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Assignment 1

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Model Human Processor

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Chapter 1

Tasks

1.1 Task A

With this task, the MHP is to process the event of brake lights in the car in front turning on. The brake lights are distinct, and have only one color state, hence no color matching is needed.

The first step is perceiving the brake lights turning on, and loading this into image store and WM. This takes one perception processor cycle time.

Subsequently, the cognitive processor creates a motor response to the brake lights turning on, using one cognitive processor cycle time.

Lastly, the motor processor processes the motor response, which takes one motor processor cycle time.

Adding these cycle times up, we get the following reaction time for this *Simple reaction*.

$$\tau_P + \tau_C + \tau_M = 100ms + 70ms + 70ms = 240ms(105ms - 470ms)$$

Adding up *Fast Man* and *Slow Man* gives us lower and upper bounds of 105ms and 470ms.

1.2 Task B

In this task, a person is showed a flag on a screen. I consider this to be a class matching, where after knowing what the country is, it is either a scandinavian country or not.

This gives the following times:

$$\tau_p + 3\tau_c = 100ms + 210ms = 310ms(125ms - 710ms)$$

Adding up *Fast Man* and *Slow Man* gives us 125ms and 710ms respectively.

This decomposes into the following steps:

- Perceive flag and load into VIS / WM (τ_p)
- Recognize the flag from LTM (τ_c)
- Classify the country (τ_c)
- Compare/match to scandinavian (τ_c)

Since we are not triggering a motor response, there is no need for the cognitive processor to generate a motor response, or the motor processor to execute it.

1.3 Task C

In this task, we calculate the modeled time required to move a cursor to a menu bar, on a windows menu and a mac OS X menu.

We were given values for the constants A and B in shannons version of Fitt's law:

$$a = 50 \ \& \ b = 150$$

Additionally, menu bar heights were set to $5mm$, with the Macintosh menubar being affected by the edge effect, yielding an effective $50mm$ height, due to not needing fine motor movements to stop before overshooting the menu bar placement.

This gives us the following two formulas:

$$T_{pos}(Windows) = 50 + 150 * log_2(80/5 + 1) = 663,12$$
$$T_{pos}(Mac) = 50 + 150 * log_2(80/50 + 1) = 256,78$$

1.4 Task D

By using the empirical data gathered from collision tests with respect to causality, we know that events that happen in shorter timespans than one perceptual cycle time will be fused into one frame of perception.

Generally, we can then say that for an image stream to be considered as flowing continuously through time, we at least need to be at a frame rate that is greater than $1/\tau_p$.

This gives the following number:

$$1f/0.1s = 10fps$$

However, this is based on the mean perceptual cycle time. To get a minimum bound that would hold for all deviations, we need to use *Fast Man* as a basis for our cycle time.

$$1f/0.05s = 20fps$$

This is closer to that of actual video content today (24 fps or 29.997 fps).