5.Four Levels for Validation

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Outline

- Why Validate?
- Four Levels of Design
- Angles of Attack
- Threats to Validity
- Validation Approaches
- Validation Examples

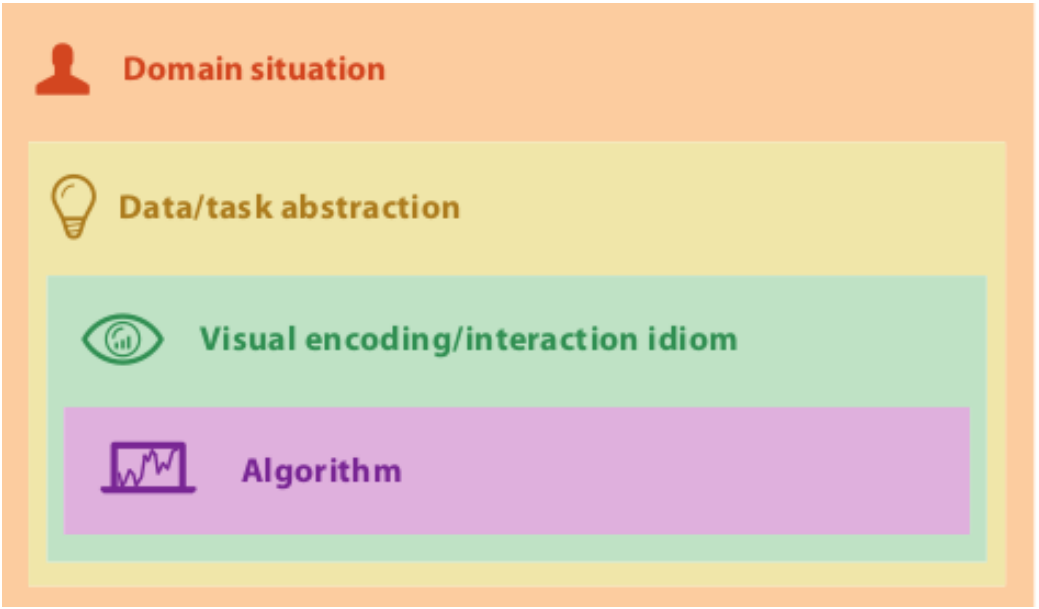
Why Validate?

- Most designs are ineffective and validation is a tricky problem that is difficult to get right.

- It’s valuable to think about how you might validate your choices from the very beginning of the design process, rather than leaving these considerations for the end as an afterthought.

Four Levels of Design

- Splitting the complex problem of vis design into four cascading levels provides an analysis framework that lets you address different concerns separately.

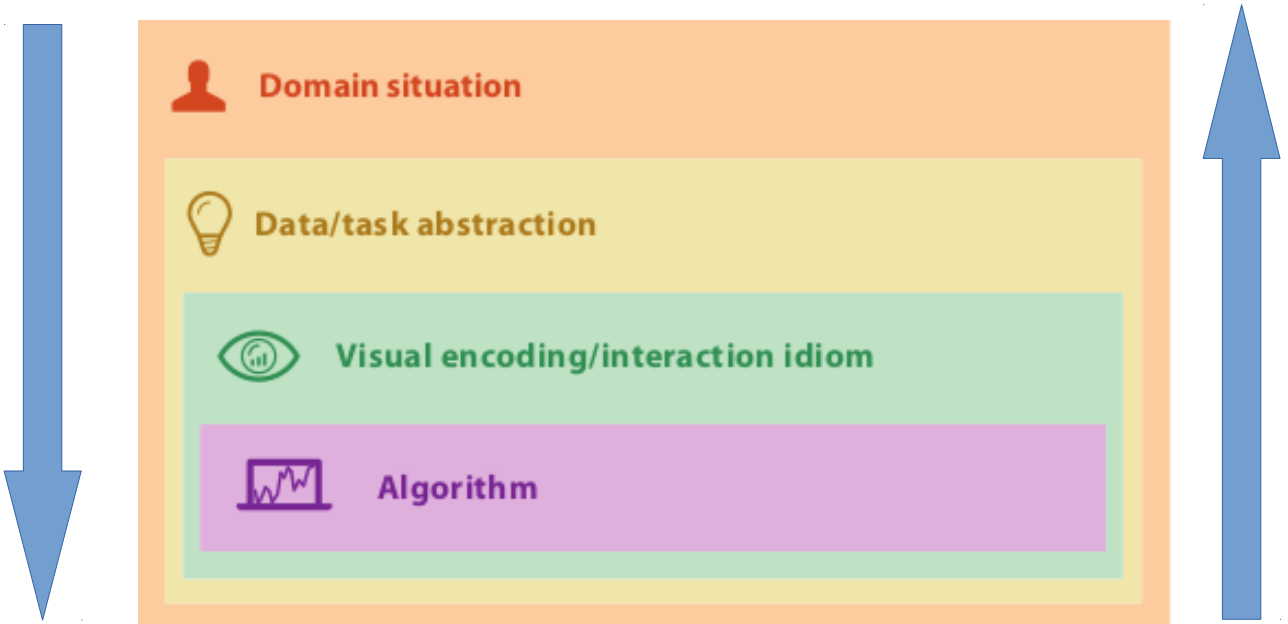


Four Levels of Design

- At the top is the situation level, where you consider the details of a particular *application domain* for vis.
- Next is the *what–why abstraction level*, where you map those domain-specific problems and data into forms that are *independent of the domain*.
- The following how level is the design of idioms that specify the approach to *visual encoding* and *interaction*.
- Finally, the last level is the *design of algorithms* to instantiate those idioms computationally

Angles of Attack

- There are two common angles of attack for vis design: top down or bottom up.



top down (problem-driven) bottom up (technique-driven)

- Considering the four levels of nested model explicitly can help you avoid the pitfall of skipping important steps

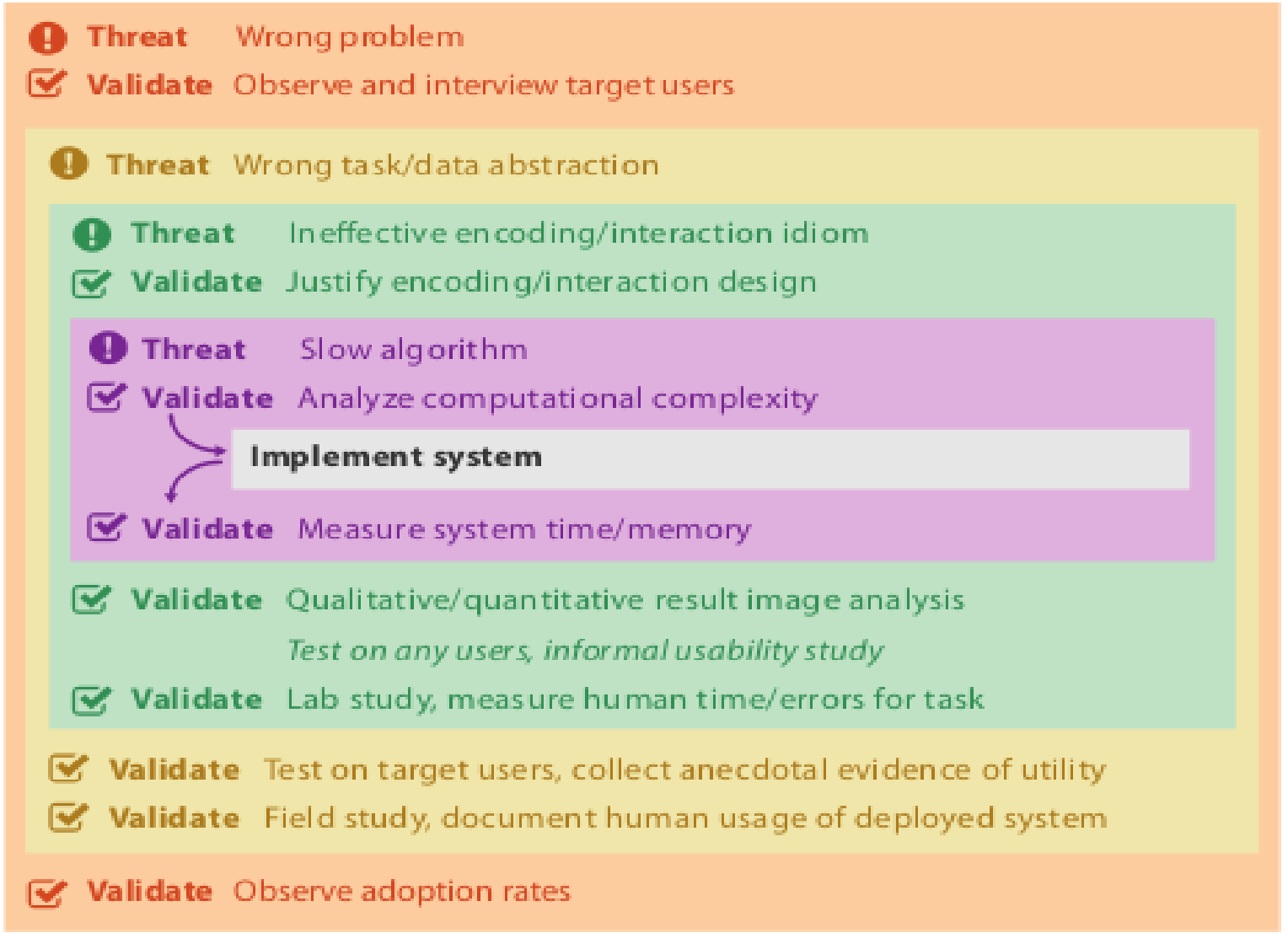
Threats to Validity

- Each of the four levels has a different set of threats to validity: that is, different fundamental reasons why you might have made the ***wrong choices***.

- Wrong problem: You misunderstood their needs.
- Wrong abstraction: You're showing them the wrong.
- Wrong idiom: The way you show it doesn't work.
- Wrong algorithm: Your code is too slow.

Validation Approaches

- Different threats require very different approaches



Validation Approaches

- Immediate Versus down-stream validation.
- Having nested levels is that most kinds of validation for the outer levels are not immediate because they require results from the downstream levels nested within them.
- Downstream dependencies add to the difficulty of validation: a poor showing of a test may misdirect attention upstream, when in fact the problem results from a poor choice at the current level.

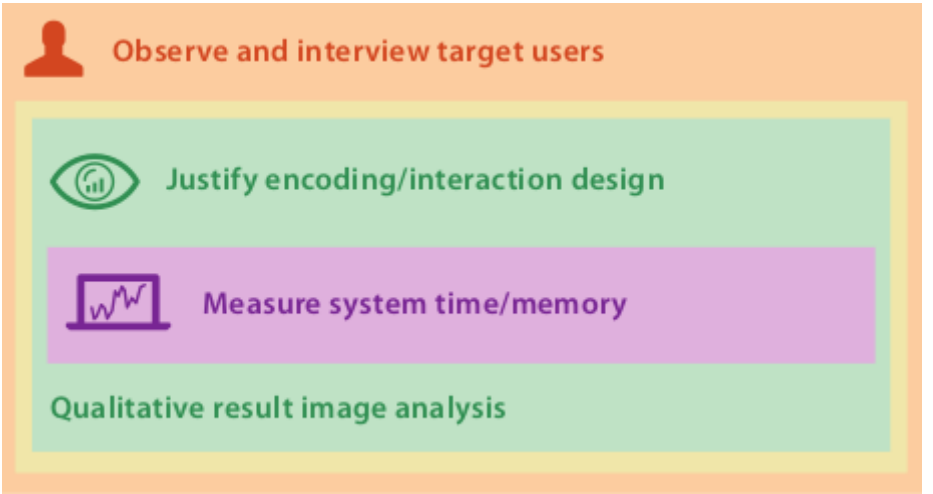
Validation Approaches

- For example, a poor visual encoding choice may cast doubt when testing a legitimate abstraction choice, or poor algorithm design may cast doubt when testing an interaction technique.
- Despite their difficulties, the downstream validations are necessary. The immediate validations only offer partial evidence of success;

Validation Examples

- Social Network Analysis- *Matrix Explorer system for social network analysis [Henry and Fekete 06],*

  At the *domain situation level*, there is explicit characterization of the *social network analysis domain*, which is validated with the *qualitative techniques of interviews and an exploratory study using participatory design methods with social scientists and other researchers* who use social network data.



Validation Examples

- At the abstraction level, the detailed list of requirements of the target user needs discussed in terms of abstract tasks and data.
- There is a thorough discussion of the primary encoding idiom design decision to use both *node–link* and *matrix views* to show the data, and also of many secondary encoding issues.
- There is also a discussion of both basic interaction idioms and more complex interaction via *interactive reordering* and *clustering*.

Validation Examples

- In both cases the authors use the *immediate validation* method of justifying these design decisions.
- There is also an extensive *downstream validation* of this level using qualitative discussion of result images.
- At the *algorithm level*, the focus is on the *reordering algorithm*. Downstream benchmark timings are mentioned very briefly

Thank You