
Test Oracles; Planning Ahead for Test Automation

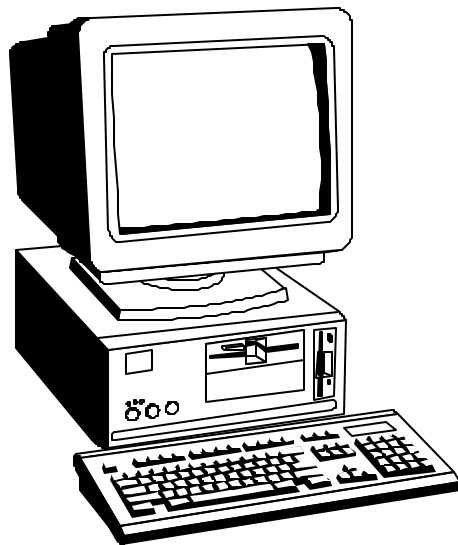
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Test Automation

is not just machines running tests!

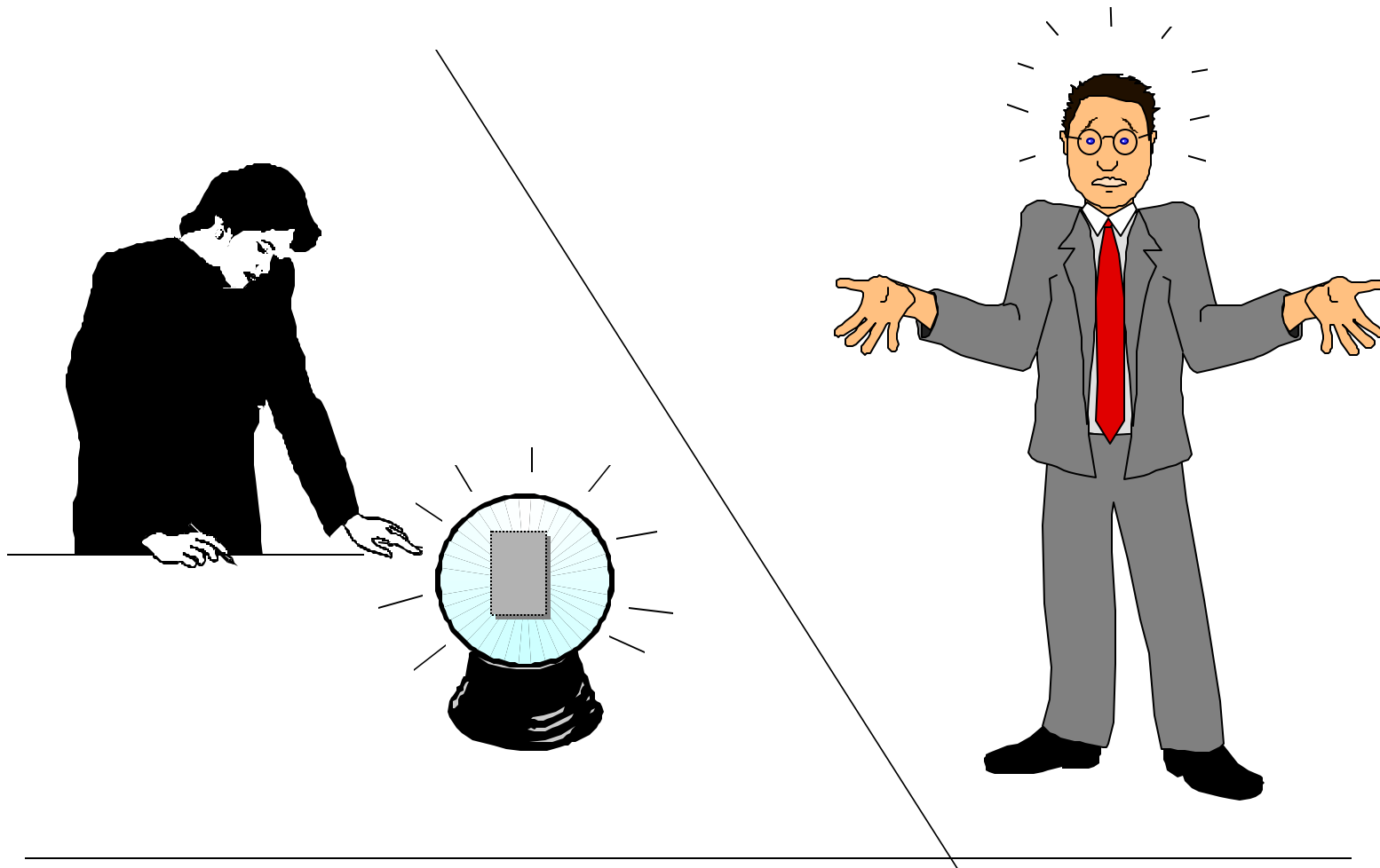


Test Automation

includes interpreting results!



Test Oracles



Human Oracles

- Norm for manual testing
- Sometimes slower than computers
- Can't observe system internals
- Loses concentration
- Easily “trained” to overlook errors
- Not Automated

Computer Oracles

- Facilitate manual verification
- Provide expected outcomes
- Machine generate in machine form
- Allow automated comparison of results

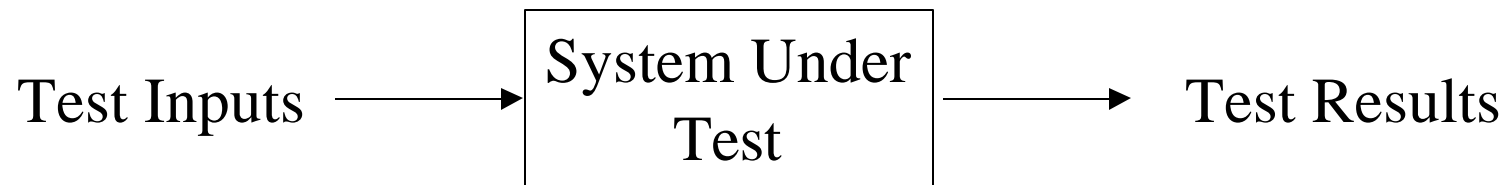
Prerequisites for Automation

- Test case organization
- Automated test execution
- Test results capture
- Machine readable expected outcomes
- Automated comparison of results

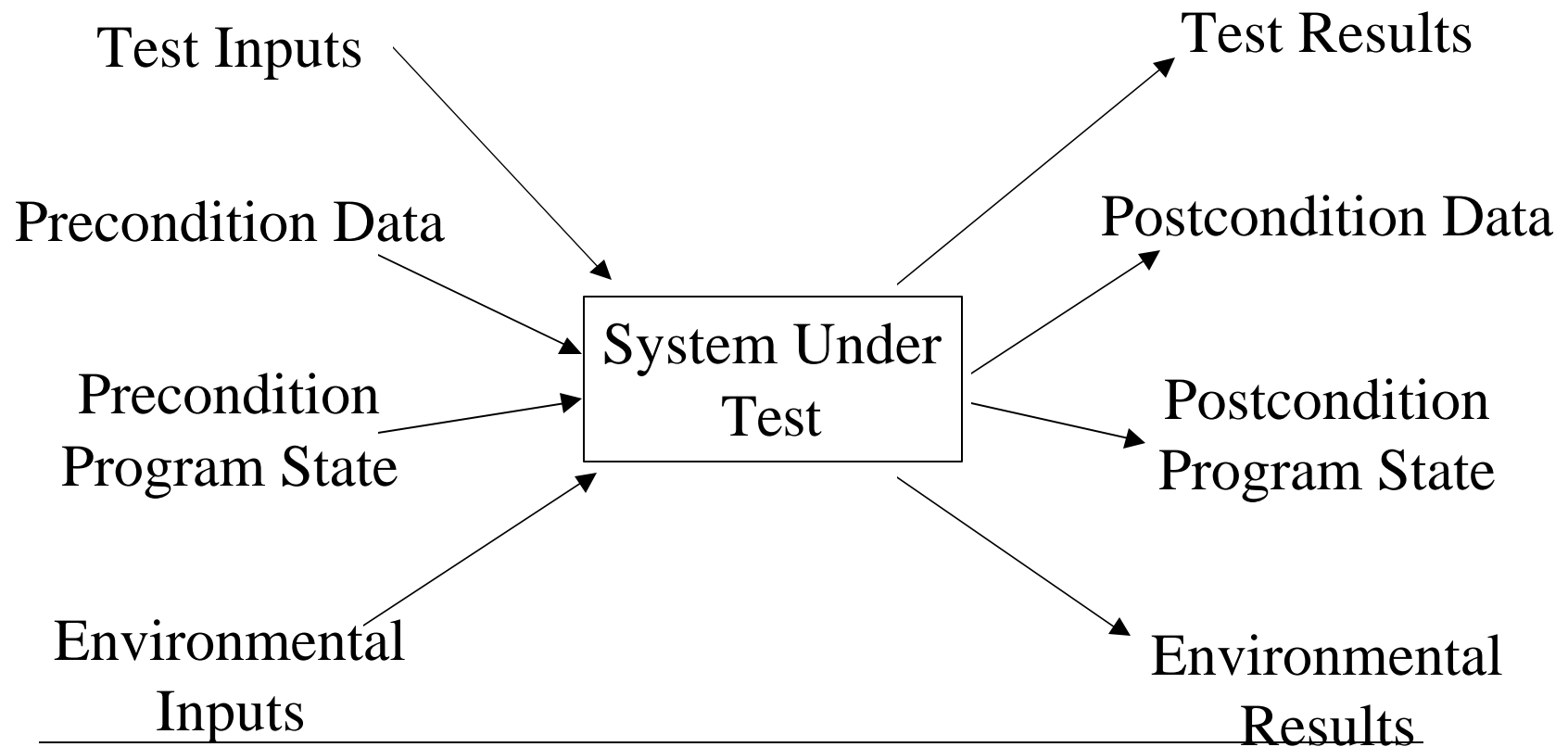
Modeling the SUT

- Inputs
- Processes
- Outputs
- Memory
- Side effects

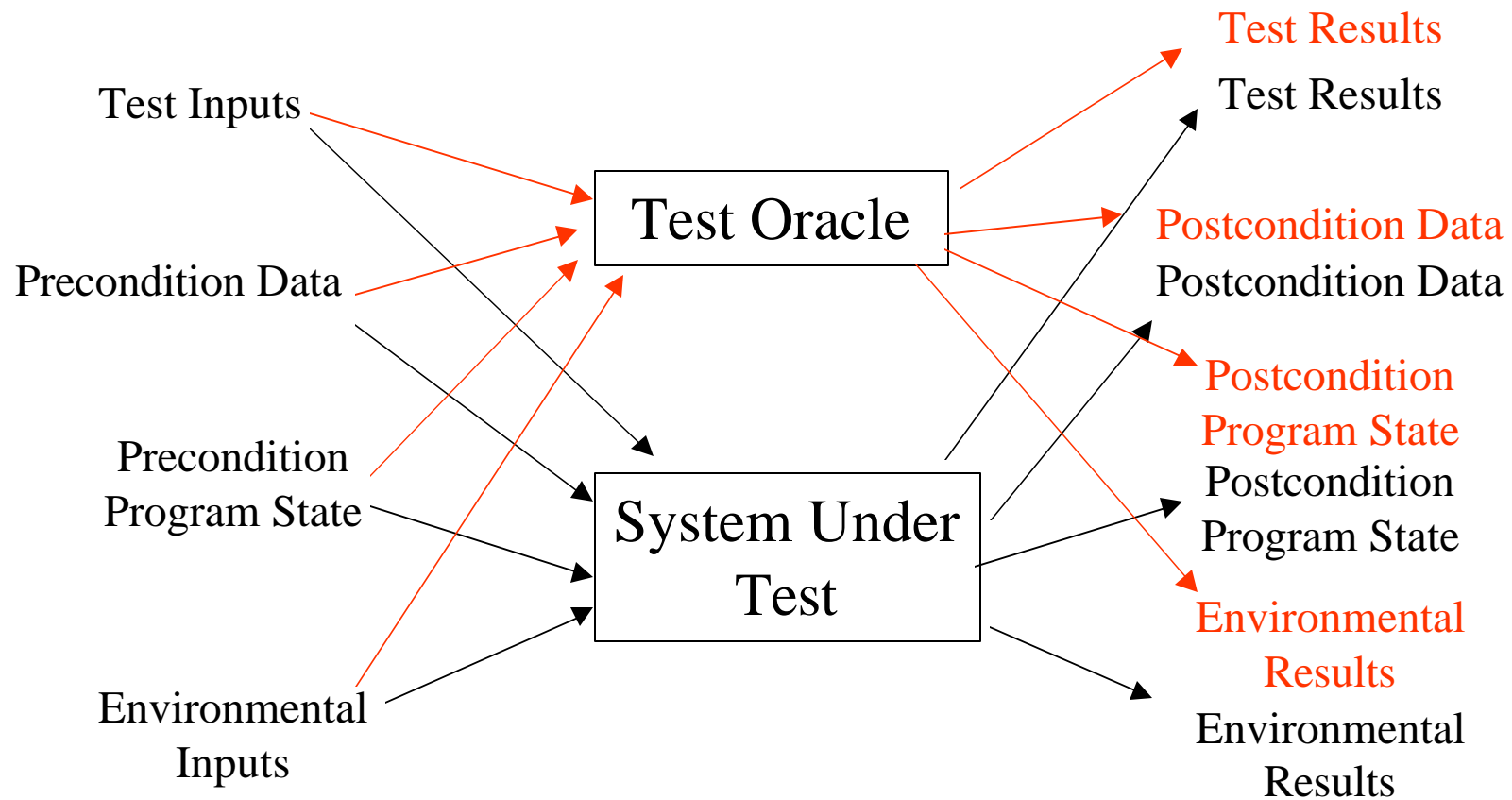
I-P-O Testing Model (Black Box)



Expanded Testing Model (Black Box)



Testing Model With Oracle



Automation Architecture

- SUT
- Monitoring tools
- ‘Interesting’ inputs, outputs, data, state, and environment characteristics
- Test running
- Results capture
- Results comparison, analysis, and reporting

Oracles Modeled in Testing

- Differ based on SUT
- May be more than one oracle for SUT
- Inputs may effect more than one oracle
- Oracle only produces some results

Oracle Characteristics

- Completeness of information from oracle
- Accuracy of information from oracle
- Independence of oracle from SUT
 - Algorithms
 - Sub-programs and libraries
 - System platform
 - Operating environment

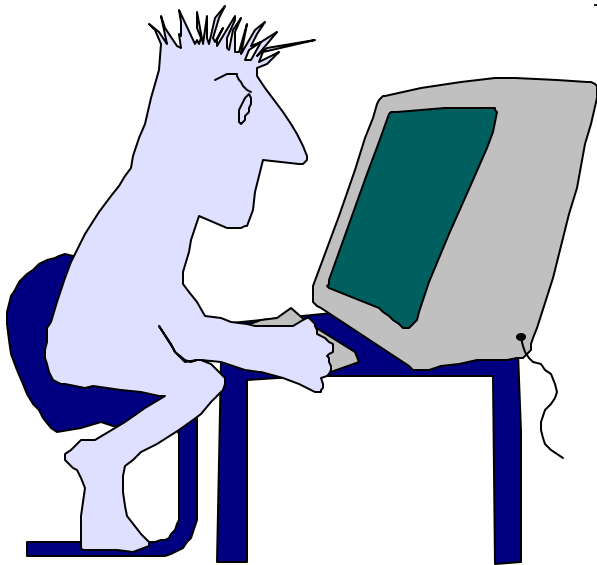
Oracle Characteristics

(continued)

- Speed of predictions
- Time of execution of oracle
- Usability of results
- Correspondence (currency) of oracle through changes in the SUT

Running An Oracle

- Type of results
- Time of running
- Method of verification
 - Manual
 - Automated
 - With test case
 - With automated test environment



Oracle Limitations

- Oracle may become as complex as SUT
- More complex oracles make more errors
- Close correspondence reduces maintainability
- Close correspondence makes common mode faults likely

Conclusions

- Different types of oracles possible
- Some kind of oracle needed to automate tests
- Oracle is not constrained like SUT
- Solutions differ with SUT
- Oracles are critical part of automation

