

Existential Paths of Function Sets

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An existential path of a function set or a family is a generalization of existential path of a single function. It tells whether any function in the set returns a value.

$$f : [A \rightarrow B]$$

$$\exists f : B \rightarrow \text{bool}$$

$$\exists f := \lambda(x : B) = \exists i \{ (\exists f_i)(x) \}$$

For example, for a function f_0 and a function f_1 has the existential path:

$$\exists[f_0, f_1] \iff \exists f_0 \vee \exists f_1$$

This can be used in non-deterministic path semantics by picking a random function from the set.

$$\lambda(x) = f[\text{floor}(\text{random}() * \text{len}(f))](x)$$