AutoInSpec: Using Missing Test Coverage to Improve Specifications in GUIs

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Abstract: Developers of a software's graphical user interface (GUI) often fail to document the interface specifications. Without these, models used for automated test generation and execution remain imperfect and incomplete. This leads to unexpected behavior that creates unrecoverable situations for test harnesses, and missed coverage. In this paper, we present AutoInSpec, a technique to infer an important class of specifications, temporal and state-based invariants between GUI events that have been incorrectly modeled. Unlike existing specification mining approaches that require full execution traces, or source code, and that mine all invariants, we simplify the problem. We guide AutoInSpec with coverage criteria and use a previously developed repair framework that builds coverage-adequate test suites, removing unexecutable sub-sequences from consideration. These failing sub-sequences are input to a logic-based inference engine, armed with known invariant templates, to obtain the missing specifications. We validate AutoInSpec on a set of well studied GUI applications.