

COGNITIVE ERGONOMICS

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INTRODUCTION

COGNITIVE ERGONOMICS

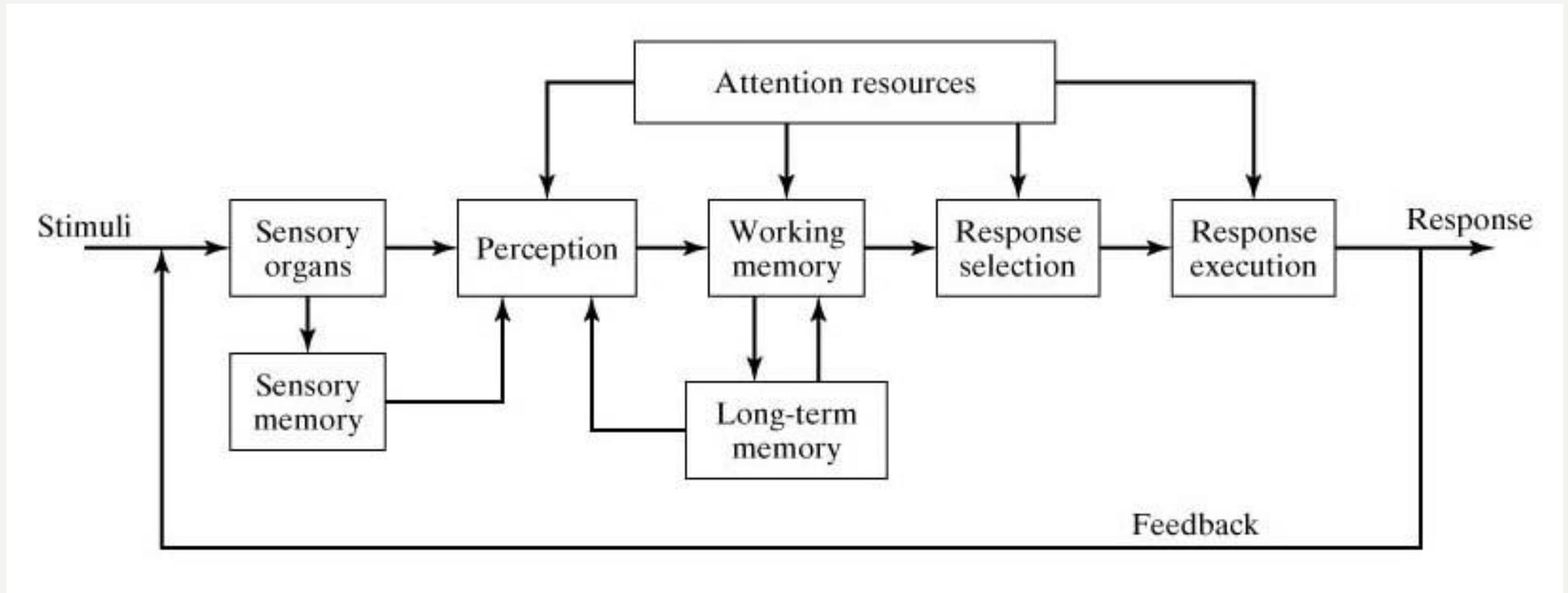
Study of the capabilities and limitations of the human brain and sensory system while performing activities that have a significant information processing content

- Why cognitive ergonomics is important
 - Growth in the service industry sector in which work has high content of information processing and communication
 - More use of mechanization and automation
 - Increased use of technologically sophisticated equipment

TOPIC OUTLINE

1. The Human Sensory System
2. Perception
3. Attention Resources
4. Memory
5. Response Selection and Execution
6. Common Cognitive Tasks
7. Design Guidelines for Cognitive Work

HUMAN INFORMATION PROCESSING MODEL





THE HUMAN SENSORY SYSTEM

HUMAN SENSORY SYSTEM

- Humans receive stimuli from sources of energy both external and internal to the body
- Receptors - the body's sensory organs:
 1. Vision ~ 80% of human information input
 2. Hearing ~ 15% to 19% of information input
 3. Touch
 4. Smell
 5. Taste

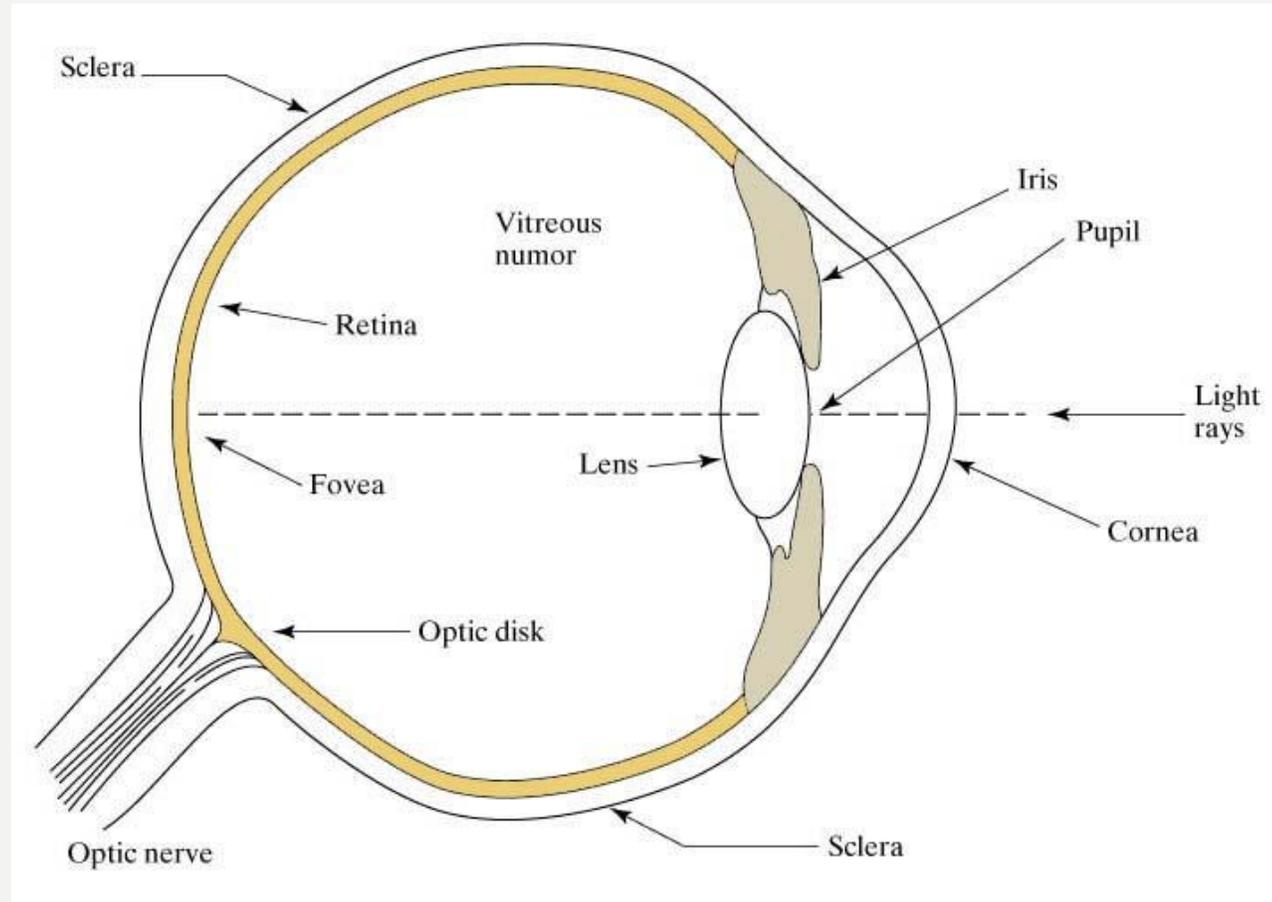


VISION

VISION

- Light - electromagnetic radiant energy that lies within the visible spectrum
 - Wavelengths between ~ 400 nm (blue-violet) and ~ 700 nm (red)
- Human eye is stimulated by light
 - Light passes through the cornea (the eyeball's window) and is focused by the lens onto the retina at the back of the eyeball
 - The retina consists of millions of light receptors
 - The optic nerve transmits the image focused on the retina to the brain for interpretation

ANATOMY OF THE HUMAN EYEBALL



VISUAL PERFORMANCE

- Visual acuity - capability to discriminate small objects or fine details

$$\text{Visual angle } \alpha_v = 3438 h/d$$

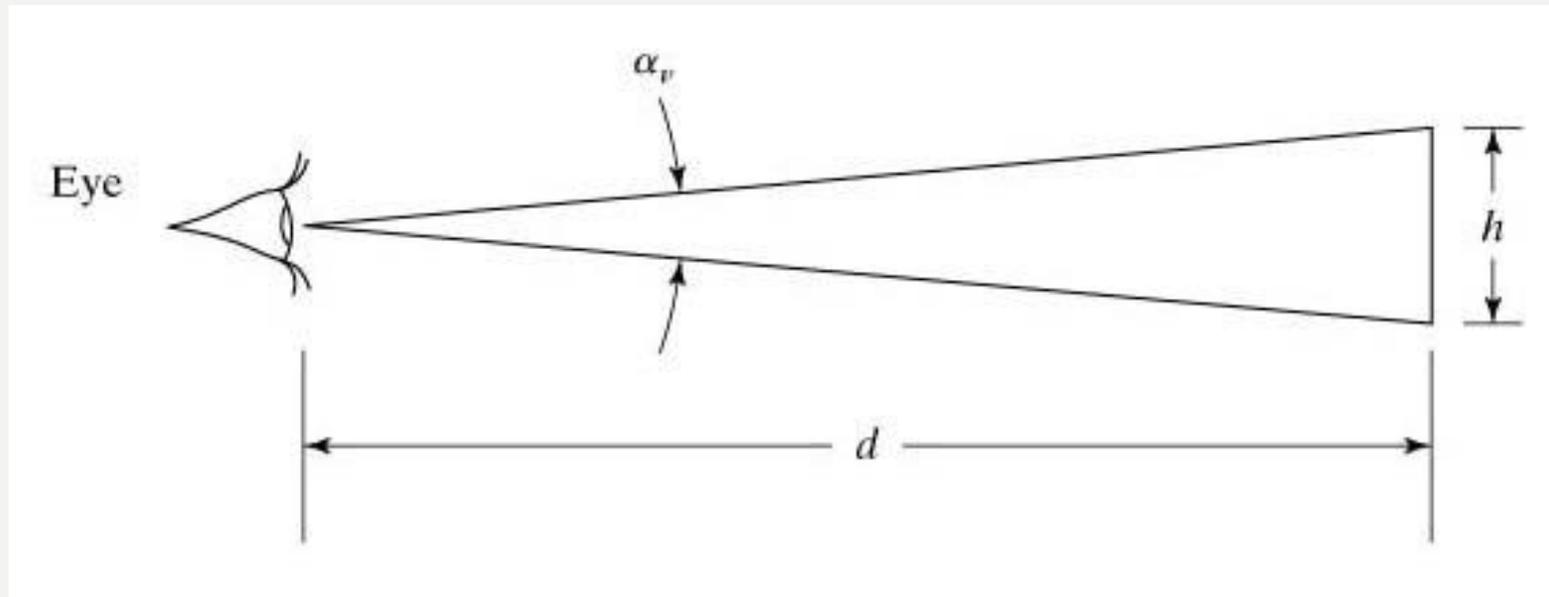
where α_v is measured in arc min, h = height of object or detail, and d = distance from eye

$$\text{Visual acuity } VA = 1/\alpha_v$$

- Snellen chart - test for visual acuity
 - Used by ophthalmologists
 - Patient asked to identify letters as their sizes get smaller and smaller

VISUAL ANGLE DEFINED

Visual angle $\alpha_v = 3438 h/d$



VISUAL PERFORMANCE

- Stereoscopic acuity - capability to perceive depth in one's field of vision
 - Enabled by the two eyes
- Color discrimination - capability to distinguish colors
- Adaptation - ability to adapt to changes in light levels
 - Dark adaptation - adapting from a bright environment to a dark one
 - Light adaptation - adapting from a dark environment to a light one



**LECTURE
CLOSING**

A BRIEF HISTORY OF COGNITIVE PSYCHOLOGY & ERGONOMICS

18th CENTURY: THE BRITISH EMPIRICISTS

George Berkeley

- Berkeley's most influential essay is *A Treatise Concerning the Principles of Human Knowledge*. It was this that earned Berkeley the title of "subjective idealist," "immaterialist," "Spiritualist," What Berkeley set out to achieve was the removing of validity from materialism and to do this by refuting the latent or explicitly materialistic content both in Locke's *Essay* and in Descartes' and Hobbes' "geometric " theories" of man and society.

David Hume (1711-1776)

- Hume published a *Treatise of Human Nature*. He emphasized Locke's notion of the compounding of simple ideas into complex ideas, developing and making more explicit the notion of association. He abolished mind as a substance and said that it is a secondary quality like matter. The mind is observable only through perception. More importantly, is the distinction he drew between two kinds of mental contents: impressions and ideas. Impressions are the basic elements of mental life. Impressions are kin to sensation and perception. Ideas are the mental experiences that we have in the absence of any stimulating element. The modern equivalent is image. He proposed two theories about association: 1) resemblance or similarity, and 2) contiguity in time and place. His work fits into the categories of empiricism and associationism. He believed that just like the astronomers determine the laws of the universe through which the planets function, it is also possible to determine the laws of mental universes

DID YOU KNOW.....?????

- Our mind has ability to detect and sense danger. If your gut tells you something is wrong, never ignore that feeling

1114-1011

GRAFFITI



"Here is my proposal for making our department more productive. The proposal contains my best cognitive distortions."

A decorative wavy line in light blue and white on the left side of the slide.

THANK YOU ...



**PLEASE READ COGNITIVE ERGONOMICS
FROM RECOMMENDED REFERENCE BOOKS
FOR A BETTER UNDERSTANDING OF NEXT
LECTURE**