

# Designing Interactive Systems 1

## Lab 1: Fitts' Law, CMN Model, Assignment 1: Fitts' Law

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<https://hci.rwth-aachen.de/dis>



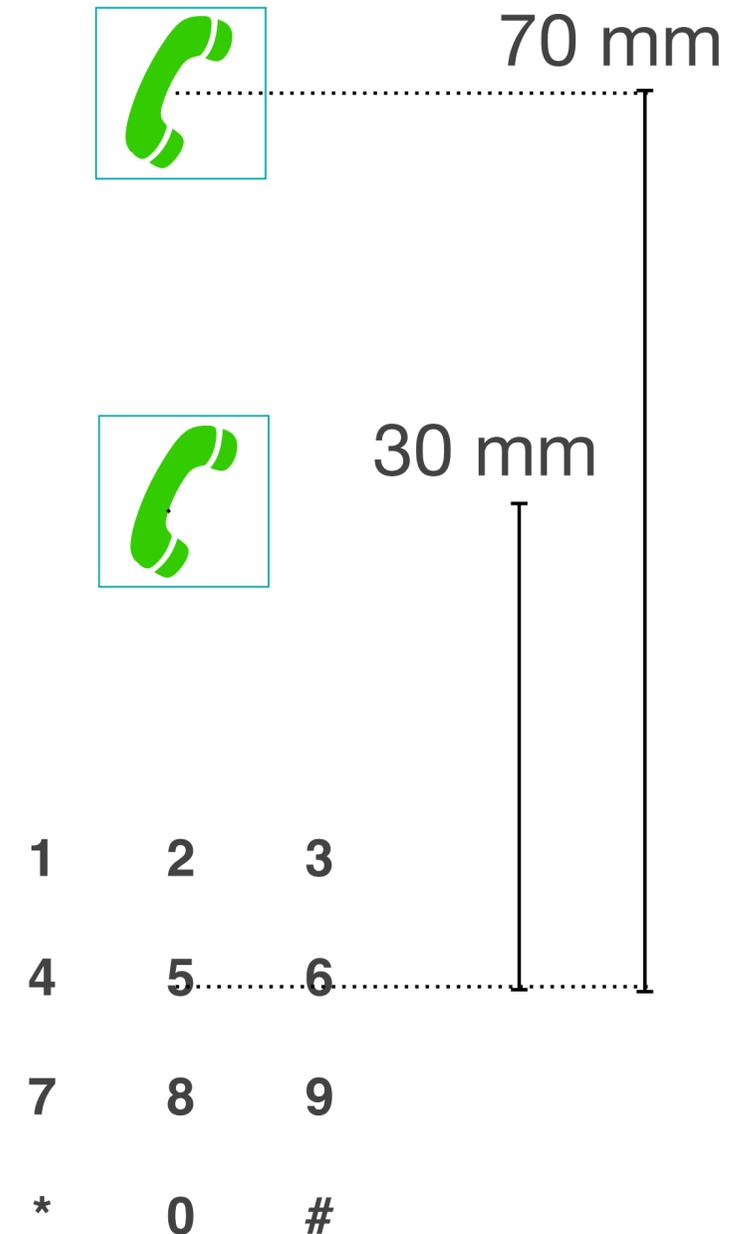
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# Fitts' Law



# 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 ms**, **b = I<sub>M</sub> = 100 ms/bit**



# Solution

$$T_{pos1} = I_M \cdot \log_2 \left( \frac{D_1}{W} + 1 \right)$$

$$T_{pos2} = I_M \cdot \log_2 \left( \frac{D_2}{W} + 1 \right)$$

$$\begin{aligned} T_{pos1} - T_{pos2} &= I_M \cdot \left( \log_2 \left( \frac{D_1}{W} + 1 \right) - \log_2 \left( \frac{D_2}{W} + 1 \right) \right) \\ &= 100 \frac{ms}{bit} \cdot \left( \log_2 \left( \frac{70}{10} + 1 \right) - \log_2 \left( \frac{30}{10} + 1 \right) \right) \text{ bit} \\ &= 100 \text{ ms} \cdot (\log_2 8 - \log_2 4) \\ &= 100 \text{ ms} \cdot (3 - 2) \\ &= 100 \text{ ms} \end{aligned}$$

⇒ Moving the call button speeds up each call by an average of about 100 ms.



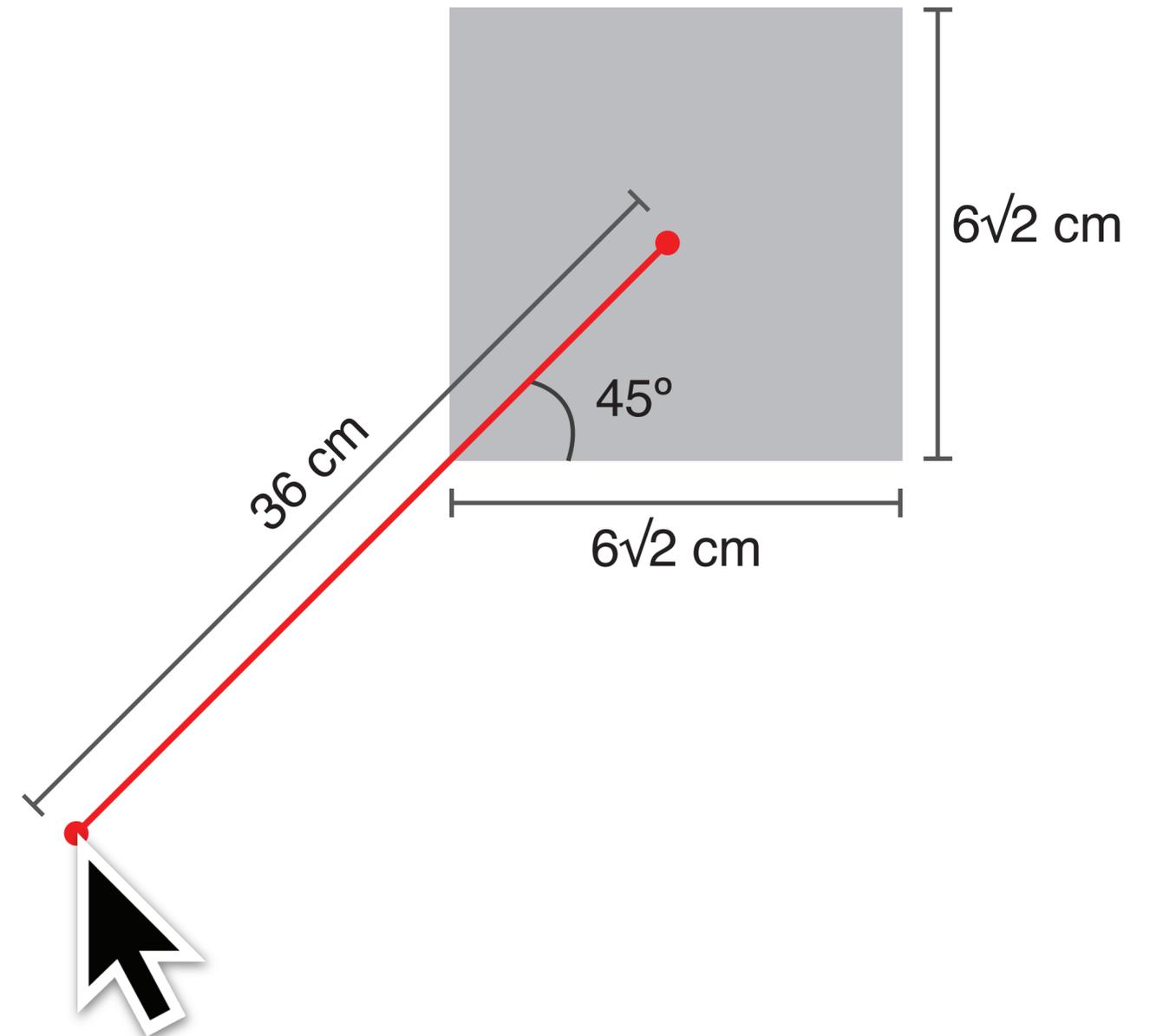
# In-Class Exercise 3

- **Task:** Calculate the average time (in *ms*) needed to reach the button.
- You don't need a calculator

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

$$a = 0 \text{ ms}$$

$$b = I_M = 100 \frac{\text{ms}}{\text{bit}}$$



# Solution

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

$$a = 0 \text{ ms}$$

$$b = I_M = 100 \frac{\text{ms}}{\text{bit}}$$

Distance,  $D = 36 \text{ cm}$

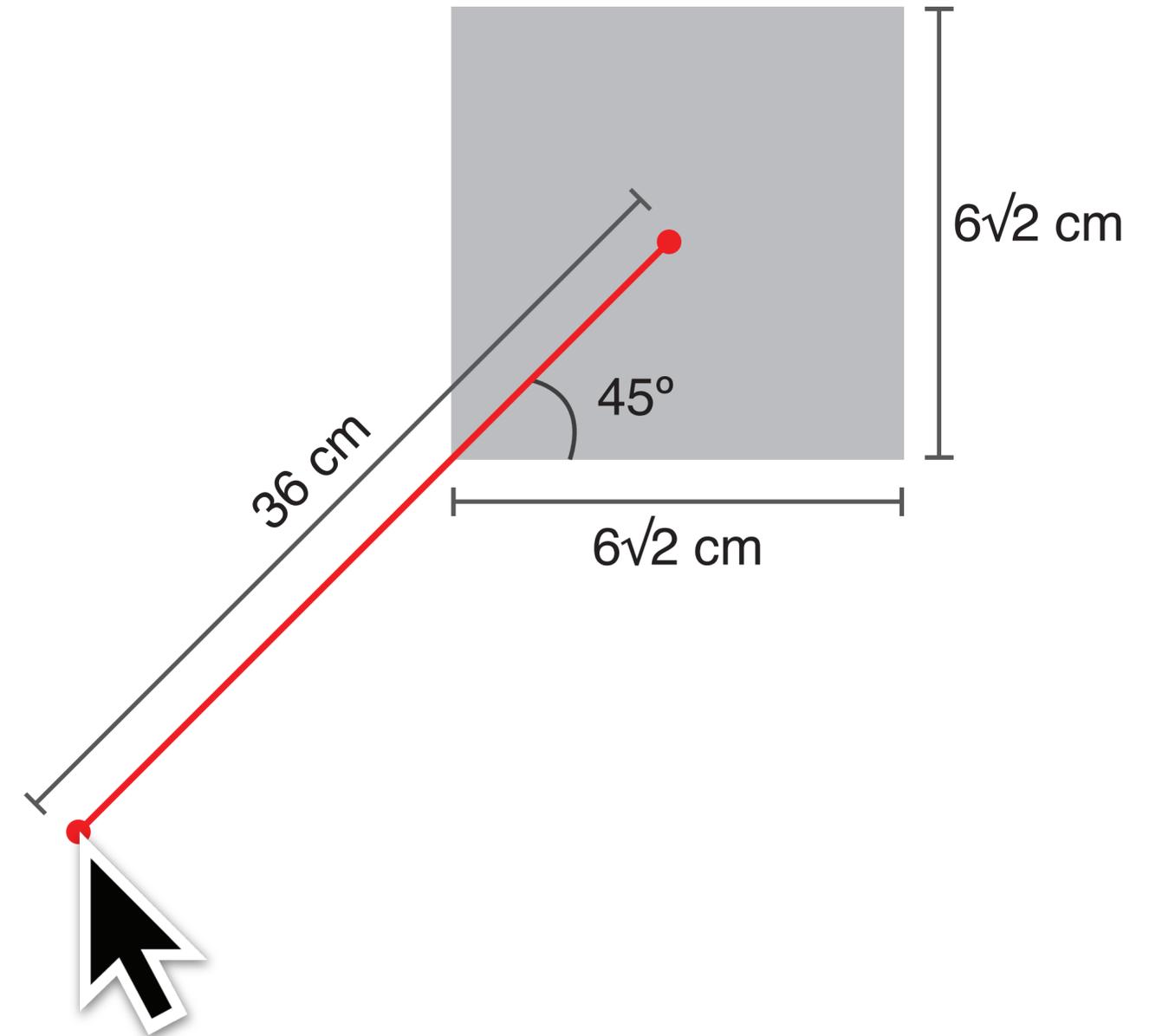
Side of the square,  $r = 6\sqrt{2} \text{ cm}$

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

$$= r\sqrt{2} \text{ cm}$$

$$= 6\sqrt{2} \cdot \sqrt{2} \text{ cm}$$

$$= 12 \text{ cm}$$



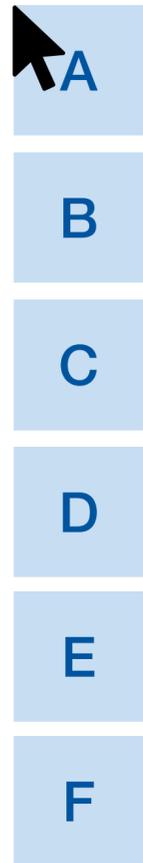
$$T_{pos} = 0 \text{ ms} + 100 \frac{\text{ms}}{\text{bit}} \cdot \log_2 \left( \frac{36}{12} + 1 \right) \text{ bit}$$
$$= 200 \text{ ms}$$

# In-Class Exercise #4: Prime Locations for Targets



# In-Class Exercise #5: Pop-up Menus

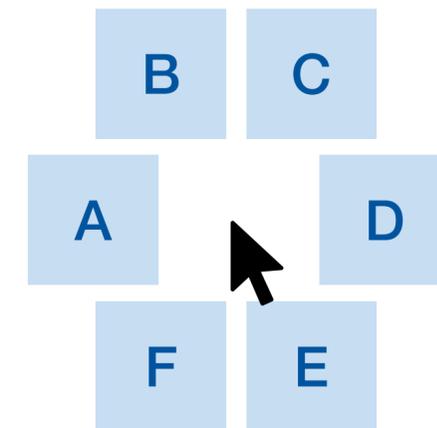
- Which of the following pop-up menus lead to a faster selection time?



**Vertical**



**Horizontal**



**Radial**

# CMN Model



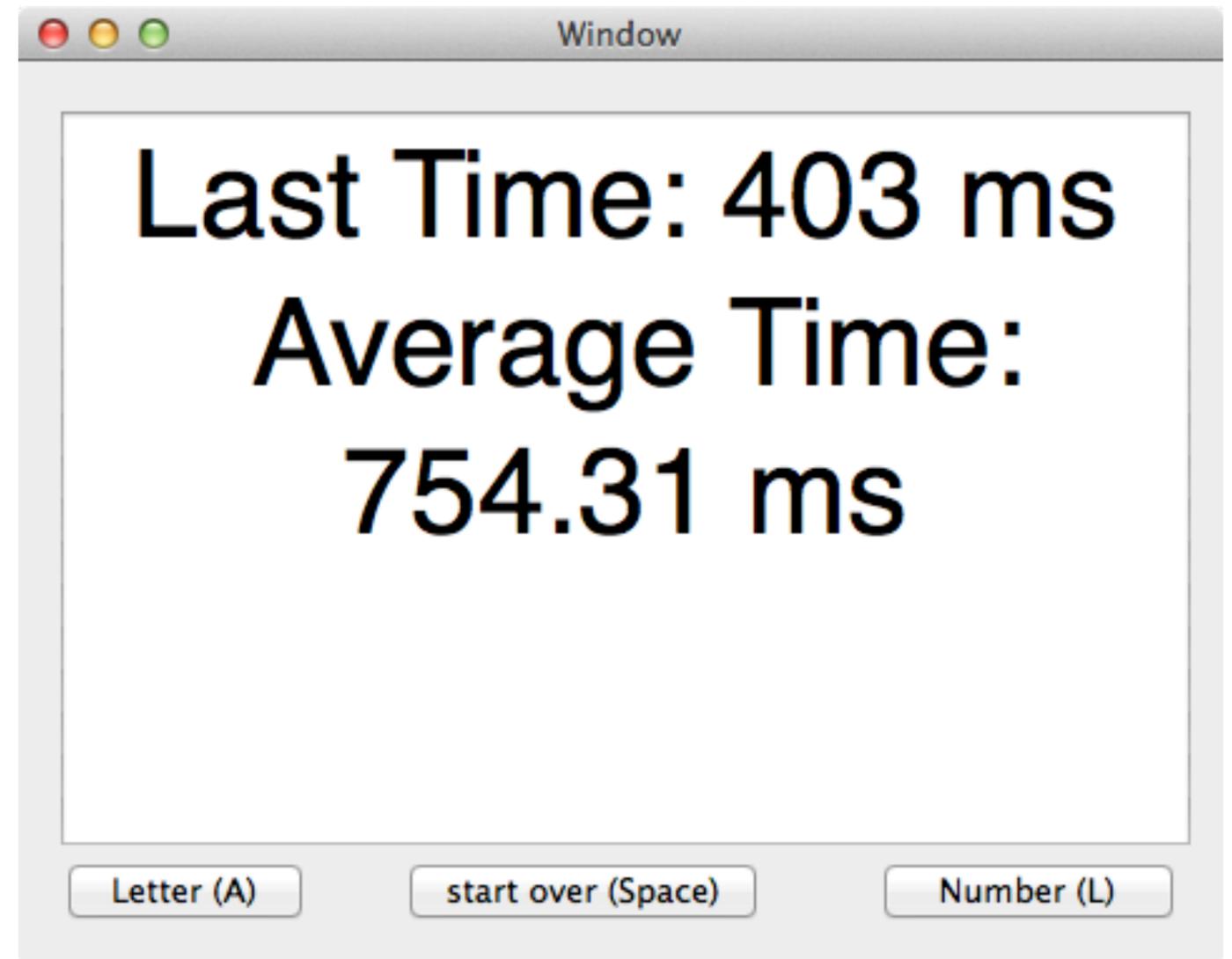
# In-Class Exercise 1

- 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.)