Designing Interactive Systems 1

Lab 1: Fitts’ Law, CMN Model, Assignment 1: Fitts’ Law

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https://hci.rwth-aachen.de/dis
Fitts’ Law
In-Class Exercise 2

- How much faster does calling become by moving the “call” button from 70 mm distance to 30 mm distance, measured from the middle of the keypad? The size of the call button is 10 x 10 mm.

- Shannon’s formulation: \( T_{pos} = a + b \cdot \log_2 \left( \frac{D}{W} + 1 \right) \)

- Use \( a = 0 \text{ ms}, \ b = I_M = 100 \text{ ms/bit} \)
Solution

\[ T_{\text{pos}1} = I_M \cdot \log_2 \left( \frac{D_1}{W} + 1 \right) \]

\[ T_{\text{pos}2} = I_M \cdot \log_2 \left( \frac{D_2}{W} + 1 \right) \]

\[ T_{\text{pos}1} - T_{\text{pos}2} = I_M \cdot \left( \log_2 \left( \frac{D_1}{W} + 1 \right) - \log_2 \left( \frac{D_2}{W} + 1 \right) \right) \]

\[ = 100 \text{ ms} \cdot \left( \log_2 \left( \frac{70}{10} + 1 \right) - \log_2 \left( \frac{30}{10} + 1 \right) \right) \text{ bit} \]

\[ = 100 \text{ ms} \cdot (\log_2 8 - \log_2 4) \]

\[ = 100 \text{ ms} \cdot (3 - 2) \]

\[ = 100 \text{ ms} \]

⇒ Moving the call button speeds up each call by an average of about 100 ms.
In-Class Exercise 3

- **Task:** Calculate the average time (in ms) needed to reach the button.

- You don’t need a calculator

Shannon’s Formula: \( T_{pos} = a + b \cdot \log_2 \left( \frac{D}{W} + 1 \right) \)

\[
a = 0 \text{ ms}
\]

\[
b = I_M = 100 \frac{ms}{\text{bit}}
\]
Solution

Shannon’s Formula: \[ T_{\text{pos}} = a + b \cdot \log_2 \left( \frac{D}{W} + 1 \right) \]

- \( a = 0 \text{ ms} \)
- \( b = l_M = 100 \text{ ms/bit} \)

Distance, \( D = 36 \text{ cm} \)

Side of the square, \( r = 6\sqrt{2} \text{ cm} \)

Target width, \( W = \sqrt{r^2 + r^2} \text{ cm} \)

\[ = r\sqrt{2} \text{ cm} \]

\[ = 6\sqrt{2} \cdot \sqrt{2} \text{ cm} \]

\[ = 12 \text{ cm} \]

\[ T_{\text{pos}} = 0 \text{ ms} + 100 \text{ ms/bit} \cdot \log_2 \left( \frac{36}{12} + 1 \right) \text{ bit} \]

\[ = 200 \text{ ms} \]
In-Class Exercise #4: Prime Locations for Targets
In-Class Exercise #5: Pop-up Menus

• Which of the following pop-up menus lead to a faster selection time?
CMN Model
In-Class Exercise 1

• A letter or a number is displayed randomly

• User has to press A (left) or press L (right) accordingly

• Assumption: user’s fingers are already on these keys

• Calculate the average time the user needs to press the correct button
Solution

• Perceptive: 100 ms
• Cognitive (semantic recognition): 70 ms
• Cognitive (categorization): 70 ms
• Cognitive (left or right?): 70 ms
• Cognitive (do something!): 70 ms
• Motor: 70 ms
• Adds up to approximately 450 ms
Assignment I: Fitts’ Law

- **Objective:** Learn how to apply Fitts’ law in interface design

- Assignment is available online on RWTHmoodle now!

- Deadline: Next **Monday, Nov. 09, 02:30 p.m.**

- Use **RWTHmoodle** to submit (1 submission per group)

- Submissions after deadline will be graded **5.0**

- Name your file **A01-GXX.pdf**, where XX indicates your group number. E.g., if you are in group 5, name your PDF document as A01-G05.pdf. We will reduce points for incorrectly named files

- A few of you will be asked to present your solution during the next lab

- You should have the possibility to form groups of three in Moodle by now (Deadline Tomorrow 08:00 a.m.)