Human Computer Systems

Heuristic Evaluation

Cognitive Walkthrough

http://www.youtube.com/watch?v=O8jqMzONS8E

User testing

Methods for Evaluating Designs

- **User Modelling/Testing**
  expensive
  time consuming
- **Two faster techniques (not requiring user)**
- Heuristic Evaluation
- Cognitive Walkthroughs

Note: faster implies faster, but likely less informative!

What is Cognitive Walkthrough?

- Evaluate a user interface design
- Emphasis on learnability
- Can be used by software developer

Cognitive Walkthrough

- **A method for analysing walk-up-and-use interfaces for ease of learning by first-time users**
  - Based on a model of exploratory learning

1. **The user explores the system, via the user interface, looking for actions that might be contribute to performing the task.**
2. **The user selects the action whose description or appearance most closely matches what they are trying to do.**
3. **The user then interprets the system's response and assesses whether progress has been made towards completing the task**

Cognitive Walkthrough

- **What**
  - evaluate design of user interface, especially for "first time" use
- **When**
  - early, from the design specification
- **Basis**
  - cognitive theory, especially exploratory learning
  - (Rieman, Franzke & Redmiles, 1995)

Cognitive Walkthrough: Theory

- **Exploratory learning**
- **User**
  - sets a goal to be accomplished (e.g., "check spelling")
  - searches interface for available actions
  - selects the action that seems most likely to relate to the goal
  - performs selection action and evaluates system's feedback for evidence that progress toward goal is being made

Cognitive Walkthrough 3 Questions

- **Q1: is the correct action action available in the interface and will it be made sufficiently evident to the user?**
- **Q2: Will the user connect the correct action's description with what they are trying to do? i.e. how well does that action's description match the user's goal?**
- **Q3: Will the user interpret the system's response to the chosen action correctly - does the system's response to the action show progress toward the user's goal? i.e., will they know if they have made a right or wrong choice?**

Key Concepts

- User has goals (domain-related)
- User mixes (knowledge-based) planning and reaction to the state of the device in deciding what to do next
- User has to get information from the display (or other computer output) to maintain awareness of system state … and learn effects of actions

Cognitive Walkthrough

- Assumes user is learning about an interface in an exploratory way and is applying simple means-ends reasoning
- Phase 1: a team of analysts agree task ‘scenarios’
- Phase 2: each analyst considers each task in turn, looking for failure stories
- Phase 3: compare notes and draw conclusions

Defining 'task scenarios'

- Who will the users be?
  - Assumptions about prior experience and knowledge
- What tasks are to be analysed?
  - NB task refers here to domain goals
  - What is the correct action sequence for each task?
- How is the interface defined?

Steps of walkthrough

- Will the user try to achieve the right effect?
  - Given their domain goal, will they identify the correct device goal?
- Will the user notice the correct action is available?
  - Is the action discoverable?
- Will the user associate the action with the effect?
  - Is it obvious the action addresses the goal?
- If the correct action is performed, with the user see that progress is being made towards the goal?
  - Is the feedback helpful?

Scenarios: brief summary

- Sometimes called Use Cases (e.g. UML)
- Tell a 'story' about task or interactive behaviour
- Capture both common and important behaviours
- Use cases tend to assume perfect user behaviour

Cognitive Walkthrough: Setup

- **Interface designer and a group or peers**
  - modelled after code walkthrough
- **Description of the users**
  - experience, knowledge, …
- **Description of tasks to be performed with the system**
- **List of correct actions required to complete each task**

Cognitive Walkthrough: Procedure

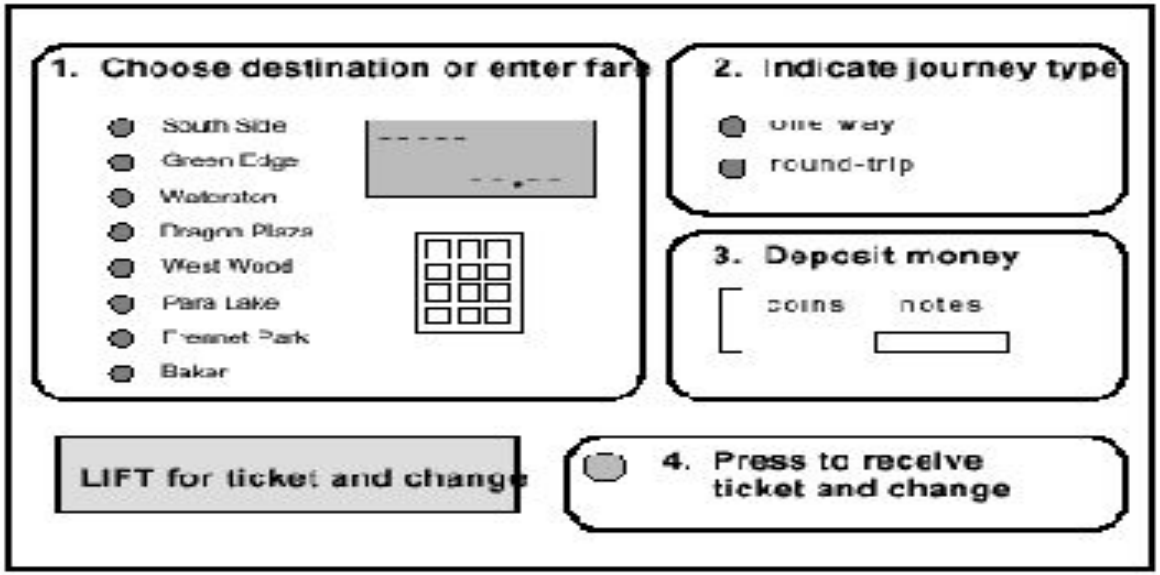
- **Select scribe and facilitator**
- **Consider the user's goal**
- **Analyse**
  - the accessibility of the correct action
  - the quality of the match between the user's goal and the action's label
  - the feedback provided after the action is taken

Cognitive Walkthrough: Example 1

- Users are clerical workers and very familiar with Windows operating system, Word, Excel, and PowerPoint
- A email system has been designed for them
- The goal is to append a mail message to a file containing other messages

Cognitive Walkthrough: example

Example: Ticket Machine (1)

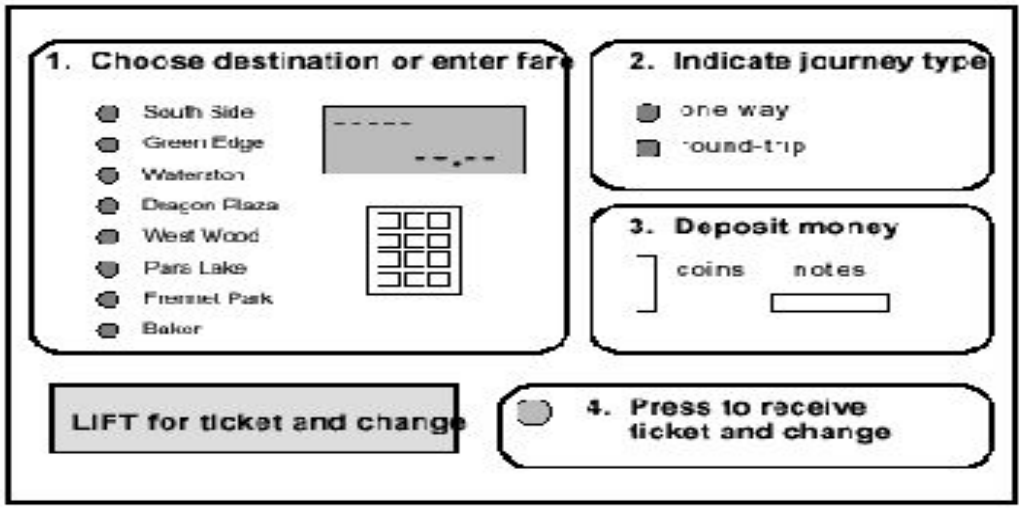


You have to walk through the interface *with a goal-driven scenario* in mind

E.g. "Purchase a round-trip ticket to Dragon Plaza"

Cognitive Walkthrough

(2)



Q1: Will the correct action be made sufficiently evident to the user?

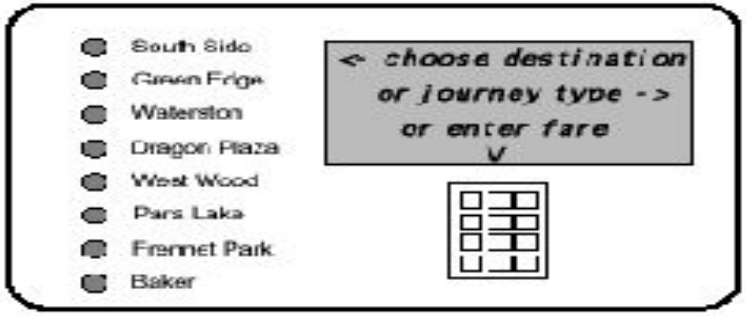
Answer: There are two possible correct actions, press the "Dragon Plaza" button or press "round–trip". The design doesn't make this clear, for it instructs the user to choose the destination before indicating the journey type.

Cognitive Walkthrough

(3)

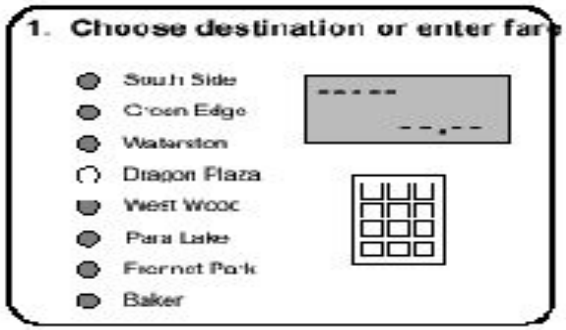
Thus we've identified Design Flaw no. 1:
Option to indicate journey type first is not made sufficiently evident.

One possible solution:
provide a prompt via a larger display.



Cognitive Walkthrough

Ticket Machine (4)



- Q2: Will the user connect the correct action's description with what they are trying to do?
- Answer: Yes, the instructions for panel 1 and the button label will enable the user to make the connection.

- Q3: Will the user interpret the system's response to the chosen action correctly, (i.e., will they know if they have made a right or wrong choice?)
- Answer: The machine will respond by lighting up the button pressed. This should appear to the user as confirmation of a correct action.

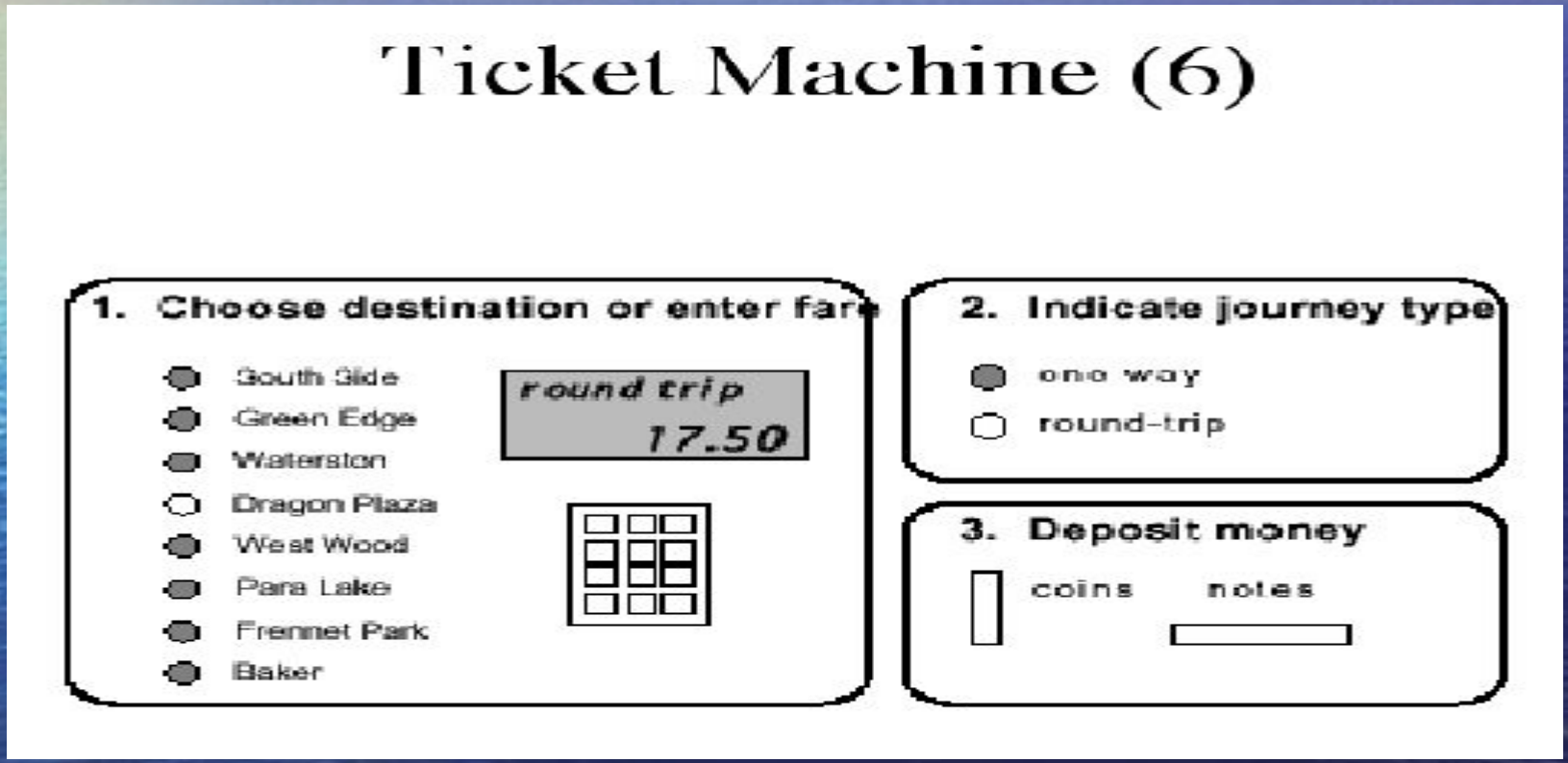
Cognitive Walkthrough

Ticket Machine (5)

- Q1: Will the correct action be made sufficiently evident to the user?
- Q2: Will the user connect the correct action's description with what they are trying to do?
- Q3: Will the user interpret the system's response to the chosen action correctly?

- Answer: Yes. The correct action is to press the "round-trip" button in panel 2, and the instructions labeling this panel make this clear.
- Answer: Yes, the instructions and the labels on the buttons make the connection very clear.
- Answer: Yes. The machine will respond by lighting up the "round-trip" button and by displaying the journey type and fare.

Cognitive Walkthrough



Cognitive Walkthrough

Ticket Machine (7)

(Just listing problems from now on....)

Q3: Will the user interpret the system's response to the chosen action correctly?

Answer: Unclear. There's no means of indicating receipt of the money, and thus no means for the user to keep track of the amount deposited.

Design Flaw no. 2:
No display of total money received.

(possible solution)

(maybe display of money still required for fare would be even more informative.)

Cognitive Walkthrough

Ticket Machine (8)

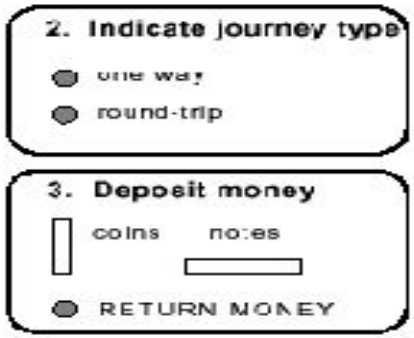
(Final problem....)

Q1: Will the correct action be made sufficiently evident to the user?

Answer: No, because there is no action that the user can take to retrieve the money deposited.

Design Flaw no. 3:
No way to retrieve money once deposited.

(possible solution)



Cognitive Walkthrough - Examples of Problems - 1/2

- Failure to add goals (e.g., load a local dictionary to check spelling)
- Failure to drop goals
- Addition of a spurious goal
- No-progress impasse
- Premature loss of goals
- Super goal kill-off (why you leave your card in the ATM!)

Cognitive Walkthrough - Examples of Problems

- Correct action doesn't match goal
- Incorrect action matches goal
- Physical difficulties in performing actions
- Time-outs too short/long

Cognitive Walkthrough: Summary

- **Pros:**
  - time efficient, based on cognitive theory
- **Cons:**
  - limited set of questions can be addressed
  - evaluators may need knowledge of cognitive theory
- **Other:**
  - focuses on exploratory learning
  - iPod example: http://www.youtube.com/watch?v=Ro77wQq0sWo&feature=related
  - http://www.youtube.com/watch?v=P72XbgQ-Zk

Discount Usability Methods

- **Examples**
  - cognitive walkthrough
  - heuristic evaluation
- **Why are they called discount?**
  - take less time than analytic methods (e.g., GOMS)

Other Usability Testing

- **Usability Studies** (Users involved)
  - handful of users asked to perform tasks using paper or computer prototype
  - user's problems, comments and successes collected
- **study run by design team**
  - design team evaluates user data and uses it to redesign interface

User Testing

- Decide what questions to ask
- Develop a task list
- Develop props
- Develop a measurement plan
- Conduct the test
- Summarise the results!

Decide What Questions to Ask

- What is it most important that you know now?
- Be specific
- NOT "will people like it"
- Be quantitative e.g., can 90% learn this system in 10 minutes?

Develop a Task List

- What is the specific task you want someone to do?
- Describe what is to be done, not how to do it!
- Develop specific goals for these tasks!
- Make the tasks meaningful to the users (this may differ from what's meaningful to designers!)

Develop Props

- A prototype (of one form or another!)
- A textual description of the tasks
- Supporting props

Develop a Measurement Plan

- What do you need to measure?
- time to learn
- time to perform task
- error rate
- How will you obtain this data?
- How will you record the data?

Tips on Recording

- Don't try to record everything!
- what's really important to you now?
- Make a checklist that highlights your goals
- what's supposed to happen?
- what do you need to record?
- Use multiple testers
- more eyes and ears involved!
- can split "host" / "analyst" roles

Recording: Things to Think About

- Videotape? Keystroke capture?
- easy to record; thorough
- time-consuming to analyse
- What's recorded already that might be of use?
- transactions, times, ...

Conduct the Test

- How many users?
- rule of thumb: 4 to 20
- A representative sample of users
- One user at a time or two? - two will slow things down
- How long a session? rule of thumb: 30 - 60 minutes
- How much training?
- What's normal?

Establishing a Testing Context

- Explain to users that they are working with a prototype of product
- If things go wrong, it is the system's fault
- Ask for user's help evaluating ease of use
- We are not testing them but system
- Tell them that their comments will be reflected in the redesign of the product
- We want to know what they like and dislike
- Get users to establish a critical but fair attitude
- Users have a tendency to be too nice

Things You (Almost) Always Want to Look At

- How easily can a user find the function they need?
- How easily can a user tell what actions are possible?
- How easily can the user determine the mapping from the way you present it to their own world?
- How easily can the user tell what state the system is in?

Other Things You (Almost) Always Want to Look At

- Time
- Errors/Accuracy
- Actions
- Comments

Summarise the Results

- Make explicit recommendations
- Action oriented
- Following directly from results of study
- Don’t try to cover up ambiguous results

Summarise the Results

- Beware the Designer/Evaluator Trade-off!
- Designers often unable to see the problems users are having with the system
- User interface evaluators often unable to suggest useful redesign
- Both skill sets are needed!

Which Method?

- lab studies may take way too long!
- lab studies may cost way too much!
- GOMS is often way, way too hard!
- perfectly polished methods often won't get used!
- quick and easy usually gets used every time!