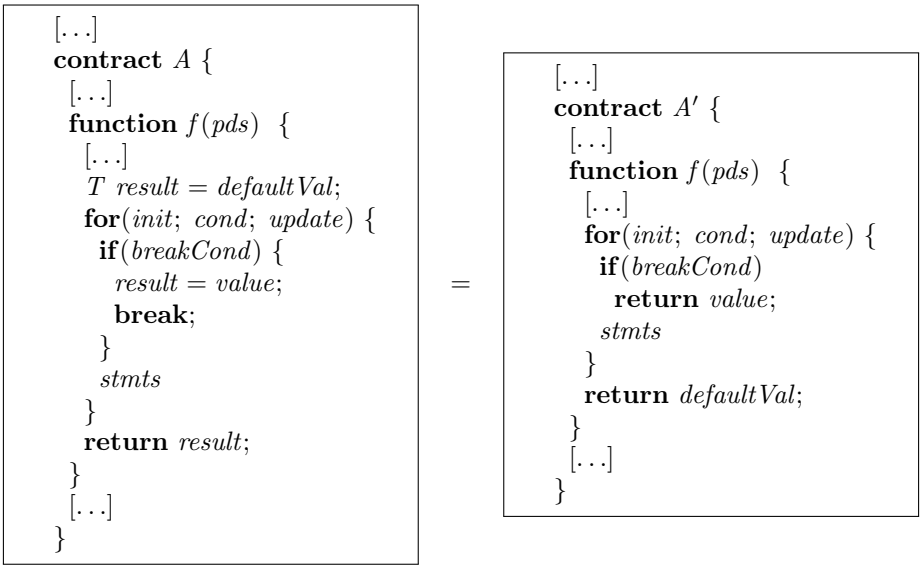
Rule 0.31 ⟨*Redundant Control Flow Removal (Break to Early Return)*⟩



where

breakCond is a boolean condition that triggers early loop termination;

T is the return type of function f;

result is a local variable of type T used to store the return value;

value is the expression assigned to *result* when *breakCond* is true;

defaultVal is the default return value when the loop completes normally;

init, *cond*, and *update* are the loop initialization, condition, and update expressions;

stmts represents the remaining statements in the loop body;

is the return type declaration.

provided

The only purpose of *result* is to store a value for return after the loop;

result is not read or modified elsewhere in the function after the loop;

The **break** statement is immediately executed after assigning to *result*;

No cleanup or finalization code exists between the loop and the return statement;

breakCond, *value*, and *defaultVal* have no side effects that affect program state.

Invariant:

Let s_i and s_i' be the initial state of A and A', respectively.

Let s_f and s_f' be the state reached by A and A', respectively, after $A.f()$ and $A'.f()$ are executed from s_i and s_i', respectively.

Then, the coupling invariant is

$$\forall\, s_i, s_i' \;.\; (s_i = s_i') \rightarrow (s_f = s_f')$$