Motivation

Problem 1: High maintenance cost
Poor documented specs ⇒ High maint. costs.

Problem 2: Issues with software reliability
Incorrect software wastes billions of dollars.
Formal specs to verify against often unavailable.

One Solution: Software Specification Mining
Discovery of software specs from execution traces, code and other soft. artifacts

Software Specifications

• Description of how a software system should behave.
• Comes in various forms and formalisms.
• Capture different aspects of software design and implementation decisions.
• Various forms of specifications:
  - Sequence Diagrams (formal & informal)
  - Temporal Rules and Constraints (formal)
  - Finite State Machines (formal)
  - Frequent Usage Patterns (informal)

Research Directions

Current/Future Work

• Extended Case Studies
• Extended Applications of Techniques in:
  - Security and Intrusion Detection
  - Program Verification, Testing, Debugging
  - Program Comprehension, Re-Engineering
• Visualization of Mined Specifications
• Analysis and Reasoning on Mined Specs

References

• D. Lo, S. Maoz. Mining Scenario-based Triggers and Effects. ASE’08.
• D. Lo, S-C. Khoo. SMARTIC: Towards Building an Accurate, Robust and Scalable Spec. Miner. FSE’06.

X11 Windowing System - Xlib, XToolkit

Windows WDK CancelSpinLock Rule:
“A device driver needs to call IoAcquireCancelSpinLock before calling IoReleaseCancelSpinLock and it needs to call IoReleaseCancelSpinLock before any subsequent calls to IoAcquireCancelSpinLock.”

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Sequence Diagrams

Automata

Temporal Rules or Ordering Constraints

Frequent Patterns

X: XNextEvent (time = X21_0)
B: XNextEvent (time = X21_0) or B = XDispatchEvent (time = X21_0)
C: XDispatchEvent (time = X21_0) or C = XLatTimeProcessed (time = X21_0)
D: XGetSelectionOwner
E: XGetSelectionOwner (time = X21_0)
F: XActivateSelectionOwner (time = X21_0)
G: XActivateSelectionOwner (time = X21_0)
H: XInitializeAtom

Resource Allocation:
“Whenever a resource is allocated, eventually it needs to be released”

Transaction Manager Set Up

Transaction Set Up

Transaction Disposal

Transaction Manager

IoAcquireCancelSpinLock

IoReleaseCancelSpinLock

IoGetThreadLocal

IoPutThreadLocal

IoFactory.

Xlibfactory.

X Toolkit.

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