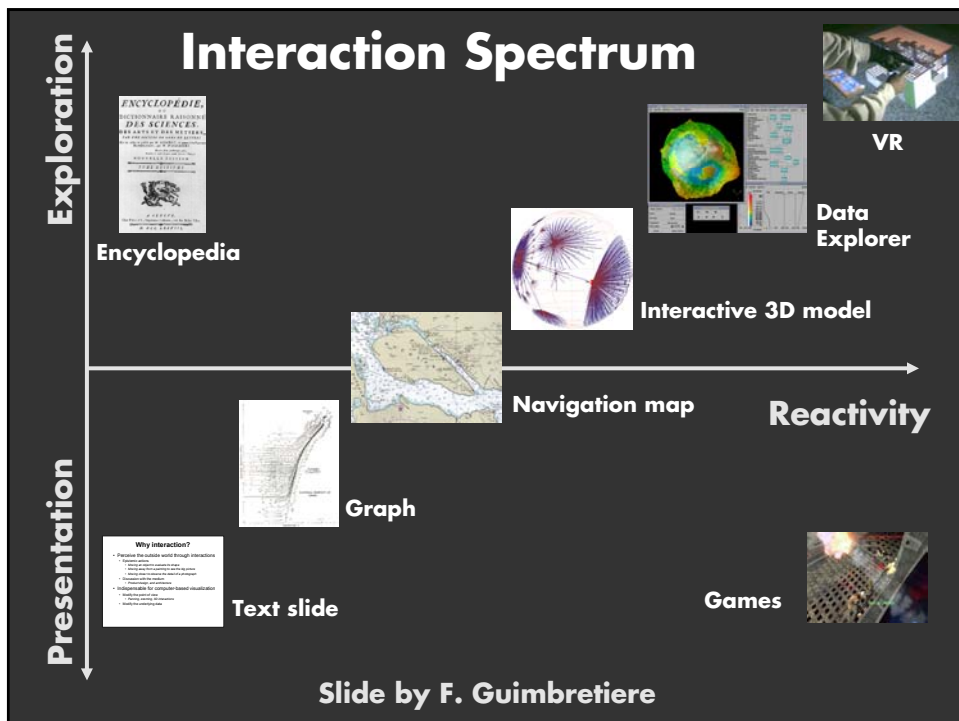
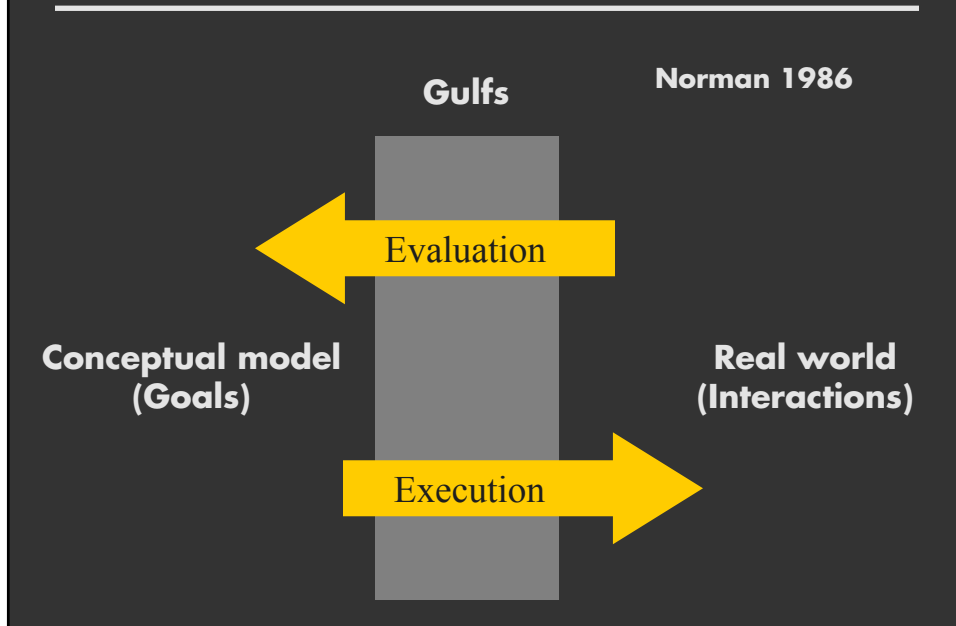


Interaction

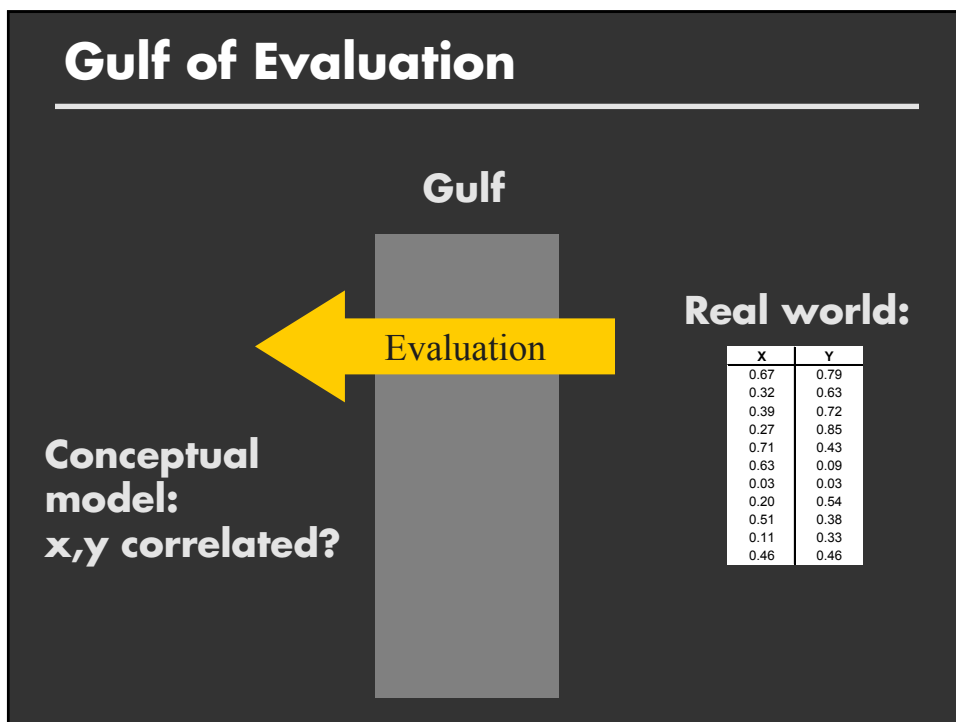
Pat Hanrahan



Gulfs of Execution & Evaluation



Gulf of Evaluation



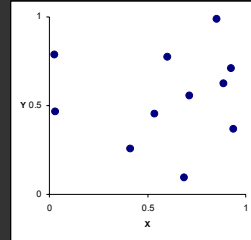
Gulf of Evaluation

Gulf



Conceptual
model:
x,y correlated?

Real world:



Gulf of Evaluation

Gulf

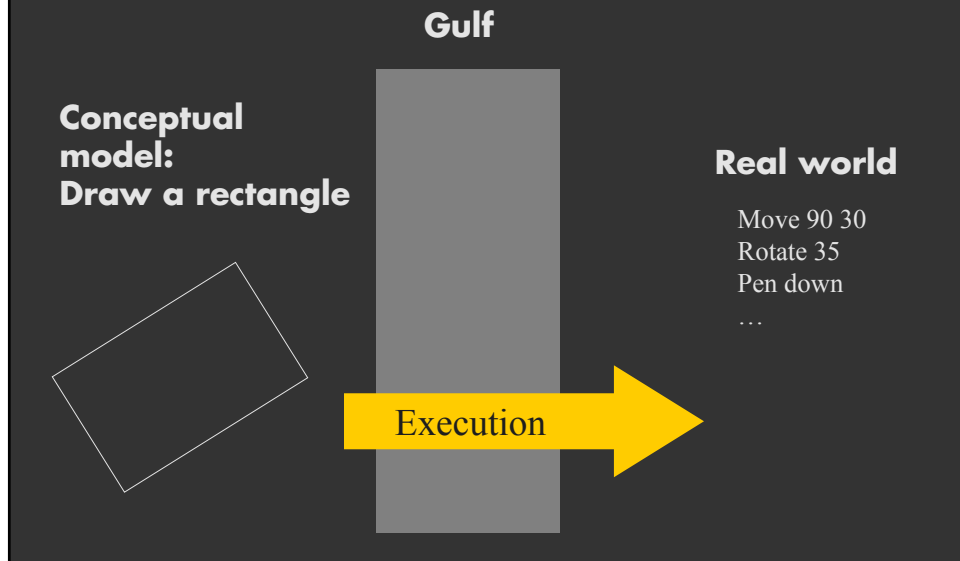


Conceptual
model:
x,y correlated?

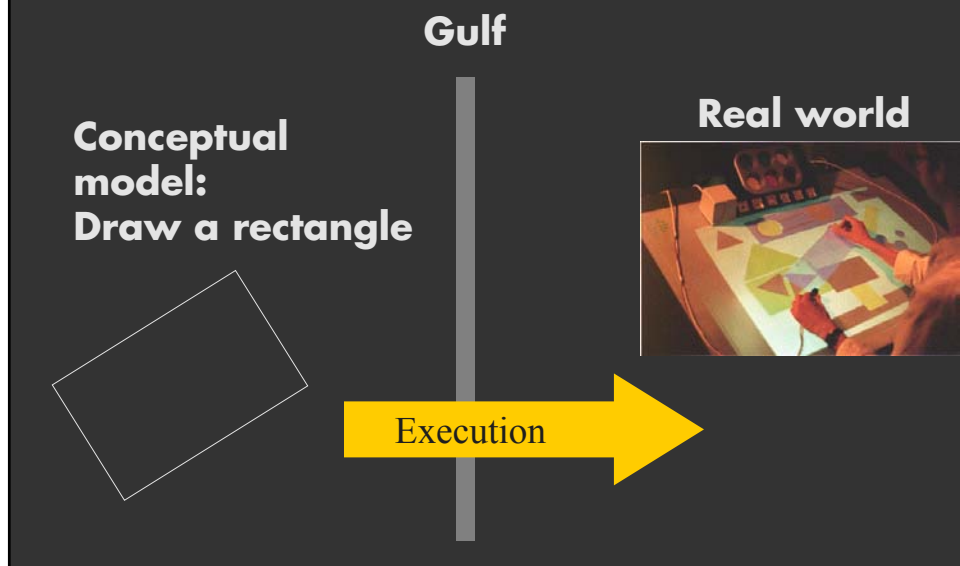
Real world:

$$\rho = -.29$$

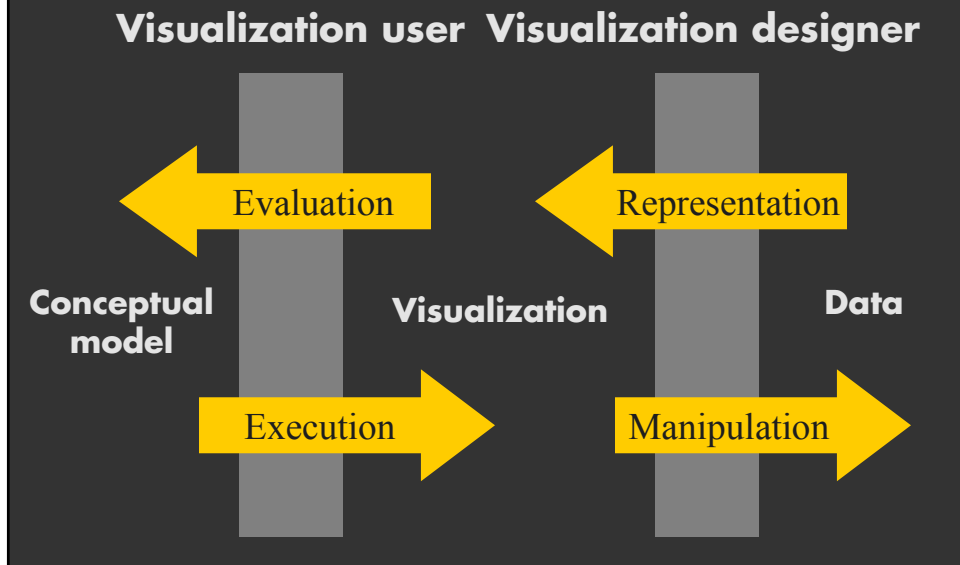
Gulf of Execution



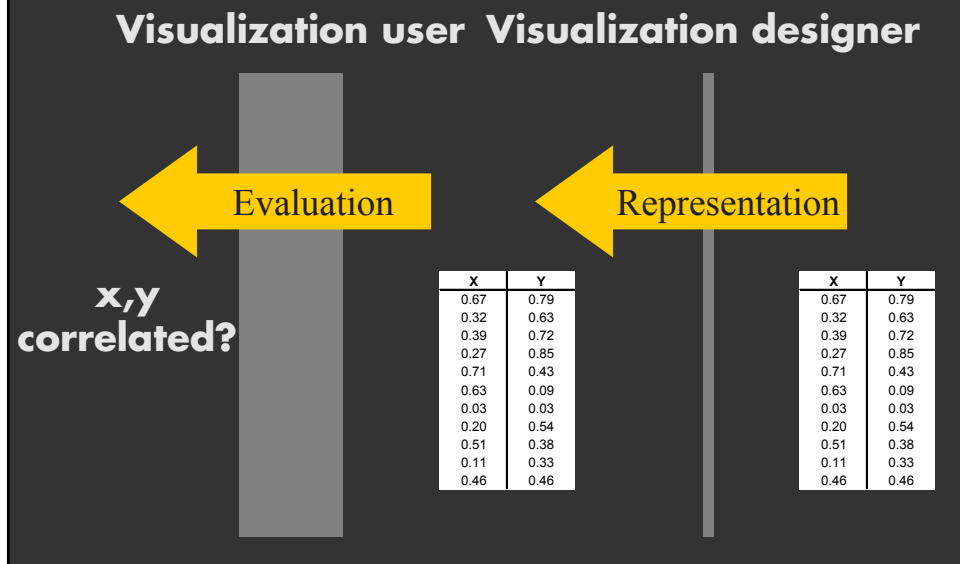
Gulf of Execution



Visualization: A Double Gulf?

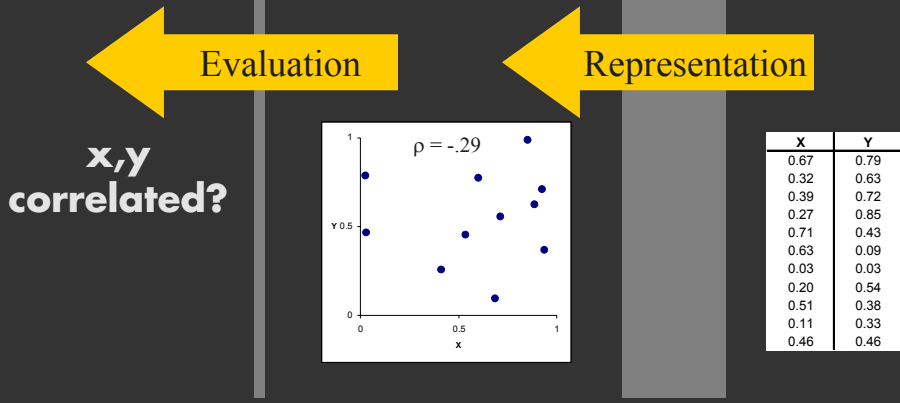


Bad visualization?



Good Visualization?

Visualization user Visualization designer



Topics

- Rotation and Rocking
- Brushing and linking
- Dynamic queries
- Attribute explorer
- Rearrangements

Rotation and Rocking

Brushing and Linking

Query Languages

```
SELECT house  
FROM peninsula  
WHERE price < 1,000,000 AND bedrooms > 3  
ORDER BY price
```

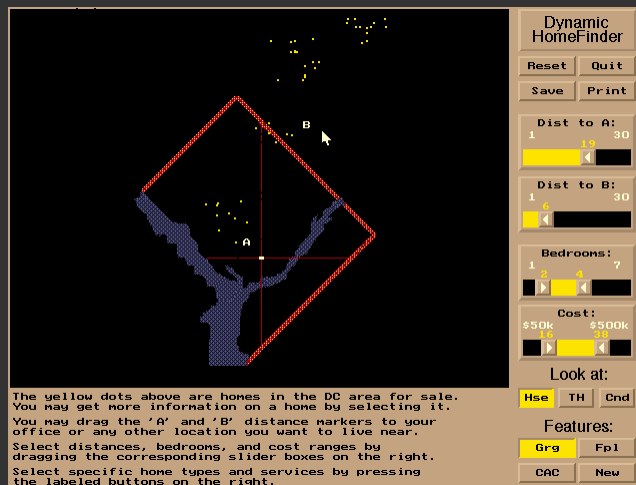
GROUP BY and **AGGREGATE**

Comments

1. For programmers
2. Rigid syntax
3. Only shows exact matches
4. Too few or too many hits
5. No hint on how to reformulate the query
6. Slow question-answer loop
7. Results returned as table

Direct Manipulation

1. Visual representation of the world of action, including both the objects and the actions
2. Rapid, incremental and reversible actions
3. Selection by pointing (not typing)
4. Immediate and continuous display of results



Dynamic Queries, Ahlberg and Schneiderman

Title :
Moonstruck

A B C D F G H L M N P R S T W Z

Alpha Slider, Ahlberg and Schneiderman

Attribute Explorer

Time Searcher

Table Lens

Cone Tree

Conclusion

Most visualizations are interactive

- Even passive media elicit interactions

Visualizations are task dependant

- Reduce the gulf of evaluation
 - Being in the right space...
- Reduce the gulf of execution
 - Picking the right interaction technique...

Human factors are important

- Leverage human strength
- Assist human limitation