

CVSScan

Visualization of Software Evolution

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*– Benevol 2005 –
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Challenge

Maintenance costs / Total costs > 90%

Erlikh, L. (2000). "Leveraging legacy system dollars for E-business" (IEEE) IT Pro, May/June 2000, 17-23.

Bug discovery = 70 – 90% time

Stephen G. Eick; "CH21: Maintenance of larger systems" in "SV: Programming as a multimedia experience", MIT Press, 1998, p. 315

Code Analysis = 47 % time

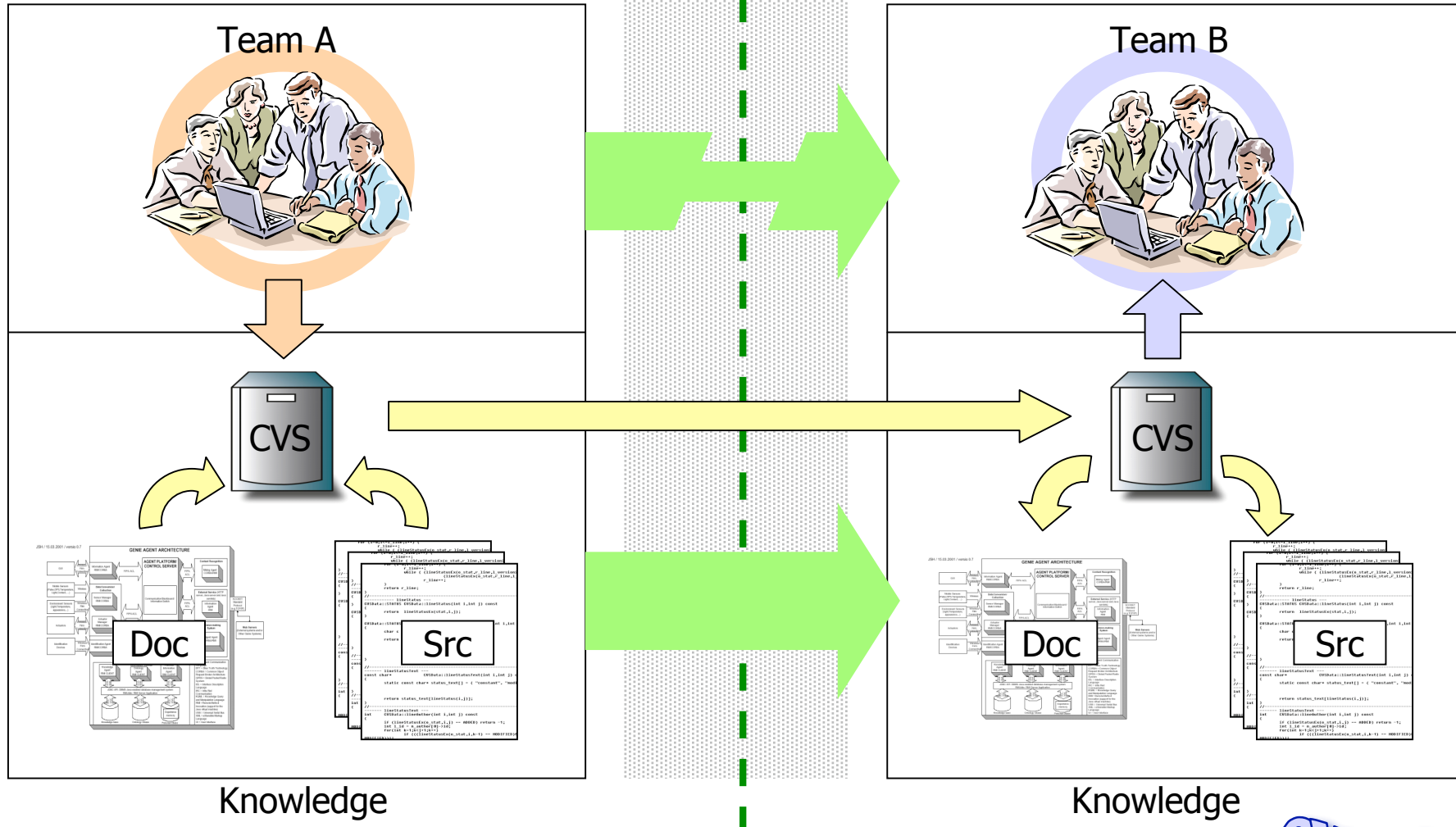
Source: "Software Quality: Producing Practical, Consistent Software" Mordecai Ben-Menachem & Garry S. Marliss, Thomson Computer Press, 1997.



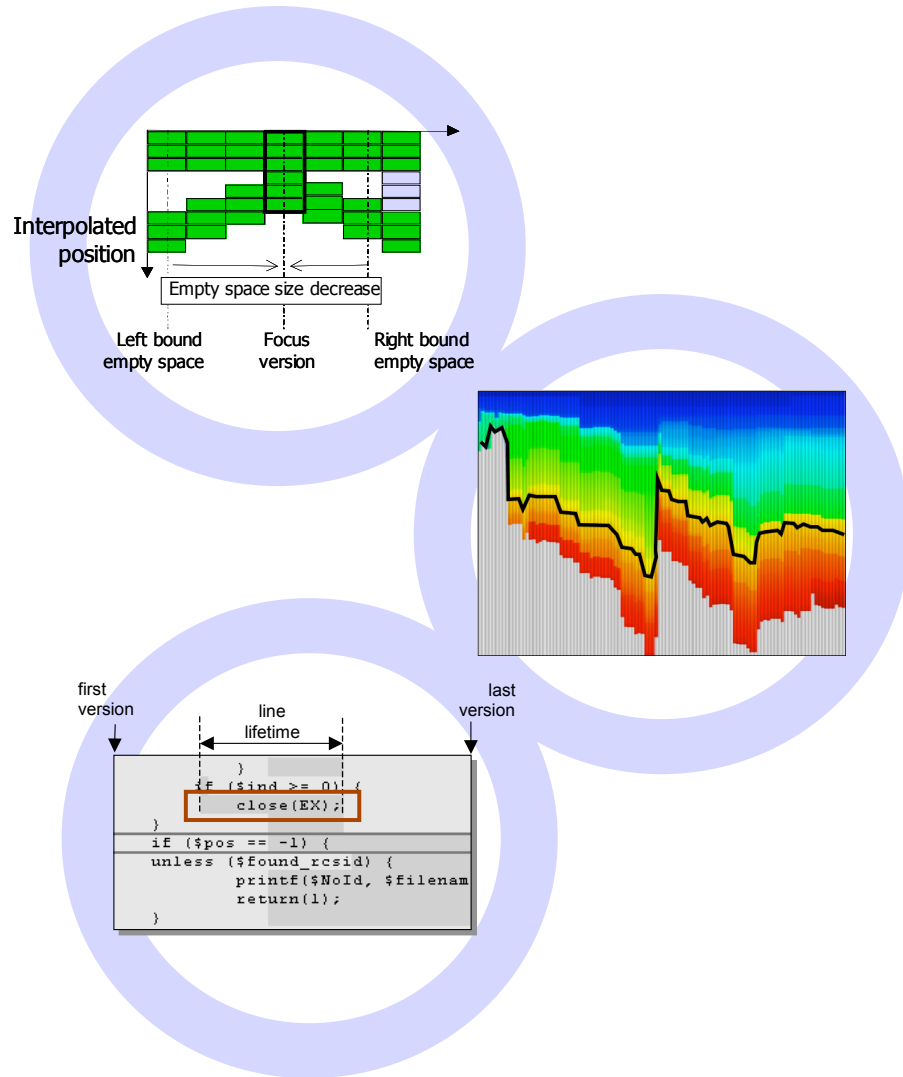
Challenge

Initial development ←

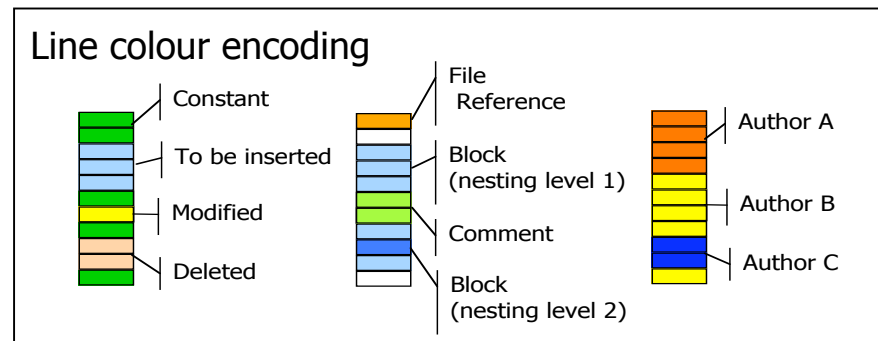
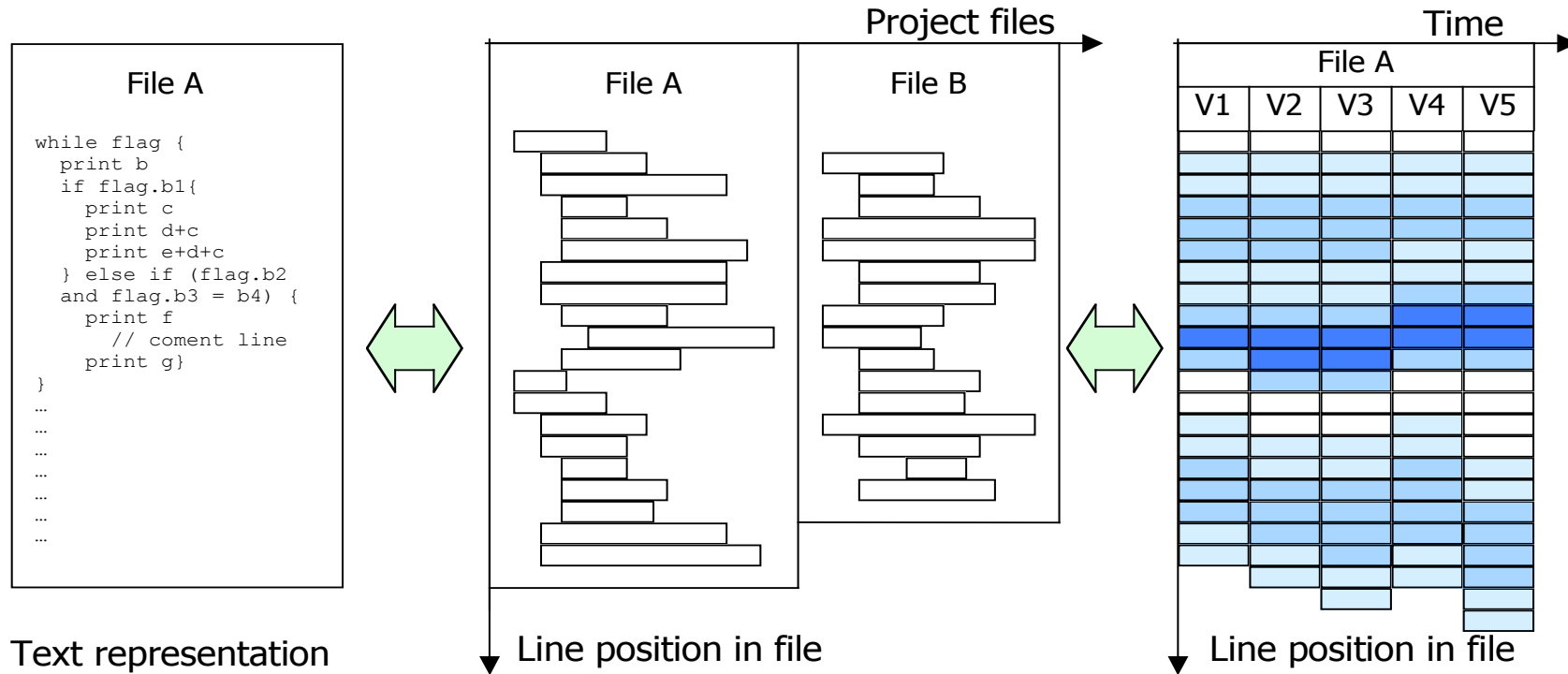
→ Maintenance



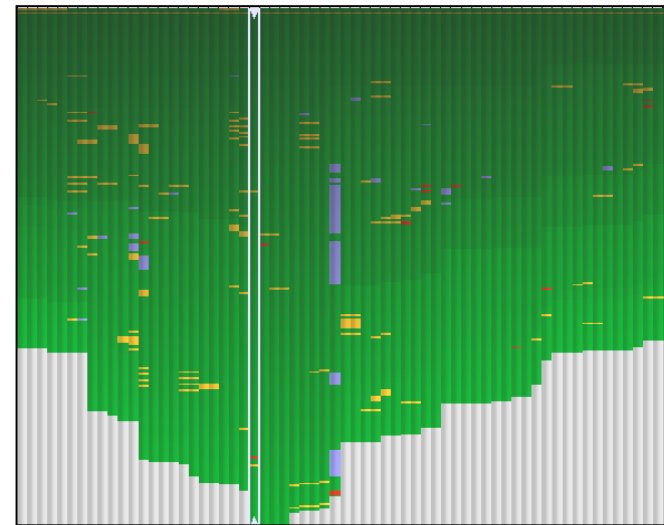
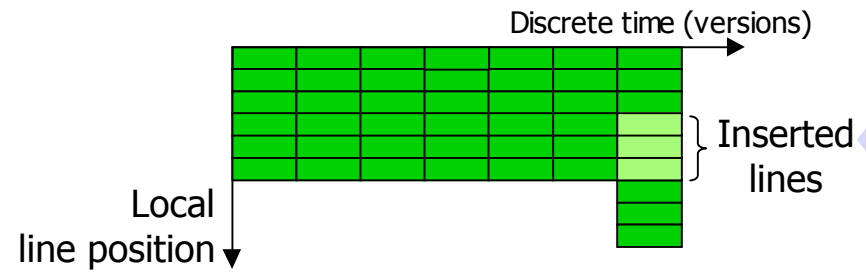
Outline



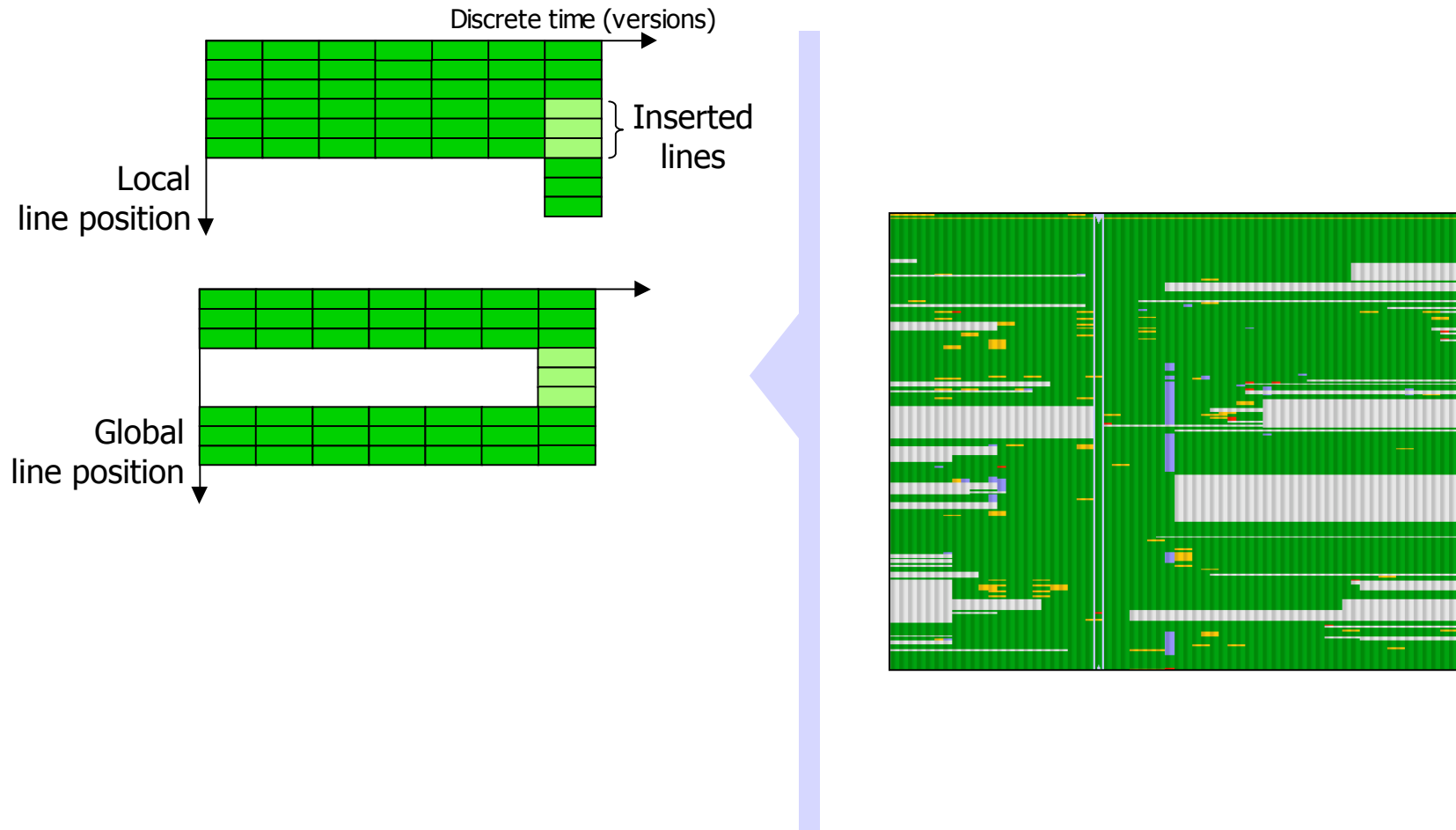
Line encoding



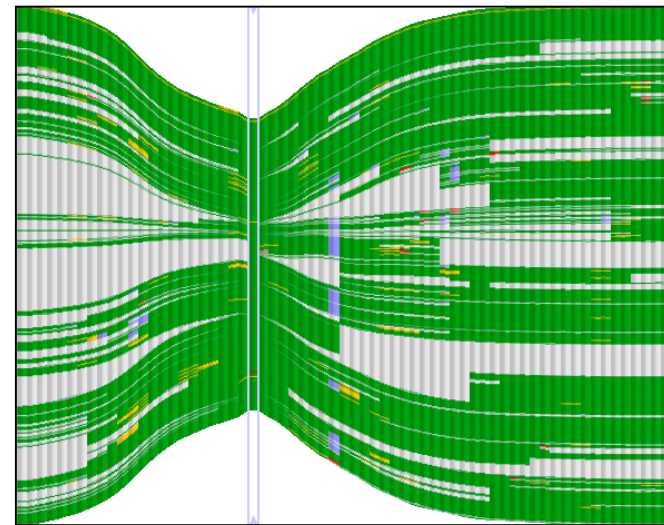
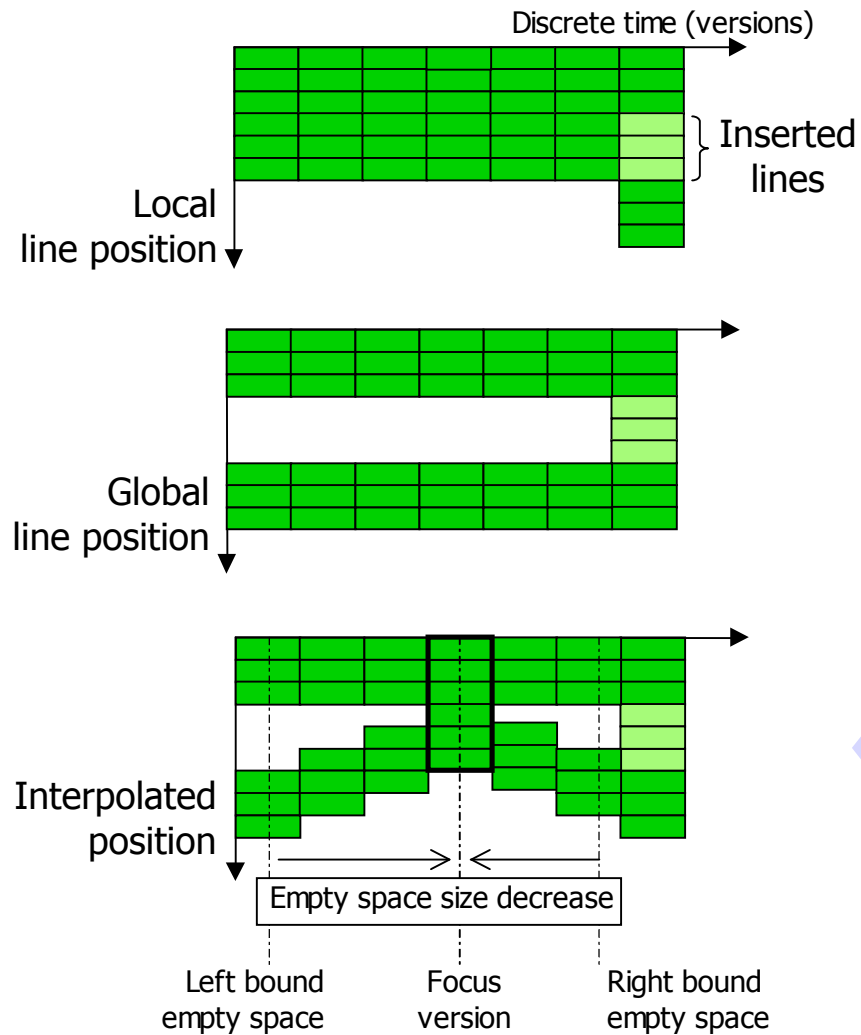
Version layout – file based



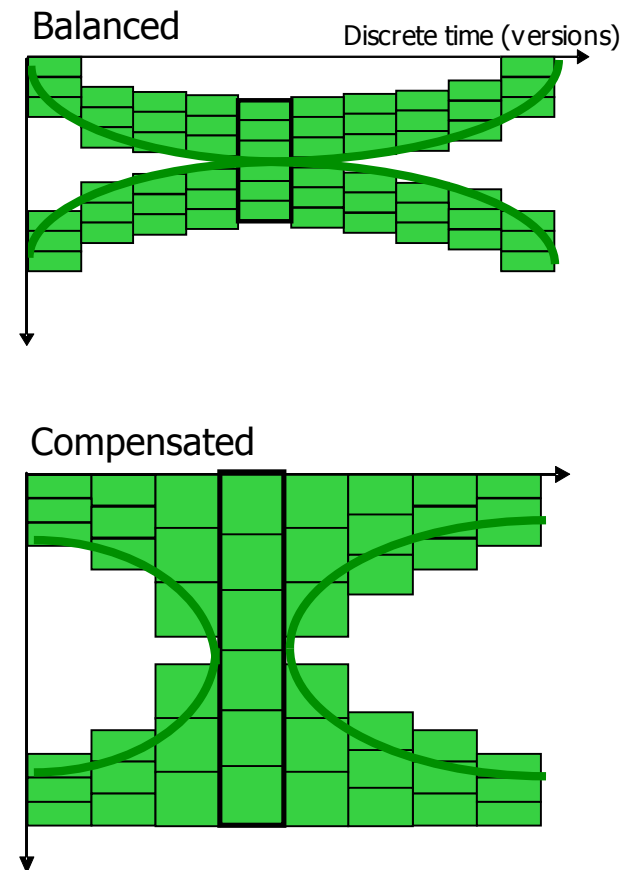
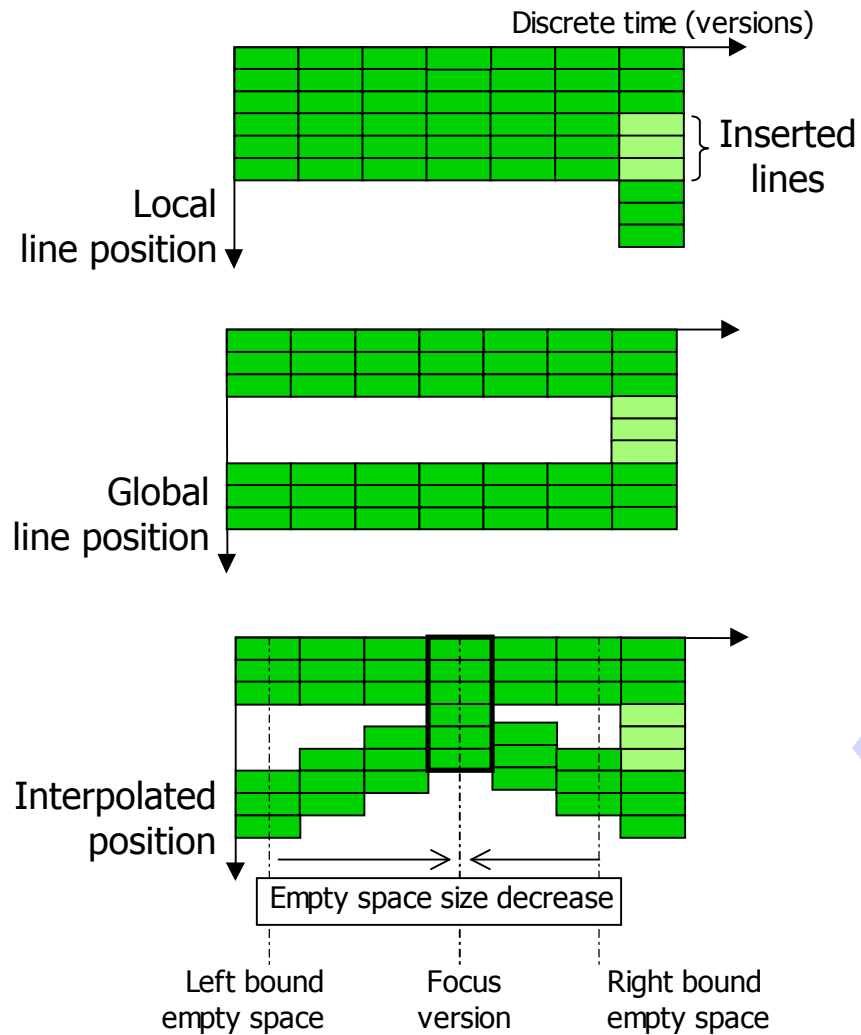
Version layout – line based



Version layout – interpolated



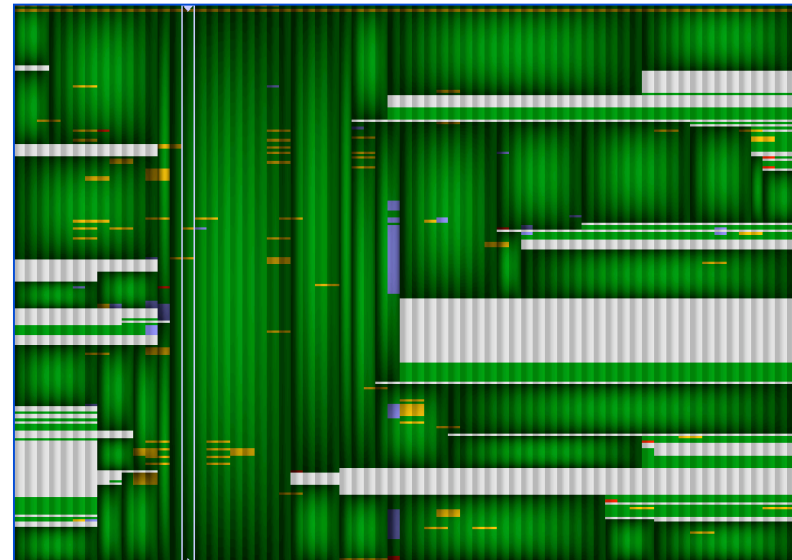
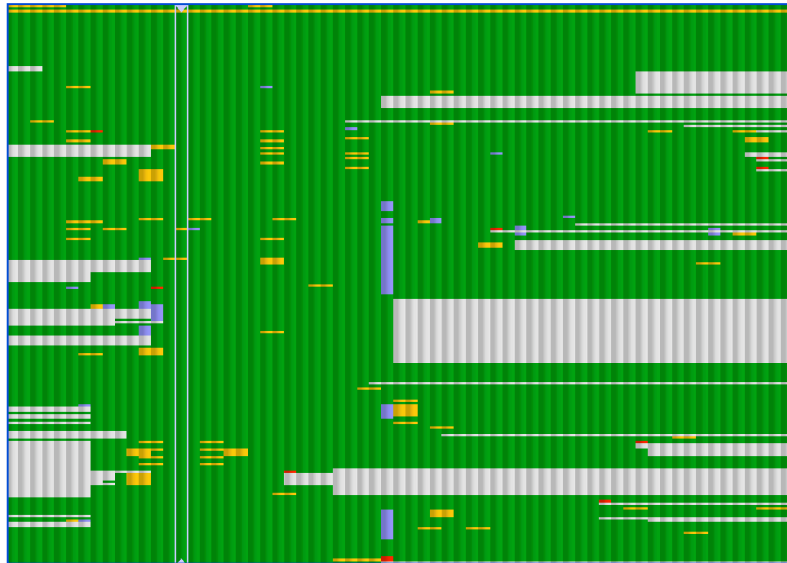
Version layout – interpolated



Visual improvements

Antialiasing : Position based (to preserve structure)

Stable block detection : Cushion based

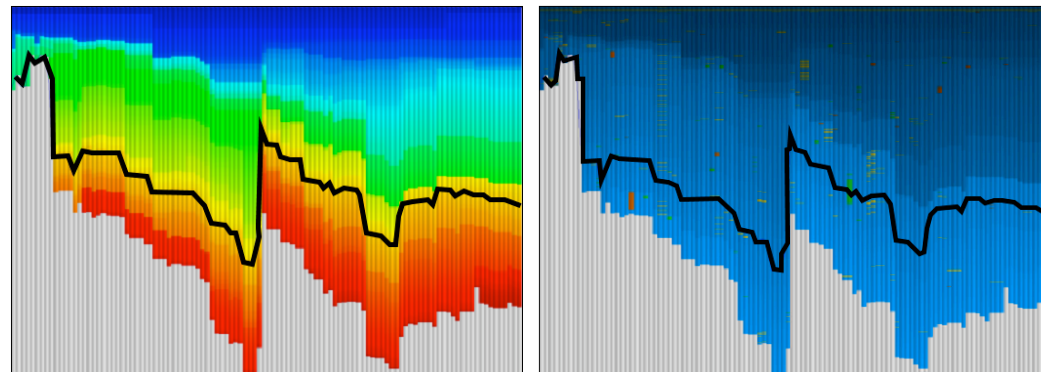


Interaction

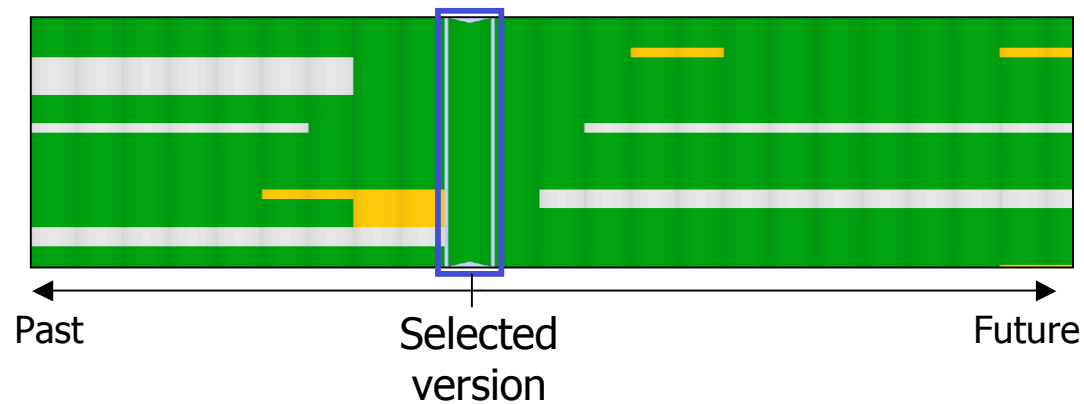
Zoom : Custom + predefined (fit to screen, fit to line)

Selection : Evolution interval selection

Navigation :



Filtering :



Interaction

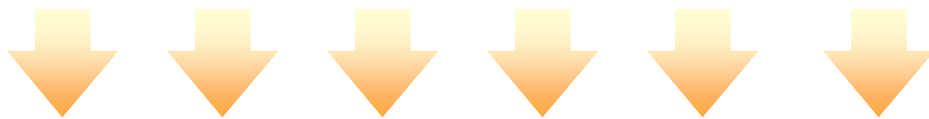
Details on demand :

```
    }
    return(0);
}

print "rname:$rname, dir/file:$directory/$filename,v.\n";

if ($rname ne "$directory/$filename,v" && $rname ne "$filename,v") {
    printf($BadName, "$directory/$filename,v", $rname);
    return(1);
}
```

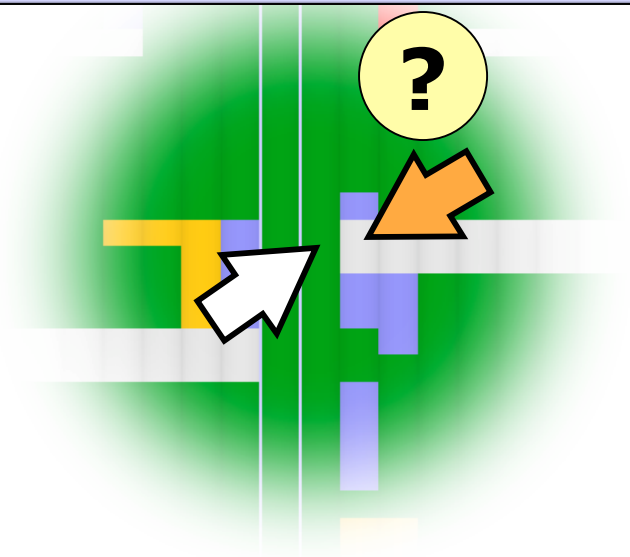
Number of lines for revision 10: 210



```
    return(1);
}
return(0);
}

if ($rname ne "$directory/$filename,v" && $rname ne "$filename,v") {
    printf($BadName, "$directory/$filename,v", $rname);
    return(1);
}

print "rname:$rname, dir/file:$directory/$f
```



Tool presentation

The screenshot displays the CVSScan tool interface. On the left is the **Control panel** with the following settings:

- File: commit_prep.pl
- Display: Engines, Blocks
- View mode: Normal
- Attributes: Evolution
- Balance Image
- Redistribute space
- Syntax highlighting
- Geometry cushions
- Curvature: 10.00
- Steepness: 0.10
- Mixer: 3.00

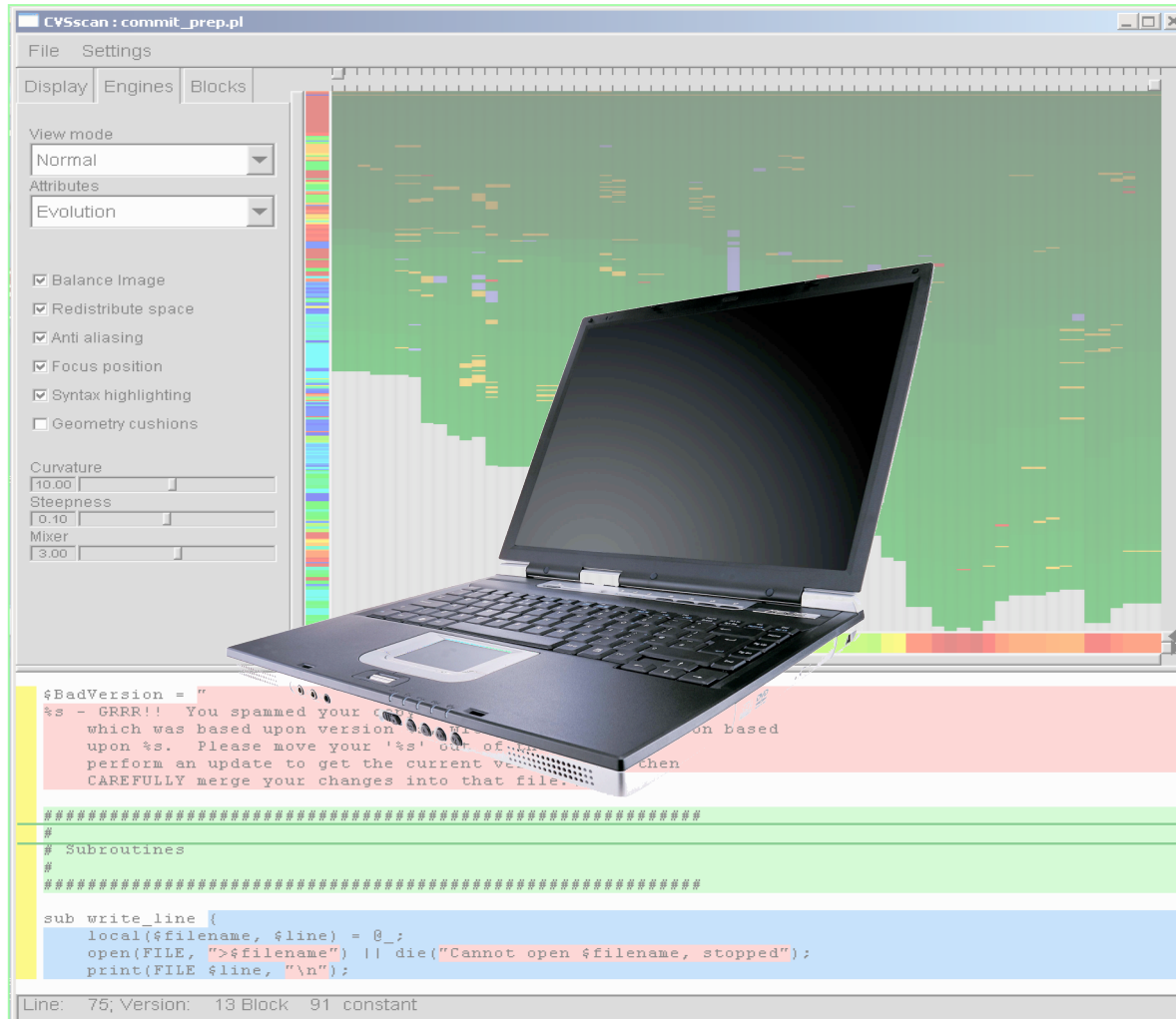
The main area is divided into two views:

- Evolution view**: A heatmap visualization showing the evolution of code blocks over time, with green representing the current state and other colors representing previous states.
- Bi-level code view**: A code editor showing the current code with syntax highlighting. The code includes a warning message and a subroutine definition:

```
$BadVersion = "  
%s - GRRR!! You spammed your copy of the file  
which was based upon version %s, with a different version based  
upon %s. Please move your '%s' out of the way,  
perform an update to get the current version, and then  
CAREFULLY merge your changes into that file.\n";  
#####  
#  
# Subroutines  
#  
#####  
sub write_line {  
    local($filename, $line) = @_;  
    open(FILE, ">${filename}") || die("Cannot open $filename, stopped");  
    print(FILE $line, "\n");  
}
```

An arrow labeled **Metric** points to the right side of the evolution view.

Demo

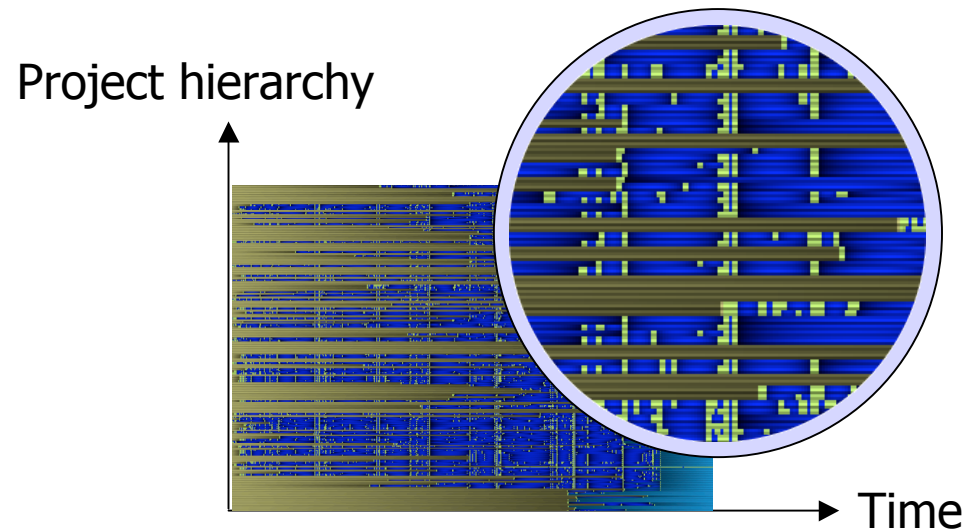


Conclusions

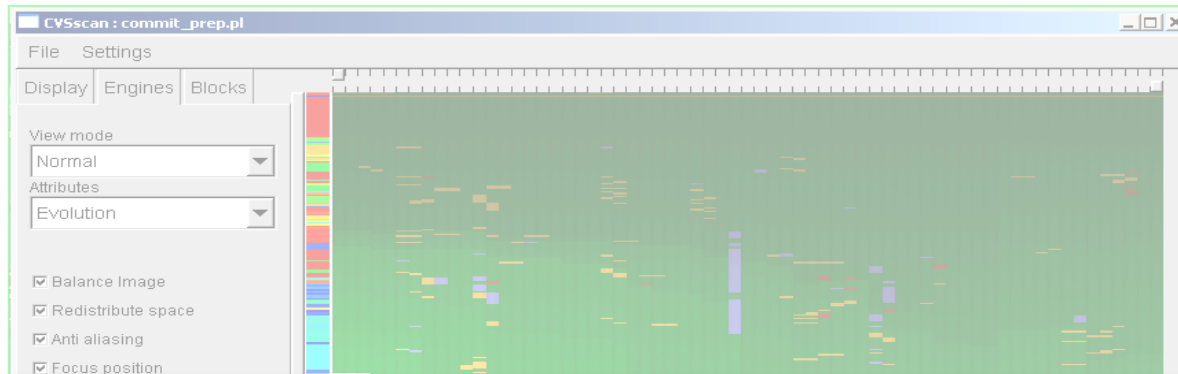
- Conveys process information embedded in the source code evolution records
- Offers version centric views on the system for relative assessment
- Appropriate mechanisms to navigate and browse the representation

Future work

- Visualize the evolution of more files in parallel



- Enrich the information about file structure
 - requires language specialization



Thank you for your attention !

www.win.tue.nl/~lvoinea/vcn.html

```
which was based upon version %s, with a different version based
upon %s. Please move your '%s' out of the way,
perform an update to get the current version, and then
CAREFULLY merge your changes into that file.\n";

#####
#
# Subroutines
#
#####

sub write_line {
    local($filename, $line) = @_;
    open(FILE, ">".$filename) || die("Cannot open $filename, stopped");
    print(FILE $line, "\n");
}

Line: 75; Version: 13 Block 91 constant
```