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SolidSource

Visual Clone Analysis with SolidSDD

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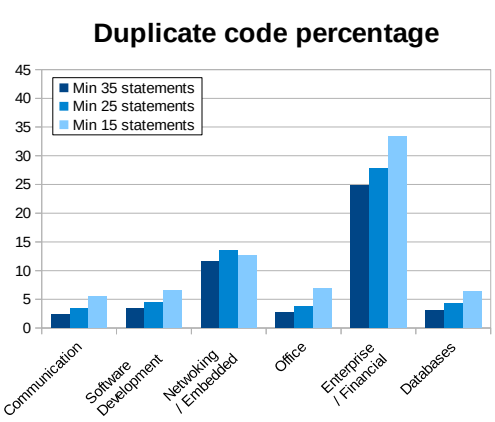
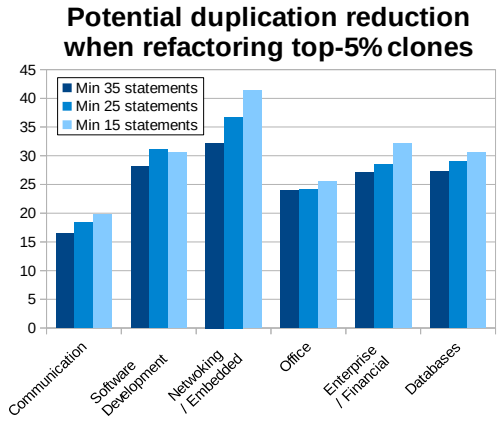
The Situation





Software Maintenance: Over 80% of the total software life-cycle costs.
Code Reuse: Proven to reduce costs in the industry with 20-40%.
Code Clones: Between 5 - 35% of a typical code base.
Low Hanging Fruit: 15 - 40% of duplication caused by 5% of clones.

The Tool: SolidSDD

Finds structural clones:

- Supports **C**, **C++**, **C#** and **Java.**
- Shows clones vs structure (directories or syntax).
- Computes *cloned code %*, number of *distinct clones*, presence of *identifier renaming*.
- Detection configurable by *clone length*, *identifier renaming*, *gap size*, *whitespace/comments*.

Implements "overview first, zoom and filter, then details-on-demand":

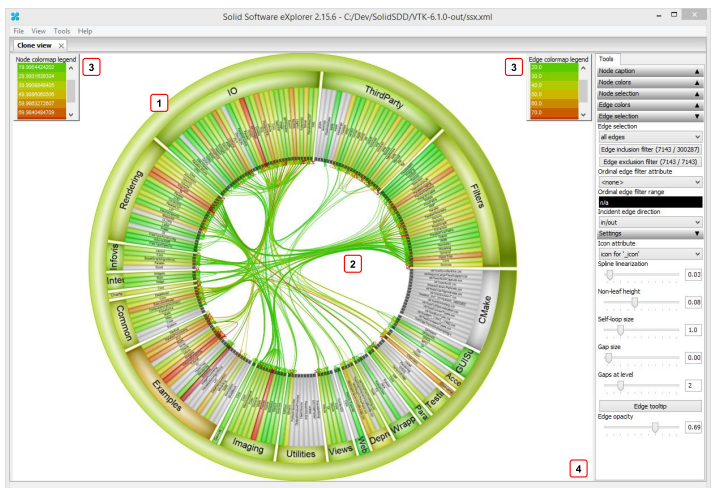
- Bundled graphs show clones vs system structure.
- Table lenses show clone and file metrics.
- Annotated text shows clones in file context and allows navigating between all pairs.
- Views are linked, allowing navigation between text, clones, and system structure.

Helps to answer questions such as:

- How are clones *distributed* vs system structure?
- Which subsystems have *high clone percentages*?
- Which files are affected by a given clone?
- How much duplication relates to the *top x% clones*?

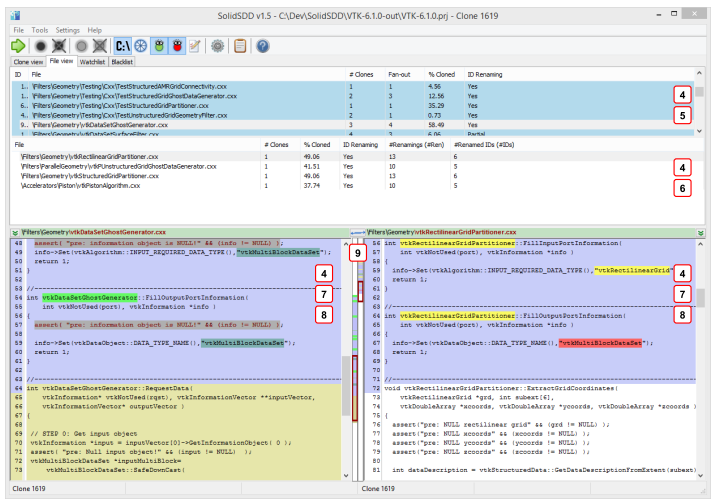
Structure View

1. **Radial tree**
   Shows system hierarchy (folders, files);
   Open/collapse subsystems by double-clicking.
2. **Hierarchical Edge Bundling**
   Aggregate clone relations atop of system structure;
   Supports finding subsystems linked by clones.
3. **Color-mapping**
   Nodes show cloned code % in a file/folder;
   Edges show cloned code % between the file-pair.

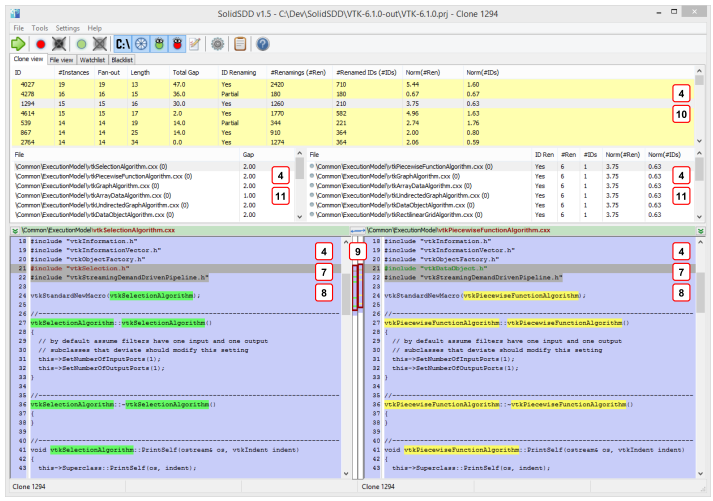


4. **Linked views**
   Select file/clone in a view to highlight it in others.
5. **File detail view**
   All files with cloned-code percentage, number of clones, and presence of identifier renaming.
6. **Clone pairs view**
   Files sharing clones with the file selected in (5).
7. **Code detail view**
   Cycle through clone-pairs by clicking a code fragment.

File & Clone Details Views

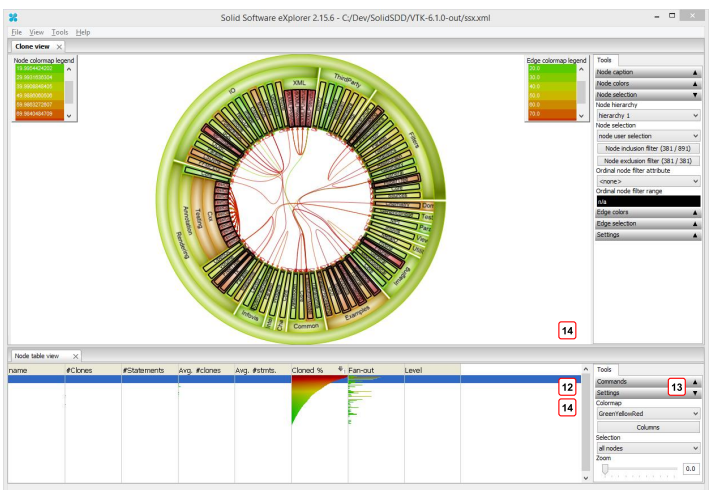


Color legend for code detail view
- non-cloned code
- clone shown in both left and right file-windows
- clone partner not shown in right file-window
- identifier renamed (shown as ■ in right window)
- abc cloned code under mouse (both file-windows)



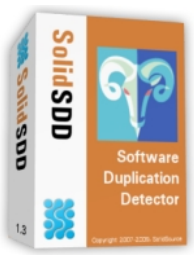
Metrics Views

8. **Color-coded text**
   Cloned code in (un)selected file-pair, renamed identifiers.
9. **Synchronized scrolling**
   Easily compare matching code fragments (6a, 6b)
10. **Clone detail view**
    All clones with number of instances, fan-out (num involved files), length, total gap, num renamed identifiers.
11. **Clone pairs view**
    Files sharing clones with the file selected in (9)



12. **Table lens**
    Files as rows with name, size, clone code %, clone fan-in (num intra-file clones), fan-out (num inter-file clones).
13. **Table lens controls**
    When zooming out, table cells are shrunk and text is replaced by colored bars showing metric values.
14. **Linked views**
    Selecting files/clones highlights them in the structure view.
    Supports investigation of e.g. top 10% largest clones.

Try it yourself!



- **Integrated** detection and exploration of code clones;
- **Free** trial and academic licenses;
- Support for **industry-sized** code bases;
- Batch-mode **report generation**, e.g. CSV and XML;
- Open API and SQLite database: easy to integrate with your own analyses or tools;
- Download, install, start using in **under 5 minutes** (Windows).

References

1. D. Reniers, L. Voinea, O. Ersoy, and A. Telea, "The Solid* toolset for software visual analytics of program structure and metrics comprehension: From research prototype to product," *Science of Computer Programming*, vol. 79, no. 1, pp. 224–240, 2014.
2. A. Telea, "Combining extended table lens and treemap techniques for visualizing tabular data," in *Proc. EuroVis*, 2006, pp. 51–58.
3. A. Hanjalic, "ClonEvol: Visualizing software evolution with code clones," in *Proc. Vissoft*, 2013, pp. 1–4.

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