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- Module Chameneos -
A specification of a 'concurrency game' requiring concurrent and symmetrical cooperation -
https://cedric.cnam.fr/fichiers/RC474.pdf
EXTENDS Naturals, Integers, FiniteSets
 number of total meeting after which chameneoses fade
Constant N
Assume N \in Nat
VARIABLE chameneoses, meetingPlace, numMeetings
vars \stackrel{\triangle}{=} \langle chameneoses, meetingPlace, numMeetings \rangle
\begin{array}{ll} Color \; \stackrel{\triangle}{=} \; \{ \text{"blue"}, \; \text{"red"}, \; \text{"yellow"}, \; \text{"faded"} \} \\ Faded \; \stackrel{\triangle}{=} \; \text{CHOOSE} \; c : c \notin Color \end{array}
\begin{array}{ll} \textit{ChameneosID} & \triangleq 1 \dots 4 \\ \textit{MeetingPlaceEmpty} & \triangleq \texttt{CHOOSE} \ e : e \notin \textit{ChameneosID} \end{array}
RECURSIVE Sum(\_, \_)
Sum(f, S) \stackrel{\triangle}{=} IFS = \{\} THEN 0
                                  ELSE LET x \triangleq \text{CHOOSE } x \in S : \text{TRUE}
                                           IN f[x] + Sum(f, S \setminus \{x\})
TypeOK \stackrel{\triangle}{=} \land chameneoses \in [ChameneosID \rightarrow (Color \cup \{Faded\}) \times (0 ... N)]
                  \land meetingPlace \in ChameneosID \cup \{MeetingPlaceEmpty\}
Complement(c1, c2) \stackrel{\triangle}{=} \text{ if } c1 = c2 \text{ then } c1 \text{ else choose } cid \in Color \setminus \{c1, c2\} : \text{true}
Meet(cid) \stackrel{\Delta}{=} \text{IF } meetingPlace = MeetingPlaceEmpty
                    Then if numMeetings < N
                                      chameneos enters meeting empty meeting place
                               THEN \land meetingPlace' = cid
                                        ∧ UNCHANGED ⟨chameneoses, numMeetings⟩
                                         chameneos takes on faded color
                               ELSE \land chameneoses' = [chameneoses EXCEPT ! [cid] = \langle Faded, @[2] \rangle]
                                        ∧ UNCHANGED ⟨meetingPlace, numMeetings⟩
                               meeting place is not empty - two chameneoses mutate
                     ELSE \land meetingPlace \neq cid
                              \land meetingPlace' = MeetingPlaceEmpty
                              \land chameneoses' = LET newColor \stackrel{\triangle}{=} Complement(chameneoses[cid][1], chameneoses[m
                                                              [chameneoses EXCEPT ![cid] = \langle newColor, @[2] + 1 \rangle,
                                                                                               ![meetingPlace] = \langle newColor, @[2] + 1 \rangle]
                              \land numMeetings' = numMeetings + 1
Init \triangleq \land chameneoses = [c \in ChameneosID \mapsto \langle \langle \text{"blue"}, \text{"red"}, \text{"yellow"}, \text{"blue"} \rangle [c], 0 \rangle]
            \land meetingPlace = MeetingPlaceEmpty
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 $\wedge numMeetings = 0$

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repeatedly try to enter meeting place for chameneoses that are not faded yet Next \stackrel{\triangle}{=} \land \exists \ c \in \{x \in ChameneosID : chameneoses[x][1] \neq Faded\} : Meet(c) Spec \stackrel{\triangle}{=} Init \land \Box[Next]_{vars} SumMet \stackrel{\triangle}{=} numMeetings = N \Rightarrow \text{LET} \ f[c \in ChameneosID] \stackrel{\triangle}{=} chameneoses[c][2] \text{IN} \quad Sum(f, \ ChameneosID) = 2 * N
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