IT University of Copenhagen

Software Architecture Reconstruction

III: Evolutionary Analysis

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Outline

- What is Evolutionary Analysis
- How can it help in architecture recovery?
- Challenges of Evolutionary Analysis

What is Software Evolution?

> No man ever steps in the same river twice, for it is not the same river and he is not the same man.
>
> -- Heraclitus

Software Systems Must Evolve

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- an e-type system is *embedded* in the real world
- the world changes, so the system must change

Software Evolution

Software evolution is the continual development of a piece of software after its initial release to address changing stakeholder and/or market requirements

- we used to talk about *software maintenance*
- nowadays evolution is the preferred term

Metaphors?

From this POV, the architecture metaphor is not the best. Would a *garden* been a better metaphor?

Although, architecture is also not that bad.

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git clone git@github.com:zeeguu/api.git
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The truck-factor To think about

- Is a turck factor good if high or if low?
- How could you improve it?

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Why?

"The value of anything is proportional to time invested in it." (M. Lungu)

Practically:

- studies observe correlation between *code churn* and complexity metrics
- it's likely that they'll require more effort in the future (e.g. yesterday's weather [Girba et al.])
- high *code churn* predicts bugs better than size

Code Churn

= a metric that indicates how often a given piece of code—e.g., a file, a class, a function—gets edited.

- process metric (*as opposed to?*)
- can suggest relevance for the architecture (*in wjhich way?*)
- can be detected with **language independent analysis** (which is good for polyglot systems)

Viewpoint: Evolutionary Hotspots

= an architectural viewpoint that highlights those code entities where most commits are made

Notebook: Computing Evolutionary Hotspots with PyDriller

Challenges

- Taking into account developer styles
  - the micro-commits developer vs. the large chunk commiter
- Removing irellevant files that change frequently (`README.md`, or `LICENSE.md`)
  - Combine with static complexity metrics
  - Manual investigation
- Selecting the appropriate time-interval for the analysis
  - Weighting towards recency (discarding past changes more)
- Sometimes git loses track of file history
  - e.g. if you rename and make changes at the same time