Mental Models

School of Computer and Communication Sciences

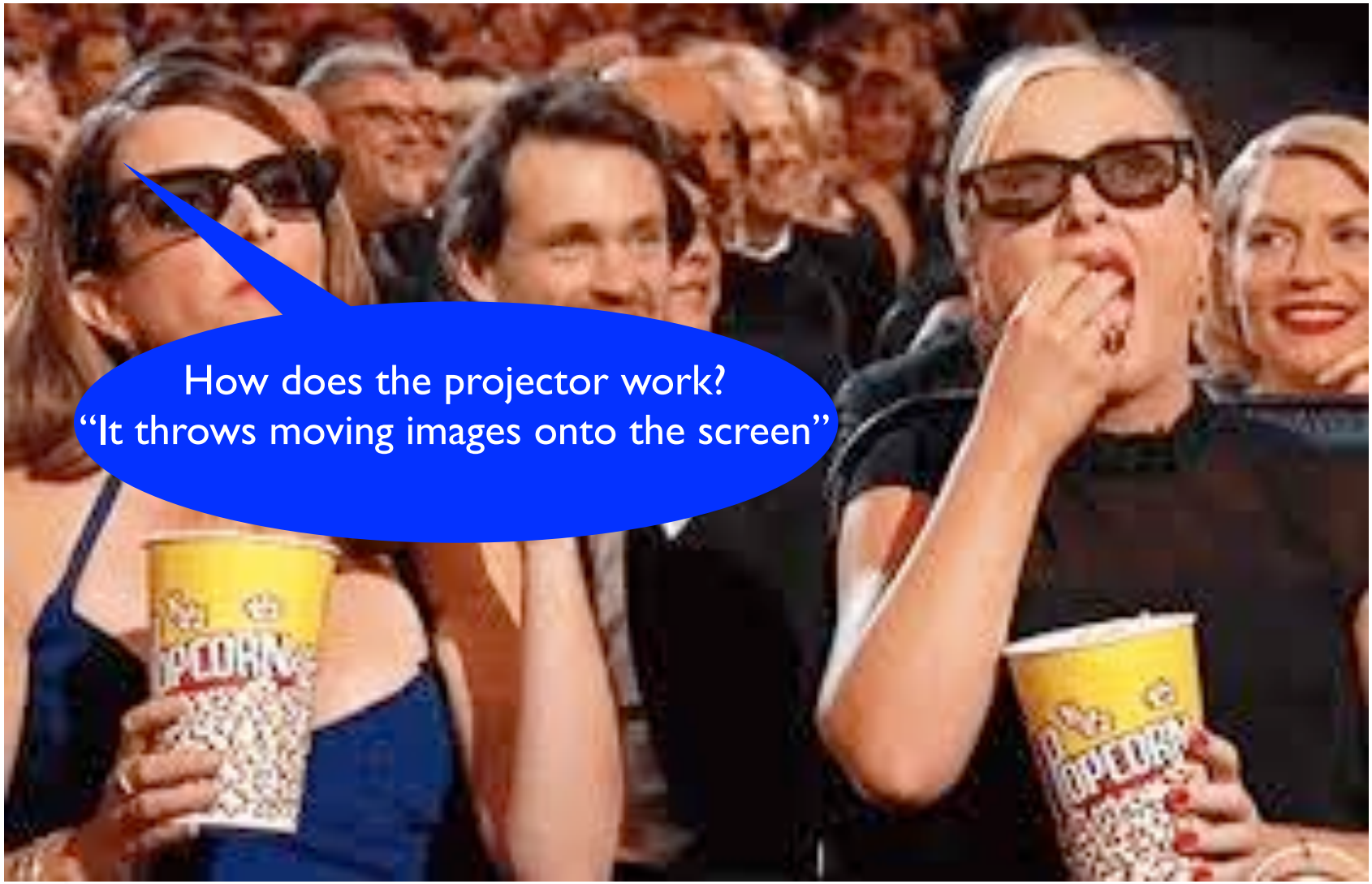
EPFL

Pearl Pu

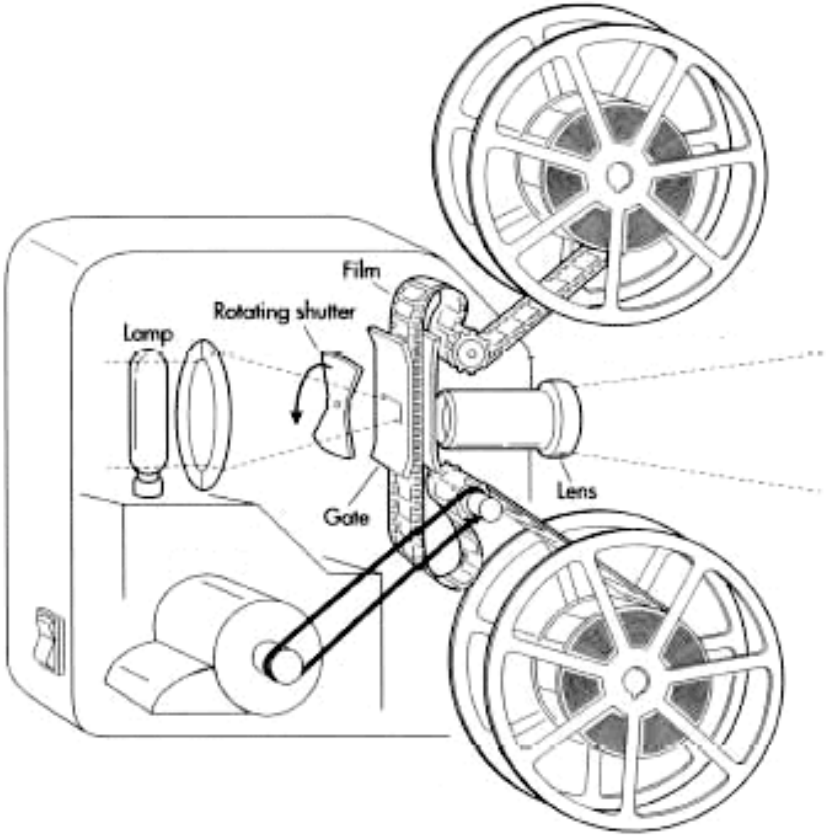
Cooper Book

Chapter 2: Implementation models and mental models pp. 27-29

How movie projectors work?



THE MOVIE PROJECTOR



Implementation Model

DEFINITIONS

- A ***mental model*** represents a person's thought process for how something works.
- The representation of how something actually works is called the ***implementation model***.

Software has another model

Book your flight

Round trip | One-way | Multi segment journey / Open jaw flights

From Geneva (GVA)

To Athens (ATH)

Travel Dates

Outbound flight: 10/11/2015

Return flight: 16/11/2015

November 2015

Mo	Tu	We	Th	Fr	Sa	Su
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

November 2015

Mo	Tu	We	Th	Fr	Sa	Su
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

Passengers

Adults: 1 | Children (2-11 y.): 0 | Infants (0-2 y.): 0

Class Economy

Airline SWISS

Search flights

DEFINITIONS

- The software ***interface*** and ***interaction behavior*** determine the ***designer's model***, or called the represented model.

Three models: how do they relate?

Cooper Book

Chapter 2: Implementation models and mental models pp. 30-40

Designer's Model

Implementation Model

User's Mental Model

How do they relate?

Implementation Model
reflects technology

Mental Model
reflects user's vision

Designer's model

As a designer, you can choose how to represent the implementation model: close to IM or MM

DESIGN PRINCIPLE

User interfaces should be based on user mental models rather than implementation models.

When a designer's model approximates the user's mental model, your design is likely to succeed.

THE PROBLEM

- Most software's represented models (designer models) are closer to the implementation models than they are to the user's mental model.

WHY?

- The designer never cared about knowing the user's mental model
- Knowing the user's mental model is hard

INTERFACE FOLLOWS FUNCTIONALITY

- Put a button for every function
- A field for every data input
- A page for every transaction step
- A dialog for every code module

TRUE OR FALSE QUESTIONS

- Designers have little control over the represented model

- Designers can hide unsavoury facts about the software's implementation model

TRUE OR FALSE QUESTIONS

- Understanding how software actually works always helps someone to use it 
- A user's mental model doesn't necessarily have to be true or accurate, but it should enable him to work effectively 

METAPHORS AS MENTAL MODELS

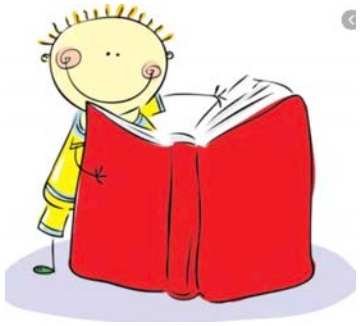
- Desktop metaphor (GUI for personal computers)
- Accounting books (Microsoft Excel)
- The trash can
- The page turning in Kindle

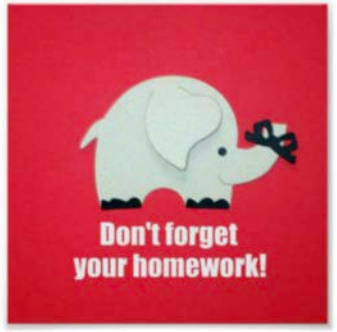
CONSISTENCY OF METAPHORS

- Windows user interface
  - Move files on the same hard drive is a move
  - Move files from hard drive C to D, the action is actually a COPY
- Inconsistency confuses users

FURTHER KNOWLEDGE

- Answer the set of questions from this week's SAQ (self-assessment questions) on implementation models and mental models





Why do we construct mental models?

Outside of the Cooper book

WHY PEOPLE USE MENTAL MODELS?

This theory comes from psychology

- Mental models allow people to make predictions about how things work and how to use something
  - How does your car start?
  - How does an ATM machine work?
  - How does your computer start?
- Mental models allow people to deal with new and unfamiliar environments based on our existing knowledge

When do users start forming MM

- Before someone tackles a task, she or he constructs a mental model of how things work

- “Deduction” by Johnson-Laird and Byrne (1991)

How user mental models form

- from earlier habits
  - desktop -> desktop operating system (Xerox PARC, Apple, Windows)
  - accounting books -> Microsoft's excel
- from earlier habits of using similar systems (past experience)
- from imagination

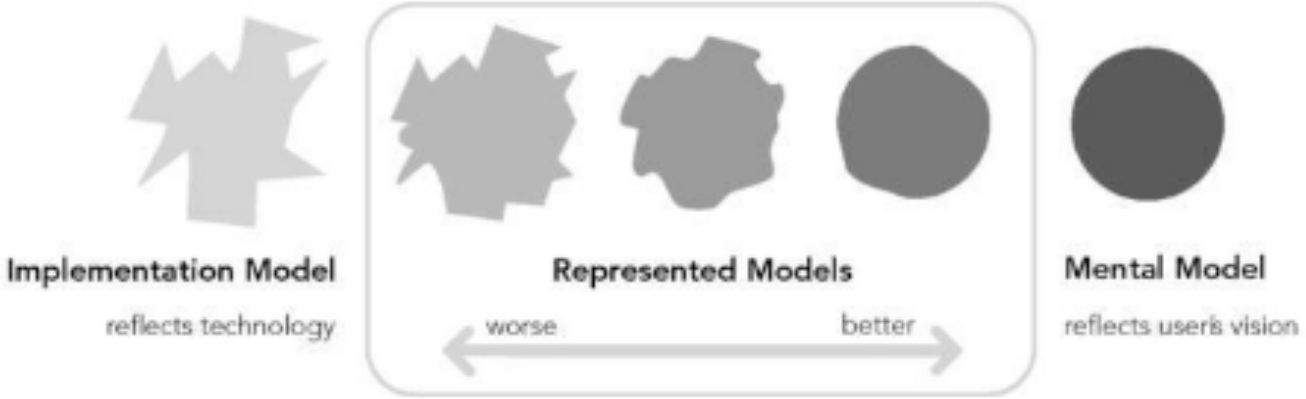
User mental models change

Users update their mental models when

- they start interacting with the system

How to order food in Japan


お客様へ
1万円・5千円・2千円札は両替いたします。
店員にお申しつけください。
500 100 50 10
1000
返却レバー
替玉1玉
無料
細麺のみ
替玉出来ます。
ざるつけ麺
チャーシューざるつけ麺
ごはん ¥100
トッピング ¥100
半熟味付玉子
トッピング ¥100
味付ネギ
トッピング ¥100
生ビール ¥350
ペプシコーク
ウーロン茶
オレンジジュース
期間限定
トッピング
白菜
100円


Implementation Model
reflects technology
Represented Models
worse
better
Mental Model
reflects user's vision

Examples of mental models

- “How to buy a book from Amazon.com?”
- “How to buy a metro ticket?”
- “How to share a folder of documents and a calendar of events with group members?”

What are user goals and their activities?

Goals and activities

- How to buy a book at Amazon.com
  - select one or multiple books from the catalog (catalog = shelves in bookstore)
  - use a basket if many books are selected
  - proceed to the checkout
  - providing shipping address
  - pay
- How to buy a metro ticket in Lausanne
  - select the destination
  - pay & print the ticket
- How to share a folder and a calendar of events with group members
  - create groups
  - share the folder, share the events

DESIGN PRINCIPLE

Goal-directed interactions reflect user mental models.

True or false questions

- People need to know all the details of how a complex mechanism actually works in order to use it 
- People create a cognitive shorthand of how something works 
- People create the same mental model of how something works 

TRUE OR FALSE QUESTIONS

- People always have a mental model 
- People get their mental models from past experience 
- It's possible to know the precise mental model of users 
- An important reason for doing user or customer research is to understand the user's mental models 

CONCLUSION

- Computer literacy is an old way of thinking
  - forcing humans to stretch their thinking to machine logic
- New way
  - Stretch technology to meet people's ways of thinking
- Goal-directed design tears down this fake barrier

THE END