Reverse Engineering

Software Systems — Design — L6T3

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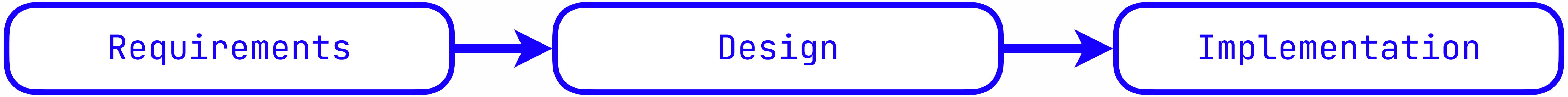
UNIVERSITY
OF TWENTE.

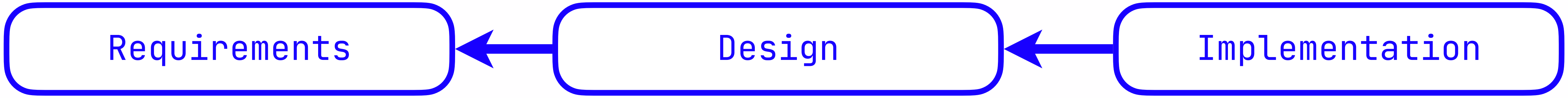
Fm Formal
Methods
& Tools

Taxonomy of Software Engineering

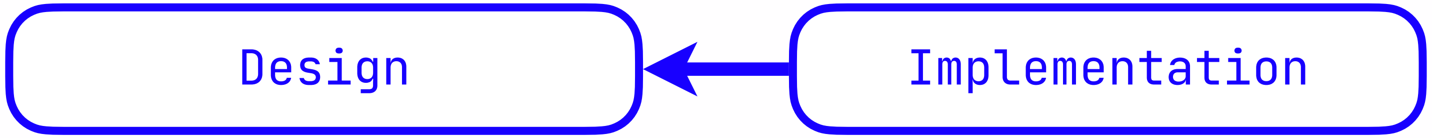
- Forward engineering



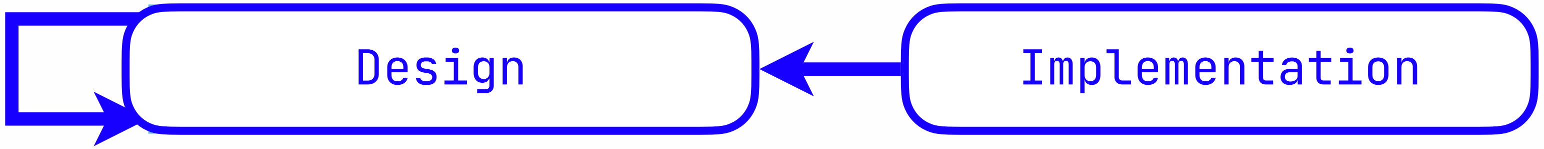
- Reverse engineering



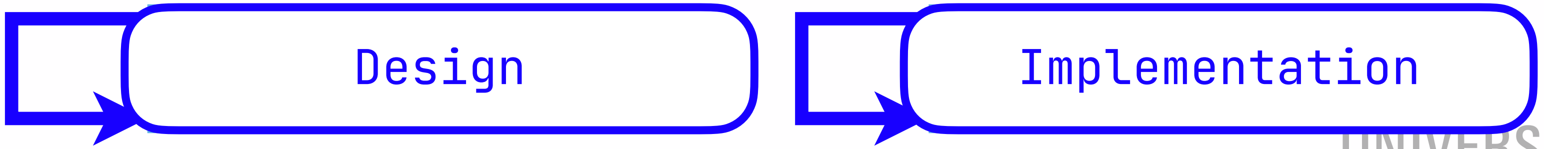
- Design recovery



- Reengineering

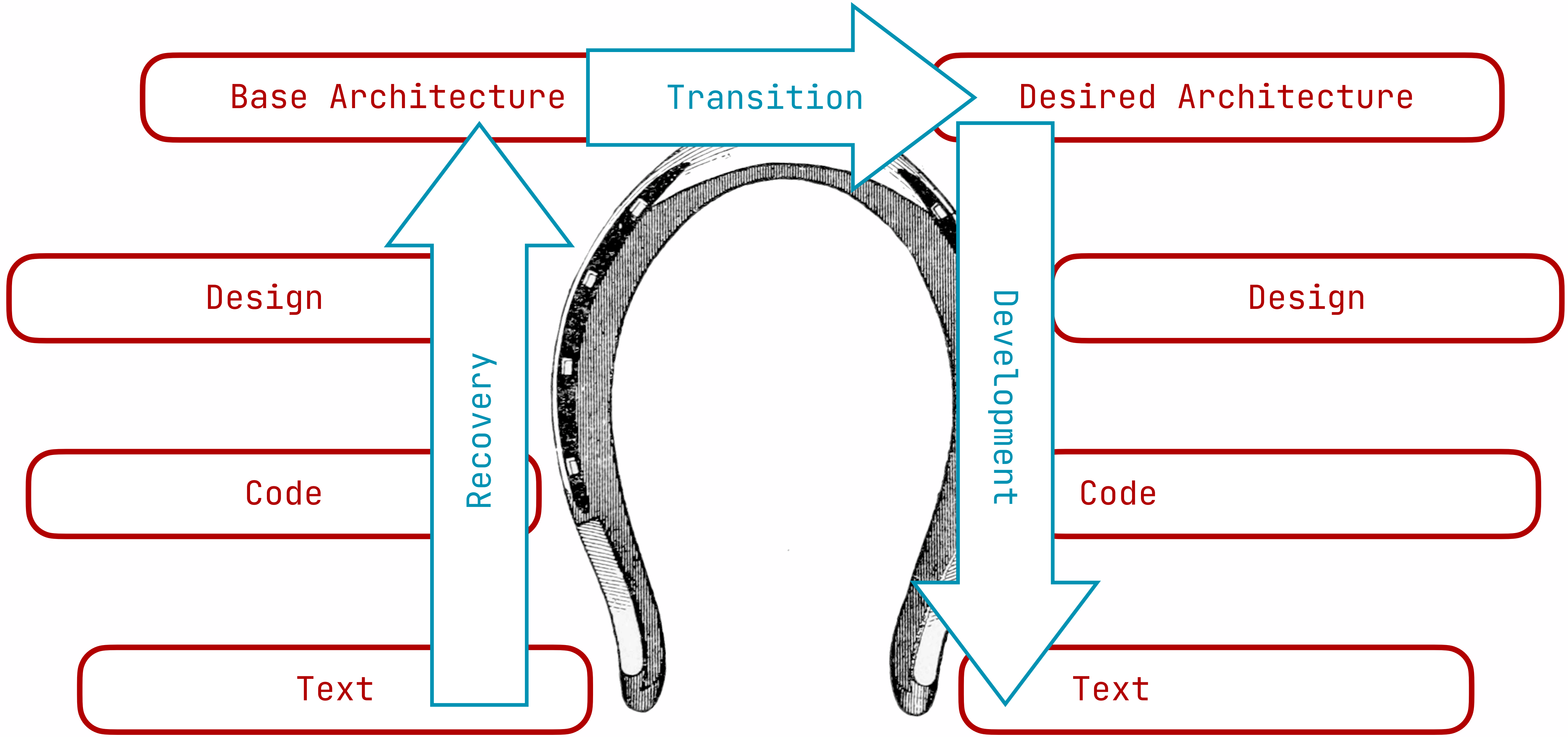


- Restructuring



Chikofsky, Cross, *Reverse Engineering and Design Recovery: A Taxonomy*. IEEE Software 7(1), 1990

The Horseshoe Model



Kazman, Woods, Carrière, *CORUM II*, WCRE, 1998

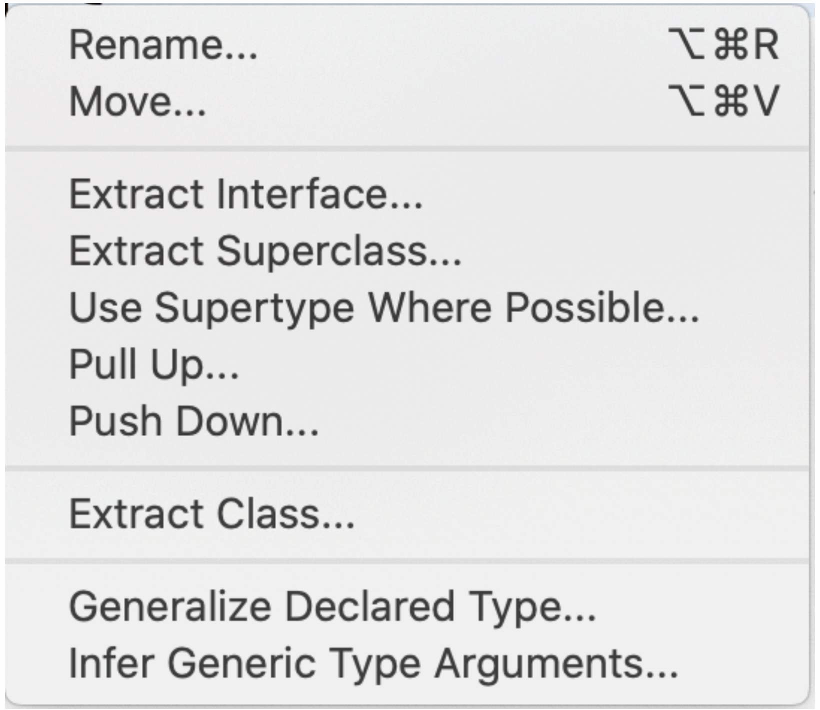
Text-Level Transformations

- Basically search/replace
- Easy to implement
- Fast to execute
- Very imprecise
- Dangerous

cf. L4T4

Program-Level Transformations

- Require parsing (in a broad sense)
- Used directly in projectional editors
  - JetBrains MPS
- Popular: refactoring
  - in most IDEs
  - Shift + Alt + T or ⌥⌘T in



Rename... ⌥⌘R
Move... ⌥⌘V

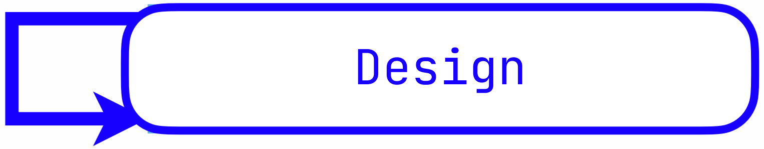
Extract Interface...
Extract Superclass...
Use Supertype Where Possible...
Pull Up...
Push Down...

Extract Class...

Generalize Declared Type...
Infer Generic Type Arguments...

Design-Level Transformations

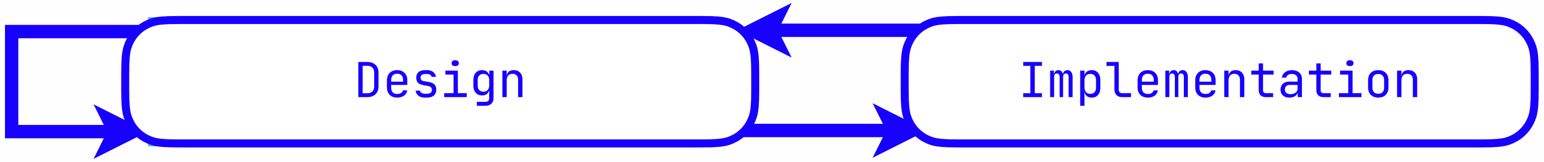
- Restructuring



Design

  - split classes in two packages
  - push attributes into a superclass
  - etc

- Reengineering



Design

Implementation

  - bundle arguments into a class
  - enforce a design pattern
  - etc

see also: Kang, Bieman, SMR 11(4), 1999 [doi]

Architecture-Level Transformation

- Migrate to another platform
  - server to cloud
- Change the database
  - SQL-based to NoSQL
- Migrate to another ecosystem
  - mainframe to .NET Core
- Retire a language
  - “4GL”

Conclusion

- Software systems are made **once**
  - but changed **many times**
- Reverse engineering
  - 313000 papers in GScholar
- Design recovery
  - to motivate decisions
- Reengineering & restructuring
- Refactoring

Topics/Slides Disclaimer

- Good ✅
  - watch before Q&A
  - embrace reality
  - try out at labs
  - ask for feedback
  - apply to project
  - dig deeper
  - recall from slides

- Bad ❌
  - slides over videos
  - assumptions
  - blanks
  - timing