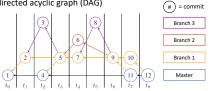
# Merge-tree: Visualizing the Integration of Commits into Linux

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
- Source: http://li.turingmachine.org

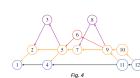
### Merge-tree

- 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
- · 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

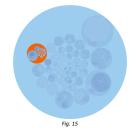
## Limitations + Next Steps

#### • No evaluation of Linvis

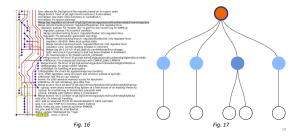
- · quantitative user-testing: improvements to user workflow
- · qualitative user-evaluation: do users think tool is helpful
- Merge-tree cannot be constructed for most repositories
- · Cannot search by filename
- · Aggregate commit patches
- · Aggregate authorship information

## Compare existing - GitHub





## Compare existing - Gitk

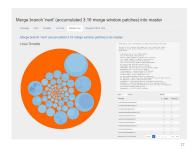


# Critique

- 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
- Q Search Commit Date Range End Date End Date (MWDD/ ■ Merges by Linu Fig. 7

# Linvis Message Tab

- · Displays Git log
- · Included for completeness



#### Linvis File Tab

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



Fig. 10

#### Linvis Module Tab

- Linux specific
- Groups files
- Count column shows number of changed files for all leaf commits



#### Linvis List Tree

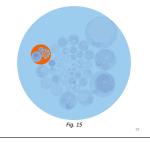
- Text-based representations of the merge-tree
- Nested lists show the hierarchy
- Designed to model tree-views of file browsers which are familiar to developers
- Easy to search and navigate

Merge branch 'next' (accumulated 3.16 merge window patches) into master

Fig. 12

#### Linvis Bubble Tree

- Organizes the commits hierarchically by having the parent commit contain the child commits
- Similar to tree maps but clearly shows leaf commits
- Good for providing clear visualization of wide, hierarchical data



## Linvis Reingold-Tilford Tree

- Intuitive representation of merge-tree
- Not effective at display large trees

