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1 CONTEXT
2   Car_C1
3 EXTENDS
4   ControlledSystemCtx
5 CONSTANTS
6   stabilizing
7   accelerating
8   braking
9   nearing_stop
10  stopped
11  A
12  b
13  v0
14  SP
15  f2_speed
16  f1_deceleration
17  f1_stable
18  f1_acceleration
19  f_deceleration
20  f_stable
21  f_acceleration
22  eod
23 AXIOMS
24  axm1: partition(STATES, {stabilizing}, {accelerating}, {braking}, {nearing_stop}, {stopped})
25  axm2: A ∈ RReal
26  axm3: Rzero ↦ A ∈ lt
27  axm4: b ∈ RReal
28  axm5: Rzero ↦ b ∈ lt
29  axm51: b ≠ Rzero
30  axm6: v0 ∈ RReal
31  axm7: Rzero ↦ v0 ∈ lt
32  axm8: SP ∈ RReal
33  axm9: Rzero ↦ SP ∈ lt
34  axm154: f2_speed ∈ (RRealPlus × S) → RReal
35  axm155: f2_speed = (λt_ ↦ (v_ ↦ x_) · t_ ∈ RRealPlus ∧ (v_ ↦ x_) ∈ S | v_)
36  axm156: f1_deceleration ∈ ((RRealPlus × RRealPlus) → (RRealPlus × S → RReal))
37  axm11:
38    ∀t_init, v_init · t_init ∈ RRealPlus ∧ v_init ∈ RRealPlus ⇒ (
39      f1_deceleration(t_init ↦ v_init) =
40        (λt_ ↦ (v_ ↦ x_) · t_ ∈ RRealPlus ∧ (v_ ↦ x_) ∈ S ∧ (t_ ↦ plus(divide(v_init ↦ b) ↦ t_init) ∈ lt) | uminus(b)) ∪
41        (λt_ ↦ (v_ ↦ x_) · t_ ∈ RRealPlus ∧ (v_ ↦ x_) ∈ S ∧ (t_ ↦ plus(divide(v_init ↦ b) ↦ t_init) ∈ geq) | Rzero)
42    )
43  axm10: f_deceleration ∈ ((RRealPlus × RRealPlus) → (RRealPlus × S → S))
44  axm102:
45    ∀t_init, v_init · t_init ∈ RRealPlus ∧ v_init ∈ RRealPlus ⇒ (f1_deceleration(t_init ↦ v_init) ∈ RRealPlus × S → RReal)
46  axm101:
47    ∀t_init, v_init · t_init ∈ RRealPlus ∧ v_init ∈ RRealPlus ⇒
48      f_deceleration(t_init ↦ v_init) = bind(f1_deceleration(t_init ↦ v_init), f2_speed)
49  axm12: f1_stable ∈ (RRealPlus × S → RReal)
50  axm13: f1_stable = (λt_ ↦ (v_ ↦ x_) · t_ ∈ RRealPlus ∧ (v_ ↦ x_) ∈ S | Rzero)
51  axm130: f_stable ∈ (RRealPlus × S → S)
52  axm131: f_stable = bind(f1_stable, f2_speed)
53  axm132: f_stable ∈ C0(RRealPlus × S, S)
54  axm14: f1_acceleration ∈ (RRealPlus × S → RReal)
55  axm15: f1_acceleration = (λt_ ↦ (v_ ↦ x_) · t_ ∈ RRealPlus ∧ (v_ ↦ x_) ∈ S | A)
56  axm150: f_acceleration ∈ (RRealPlus × S → S)
57  axm151: f_acceleration = bind(f1_acceleration, f2_speed)
58  axm152: f_acceleration ∈ C0(RRealPlus × S, S)
59  axm16: ∀t0 · t0 ∈ RRealPlus ⇒ lipschitzContinuous(S, S, partial2(f_stable, t0))
60  axm17: ∀t0 · t0 ∈ RRealPlus ⇒ lipschitzContinuous(S, S, partial2(f_acceleration, t0))
61  axm22: eod ∈ (RRealPlus × RRealPlus → RRealPlus)
62  axm21: eod = (λti ↦ vi · ti ∈ RRealPlus ∧ vi ∈ RRealPlus | plus(divide(vi ↦ b) ↦ ti))
63  axm20:
64    ∀eta1, eta2, t_init, v_init, x_init ·
65      t_init ∈ RRealPlus ∧ v_init ∈ RRealPlus ∧ x_init ∈ RReal ∧
66      eta1 ∈ Closed2Closed(t_init, eod(t_init ↦ v_init)) → S ∧
67      solutionOf(
68        Closed2Closed(t_init, eod(t_init ↦ v_init)), eta1,
69        ode(
70          (λt_ ↦ (v_ ↦ x_) · t_ ∈ RRealPlus ∧ (v_ ↦ x_) ∈ S ∧ (t_ ↦ eod(t_init ↦ v_init) ∈ lt) | (uminus(b) ↦ v_)),
71          (v_init ↦ x_init),
72          t_init
73        )

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73 )∧
74 eta2 ∈ Closed2Infinity(eod(t_init ↦ v_init)) → S∧
75 solutionOf(
76   Closed2Infinity(eod(t_init ↦ v_init)), eta2,
77   ode(
78     (λt_ ↦ (v_ ↦ x_) · t_ ∈ RRealPlus ∧ (v_ ↦ x_) ∈ S ∧ (t_ ↦ eod(t_init ↦ v_init)) ∈ geq) | (Rzero ↦ v_)),
79     eta1(eod(t_init ↦ v_init)),
80     eod(t_init ↦ v_init)
81   )
82 ) ⇒
83   solutionOf(
84     Closed2Infinity(t_init), eta1 ∪ eta2,
85     ode(
86       f_deceleration(t_init ↦ v_init),
87       (v_init ↦ x_init),
88       t_init
89     )
90   )
91 axm153:
92   ∀t_init, v_init, x_init.
93   t_init ∈ RRealPlus ∧ v_init ∈ RRealPlus ∧ x_init ∈ RReal ⇒
94     Solvable(
95       Closed2Infinity(t_init),
96       ode(
97         f_deceleration(t_init ↦ v_init),
98         (v_init ↦ x_init),
99         t_init
100      )
101    )
102

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**END**