

# Visualizing Software Changes

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MSR Class

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# Introduction

- Goal: To use visualizations to understand understand software change
  - Insightful rather than faithful
  - Rapid exploration
    - Linked views
- Evaluated techniques on a large telephone switch software:
  - 15yrs, 100M, 50 sub systems

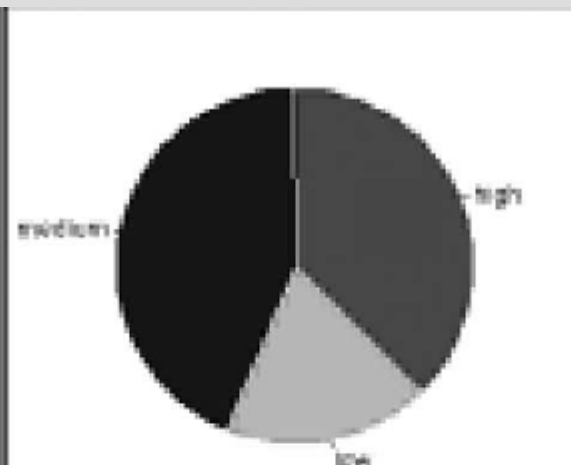
# Vocabulary

- Components
  - Time, Software Space, Developer, Type of change, Effort (hrs), Interval (calendar)
- Metaphors or Views
  - Matrix, city scape, data sheets, network views
  - Favorites?
- Perspectives
  - Combinations of views

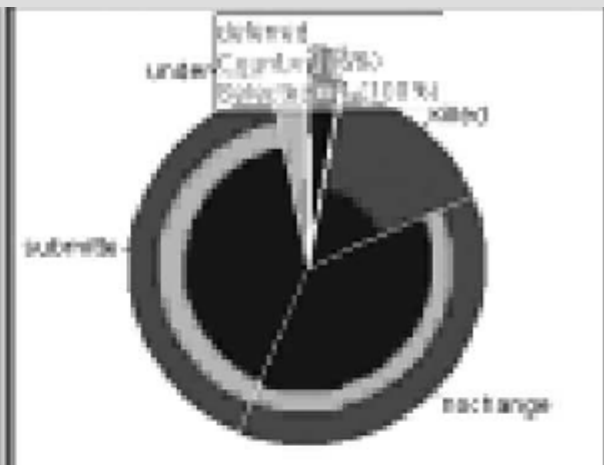
# Concrete example



Bar Chart  
No data selected for display

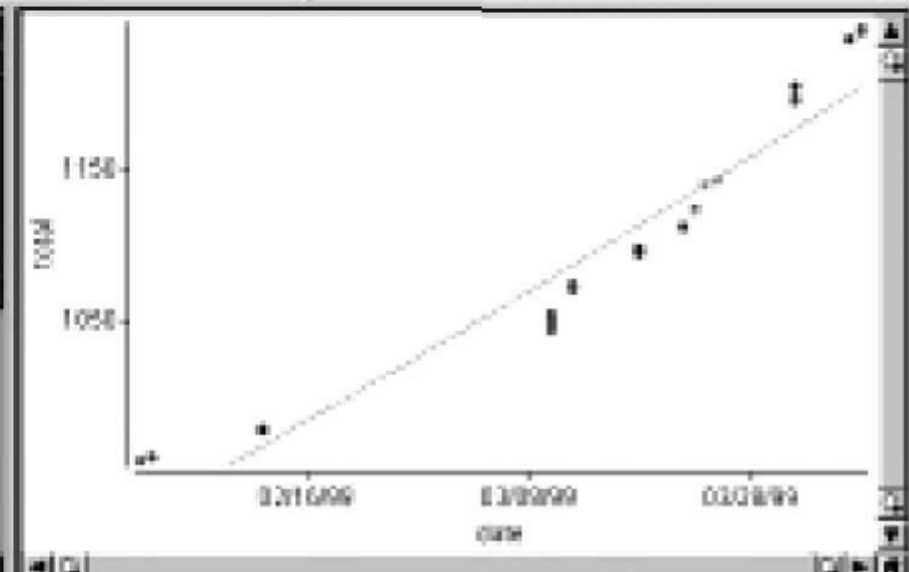


Count per severity



Count per state

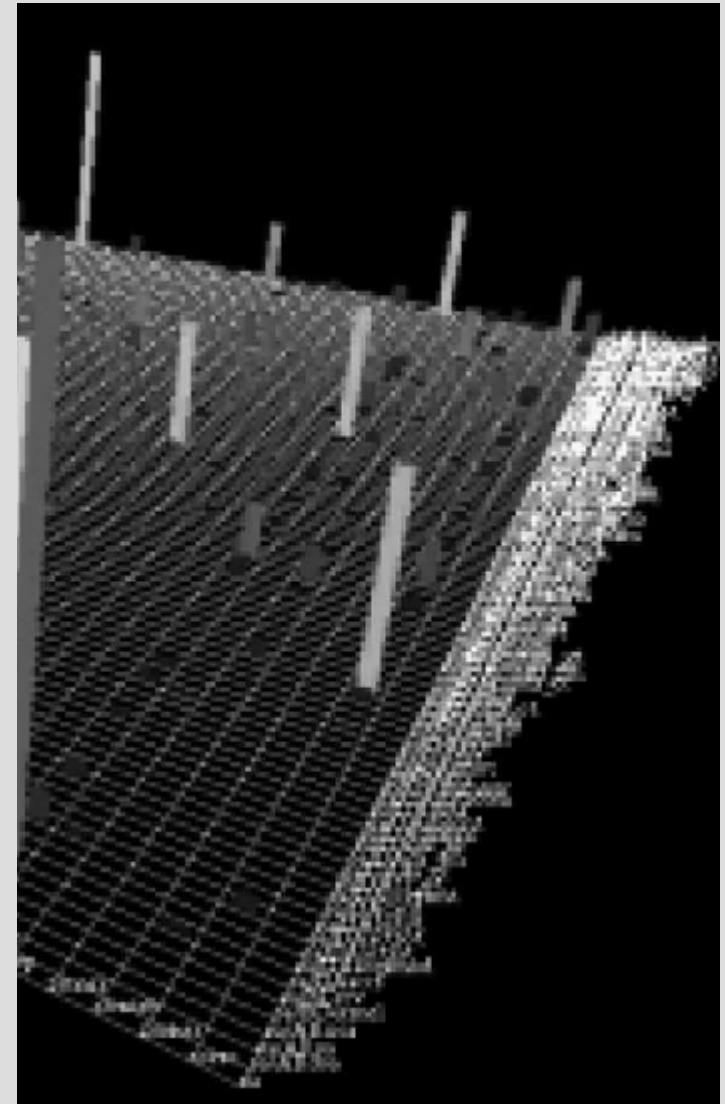
ref	abstract
rs42790	Control-Z doesn't Undo
rs42790	Closing tool with associated preview page soon causes later
rs42790	File Check Update for updates during work time
rs42890	3D Multiscope: X-axis labels do not align with grid
rs42310	Data Sheet: Cannot remove sorted column
rs42190	3D Multiscope: does not resize within Valid data splitter window.
rs42190	MM vs 40480 not fixed
rs42190	Data Sheet: Property Sheet does not refresh when selected
rs42190	File Open: Cannot open file that is already opened in GOCES.
rs41290	Platform: Tool Name Editors in Windows Menu do not track ac
rs41290	Data constellations: Adjusting link and node size effects link
rs41290	3D Table: Changing on Table to bring top may have effect
rs41190	Data Sheet: Changing input data can cause crash
rs41810	BarChart: Grid Line colors need to be selectable.





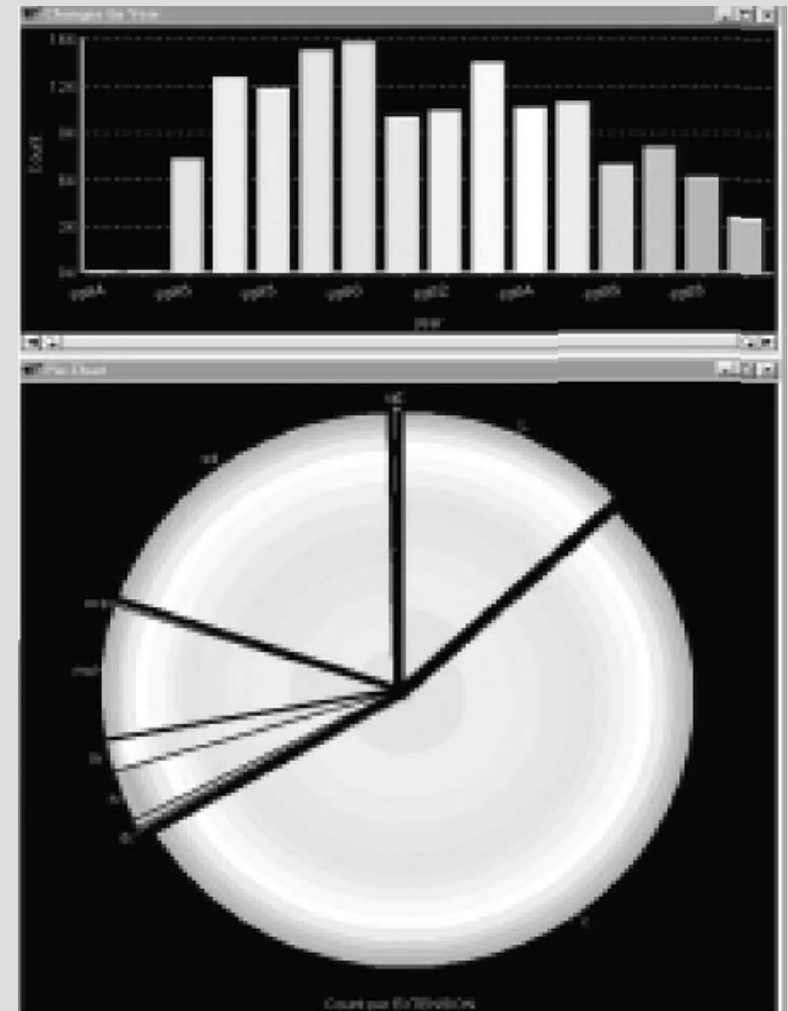
# Cityscape View

- Similar to previous
- Height and colour = number of changes
- Strength
  - “More compelling”
- Weaknesses
  - Decreased scalability
  - Occlusion
- Can use rotation



# Bar and Pie Charts

- Bar = number of changes per year
- Pie = Number of changes per file type
- Strength
  - Trends
  - Common
- Weakness
  - Bar: overplotting
  - Pie: don't zoom



# Data Sheets

- Changes by subsystem
- Changes by module
- Strength
  - Very specific
  - Zoom out see trends (bottom)
  - Immediate access to data
- Weakness
  - Can be too specific and overwhelming





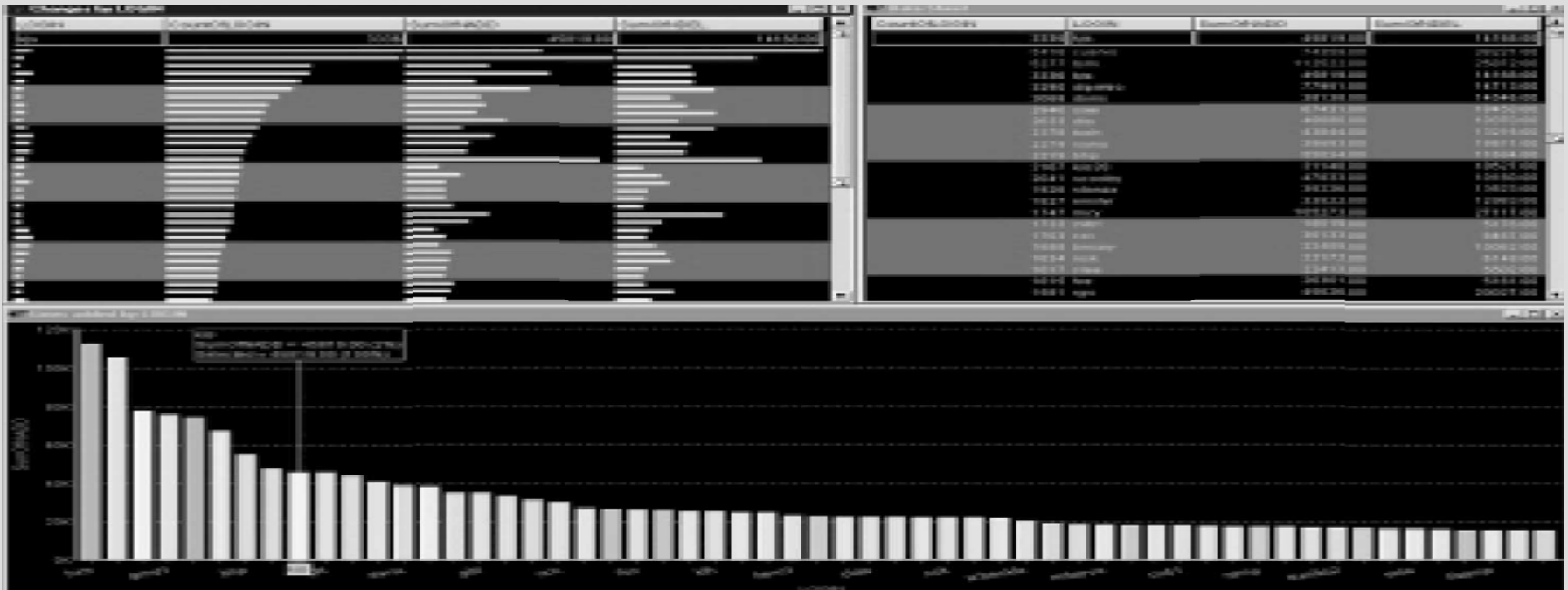
# Network Views

- Relationships between files based on IMR
- Strength
  - Abstract, High-level
  - Shows structure
    - Hierarchical, function calls, etc
- Weakness
  - Link overplotting
  - Scalability
  - Single characteristics
- Can use movement to make links obvious



# Perspectives

- Allow the domain expert to clip together views
- Changes and selection can be linked
- 90-10 of added lines for developers



# Strengths

- Paper Structure: abstract to concrete
- Visualizations help find trends that would be difficult to locate using other techniques
- Practical application to management problems
- Creation of perspectives from linking views

# Weaknesses

- Difficult to understand the views without an example of why it is interesting
- Could not read labels in views
  - Relied on text description instead of purely interpreting visualizations (IEEE colour)
- Given a data set would SQL and scripts provide more interesting results than vis techniques?
- Do you see what you want to see?
  - Especially matrix and cityscapes