Test Oracles

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Test Oracle

- A test oracle determines whether a system behaves correctly for test execution

- Webster Dictionary - Oracle
  - a person giving wise or authoritative decisions or opinions
  - an authoritative or wise expression or answer

Purpose of Test Oracle

- **Sequential Systems**

  Purpose of Test Oracle

Parts of an Oracle

- **Oracle information**
  - **Specifies what constitutes correct behavior**
    - Examples: input/output pairs, embedded assertions
- **Oracle procedure**
  - **Verifies the test execution results with respect to the oracle information**
    - Examples: equality
- **Test monitor**
  - **Captures the execution information from the run-time environment**
    - Examples
      - Simple systems: directly from output
      - Reactive systems: events, timing information, stimuli, and responses

Approach

- Test class
  - Set of test data described by a condition that constrains input data and the initial system state
- Every test class will have an explicitly represented test oracle
- Results are monitored and verified against the oracle corresponding to all test classes satisfied for the test data

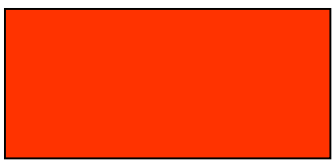
Phases of the Approach

- Oracle derivation
  - From specifications for each test class
- Monitoring test execution
- Mapping and applying the oracle procedure to the execution results

GUI Test Cases

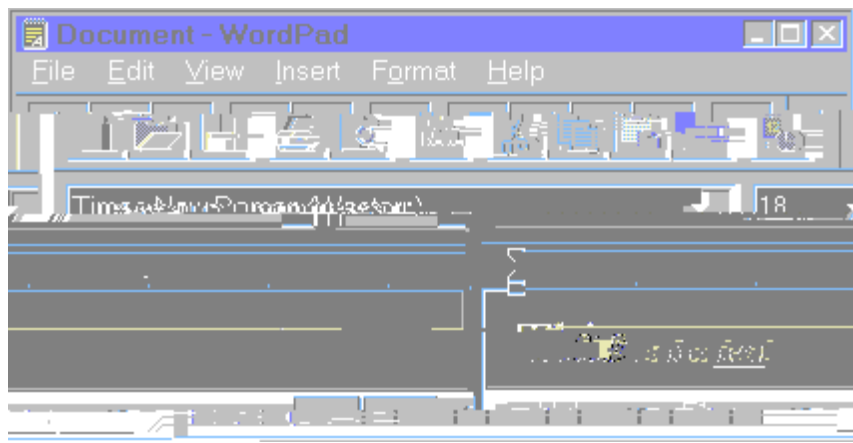
- GUI Test Case
  - Sequence of events

A Test Case for WordPad



What Is Correct Behavior

This is the text.



Outline

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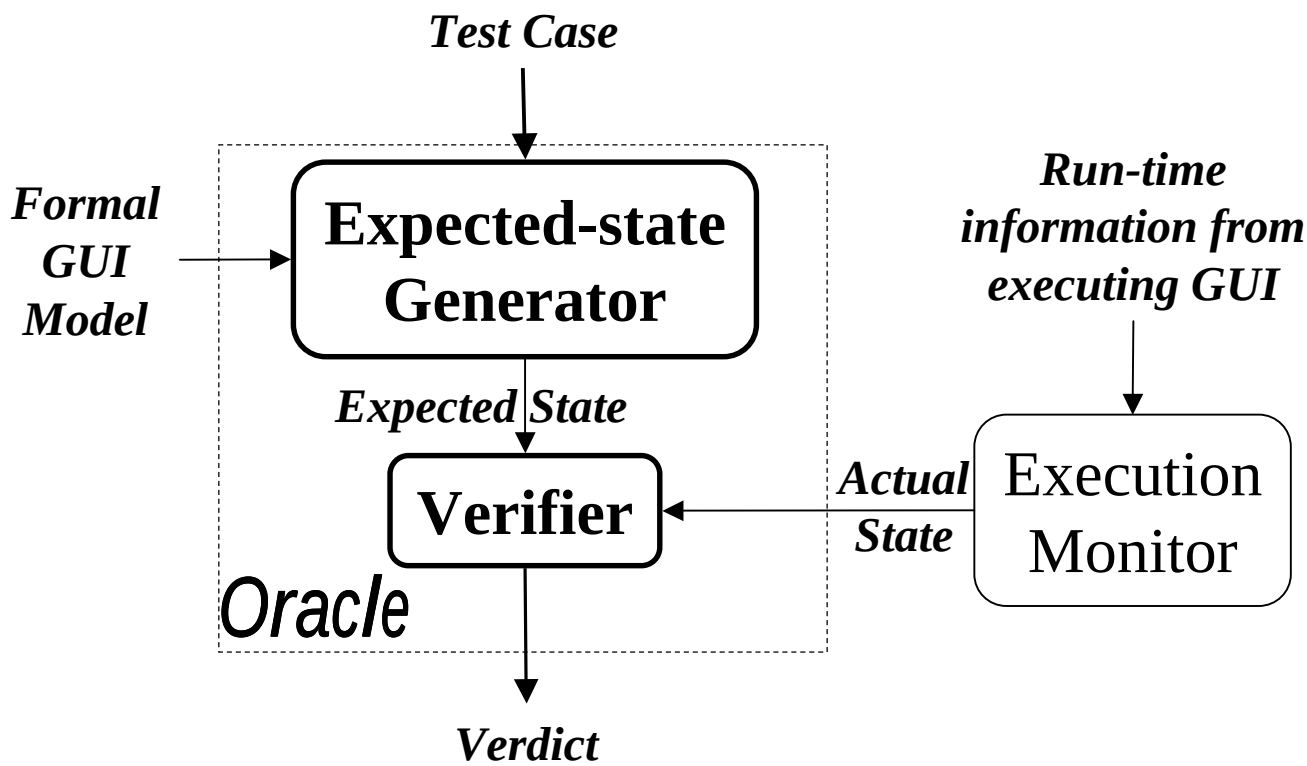
Overview of GUI Oracle



Modeling Events

- Events are State Transducers

Representing Events

- **We define an event as:**

$$State_j \; j \; Tm \; 0.90 \; 0.91 \; 1.72 \; 1.48 \; 2.4 \; 5 \; rg \; 0 \; Tc \; 0 \; T$$

Operator ::

Deriving Expected State

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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
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