Fault Localization & Relevance Analysis

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Definition 1 (Execution). *Let π be an error trace of length n. An execution of π is a sequence of states $s_0, s_1...s_n$ such that $s_i, s_{i+1} \models T$, where T is the transition formula of $\pi[i]$.*
Let ϵ represent the set of all possible executions of the error trace.

Definition 2 (Blocking Execution). *An execution of a trace π of size n is called a blocking execution if there exists a sequence of states $s_0, s_1...s_j$ where $i < j \leq n$ such that $s_i, s_{i+1} \models T[i]$, where $T[i]$ is the transition formula of $\pi[i]$ and there exits an assume statement in the trace π at position j such that $s_j \not\models guard(\pi[j])$.*

Definition 3 (Relevancy of an assignment statement). *Let β represent the set of all blocking executions of a trace π. Let there be an assignment statement of the form $x := t$ at position i. Let π' represent the trace that we get after replacing $\pi[i]$ with a havoc statement of the form $havoc(x)$ and let β' represent the set of all blocking executions for π'.*
We say that the assignment statement $\pi[i]$ is relevant if the trace after the replacement has strictly more blocked executions than the trace before the replacement, i.e if $\beta \subsetneq \beta'$.

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