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1 MACHINE
2   WaterTank_1Ctrl_1Tank
3 REFINES
4   WaterTank_ode
5 SEES
6   WaterTank_1Tank_Ctx
7 VARIABLES  $t, V, x_s$ 
8 EVENTS
9   INITIALISATION
10  THEN
11    act1:  $t := Rzero$ 
12    act2:
13       $V := |$ 
14         $V' \in RRealPlus \rightarrow S \wedge$ 
15         $solutionOf(RRealPlus, V', ode(NoFlow, V0, Rzero))$ 
16    act3:  $x_s := Stable$ 
17  END
18
19 Progress
20 REFINES Progress
21 THEN
22   act1:  $t := | t' \in RRealPlus \wedge (t \mapsto t' \in lt)$ 
23 END
24
25 Behave
26 REFINES Behave
27 ANY  $e$ 
28 WHERE
29   grd1:  $e \in DE(S)$ 
30   grd2:  $Solvable(Closed2Infinity(t), e)$ 
31 THEN
32   act1:  $V := | V' \in RRealPlus \rightarrow S \wedge AppendSolutionBAP(e, RRealPlus, Closed2Open(Rzero, t), Closed2Infinity(t), V, V')$ 
33 END
34
35 ctrl_sense_too_high
36 REFINES ctrl_sense_too_high
37 WHERE
38   grd1:  $Vhigh \mapsto V(t) \in leq$ 
39 THEN
40   act1:  $x_s := Emptying$ 
41 END
42
43 ctrl_sense_too_low
44 REFINES ctrl_sense_too_low
45 WHERE
46   grd1:  $V(t) \mapsto Vlow \in leq$ 
47 THEN
48   act1:  $x_s := Filling$ 
49 END
50
51 ctrl_transition_emptying
52 REFINES ctrl_transition_emptying
53 WHERE
54   grd1:  $Vlow \mapsto V(t) \in lt$ 
55 THEN
56   act1:  $x_s := Emptying$ 
57 END
58
59 ctrl_transition_filling
60 REFINES ctrl_transition_filling
61 WHERE
62   grd1:  $V(t) \mapsto Vhigh \in lt$ 
63 THEN
64   act1:  $x_s := Filling$ 
65 END
66
67 ctrl_transition_normal
68 REFINES ctrl_transition_normal
69 WHERE
70   grd1:  $Vlow \mapsto V(t) \in lt$ 
71   grd2:  $V(t) \mapsto Vhigh \in lt$ 
72 THEN
73   act1:  $x_s := Normal$ 

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74  END
75
76  ctrl_transition_stable
77  REFINES ctrl_transition_stable
78  WHERE
79    grd1:  $V_{low} \mapsto V(t) \in lt$ 
80    grd2:  $V(t) \mapsto V_{high} \in lt$ 
81  THEN
82    act1:  $x_s := Stable$ 
83  END
84
85  ctrl_actuate_pumps
86  REFINES ctrl_actuate_pumps
87  ANY  $ss, io$ 
88  WHERE
89    grd4:  $ss \in STATES$ 
90    grd5:  $x_s = ss$ 
91    grd6:  $io \in SingleTankPolicy(ss)$ 
92  WITH
93     $\Phi: \Phi = flowIO(Rzero, Vmax, delta\_in, delta\_out)(io)(t \mapsto V(t))$ 
94  THEN
95    act1:
96       $V:|$ 
97       $V' \in RRealPlus \rightarrow S \wedge$ 
98      AppendSolutionBAP(
99        ode(flowIO(Rzero, Vmax, delta_in, delta_out)(io)(t  $\mapsto$  V(t)), V(t), t),
100      RRealPlus,
101      Closed2Open(Rzero, t), Closed2Infinity(t),
102      V, V'
103    )
104  END
105
106  END

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