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1  ---------- MODULE OTMC ----------
   (* Model checking the OT functions defined in the OT module.
      The OT functions are expected to satisfy both the CP1 property and the generalized CP1 property. *)
8  EXTENDS OT, TLC, AdditionalSequenceOperators

   (* Constants for finite/bounded model checking. *)
13 CONSTANTS MaxPr,    (* max priority *)
14           MaxLen    (* max length of list *)

16 ASSUME /\ MaxPr \in PosInt
17        /\ MaxLen \in Nat

19 ListMaxLen == SeqMaxLen(Char, MaxLen)
20 ==========================

   (* The CP1 (C for Convergence) property.
      TODO: refactor the generation of op1 and op2. *)

   (* Legal operations with respect to a list l. *)
30 InsOp(l) == (* Position of an insertion cannot be too large. *)
31     [type : {"Ins"}, pos : 1 .. Len(l) + 1, ch : Char, pr : 1 .. MaxPr]

33 DelOp(l) ==
34     IF l = <<>>
35      THEN {} (* Not allowed to delete elements from an empty list. *)
36      ELSE [type : {"Del"}, pos : 1 .. Len(l)] (* Position of a deletion cannot be too large. *)
37 OpOnList(l) == InsOp(l) \cup DelOp(l)

39 CP1 ==
40     \A l \in ListMaxLen :
41        \A op1 \in OpOnList(l), op2 \in OpOnList(l) :
42           /\ PrintT(ToString(l) \o ", " \o ToString(op1) \o ", " \o ToString(op2))
43           /\ (* Priorities of these two insertions cannot be the same. *)
44              \/ (op1.type = "Ins" /\ op2.type = "Ins" /\ op1.pr = op2.pr)
45                 (* The CP1 itself. *)
46              \/ ApplyOps(<<op1, Xform(op2, op1)>>, l) = ApplyOps(<<op2, Xform(op1, op2)>>, l)

   (* The generalized CP1 (C for Convergence) property.
      See also Theorem 2.14 of the paper "Imine @ TCS06".
      FIXME: Generate legal operation sequences. *)
55 GCP1 ==
56     \A l \in ListMaxLen, ops1 \in SeqMaxLen(Op, 1), ops2 \in SeqMaxLen(Op, 1) :
57        \/ (Head(ops1).type = "Del" \/ Head(ops2).type = "Del")
58        \/ ApplyOps(ops1 \o XformOpsOps(ops2, ops1), l) =
59           ApplyOps(ops2 \o XformOpsOps(ops1, ops2), l)
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60 \* Modification History
   \* Last modified Sat Jul 07 13:36:50 CST 2018 by hengxin
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