B Mathematical Definition of Term Coverage

The definition of Term Coverage is based on definitions of test classes, test frames, frame stimuli, and test class normal form [2]. The definition of Term Coverage expresses a relationship between frame stimuli within test frames and the frame stimuli of a test class normal form of the specification. The mathematical definition of Term Coverage follows.

The following definitions are assumed:

- Let $C_i, 1 \leq i \leq n$, represent the n test classes of specification Q, i.e., $Q = C_1 \wedge ... \wedge C_n$.
- Let c_i represent the test class antecedent of C_i.
- Let $\mathrm{Conj}(E)$ represent the set of conjuncts in an expression E.

Now, let $S(E)$ represent the set of frame stimuli in the test class normal form of an expression, E, i.e.,

$$S = \{s | \exists i . C_i \in \mathrm{Conj}(TC(E)) \wedge s \in FS(c_i)\},$$

where TC is the test class algorithm and $FS(c)$ represents the set of frame stimuli obtained from the test class antecedent, c, as determined by the test frame generation algorithms [2].

Let f_{ik} represent the antecedent of the k^{th} test frame F_{ik} derived from C_i, i.e.,

$$\forall ik.(f_{ik} \Rightarrow c_i) \wedge \forall e.(e \Rightarrow c_i) \Rightarrow \mathrm{Conj}(e) \not\subset \mathrm{Conj}(f_{ik}). \quad (1)$$

Equation (1) states that F_{ik} is a valid test frame of test class C_i and f_{ik} is a prime implicant. The F_{ik} test frames satisfy Term Coverage of a specification, E, when:

$$\forall s \in S(E). \exists ik . s \in \mathrm{Conj}(f_{ik}). \quad (2)$$

An alternative variation of Term Coverage is where the coverage of the F_{ik} test frames is measured relative to each individual test class rather than the specification as a whole:

$$\forall i . C_i \in \mathrm{Conj}(TC(E)) \Rightarrow \forall s \in S(C_i). \exists k . s \in \mathrm{Conj}(f_{ik}). \quad (3)$$