

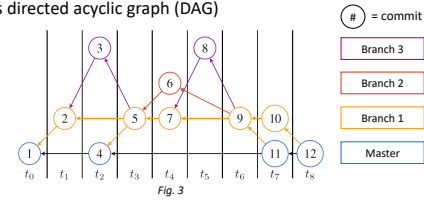
Merge-tree: Visualizing the Integration of Commits into Linux

Evan Wilde, Daniel German.
2016 IEEE Working Conference on Software Visualization (VISSOFT), Raleigh, NC, pp. 1-10, 2016.

Presented by: Nick Bradley
March 16, 2017

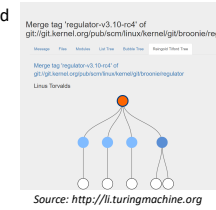
Git Version Control

- Is a distributed version control system
- Supports non-linear workflows
- Uses directed acyclic graph (DAG)
- Commits
- Branches



Domain Task

- **Show when and how a commit was merged into master**
- **Challenge:** commits cannot be changed
 - can't link to later commits
 - can't track merge dates
- **Solution:** Linvis
 - Shows topological view of merges
 - Supports aggregation and filtering
 - Supports two use-cases
 1. top-to-bottom: aggregate
 2. bottom-to-top: see flow into master



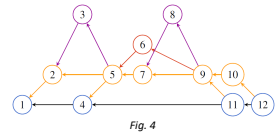
Merge-tree

- Transforms DAG into trees
 - each rooted on master
 - such that all commits are assigned to exactly one tree
- **Algorithm**
 - Invert DAG
 - For every commit
 - compute distance to each subsequent commit
 - only keep link to closest (in time) in merge-tree
 - stop at master commit
- Relies on specific Git workflow

Convert DAG to Trees

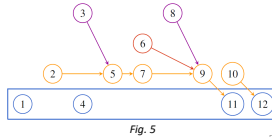
DAG Model

- Newer commits link to older
- All links present



Merge-tree Model

- Older commits link to newer
- Removed links
 - Only keep links on shortest path



Linvis Live Demo

<http://li.turingmachine.org>

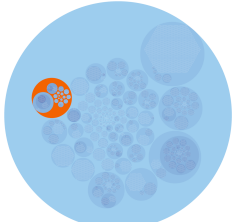
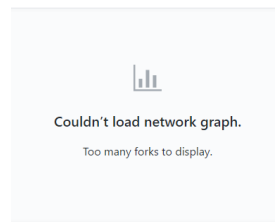
Linvis analysis

- **What:** data
 - DAG
- **What:** derived
 - Merge-tree
- **Why:** tasks
 - Search for commits
 - Summarize changes
- **How:** reduce
 - Filtering
- **How:** Manipulate
 - Navigate with pan/zoom
 - Select
- **How:** encode
 - indented outline (*list tree*)
 - tree map using nested circles and radial containment (*bubble tree*)
 - vertical node-link (*Reingold-Tilford tree*)

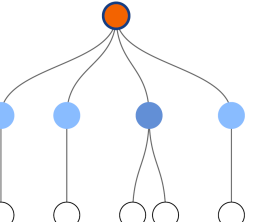
Limitations + Next Steps

- **No evaluation of Linvis**
 - quantitative user-testing: improvements to user workflow
 - qualitative user-evaluation: do users think tool is helpful
- Merge-tree cannot be constructed for most repositories
- Cannot search by filename
- Aggregate commit patches
- Aggregate authorship information

Compare existing - GitHub



Compare existing - Gitk

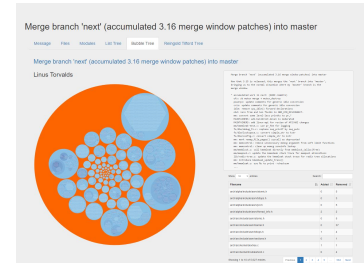


Critique

- **Strengths**
 - Main contribution of merge-tree
 - Demonstrated on most complex DAG
 - Natural interactions (e.g. pan, zoom)
 - Different encodings of tree structure, all intuitive
- **Weaknesses**
 - Merge-tree algorithm not robust
 - Navigation between views cumbersome
 - Vis felt like afterthought

Suggestion

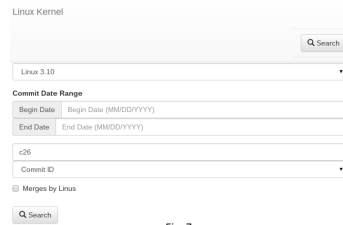
- Juxtapose:
 - Git log
 - Files
 - tree vis



Questions

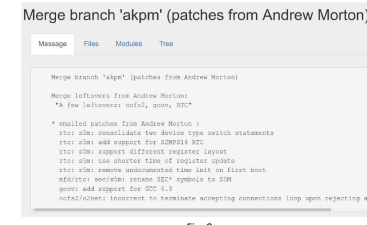
Linvis Search View

- Allows filtering by
 - Merge date range
 - Commit author
 - Keyword
 - Commit ID



Linvis Message Tab

- Displays Git log
- Included for completeness



Linvis File Tab

- Files changed in leaf commits
- Added/Removed number of columns show number of changed lines
- Aggregates number of changes to single file across all commits

