Automated Test Oracles for GUIs

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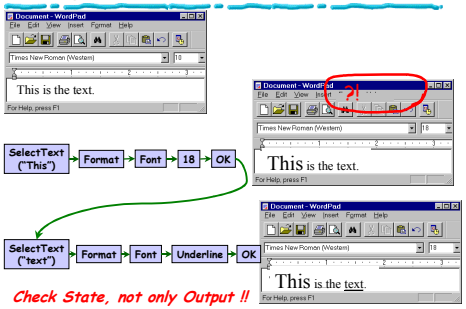
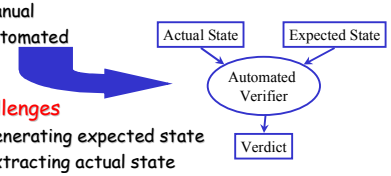
What Is Correct Behavior



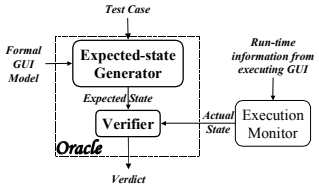
Research Focus

- Goal
  - To check the GUI's state after each event
- Approaches
  - Manual
  - Automated



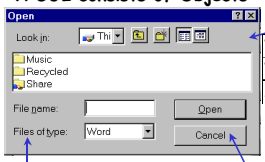
- Challenges
  - Generating expected state
  - Extracting actual state
  - Comparing expected & actual states

Overview of GUI Oracle



Modeling the GUI

A GUI consists of Objects

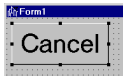


Form	
Window State	wsNormal
Width	1088
AutoScroll	TRUE

Label	
Align	alNone
Caption	Files of type:
Color	clBtnFace
Font	(tFont)

Button	
Caption	Cancel
Enabled	TRUE
Visible	TRUE
Height	65

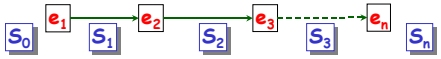
All Properties of Cancel



Deriving Expected State

- Given S_0, the initial state,
- A sequence of events

- Obtain $S_1 = [S_0, e_1]$
- And $S_i = [S_{i-1}, e_i]$

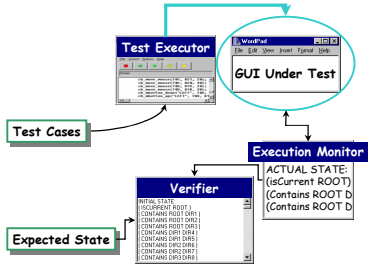


Obtaining Actual GUI's State

- Execution Monitor
  - Screen Scraping
  - Queries
  - Compatible with Expected State
  - Returns <Object, Property, Value>

<Button1, "Caption", "Cancel">

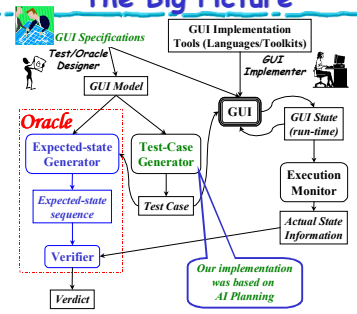
Automated Execution



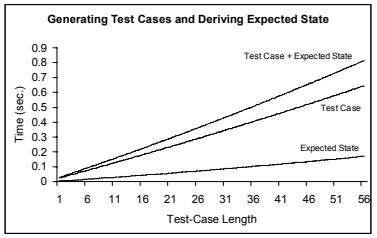
Comparing Actual and Expected States

- Verifier
- Three Levels of Testing
  - Changed Property Set *(Operators)*
  - GUI Relevant Property Set *(Specifications)*
  - Complete Property Set *(Toolkit/Language)*
- Hybrid Approach
  - Use all 3

The Big Picture



Deriving Expected State



Total CPU time (test case and expected state)
75.84 sec.

Further Reading: Publications

- ✓ Atif M. Memon, Martha E. Pollack and Mary Lou Soffa, **Automated Test Oracles for GUIs**, *Eighth International Symposium on the Foundations of Software Engineering (FSE-8)*, San Diego, CA, Nov. 6-10, 2000.
- ✓ Atif M. Memon, **A Comprehensive Framework for Testing Graphical User Interfaces**, *PhD Dissertation, University of Pittsburgh*, Pittsburgh, PA, July 2001.