Theories, Principles & Guidelines

Sameer Kharel

- High-Level Theories
- Object-Action Interface Model
- Principles
- Guidelines for Data Entry

High-Level Theories

- Conceptual, semantic, syntactic and lexical model
- GOMS and the keystroke-level model
- Stages of action models
- Consistency through grammars

Conceptual, semantic, syntactic, and lexical model

- Foley and Van Dam developed in the late 1970s
- Four-level approach
  - Conceptual
  - Semantic
  - Syntactic
  - Lexical

Contd…

- Conceptual level – user's mental model of the interactive system
- Semantic level - describes the meanings between the input and output
- Syntactical level - a set of rules to create a sentence, which will give the computer a set of instructions to complete a particular task

Contd…

- Lexical level - input device dependencies

Example

Conceptual: Provides a mental model

Example: text editor objects = characters, files, paragraphs
relationships = files contain paragraphs contain chars
operations = insert, delete, etc.

Contd…

Semantic: meaning/desired function

Example: move the paragraph

Syntactic: how the semantic command is formed

Example: Edit, Highlight, Cut, Paste

Contd…

Lexical: sequence of actions

Example: how mouse and keyboard combined into menu, button, string, pick, etc.
Point to edit on menu bar->click ->select option within edit menu.

GOMS & KEYSTROKE

Sameer Kharel

GOMS

- Goals
- Operations
- Methods
- Selections

Example

```
GOAL: DELETE-FILE
.   GOAL: SELECT-FILE
.   .   [select:  GOAL: KEYBOARD-TAB-METHOD
.   .             GOAL: MOUSE-METHOD]
.   .   VERIFY-SELECTION
.   GOAL: ISSUE-DELETE-COMMAND
.   .   [select*: GOAL: KEYBOARD-DELETE-METHOD
.   .             .   PRESS-DELETE
.   .             .   GOAL: CONFIRM-DELETE
.   .             GOAL: DROP-DOWN-MENU-METHOD
.   .             .   MOVE-MOUSE-OVER-FILE-ICON
.   .             .   CLICK-RIGHT-MOUSE-BUTTON
.   .             .   LOCATE-DELETE-COMMAND
.   .             .   MOVE-MOUSE-TO-DELETE-COMMAND
.   .             .   CLICK-LEFT-MOUSE-BUTTON
.   .             .   GOAL: CONFIRM-DELETE
.   .             GOAL: DRAG-AND-DROP-METHOD
.   .             .   MOVE-MOUSE-OVER-FILE-ICON
.   .             .   PRESS-LEFT-MOUSE-BUTTON
.   .             .   LOCATE-RECYCLING-BIN
.   .             .   MOVE-MOUSE-TO-RECYCLING-BIN
.   .             .   RELEASE-LEFT-MOUSE-BUTTON]

*Selection rule for GOAL: ISSUE-DELETE-COMMAND
  If hands are on keyboard, use KEYBOARD-DELETE-METHOD,
    else if Recycle bin is visible, use DRAG-AND-DROP-METHOD,
    else use DROP-DOWN-MENU-METHOD
```

Keystroke-Level Model

- Simplified version of GOMS
- Predicting user performance
- Execution time is estimated by listing the sequence operators and then summing the times of the individual operators

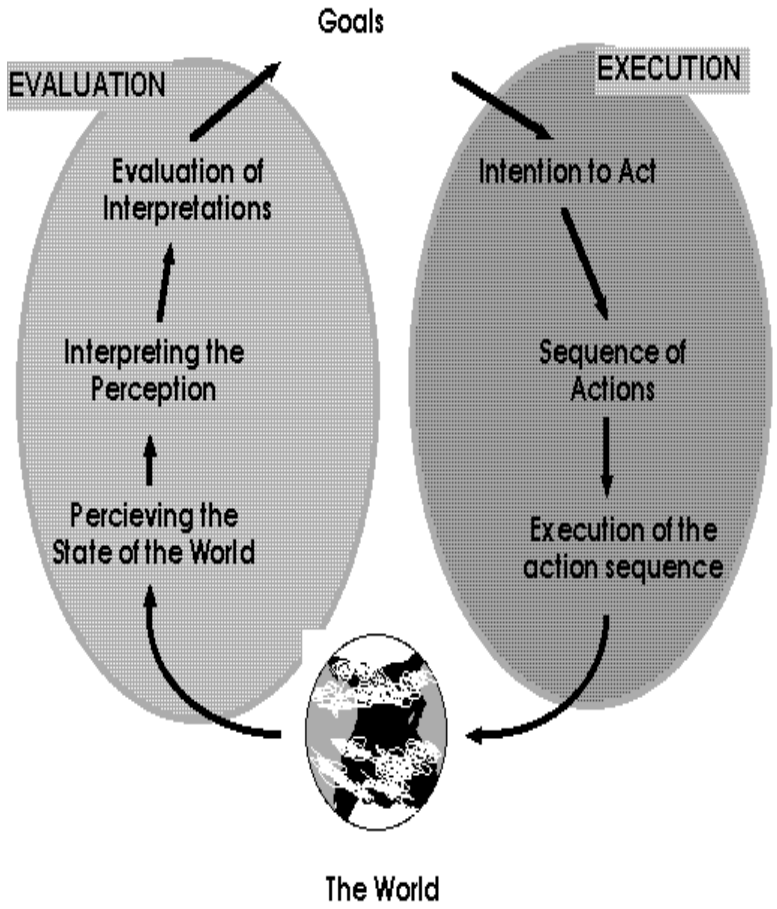
Example

Description	Operation	Time (sec)
Reach for mouse	H[mouse]	0.40
Move pointer to "Replace" button	P[menu item]	1.10
Click on "Replace" command	K[mouse]	0.20
Home on keyboard	H[keyboard]	0.40
Specify word to be replaced	M4K[word]	2.15
Reach for mouse	H[mouse]	0.40
Point to correct field	P[field]	1.10
Click on field	K[mouse]	0.20
Home on keyboard	H[keyboard]	0.40
Type new word	M4K[word]	2.15
Reach for mouse	H[mouse]	0.40
Move pointer on Replace-all	P[replace-all]	1.10
Click on field	K[mouse]	0.20
Total		**10.2**

According to this KLM model, it takes 10.2 seconds to accomplish this task.

Stage of Action

- Forming the goal
- Forming the intention
- Specifying the action
- Executing the action
- Perceiving the system state
- Interpreting the system state
- Evaluation the outcomes



gulf of execution

Consistency through grammars

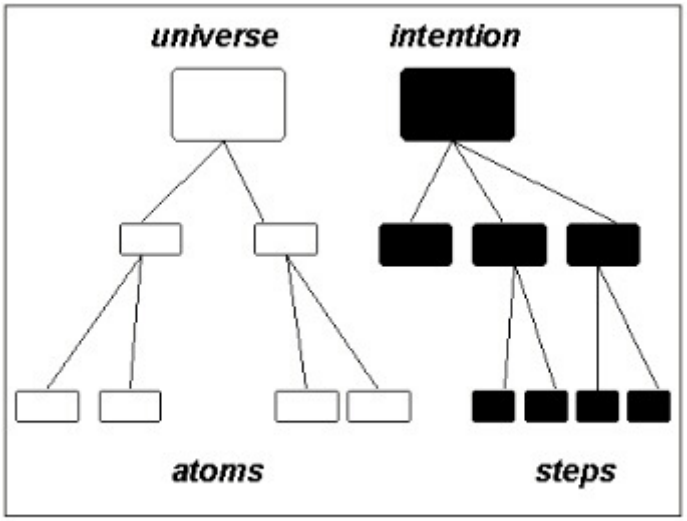
Consistent	Inconsistent A	Inconsistent B
delete/ insert character	delete/ insert character	delete/ insert character
delete/insert word	remove/bring word	remove/insert word
delete/ insert line	destroy/ create line	delete/ insert line
delete/ insert paragraph	kill/birth paragraph	delete/ insert paragraph

- Simpler grammar are easier to learn

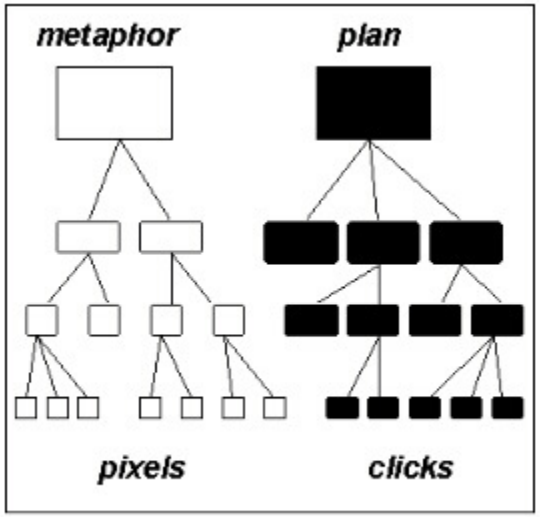
Object-Action Interface Model

- The user first selects an object and then selects the action to be performed on the selected object

- The OAI model is also in harmony with the software engineering model of Object Oriented programming model



TASK



INTERFACE

PRINCIPLES

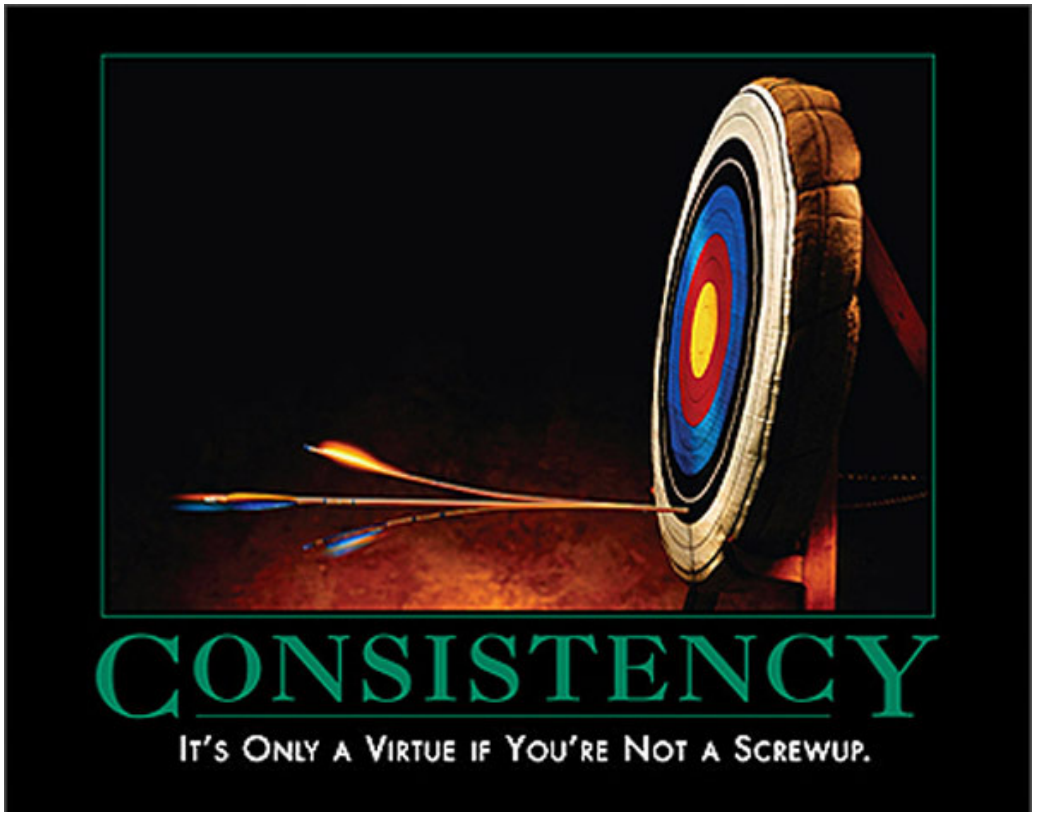
PRINCIPLE 1: RECOGZINE THE DIVERSITY

- User Profiles
  - Novice
  - Knowledgeable
  - Expert
- Task Profile
  - Frequent
  - Intermediate and Infrequent

- Interaction Styles
  - Direct Manipulation
  - Menu Selection
  - Form Fillin
  - Command Language
  - Natural Language

PRINCIPLE 2: USE THE EIGHT GOLDEN RULES OF INTERFACE DESIGN

- Strive for Consistency

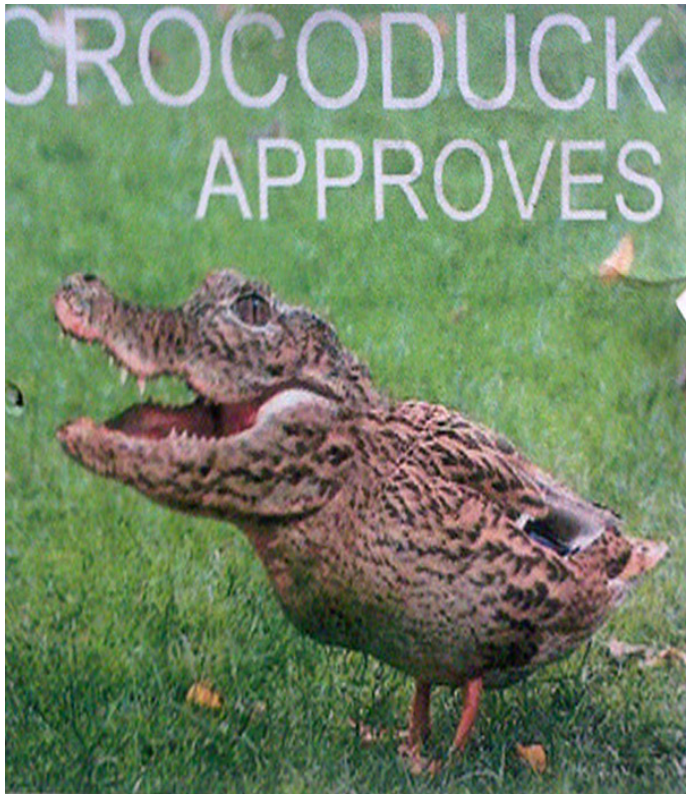


Contd…

- Enable frequent users to use shortcuts

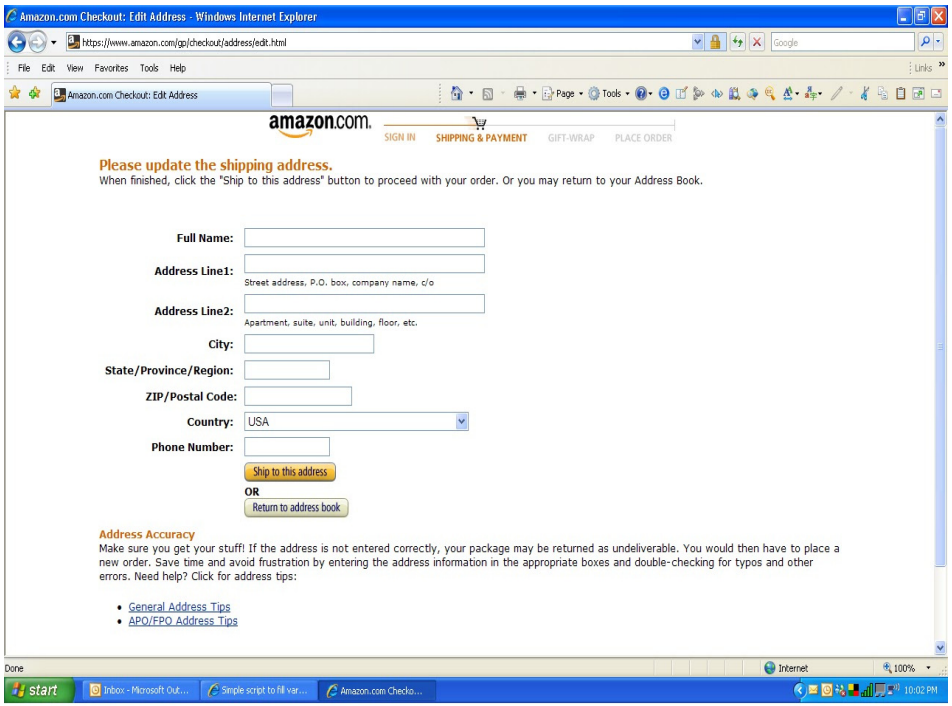
Contd…

- Offer informative feedback



Contd…

- Design dialogues to yield closure



Contd…

- Offer error prevention and simple error handling

Contd…

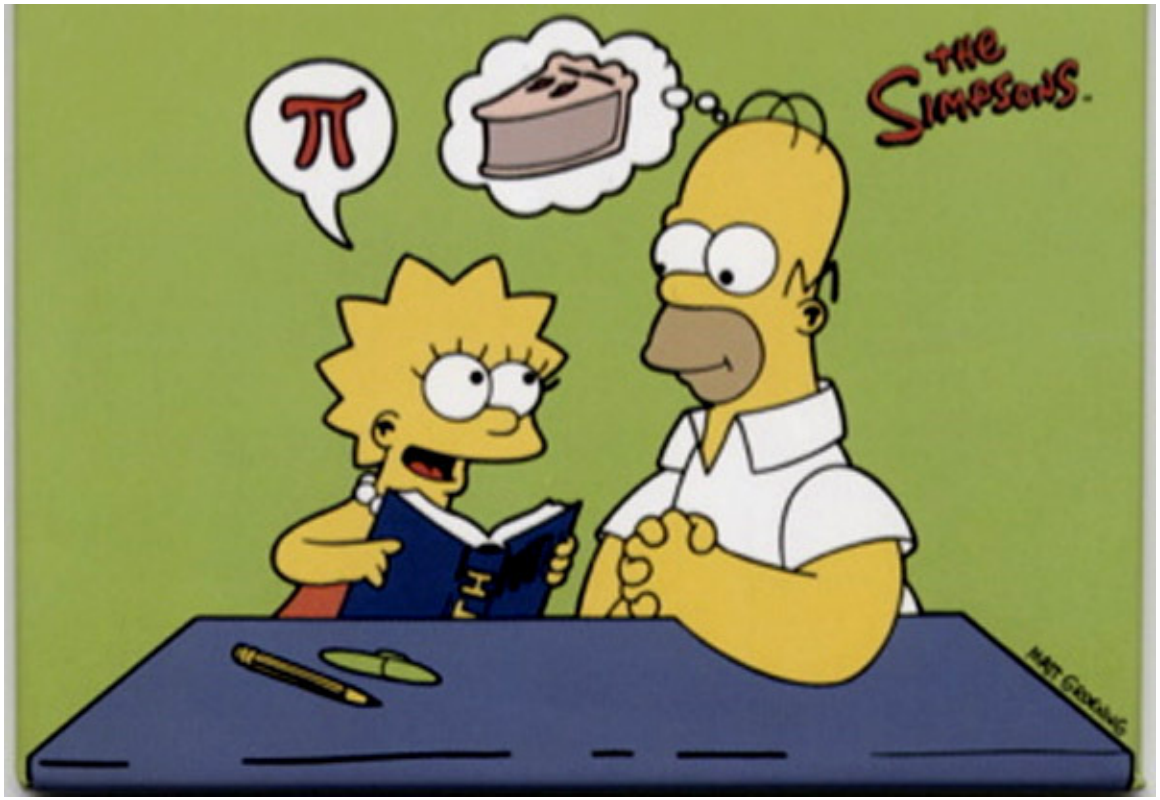
- Permit easy reversal of action

Contd…

- Support internal locus of control

Contd…

- Reduce short term memory load



PRINCIPLE 3: PREVENT ERRORS

- There is no medicine against death, and against error no rule has been found.

  -Sigmund Freud

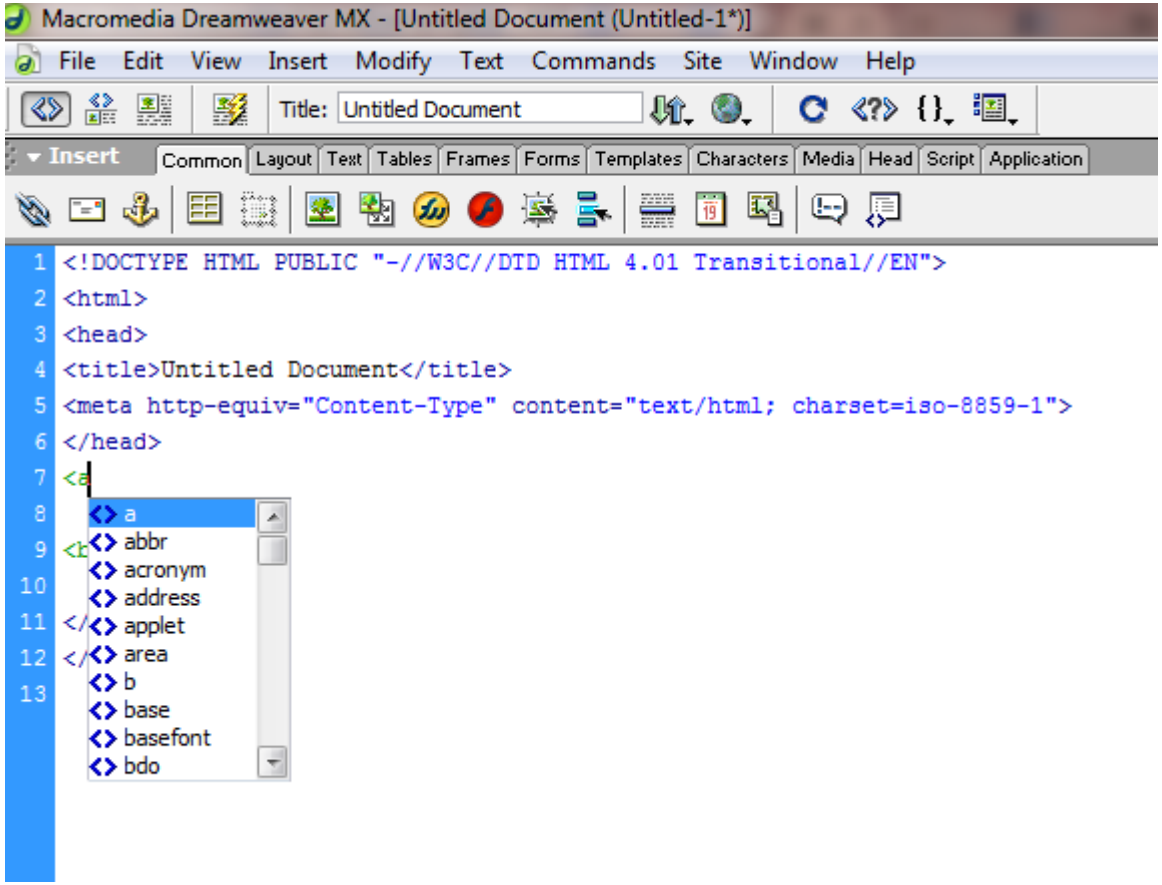
- Correct Matching Pairs { } <B>HCl </B>
- Complete Sequences
- Correct Commands

Complete Sequences

- When a pilot throws a switch to lower the landing gear, hundred of steps and checks are invoked automatically

- Designer can gather information about potential complete sequence by studying sequence of commands that people actually issue, and the patterns of errors that people actually make

Correct Commands



GUIDELINES FOR DATA DISPLAY

- Guidelines for Data Display

- Guidelines for Data Entry
  - Consistency of data-entry transactions
  - Minimal input actions by user
  - Minimal memory load on users
  - Compatibility of data entry with data display
  - Flexibility for user control of data entry

THANK YOU!!!