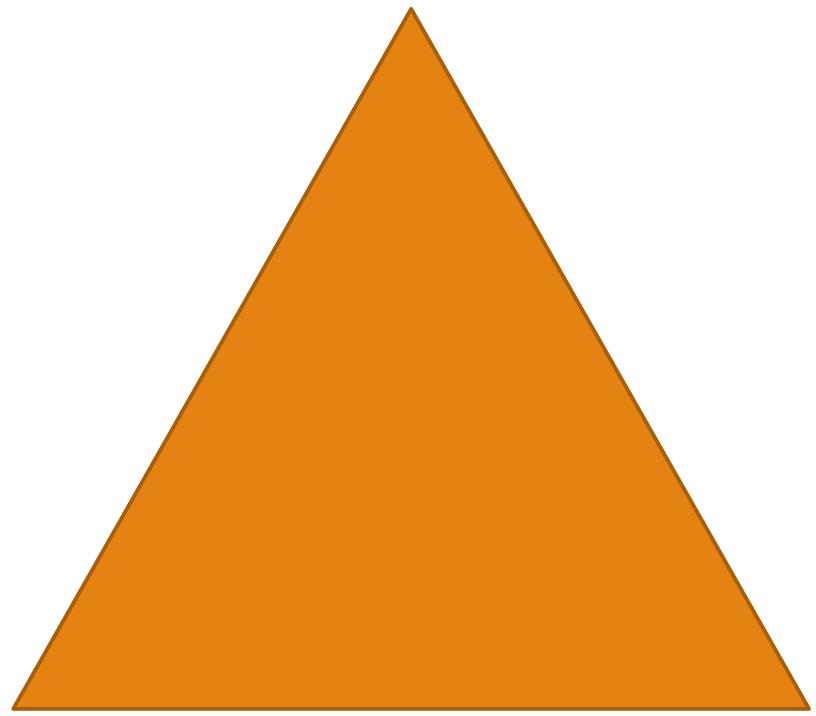
Mental Model of A Tablet?



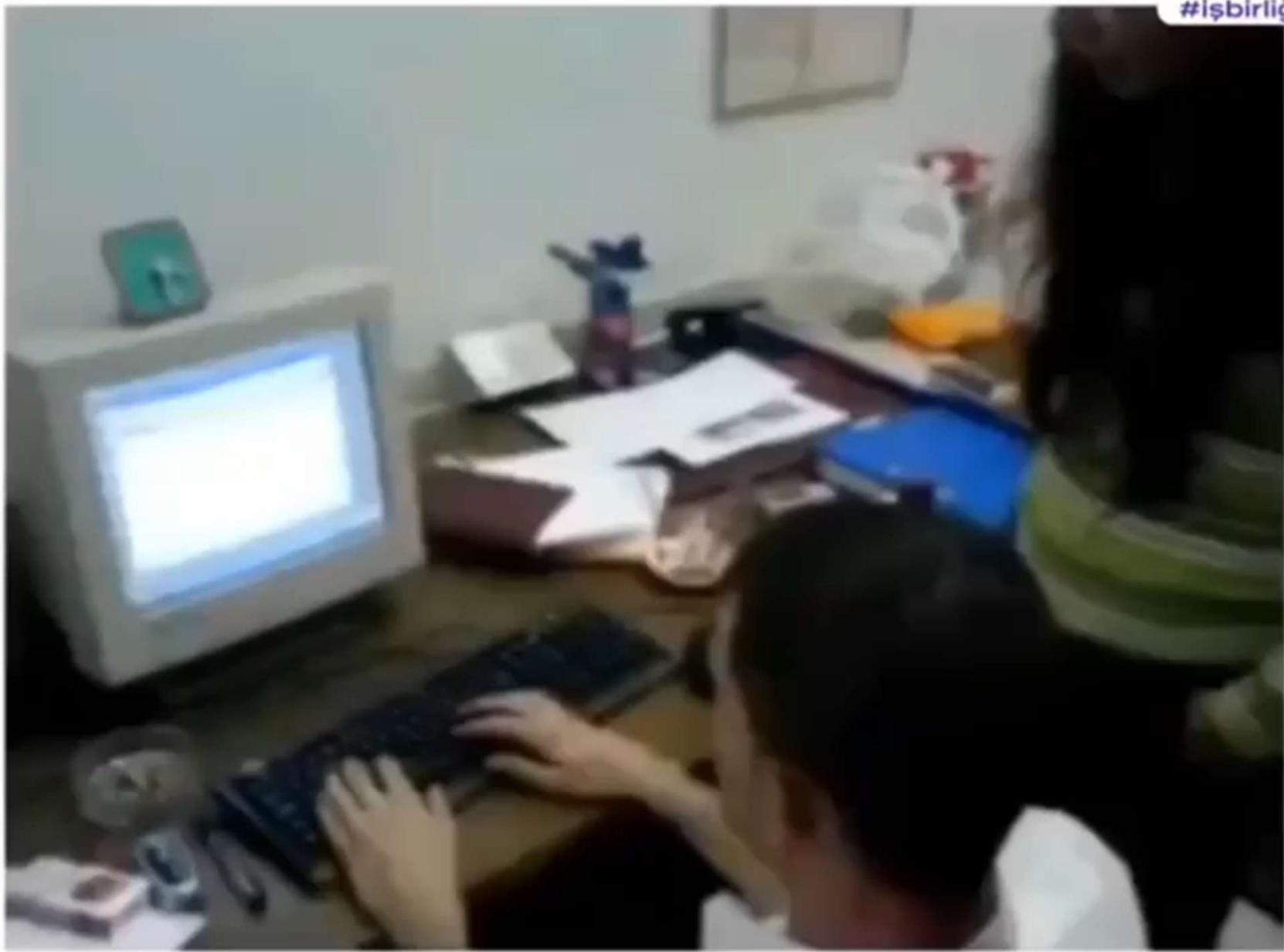
Mental Models

Eberts, R. (1994) Mental Models

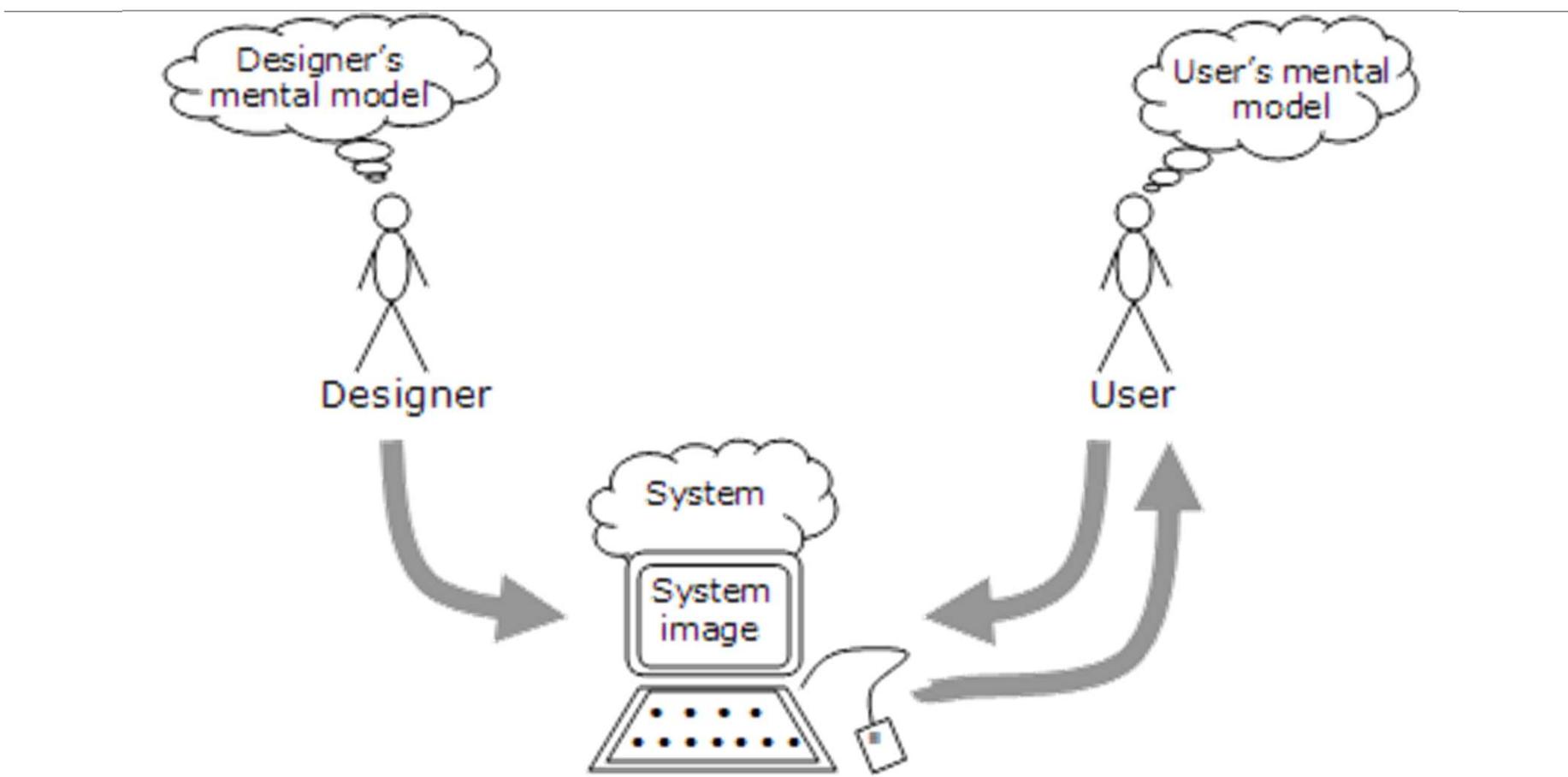
- Assumed to be automatically created in working memory
- Dynamic representation of current condition of the world (or system etc.)
- Most noticeable in situations of incomplete or ambiguous information
- Incoming info (WM) meets activated schema (LTM) to form model
- Let's make a test with mouse



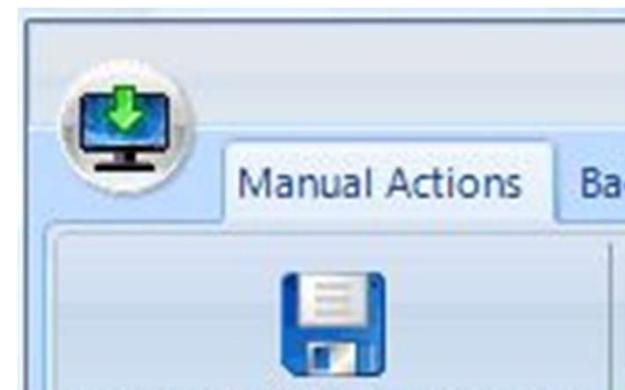
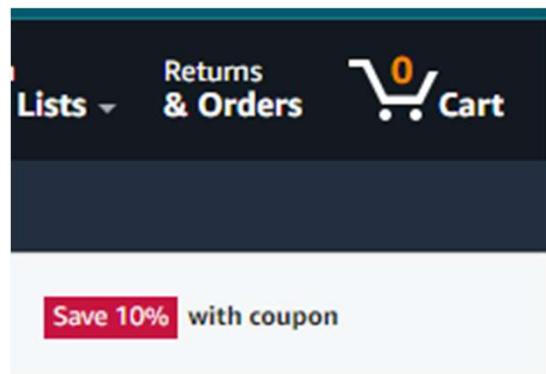
#İşbirliği

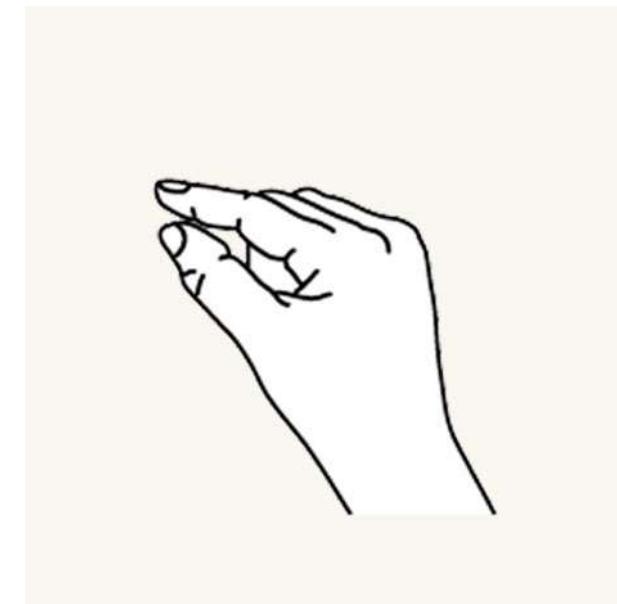
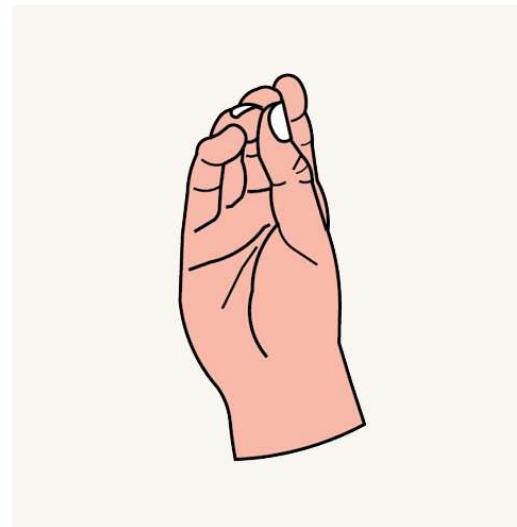
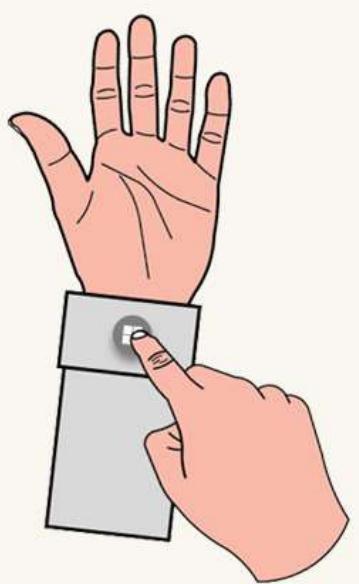
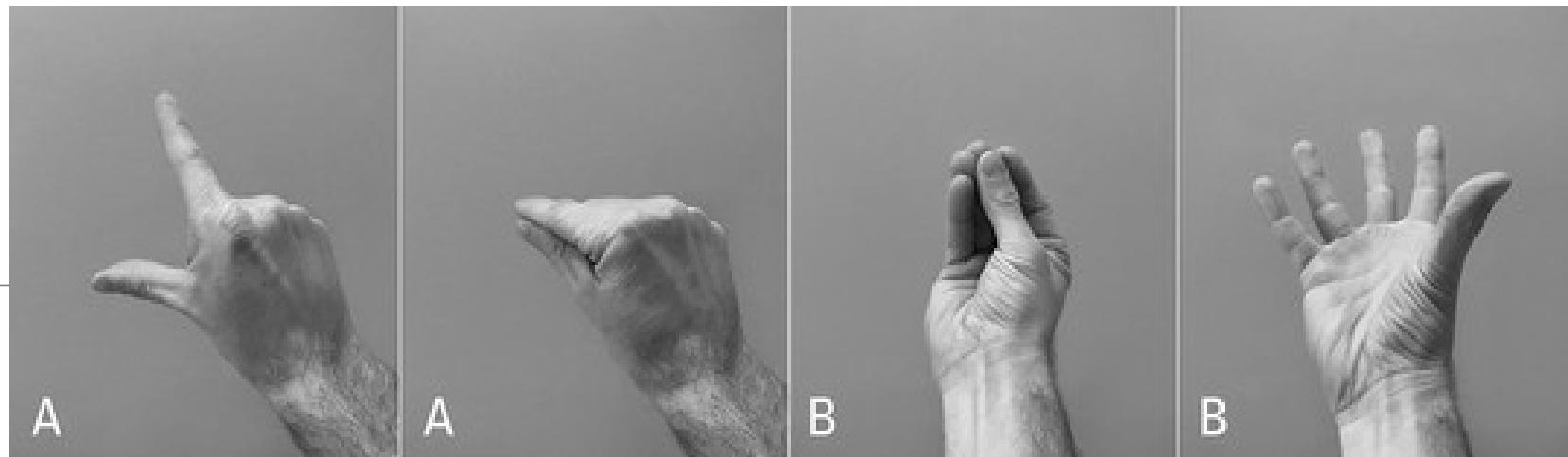


Implications on HCI



What does your mental model say?



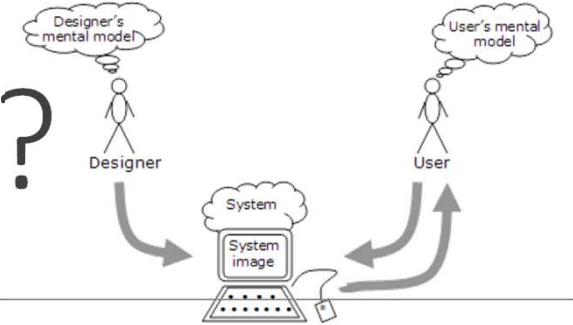




Mixed Reality – New Mental Models



Which model is which?



- User's model of the system
 - User's conceptual model
- Designer's intended model (for the user)
 - The system image
- User's mental model
 - Model created at the time of use
 - Based on both the above models

More than an image..

- A mental model supports *inference*
- Users develop models of the applications they use
- Models are often incorrect, partial etc.
- May be functional (how do I operate this?)
 - Essential for effective use
- or Structural (how does this machine work?)
 - Essential for troubleshooting or repairing

What is this?
How do we use it?
For what purpose?



So?

- Users will form mental model
- Influenced by design
- HCI mostly interested in functional models
- Model that is based on experience and familiar context is richer
- Rich model seems to support inference

Good
artists
copy,
great
artists
steal !

Picasso

Ziraat Bankası

- Hesaplarım
- Para Transferleri
- Kartlarım
- Ödemeler
- Döviz ve Altın
- Krediler
- Sigorta ve Bireysel Emeklilik
- Yatırım ve Borsa İşlemleri
- QR İşlemleri
- Üye İşyeri İşlemleri
- E-Devlet İşlemleri
- Başvurular
- Profil ve Ayarlar
- Güvenli Çıkış

Aradığınız işlemi yazın

KAPAT

İşCep

İşCep'te Ara

- Para Aktar
- Ödeme Yap
- Bankamatik Para Çek/Yatır
- Kampanyalar
- Hesaplar
- Kartlar
- Krediler
- Yatırım
- İşCep'e Özel Fırsatlar
- Bireysel Emeklilik
- Sigorta
- Başvurular
- Belgelerim

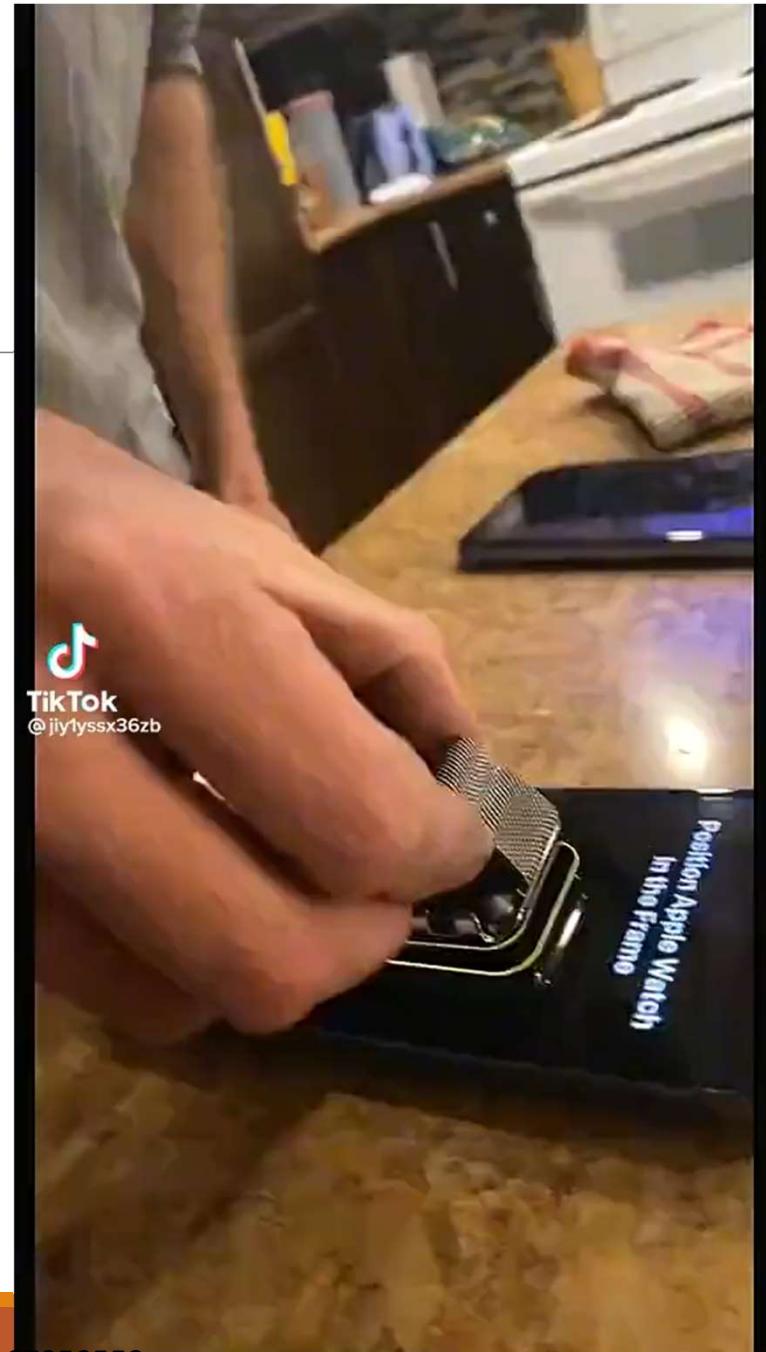
pazarama

Ana Sayfa Para Aktar Ödeme Yap Harcamalar

?



Position Apple Watch in the Frame



Position Apple Watch in the Frame

- smart devices and dumb human in one frame
 - Never underestimate the stupidity of the user.
 - This individual should not own a smart phone
-
- an example of poorly designed UI
 - There is always a first time and it's not the same for everyone.
 - I saw this happen live last week. Great demonstration of how hard UX is, even if you're Apple.

LONG-TERM MEMORY

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WORKING MEMORY

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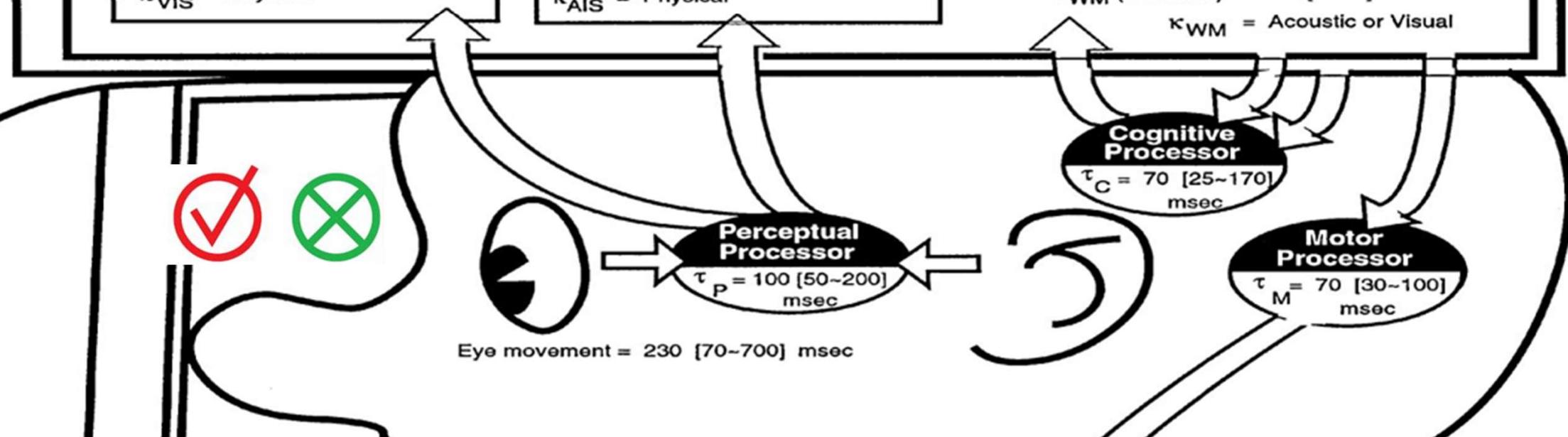
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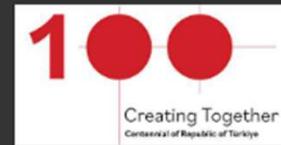


Gestalt (Form, Pattern)

- A psychology term which means “unified whole”.
- It refers to theories of visual perception developed by German psychologists in the 1920s.
- Attempt to describe how people tend to organize visual elements into groups or unified wholes
- We understand the world not by interpreting the stimuli coming from around us one by one, but by perceiving it as a whole
- «The whole is greater than the sum of its parts». (Kurt Koffka)

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- Summer@EPFL Internship Program Switzerland
- Erasmus+ Internship Program Info Sessions (Fall Semester Graduates)
- Erasmus+ Internship Program Info Sessions (Summer Semester)
- BUGÜN: Major Fest Fall 2023 Workshop: "Anadalımı Nasıl Seçmeliyim?"
- Part-time Job for Students - (ID1975)
- Türkiye Innovation Week
- SUbasket League registrations started
- Coaching Session with our Alumni
- İŞKUR Career Counseling Service - Yetenek Kapısı (Talent Gate)
- Campus Vehicle Entry Plate Recognition System(PTS-Sticker) Registration!
- P&G New Grad & Summer Internship Roles
- The Course Schedule of 2023-2024 Spring Term
- Application Call for Erasmus+ Internship Program (Fall Term Graduates)
- Application Call for Erasmus+ Internship

ALL EVENTS

09:00 Exhibition / Creating Together - Centennial of the Republic of Turkey



12:50 SSM Kasım Ayı ve Ara Tatil Atölyeleri



14:45 Ph.D. in Management Applications Now Open



20 Nov Co-Space Sewing Beginner Training



21 Nov Wall Climbing Day - Outdoor Sports Club



28 Nov Ph.D. in Management Information Session is open

Eye Tracking Results

Tobii Technology - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address: <http://www.tobii.se/> Go Links

tobii technology

Eye-tracking makes experiencing the world easier.

Eye-tracking
easier to use and more
powerful than ever before...

Tobii Technology provides complete solutions and core eye-tracking technology for customers in commercial and research-related applications.

Eye-tracking enables a computer to tell exactly where a person is looking – in essence, you thereby know the precise attention of this person. Today, this provides great value in evaluations of web sites/advertisements and many forms of research of human behavior. Tomorrow, eye-tracking will improve our communications by being an integral part of how we interact with computers, machines and each other on a daily basis.

Thanks to our radical and innovative approach to eye-tracking hardware and software, Tobii's products take eye-tracking to a new level:

- Plug-and-play eye-tracking
- Remote tracking with true tolerance to user movements
- Powerful analysis tools for cost-effective analysis

This is achieved in combination with outstanding tracking quality, accuracy and robustness.

 Tobii ET-17 - eyetracker built into a TFT monitor.

5186 ms

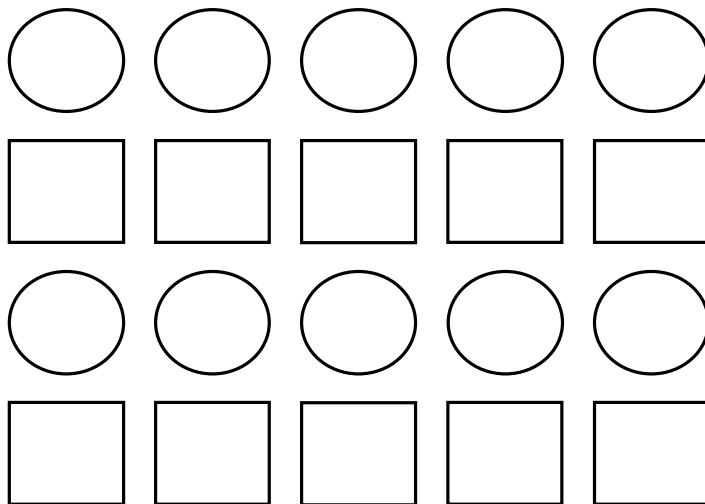
0 ms

How do we perceive objects:

Gestalt principles of organization

- Law of Similarity
- Law of Proximity
- Law of Closure
- Law of Symmetry
- Law of Continuity
- Law of Common Fate
- Law of Figure and Ground

Law of Similarity

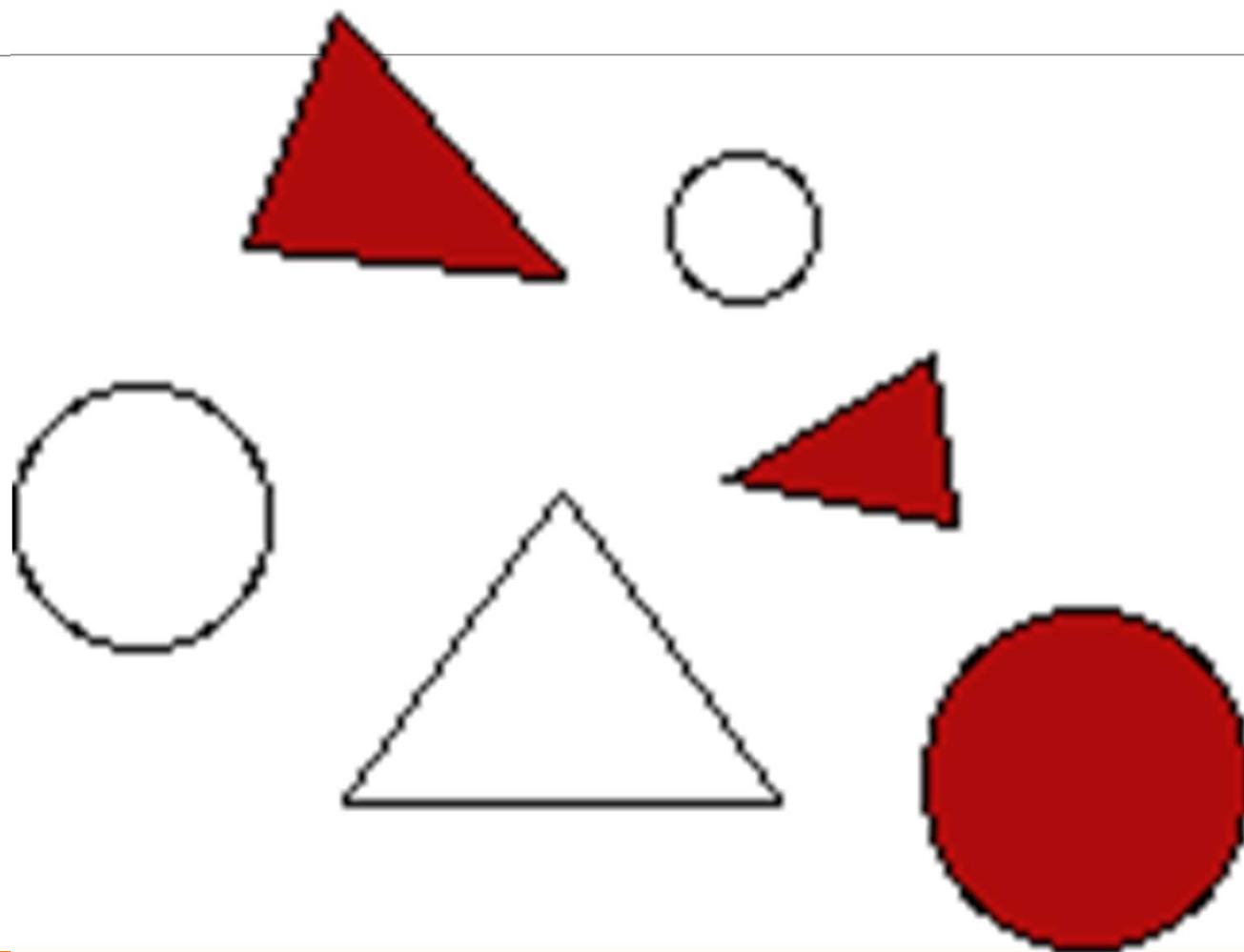




Gestalt principle of Similarity



Color is a dominant attribute



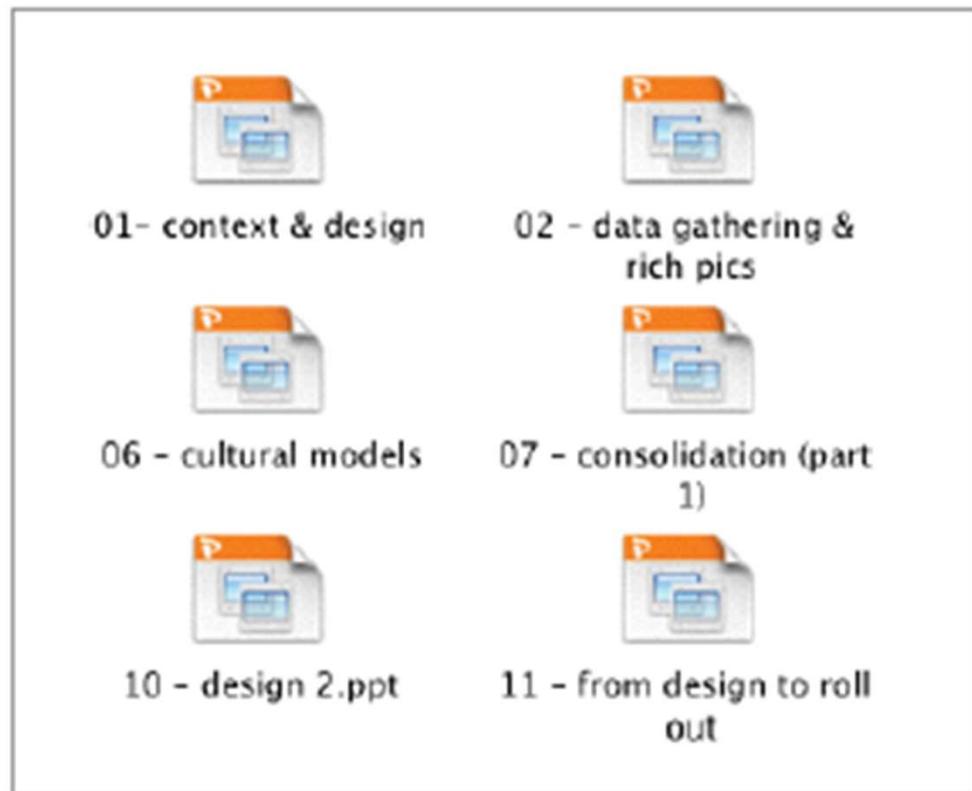


Figure 12.20 Organizing files using similarity

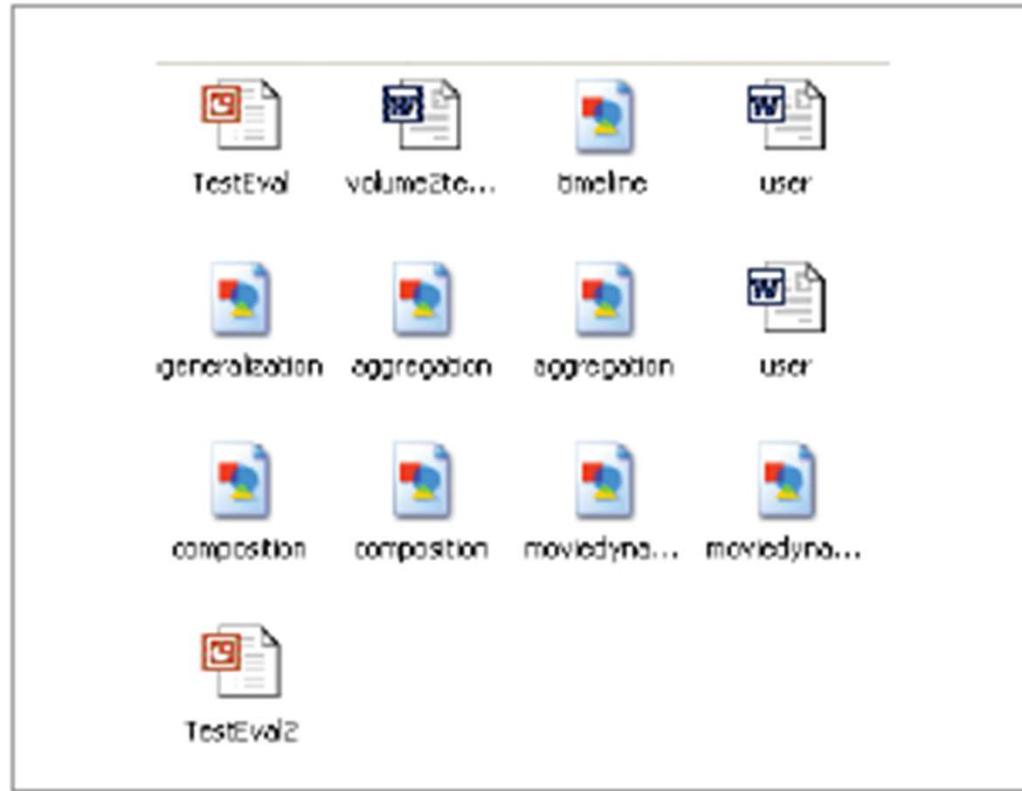


Figure 12.21 Disorganized files

amazon

All

EN Hello, Kursat Account & Lists Orders

Deliver to Ozge
Hamburg 22453

Today's Deals Kursat's Amazon.com Help Browsing History Registry Buy Again Gift Cards Sell Credit Cards

Shop 12 Days of Deals

You are on amazon.com. You can also shop on Amazon Germany for millions of products with fast local delivery. Click here to go to amazon.de

Discover Amazon [Click to learn more](#)



Deals and promotions

Shop in 8 languages

Shop in 60+ currencies

Secure payments

Estimated import fees

Track your package

Customer Service

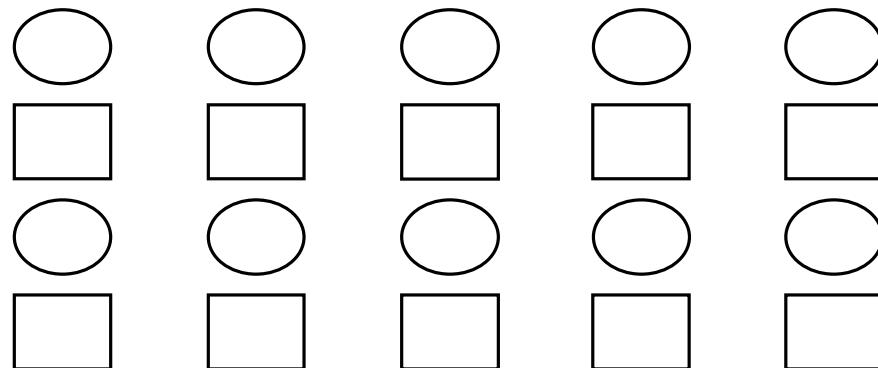
Best Sellers in Clothing, Shoes & Jewelry [See more](#)



Best Sellers in Cell Phones & Accessories [See more](#)



Law of Proximity



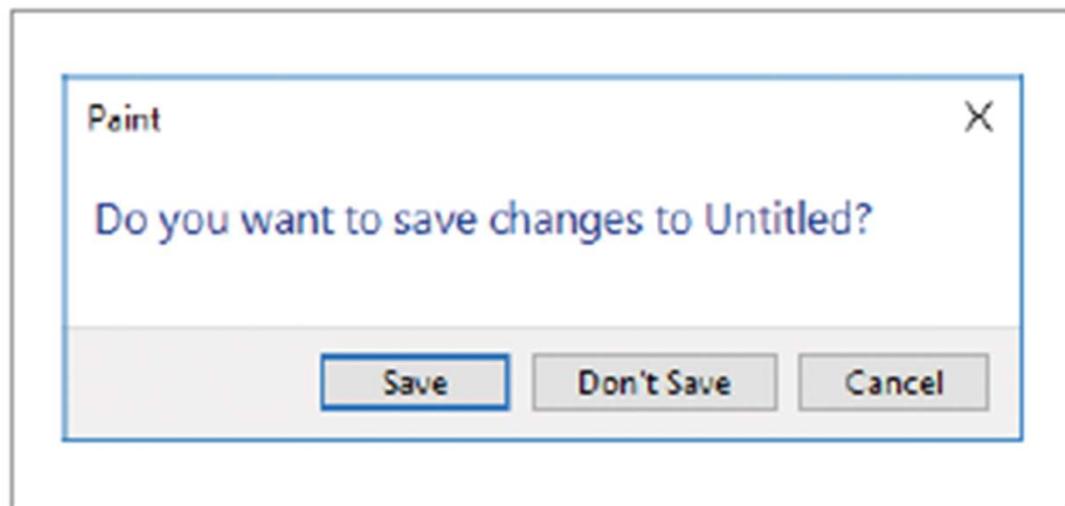


Figure 12.18 Equally spaced buttons – Windows 10

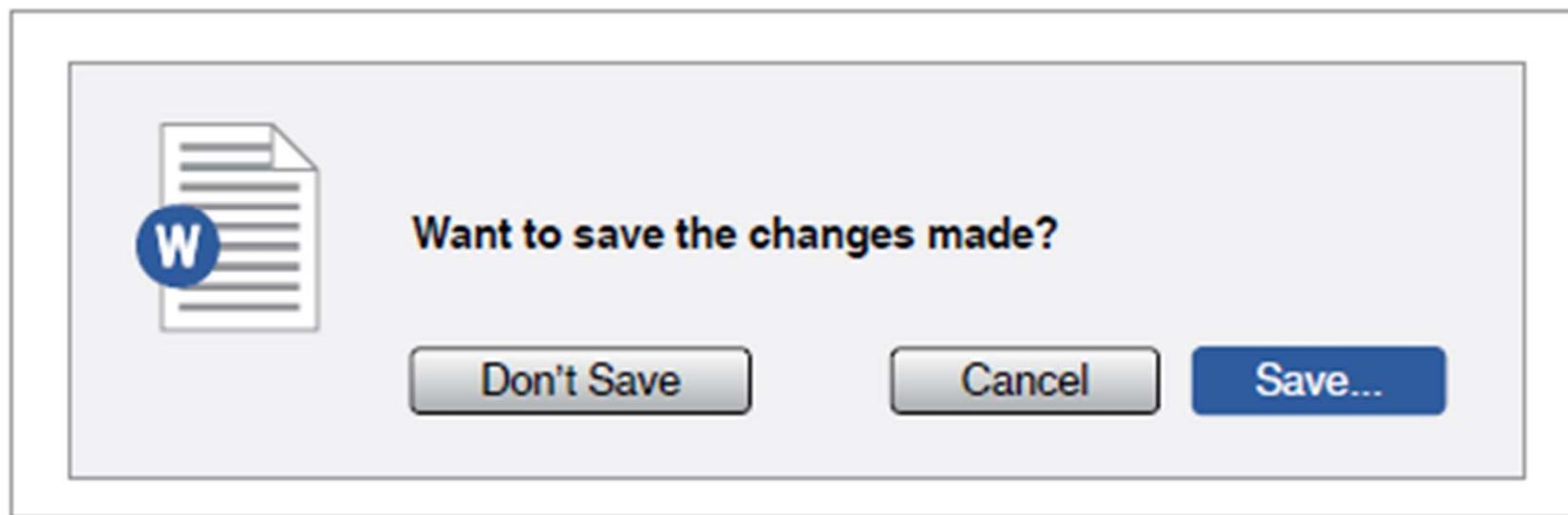


Figure 12.19 Buttons organized by proximity

Proximity

Google Hakkında - Mozilla Firefox

Dosya Düzen Görünüm Geçmiş Yer İmleri Araçlar Yardım

En çok ziyaret edilenler İlk Adım Haberler

Google Hakkında

Google™ Hakkında

Sitemizde arayın

Ürünlerimiz

[Google Chrome](#)
İnterneti Google gücüyle tarayın. Daha hızlı, güvenli ve kolay arama yapın.

[Toolbar](#)
Internet kullanım alışkanlıklarını Google Araç Çubuğu ile değişıyor

[Google Apps](#)
İşletmenizde Gmail ve diğer hizmetleri kullanın.

[iGoogle](#)
Google açılış sayfanı ücretsiz temalar ve gadgetlarla kişiselleştir

[Gmail](#)
Gelişmiş spam filtresi, entegre

Yardım
[Google Hizmetleri, Ürünleri ve Arama için Yardım...](#)

[Google Web Arama Özellikleri](#)
Çeviri, Şansımı Denemek İstiyorum, Önbellegeye alındı...

[Google Hizmetleri ve Araçları](#)
Araç Çubuğu, Google Web API'ları, Düğmeler...

[Neden Google?](#)
Google arama hakkında kapsamlı bilgi...

Şirketimiz

[Basın Merkezi](#)
Haberler, Resimler, Zeitgeist...

[Google Kariyer](#)
Olanaklar, Avantajlar, Kültür...

[Şirket Bilgileri](#)
Şirkete Genel Bakış, Şirket Felsefesi, Çeşitlilik, Adresler...

Site Sahipleri için

[Reklamcılık](#)
AdWords, AdSense...

[Ticari Çözümler](#)
Google Arama Cihazı, Google Mini, Web'de Arama...

[Web Yöneticisi Merkezi](#)
Google'nın web sitelerini nasıl taradığına ve dizine nasıl eklediğine ilişkin tek noktadan kapsamlı bilgi...

[İçeriğinizi Google'a gönderin](#)
Sitenizi ekleyin, Google Base, Google Sitemaps...

Daha fazla Google

[Bize Ulaşın](#)
SSS, Görüşler, Bülten...

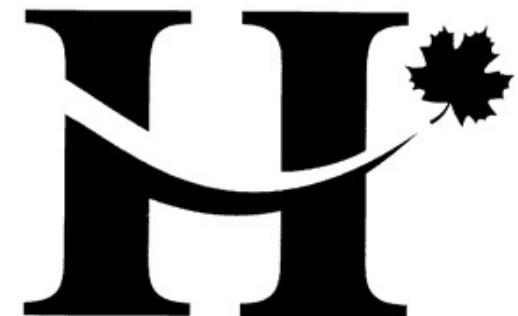
[Logolar ve Fotoğraflar](#)
Logolar, Doodle ve Google çalışanları çalışırken ve eğlenirken...

Bitti

Law of Continuity



- continuation to guide the eye through designs,
- establishing relationships between elements
- directing attention to specific groups or elements



Law of Continuity

The screenshot shows the Turkish Airlines website's search interface. At the top, there is a navigation bar with links for "PLAN&BOOK", "FLY DIFFERENT", "DISCOVER", and "Sign up". Below the navigation bar, there are four main tabs: "Flight" (selected), "Flight + Hotel", "Check-in / Manage booking", and "Flight status". Underneath these tabs, there are three radio button options: "Round trip" (selected), "One way", and "Multi-city". To the right of these options is a checkbox for "Award ticket - Buy a ticket with Miles". The search form itself has fields for "From" (set to Istanbul), "To" (with a placeholder icon), "Dates" (with a calendar icon), and "Passengers" (set to 1 Passenger ECO). A large red button on the right says "Search flights →". A thick blue arrow points from the bottom left towards the "Search flights" button.

TURKISH AIRLINES

PLAN&BOOK | FLY DIFFERENT | DISCOVER | Sign up

Flight | Flight + Hotel | Check-in / Manage booking | Flight status

Round trip One way Multi-city Award ticket - Buy a ticket with Miles

From
Istanbul
Istanbul (All)

Dates

Passengers
1 Passenger
ECO

Search flights →

→

Law of Continuity



TRENDING ON TCM

[VIEW ALL →](#)

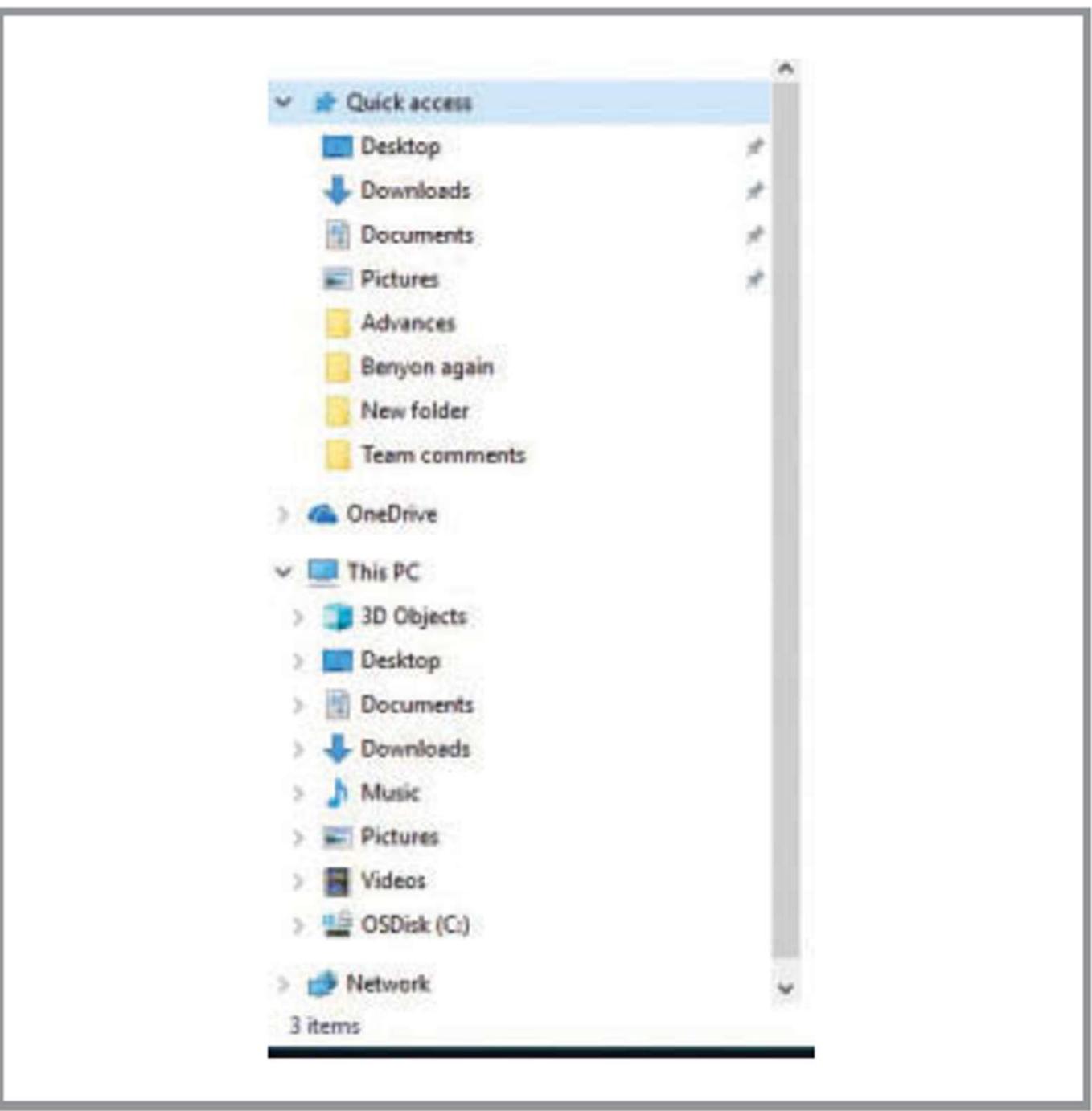


The Automat



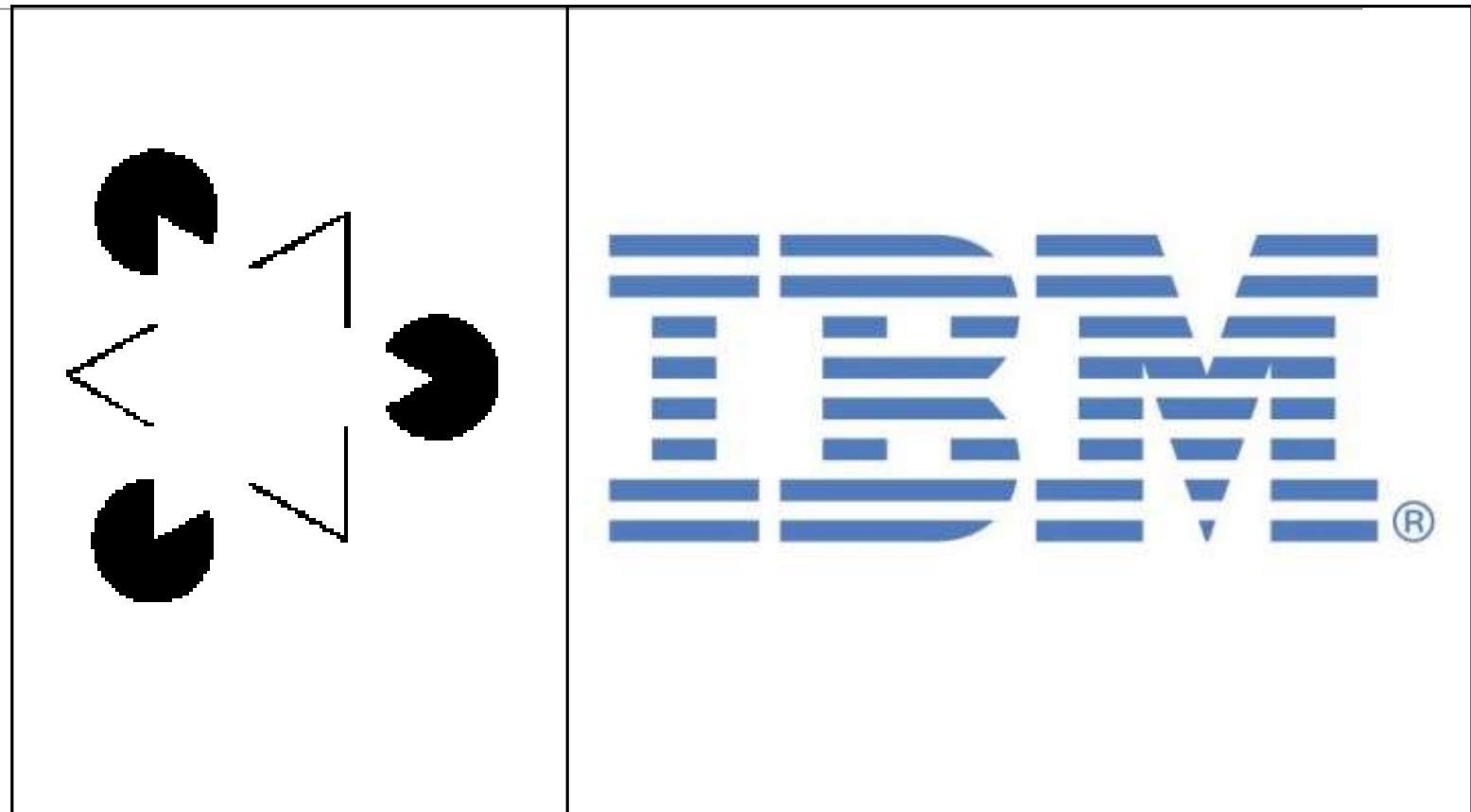
Star of the Month

Continuity



Law of Closure

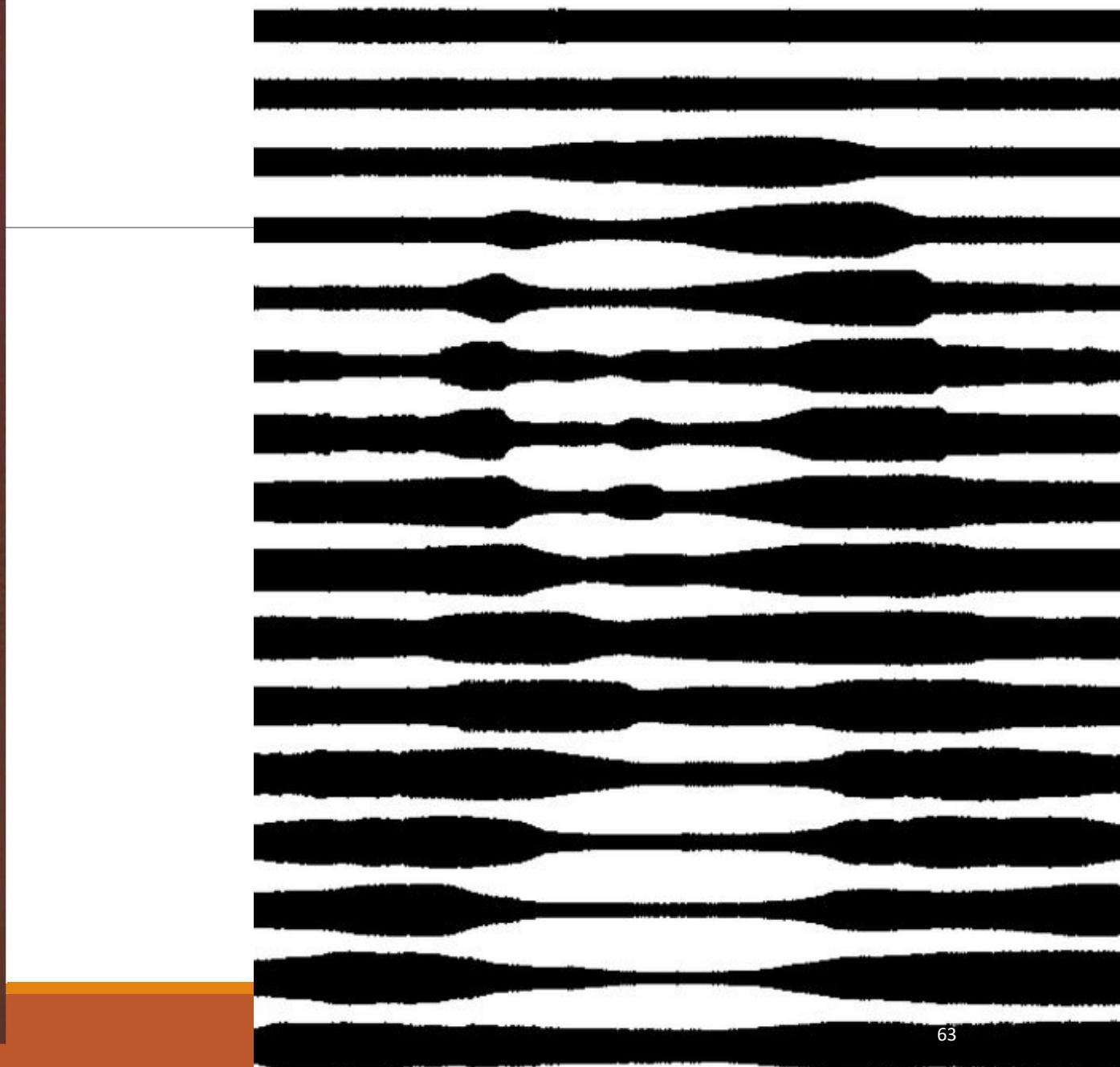
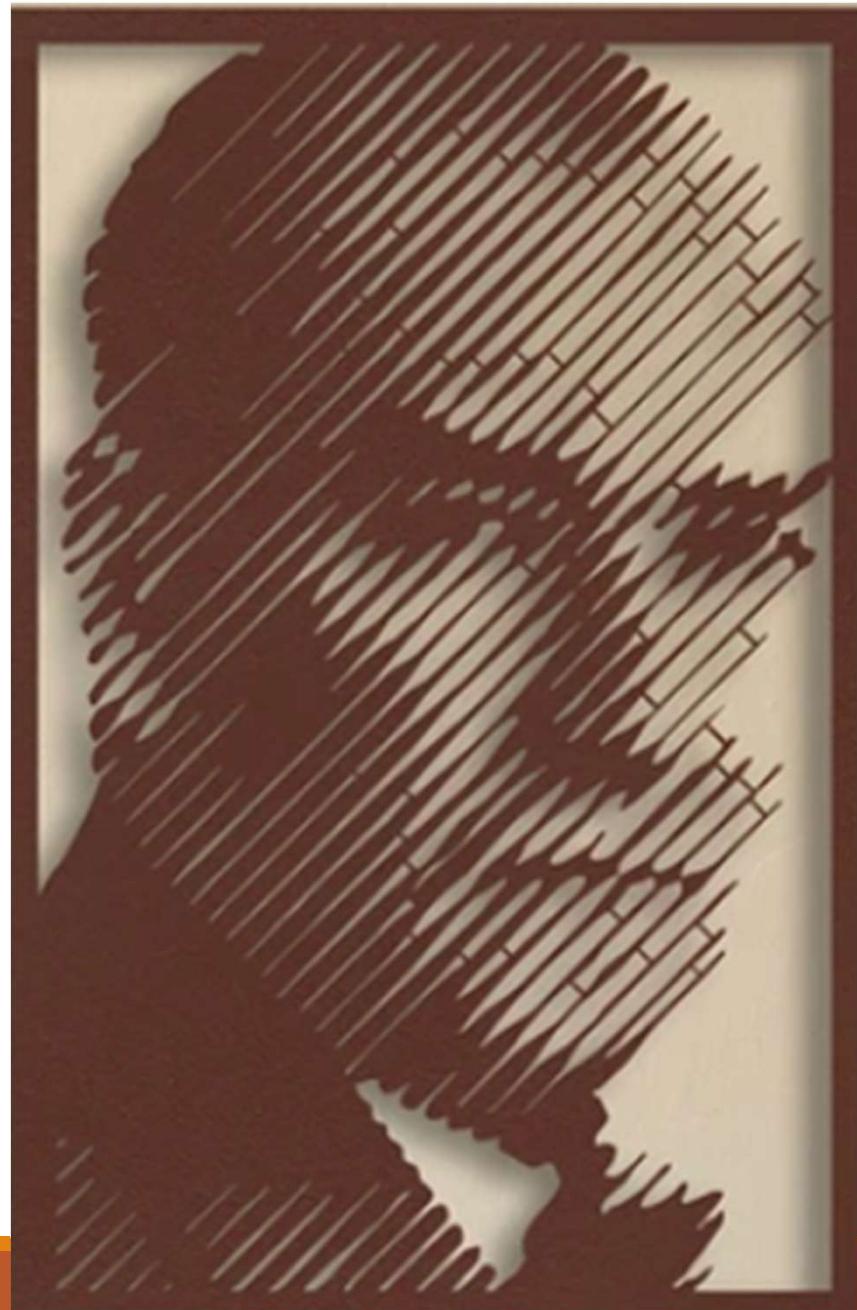
- We tend to 'close' the gaps in the incomplete objects
- we convert complex objects into simpler or known shapes



Law of Closure

- when we look at a complex arrangement of visual elements, we tend to look for a single, recognizable pattern





Searching for order

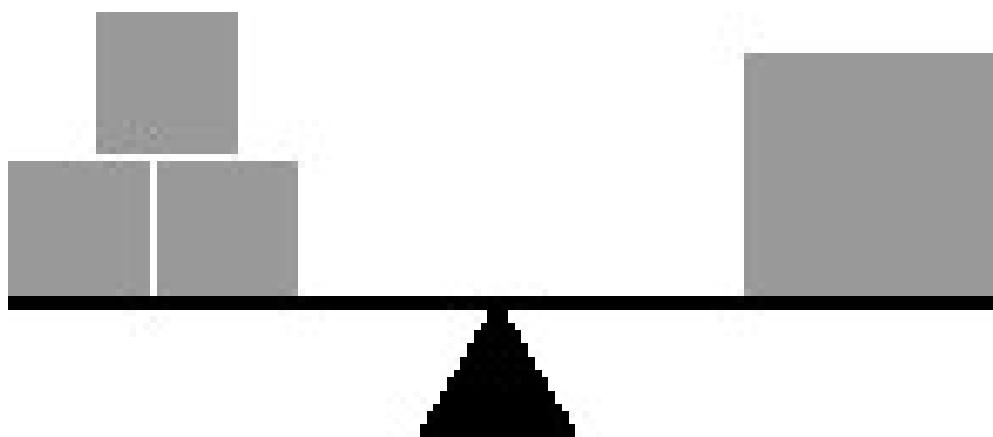
- Humans seek regularity and patterns in order to categorize and reduce processing effort.



Law of Symmetry

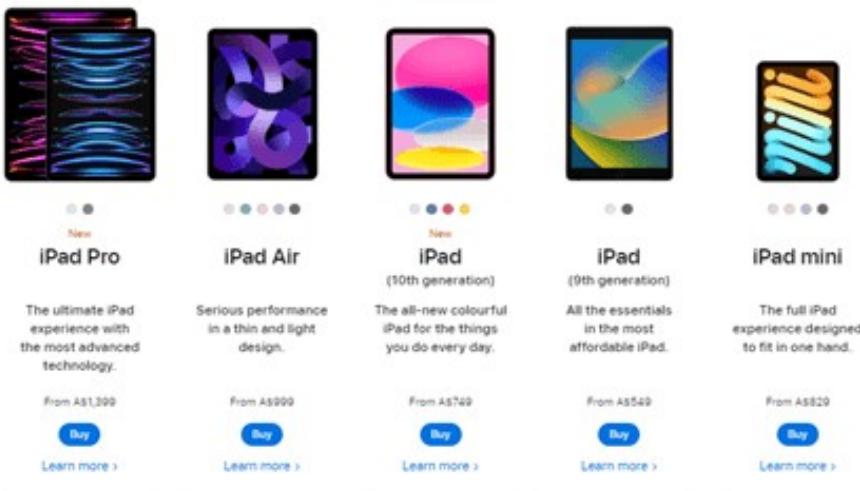
{ } { } { } { }

- perceive symmetrical elements as part of a unified group
 - the viewer should not be given the impression that something is out of balance, or missing, or wrong
 - People tend to prefer symmetry
-
- Balance =Symmetry
 - It is like a seesaw



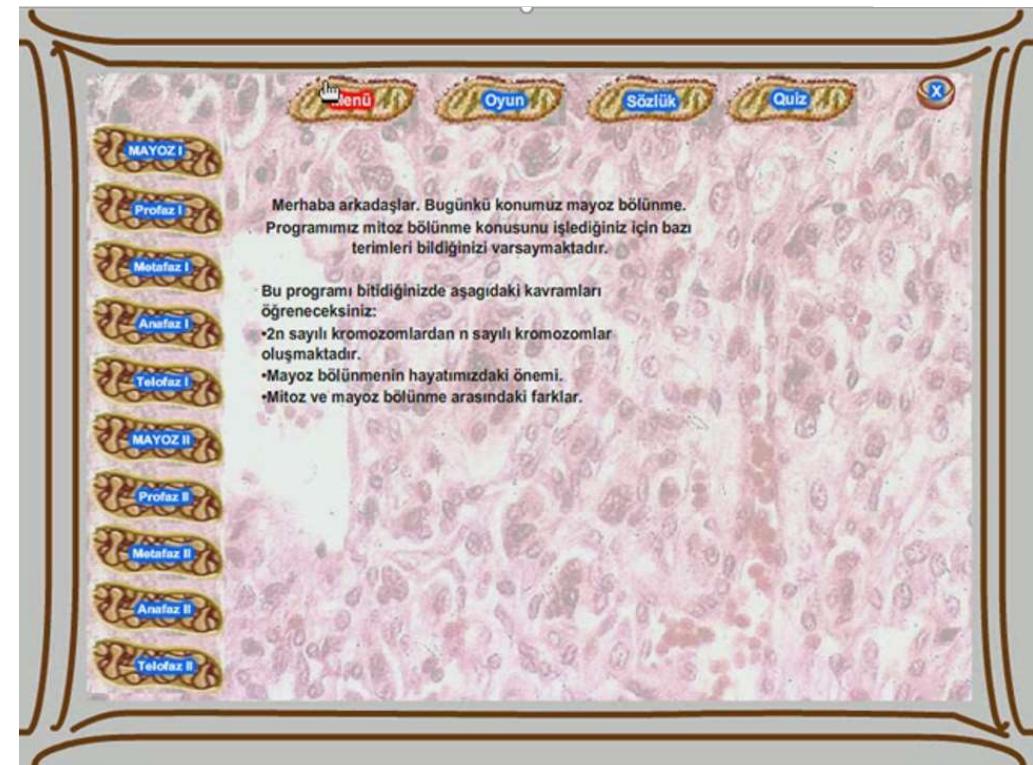
Law of Symmetry

Which iPad is right for you?



[Compare all iPad models >](#)

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English

ALO
131
ACİL DURUM
İHBAR HATTI



[Tüm Haberler »](#)

10.11.2022



TÜRKİYE İLE BULGARİSTAN ARASINDAKİ TREN TRAFİĞİ HIZLANACAK

TCDD Genel Müdürü Hasan Pezük, Türkiye ile Bulgaristan arasındaki tren trafiğini hızlandırdı ve ülkemizin ihracatına daha fazla katkı sağlamak için görüşmeler yaptı.

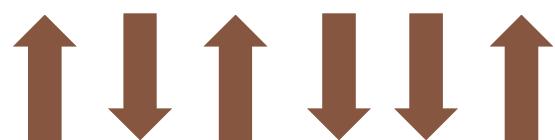


 T.C. ULAŞTIRMA VE ALTYAPI BAKANLIĞI



Law of Common Fate (Coordinated Motion)

- any objects that coordinate movement similarly are perceived to be more related.



- This helps us show the relationship between elements

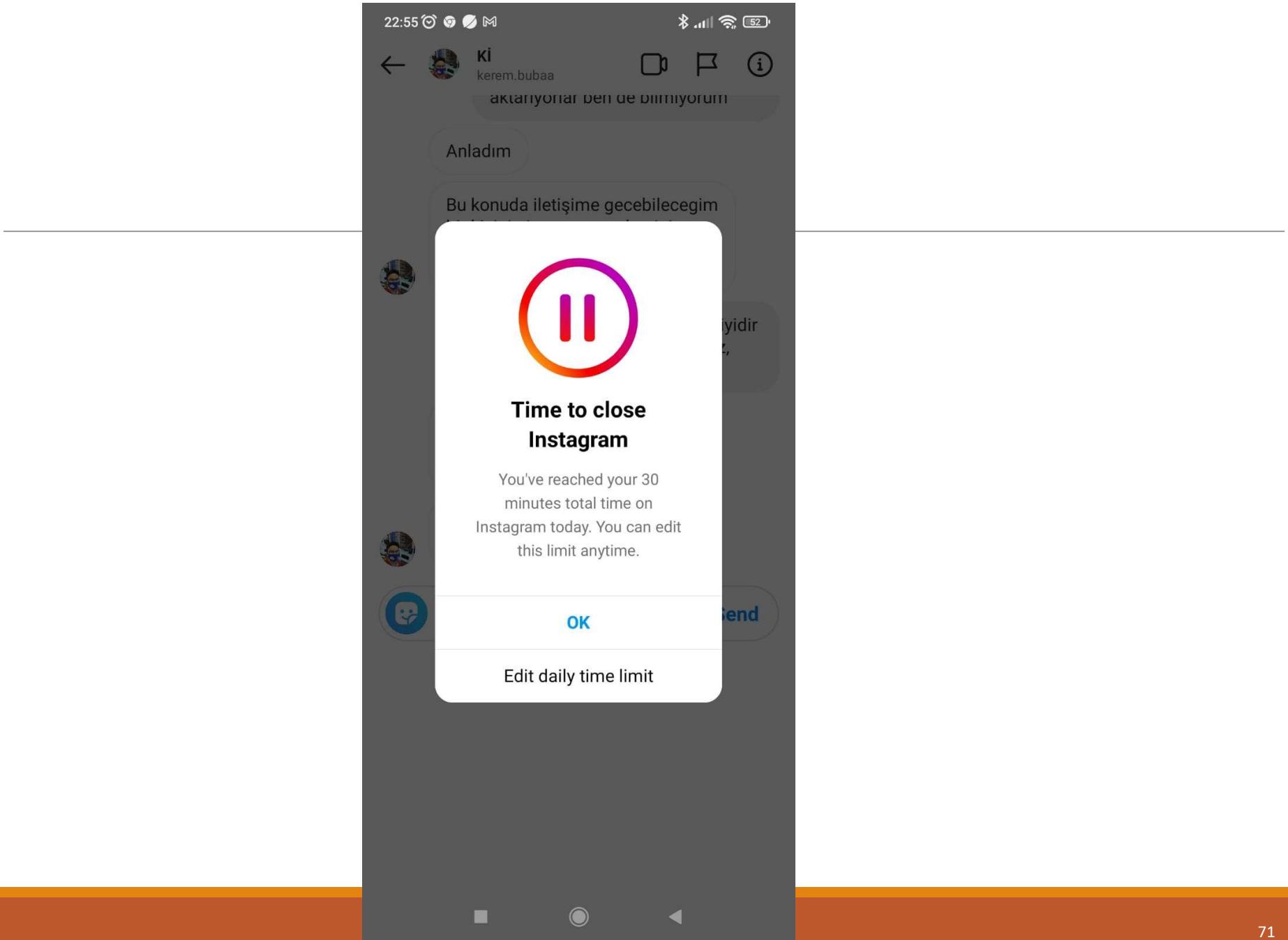
Law of Common Fate (Coordinated Motion)



Law of Figure and Ground

- We perceive objects as either being in the foreground or the background.
- People involuntarily notice when using a website or app is determining which is the figure and which is the ground.
- We cannot focus on the image prominently in the front and on the ground simultaneously





Law of Figure and Ground



Law of Figure and Ground



Gestalt* principles of organization

- Proximity - 000 000 000
- Similarity - AAABBBCCC
- Closure - [] [] []

Grouping elements accordingly establishes perceptual structure and can improve visual search

* form-forming capability of our senses, whole forms instead of just a collection of simple lines and curves

Combine principles logically

- Proximity and similarity AAA BBB
- Proximity and closure [] [] []
- Avoid conflicting two principles
 - Proximity opposing closure][][][
 - Proximity opposing similarity AAB BBC CCD
- Space is a screen element too

In design terms:

- Layout and structure of screens should
 - support perceptual grouping -navigation and content
 - aid visual scanning
 - Use whitespace, color and headings to guide the eyes
 - aid location
 - Consistency of location matters
 - improve aesthetics
 - Interface beauty matters!

Gestalt can help identify design problems

- There are many ways to achieve good design,
- but when we encounter vague, ambiguous and difficult design messages,
- the Gestalt Principles can help us define the problem and identify the solution.

Applying Gestalt to code

```
[Fact]
public async Task Send()
{
    // given
    var cancelToken = default(CancellationToken);

    var smtpSettings = new SmtpSettings()
    {
        Host = "spammail.com",
        Port = 1234,
        Username = "gareth",
        Password = "bale100",
        UseSsl = true
    };
    var emailController = new EmailController(_mailTransportMock.Object, smtpSettings);

    string to = "to@example.com";
    string from = "from@example.com";
    string subject = "the subject";
    string body = "the body";

    var expectedMessage = new MimeMessage();
    expectedMessage.From.Add(MailboxAddress.Parse(from));
    expectedMessage.To.Add(MailboxAddress.Parse(to));
    expectedMessage.Subject = subject;
    expectedMessage.Body = new TextPart(body);

    _mailTransportMock.Setup(x => x.Send(expectedMessage, cancelToken, null));

    // when
    await emailController.Send(from, to, subject, body);
}
```