Usability Engineering

Session 6

Agenda

- Session 6 Topics
- Questions from Session 5?
- Objectives of Session 6
  - Controls and Data Entry Devices
  - Hand Tools and Devices
  - Environmental Conditions
    - Illumination
- Remote Control New Design and Support
- Project Proposals

Controls and Data Entry Devices: Controls

Controls

- Function: Transmit control information to some device, mechanism or system
- Types
  - Discrete: e.g., push buttons, toggle switches, foot push buttons
  - Continuous: e.g., rotary knobs, levers, small cranks, foot pedals, mice, joysticks, trackballs
- Identification of Controls
  - Identification of controls is a coding problem: e.g., shape, texture, size, location, operational method, color and labels.
- Control-Response Ratio (C/R): the ration of the movement of the control device to the movement of the system response.


Dials & Knobs


Ford

Controls and Data Entry Devices: Data Entry

Data Entry Devices

- Data Entry Devices are used for storing, transmitting, and analyzing information.
- Keyboards
  - Chord
  - Sequential
  - Alphabetic
    - QWERTY
    - Simplified
  - Numeric
    - Calculator
    - Telephone

Input and Speed/Accuracy Tradeoff

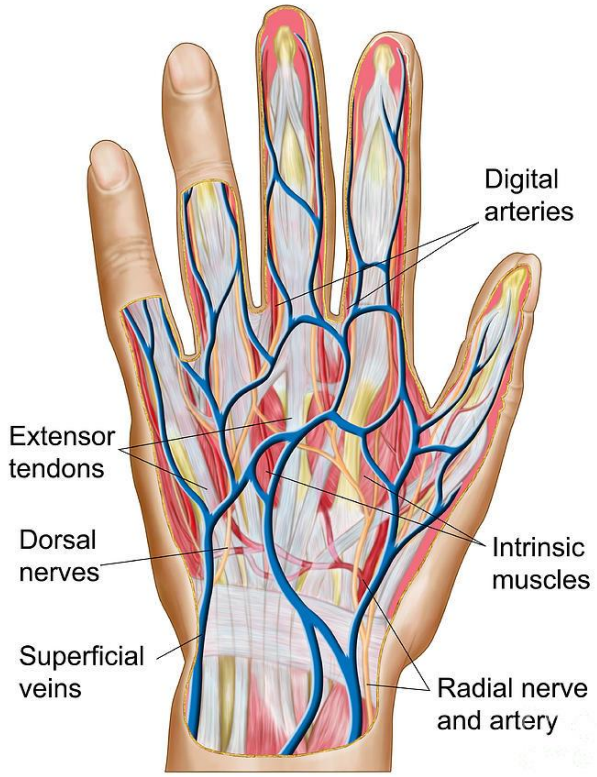
- Speed/Accuracy Tradeoff is described when a task must be accurate and so the speed is slow, or the opposite.
- Most common input devices are keyboard, light pen, trackball, mouse, touch screen, joystick, etc.
- Some trade offs:
  - Touch Screen has the fastest speed but the lowest accuracy for cursor positioning
  - Track Ball has a medium speed but the best accuracy for cursor positioning
  - Keyboard has the slowest speed and next lowest accuracy for cursor positioning

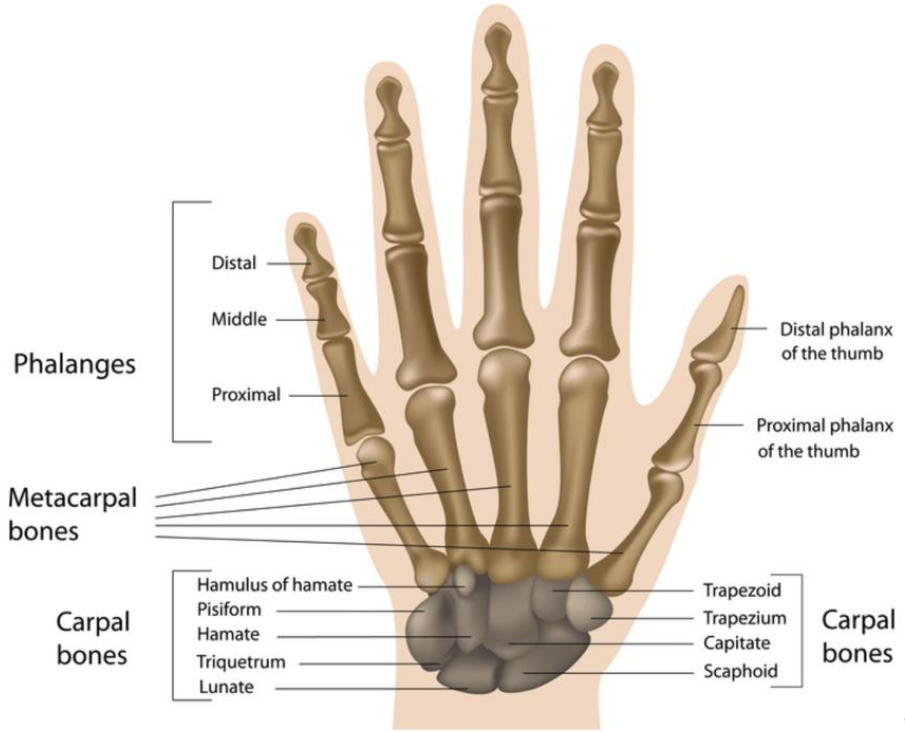
Special Control Devices

- Teleoperators: general-purpose human-machine systems that augment the physical skills of the operator. E.g., handling of dangerous materials, etc.
- Speech Activated Control: use of speech recognition for the control of a device. E.g., Telephones, Tablets, Computers, Assistants (Alexa, language translation, etc.)
- Eye activated systems: tracking of head and eye movement to control an input.

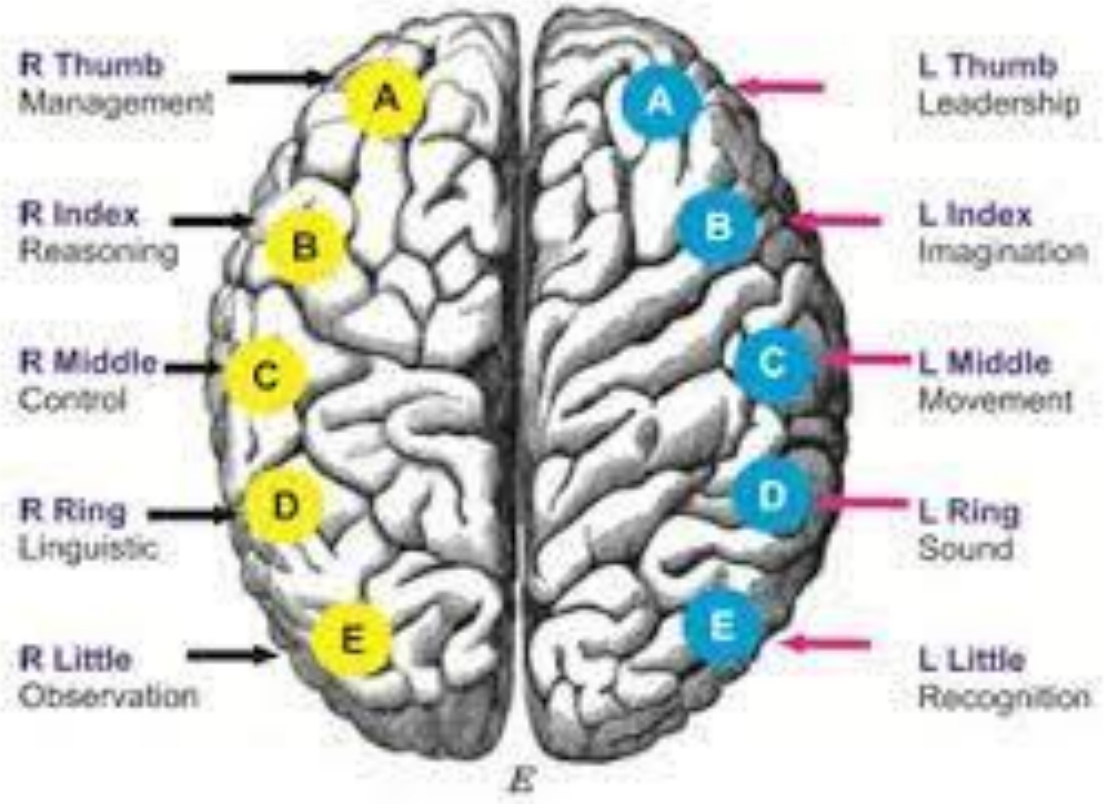
Hand Tools and Devices

Human Hand


Digital arteries
Extensor tendons
Dorsal nerves
Superficial veins
Intrinsic muscles
Radial nerve and artery


Phalanges
Distal
Middle
Proximal
Distal phalanx of the thumb
Proximal phalanx of the thumb
Metacarpal bones
Carpal bones
Hamulus of hamate
Pisiform
Hamate
Triquetrum
Lunate
Trapezoid
Trapezium
Capitate
Scaphoid
Carpal bones

Human Hand and the Brain



Principles of Hand Tool and Device Design

- Foundational Principles
  - Maintain a straight wrist
  - Avoid tissue compression stress
  - Avoid repetitive finger action
- Gender
  - Hand size
  - Hand/grip strength
- Handedness
  - 10-12 percent are left hand dominant
- Vibration

Environmental Conditions

Illumination

- Light is “radiant energy that is capable of exciting the retina of the eye and producing a visual sensation”.
- Illumination is the brightness of light.
- Natural illumination (e.g., sun, moon, etc.) and artificial illumination (e.g., indoor lighting) do not seem to make a difference for tasks such as proof reading.
  - Artificial illumination systems can have an effect on performance and comfort and effective responses.

Lighting and Human Factors

- Color: variations in wavelength within the visible spectrum will result in the perception of color.
- The retina is made of rods and cones.
  - When light reaches cones, then we see color.
  - Cones respond to blue/yellow or red/green.
  - Rods respond to black/gray.
- Color blindness/deficiency
  - Incidence: 1 in 12 men / 1 in 200 women
  - Ratios are different for some professions, e.g., software, medicine.
  - Table 16-3, page 530

Pantone Chart

The Pantone Matching System standardizes 1,114 colors and assigns each color a number and name.

Remote control redesign

Presentations

Project Proposal

- The Idea
- The Implementation
- Human Factors Elements
  - How to Control
  - How to Integrate
- Show the original Design and the new design after controlling/integrating Human Factors
- Predict the Anticipated results of your work