软件交互设计

基本概念、设计目标、**设计原理**、设计过程

GUI设计规则、**KLM效率模型**、Fitts定律

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KLM效率模型

Measure how long will a user take to perform a particular operation

✓ **Keystroke-Level Model**

- **Notations**
- **Interface Timings**
- **Calculation Rules**
- **An Example**

✓ **The fastest possible interface?**

KLM效率模型：Notations

Tap: pressing and releasing a key

Click: positioning the GID and then tapping the GID button

Drag: pressing the GID button at one location and then moving the GID before releasing the GID button at a new location

Double click: positioning the GID and then tapping the GID button twice quickly

Keystroke Level Model   GID: Graphic Input Device

Denote keyboard operations

- ↓ immediately after the name of a key to indicate that the key has been pressed and to be held: Shift↓

- ↑ immediately after the name of a key to indicate the release of the key: Shift↑

- t↓ t↑ , t↓↑ , t

- A space separates the notation of consecutive actions

- A tap of the space bar is represented by the notation Space

- s p a c e, s↓s↑p↓p↑a↓a↑c↓c↑e↓e↑

- Shift↓ n Control↓ k Shift↑ w Control↑

KLM效率模型：Timings

- **Interface Timings**
  - The time it takes the user-computer system to perform a task is the sum of the times the system to perform the serial elementary gestures that the task comprises

Naming	Typical value	Meaning
Keying, K	0.2s	Tap a key on the keyboard
Pointing, P	1.1s	Point to a position on a display
Homing, H	0.4s	User's hand move from the keyboard to Mouse or other GID(Graphical Input Device) or from GID to keyboard
Mentally preparing, M	1.35s	Prepare mentally for the next step
Responding, R		Wait for a computer to respond to input

- **Calculation Rules**

   Figuring out at what points the user will stop to perform an unconscious mental operation (M)

   Rule 0 Initial insertion of candidate Ms

   - Insert Ms in front of all Ks
   - Insert Ms in front of all Ps that select command

      (but not for any Ps that point to arguments of those commands)

   Rule 1 Deletion of anticipated Ms

   If an operation symbol following an M is fully anticipated just previous to that M, delete the M.   Pointing and clicking (you move the GID with the intent of tapping the GID button when you reach the target), PMK, PK

- **Calculation Rules**

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Rule 2 Deletion of Ms within cognitive units

If a string of MKs belongs to a cognitive unit, delete the all the Ms but the first. a command name, an argument to a command: typing 4567.89

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Rule 3 Deletion of Ms before consecutive terminator

If a K is a redundant delimiter at the end of a cognitive unit (such as the delimiter of a command immediately following the delimiter of its argument), delete the M in front of it.

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- **Calculation Rules**

Rule 4 Deletion of Ms for the terminators of commands

If a K is a delimiter that follows a constant string (such as command name or any typed entity that is the same every time you use it), delete it. But if the K is a delimiter for an argument string or any string that can vary, then keep the M in front of it.

Rule 5 Deletion of overlapped Ms
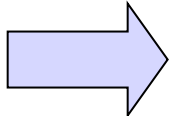
Don't count any portion of an M that overlaps an R

KLM效率模型：例子

‣ H (move hand to GID)

‣ HP (point to the desired radio button)

‣ HPK(click the radio button)

‣ HPKH (move hand back to keyboard)

‣ HPKHKKKK (type 4 characters)

‣ HPKHKKKKK (tap Enter)

‣ Rule 0:　　 HMPMKHMKMKMKMKMK

‣ Rule 1、2、4: HMPKHMKKKKMK

‣ ∑=0.4+1.35+1.1+0.2+0.4+1.35+4X(0.2)+1.35+0.2=7.15

‣ : MKKKKMK = 3.7

‣ **(7.15+3.7)/2=5.4 second**

Temperature Converter
Choose which conversion is desired, then type the temperature and press Enter
⊙ Convert F to C
○ Convert C to F

The fastest possible interface?

The amount of data conveyed by a communication is the information an user has to provide to complete the special task, which has a lower bound.

This minimal amount is *independent* of the design of the interface.

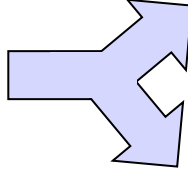*Consider the information required for a task*

✦ if the possible message forms (the value of the temperature) of the temperature converter are, -.dd, -d.d, .ddd, d.dd and dd.d

✦ achieving an interface that required 4 keystrokes, will give us the **highest efficiency**

✦ **In KLM, MKKKK=2.15s**

KLM效率模型：例子

The fastest possible interface?

Temperature Converter

Type in the temperature to be converted. The converted temperature will appear on the right as you type

F → C

C → F

✦ if the possible message forms (the value of the temperature) of the <u>temperature converter</u> are, -.dd, -d.d, .ddd, d.dd and dd.d

✦ achieving an interface that required 4 keystrokes, will give us the **highest efficiency**

✦ **In KLM, MKKKK=2.15s**

Implement the Temperature Converter with the fastest possible interface?