

Lecture #01

S1 – Interaksi Manusia Komputer



MANUSIA

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Manusia

- Informasi i/o (input/output)
 - visual, pendengaran, haptic, gerakan
- Informasi yang tersimpan di memori
 - sensori, memori jangka pendek & jangka Panjang
- Pemrosesan informasi
 - reasoning, problem solving, skill, error
- Emosi mempengaruhi kemampuan manusia
- Setiap individu berbeda

Penglihatan

Dua tahap dalam penglihatan

- penerimaan stimulus secara fisik
- pemrosesan dan interpretasi stimulus



Mata – physical reception

- mekanisme untuk menerima cahaya dan mengubahnya menjadi energi listrik
- cahaya dipantulkan dari benda
- gambar terfokus terbalik pada retina
- Retina mengandung batang untuk penglihatan pada cahaya rendah dan kerucut untuk penglihatan warna
- sel ganglion (otak!) mendeteksi pola dan gerakan



Interpreting the signal

- Ukuran dan kedalaman
 - Sudut visual menunjukkan seberapa banyak objek pandang yang ditempati
(berhubungan dengan ukuran dan jarak dari mata)
 - Ketajaman penglihatan adalah kemampuan melihat detail
(terbatas)
 - objek familiar dianggap berukuran konstan
(meskipun ada perubahan sudut visual saat jauh)
 - isyarat seperti tumpang tindih membantu persepsi ukuran dan kedalaman



Interpreting the signal (Cont.)

- **Brightness/kecerahan**

- reaksi subyektif terhadap tingkat cahaya
- dipengaruhi oleh pencahayaan objek
- diukur dengan perbedaan yang nyata
- Ketajaman visual meningkat seiring dengan pencahayaan, begitu pula dengan kedipan

- **Colour/warna**

- terdiri dari rona, intensitas, saturasi
- Cone cell/Reseptor warna peka terhadap panjang gelombang warna
- ketajaman biru paling rendah
- 8% laki-laki dan 1% perempuan buta warna

<https://www.youtube.com/watch?v=uuWb1L2Vwsk>

https://www.youtube.com/watch?v=l8_fZPHasdo



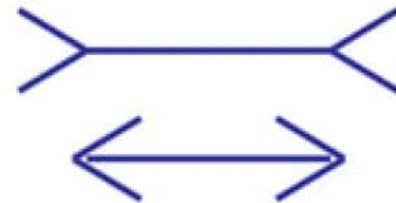
Interpreting the signal (Cont.)

- Sistem visual mengkompensasi:
 - movement
 - changes in luminance.
- Context is used to resolve ambiguity
- Optical illusions sometimes occur due to over-compensation

Optical illusions



the Ponzo illusion



the Muller Lyer illusion

<https://www.youtube.com/watch?v=COvd1HkDCWQ>

Reading

- Several stages:
 - visual pattern perceived
 - decoded using internal representation of language
 - interpreted using knowledge of syntax, semantics, pragmatics
- Reading involves saccades and fixations
- Perception occurs during fixations
- Word shape is important to recognition
- Negative contrast improves reading from computer screen





Hearing

- Provides information about environment:
 - distances, directions, objects etc.
- Physical apparatus:
 - outer ear → protects inner and amplifies sound
 - middle ear → transmits sound waves as vibrations to inner ear
 - inner ear → chemical transmitters are released and cause impulses in auditory nerve
- Sound
 - Pitch → sound frequency
 - loudness → amplitude
 - timbre → type or quality

Hearing (Cont.)

- Humans can hear frequencies from 20Hz to 15kHz
 - less accurate distinguishing high frequencies than low.
- Auditory system filters sounds
 - can attend to sounds over background noise.
 - for example, the cocktail party phenomenon.

<https://www.youtube.com/watch?v=LkGOGzpbrCk>



Touch



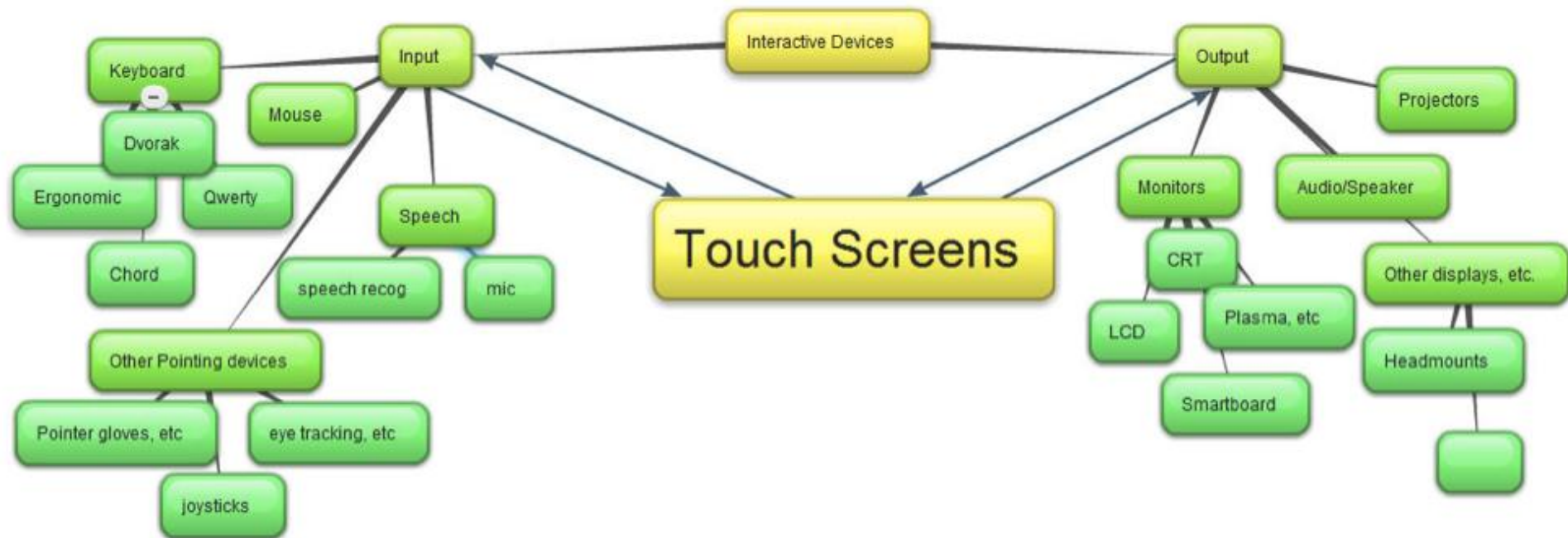
- Provides important feedback about environment.
- Maybe key sense for someone who is visually impaired.
- Stimulus received via receptors in the skin:
 - Thermoreceptors - heat and cold
 - Nociceptors - pain
 - Mechanoreceptors - pressure(some instant, some continuous)

Touch (Cont.)

- Some areas more sensitive than others e.g. fingers.
- Kinethesis
 - awareness of body position
 - affects comfort and performance



Touch (Cont.)





Movement

- Time taken to respond to stimulus:
reaction time + movement time
- Movement time dependent on age, fitness etc.
- Reaction time, dependent on stimulus type:
 - visual ~ 200ms
 - auditory ~ 150 ms
 - pain ~ 700ms
- Increasing reaction time decreases accuracy in the unskilled operator but not in the skilled operator.

Movement

- Fitts' Law describes the time taken to hit a screen target:

$$M_t = a + b \log_2 (D / S + 1)$$

where: a and b are empirically determined constants

M_t is movement time

D is Distance

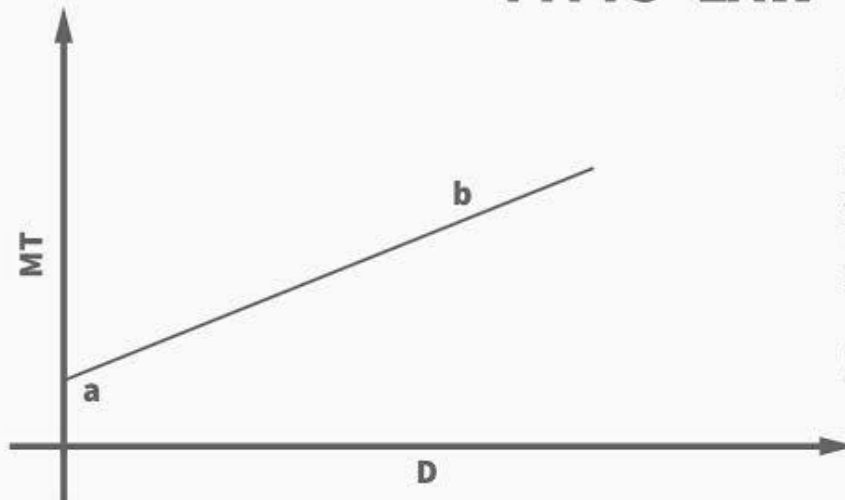
S is Size of target

→ *targets as large as possible*
distances as small as possible.





FITTS' LAW



$$MT = a + b \cdot \log_2 \left(2 \frac{D}{W} \right)$$

MT - The movement time

a - The intercept

b - The slope

D - The distance between the origin and the target

W - The width of the target



INTERACTION DESIGN
FOUNDATION

INTERACTION-DESIGN.ORG

<https://www.youtube.com/watch?v=bCmm2HFWMZU>

Movement (Cont.)

Fitts' Law examples:

- **Example 1:** Imagine you have two icons on your smartphone screen, one for a music app and another for a weather app. If the music app icon is larger (S) and closer (D) to your thumb's resting position, you'll be able to tap it more quickly and accurately, even in a hurry.
- **Example 2:** In a computer game, if you have a clickable button to fire a weapon, its size (S) and its distance (D) from your character's current position on the screen will impact how quickly and accurately you can take action.



