CSE 165: 3D User Interaction

Lecture #18: Future

Instructor:
Jurgen Schulze, Ph.D.

Announcements

- Homework Assignment #5
  - Discussion tomorrow at 4pm
  - Due Thursday March 19th at 3pm
- Reminder of CAPE + TA evaluations
- Please return borrowed devices (Leaps, Hydras, Kinects, Moves)
  - After final homework presentation
  - In my office hour
  - Whenever I'm in the office

Programmer Position

The cellular biomechanics lab headed by Prof. Rangamani is looking for a talented programmer to develop a GUI for stability and bifurcation analysis of reaction-diffusion equations (partial differential equations). The project involves converting a Mathematica notebook to open-source code, python preferably and developing a GUI to go with it. This project is part of a computational tool manuscript that the lab is working on. The student programmer is expected to participate in the project and work directly with Prof. Rangamani and will be listed as an author on the manuscript and can receive academic research credit also. The student must be committed to at least 6-9 months of research. This project is part of a larger effort by the group to disseminate information of how to use mathematical tools and computational analysis to biologists. Please email Prof. Rangamani (padmini.rangamani@eng.ucsd.edu) if interested.

3D Usability Evaluation

Things to Consider

Formality of Evaluation

- Formal
  - independent & dependent variables
  - statistical analysis
  - strict adherence to a procedure
  - hold constant all other variables
  - usually done to compare multiple techniques or at the end of the design process
- Informal
  - looser procedure
  - often more qualitative
  - subject comments very important
  - looking for broad usability issues
  - usually done during the design process to inform redesign

What is Being Evaluated?

- Application:
  - Prototype - consider fidelity, scope, form
  - Complete working system
  - Controlled experiments are rare
- Interaction techniques / UI metaphors
  - Can still evaluate a prototype
  - More generic context of use
  - Formal experiments more often used
- Consider "Wizard of Oz" evaluation

Subjects / Participants

- How many people?
- What backgrounds?
  - technical vs. non-technical
  - expert vs. novice VE users
  - domain experts vs. general population
- What age range?
- Recruiting
  - flyers
  - email/listservs/newsgroups
  - psychology dept.
  - CS classes

Number of Evaluators

- Multiple evaluators often needed for 3DUI evaluations
- Roles
  - cable wrangler
  - software controller
  - note taker
  - timer
  - behavior observer
  - …

Procedure

- Welcome
- Informed consent
- Demographic/background questionnaire
- Pre-testing
- Familiarize with equipment
- Exploration time with interface
- Tasks
- Questionnaires / post-testing
- Interviews

Pilot Testing

- Pilot testing should be used to:
  - "debug" your procedure
  - identify variables that can be dropped from the experiment

Instructions

- How much to tell the subject about purpose of experiment?
- How much to tell the subject about how to use the interface?
- Always tell the subject what they should try to optimize in their behavior.
- If using think-aloud protocol, you will have to remind them many times.
- If using trackers, you will have to help users "learn" to move their heads, feet, and bodies – it doesn't come naturally to many people.
- Remind subjects you are NOT testing THEM, but the interface.

Formal Experiment Issues

- Choosing independent variables
- Choosing dependent variables
- Controlling (holding constant) other variables
- Within- vs. between-subjects design
- Counterbalancing order of conditions
- Full factorial or partial designs

Independent Variables

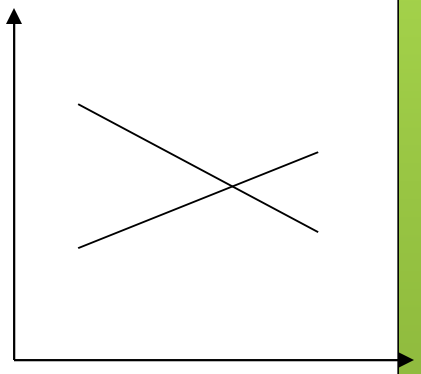
- Main variable of interest (e.g. interaction technique)
- Secondary variables
  - task characteristics
  - environment characteristics
  - system characteristics
  - user characteristics

Metrics (dependent variables)

- Task performance time
- Task errors
- User comfort (subjective ratings)
- Observations of behavior (e.g. strategies)
- Spoken subject comments (e.g. preferences)
- Surveys/questionnaires
- Interviews

Data Analysis

- Averages (means) of quantitative metrics
- Counts of errors, behaviors
- Correlate data to demographics
- Analysis of variance (ANOVA)
- Post Hoc analysis (t-tests)
- Visual analysis of trends (esp. learning)



- *Interactions between variables* are often important
- Expect high variance in 3DUI interaction studies

Analysis Tools

- SPSS, SAS, etc.
  - full statistical analysis packages
  - parametric and non-parametric tests
  - test correction mechanisms (e.g., Bonferroni)
- Excel
  - basic aggregation of data
  - Correlations
  - confidence intervals
  - graphs
- Matlab, Mathematica

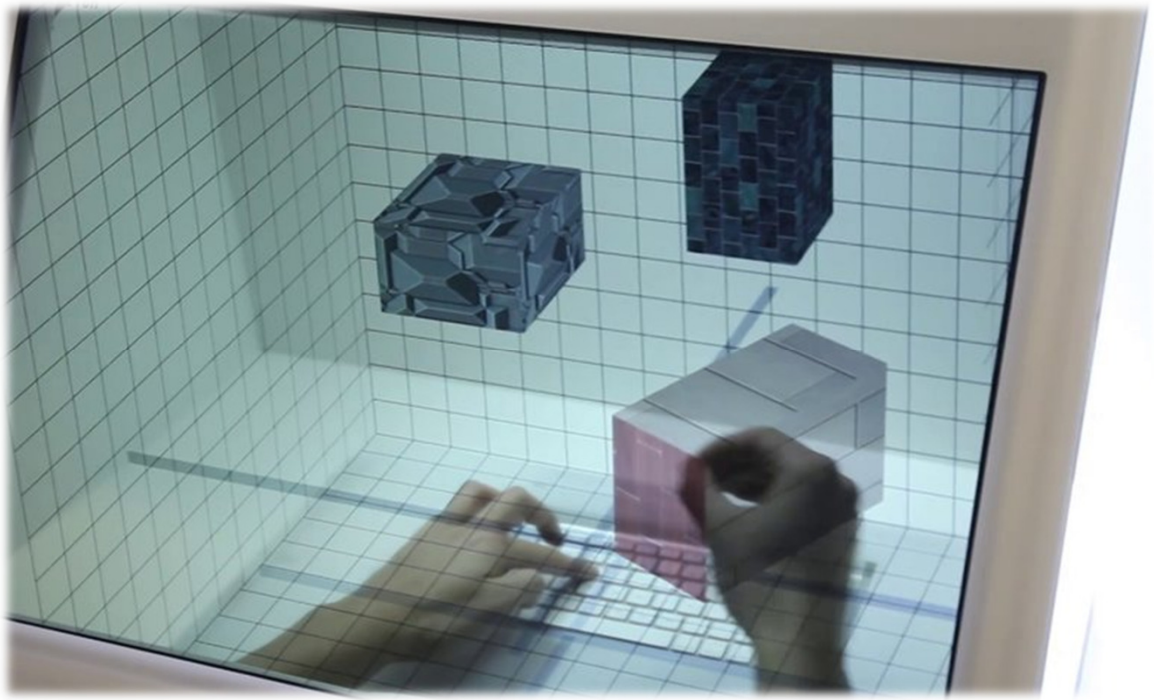
3D UIs of the Future

Discussion

- What is feasible today?
  - How could you implement it?
    - Hardware
    - Algorithms
- What is not feasible today but probably will be soon?
- What may never be feasible?

Touch UI

- http://vimeo.com/59231624

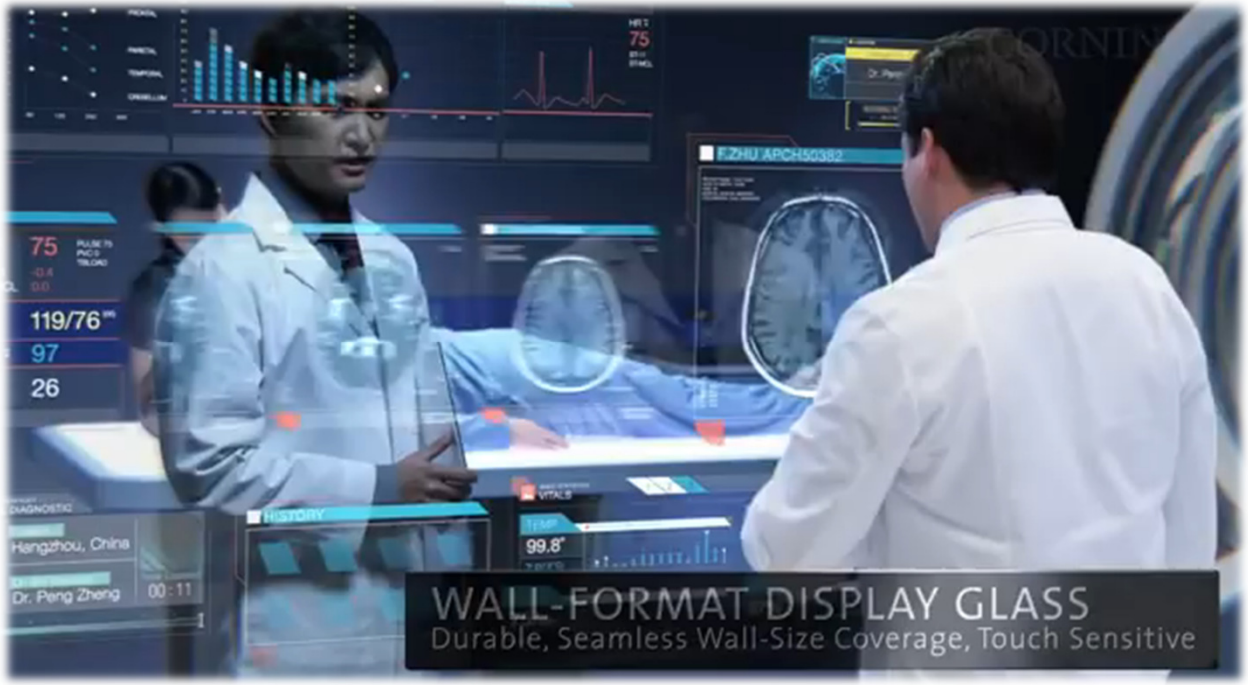


Iron Man 2 User Interface

- http://www.youtube.com/watch?v=-KPhqy7ZwHU

A Day Made of Glass 2

- http://www.youtube.com/watch?v=jZkHpNnXLB0



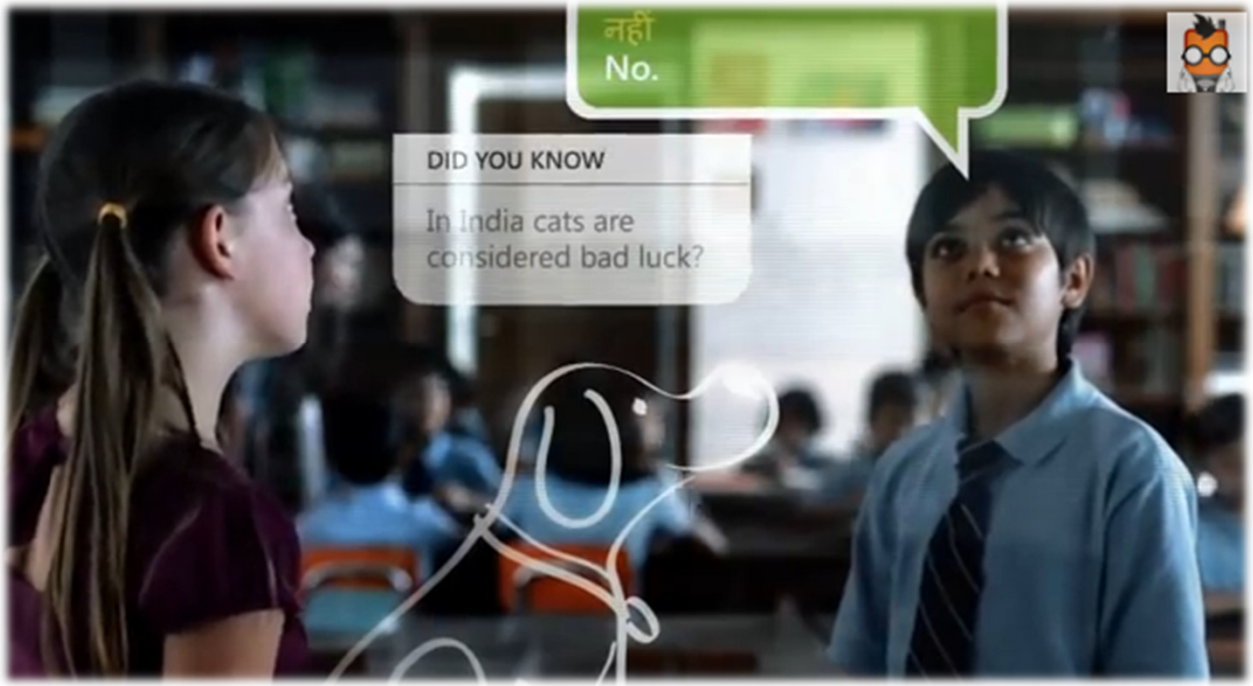
More Videos

The Story Behind "A Day Made of Glass 2"

- http://www.youtube.com/watch?v=X-GXO_urMow

Microsoft's Concept of 2019

- http://www.youtube.com/watch?v=bwj2s_5e12U



A Day Made of Glass

- http://www.youtube.com/watch?v=6Cf7IL_eZ38

UI Design for Iron Man 2

- http://www.youtube.com/watch?v=YAXsZphpiu8