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| **2007** | **2015** |
| Мячик | |
| y=10;  v'=-g;  y'=v;  vzlet [y<0] is  v'=-g;  y'=v;  v=-v;  from;  padenie [v<0] is  v'=-g;  y'=v;  from; | const g =9.81;  v' = -g;  y' = v;  y (0) = 10;  state vzlet (y<0) {  v' = -g;  y' = v;  set v = -v;  } from init, padenie;  state padenie (v<0) {  v' = -g;  y' = v;  } from init, vzlet; |
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| Седло | |
| L1=1.725;  L2=-1.725;  x1=0.001;  x2=1;  x1'=L1\*x1; // äèôôåðåíöèàëüíûå óðàâíåíèÿ, îïèñûâàþùèå  x2'=L2\*x2; // äèíàìèêó ñèñòåìû  // îïåðàòîðû, ìåíÿþùèå ÍÓ (âîçìîæíû 4 êîìáèíàöèè)  st1 [ (x1<1) and (x2<0.001 1)] is // + -  x1=0.001;  x2=1;  from init, st4;  st2 [ (x1>1) and (x2<0.001)] is // - +  x1=-0.001;  x2=-1;  from st1;  st3 [ (x1<-1) and (x2>-0.001) ] is // + +  x1=0.001;  x2=-1;  from st2;  st4 [ (x1>1) and (x2>-0.001) ] is // - -  x1=-0.001;  x2=1;  from st3; | const L1=1.725;  const L2=-1.725;  x1'=L1\*x1; // äèôôåðåíöèàëüíûå óðàâíåíèÿ, îïèñûâàþùèå  x2'=L2\*x2; // äèíàìèêó ñèñòåìû  x1 (0)=0.001;  x2 (0)=1;  // îïåðàòîðû, ìåíÿþùèå ÍÓ (âîçìîæíû 4 êîìáèíàöèè)  state st1 ( x1<1 && x2<0.0011 ){ // + -  set x1=0.001;  set x2=1;  } from init, st4;  state st2( x1>1 && x2<0.001) { // - +  set x1=-0.001;  set x2=-1;  } from st1;  state st3 (x1<-1 && x2>-0.001) { // + +  set x1=0.001;  set x2=-1;  } from st2;  state st4 ( x1>1 && x2>-0.001 ){ // - -  set x1=-0.001;  set x2=1;  }from st3; |
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| 2 бака | |
| H=0.39;  d1=0.12; d2=0.05;  TIME1=60; TIME2=85;  Lplus=0.9; Lminus=0.3;  // âõîäíîé ïîòîê 400 ë/÷ = 400/3600 ë/ñ = 400/3600000 ì3/ñ = 1.11111E-4 ì3/ñ  VInput=1.11111E-4;  p1=80; p2=80;  macro S1 = Pi\*d1\*d1/4;//Pi\*pow(d1/2, 2);  macro S2 = Pi\*d2\*d2/4;//Pi\*pow(d2/2, 2);  macro K1 = 0.000185\*exp(-0.000006 \*pow(p1, 3))\*L1;  macro K2 = 0.000226\*exp(-0.0000057\*pow(p2, 3))\*L2;  macro V12 = K1\*sqrt(h1-(h2-H)\*B);  macro Vout= K2\*sqrt(h2);  h1'=(VInput - V12)/S1;  h2'=(V12 - Vout)/S2;  p1~=max(0, min(p1, 80));  p2~=max(0, min(p2, 80));  if (h2>H) then B~=1; endif;  if (h2<=H) then B~=0; endif;  if (p1<80) then L1~=1; endif;  if (p1>=80) then L1~=0; endif;  if (p2<80) then L2~=1; endif;  if (p2>=80) then L2~=0; endif;  V12closed [TIME>0] is  p1'=0;  from init;  openV12 [TIME>TIME1] is  p1'=-1;  from V12closed;  openVout [TIME>TIME2] is  p1'=-1;  p2'=-1;  from openV12;  full [(h2>=Lplus)] is  p1'=-1;  p2'=-1;  from openVout, empty;  empty [(h2<=Lminus)] is  p1'=-1;  p2'= 1;  from full; | const H = 0.39;  const d1 = 0.12;  const d2 = 0.05;  const TIME1 = 60;  const TIME2 = 85;  const L\_plus = 0.9;  const L\_minus = 0.3;  VInput = 1.11111E-4;  p1'=0; p2'=0;  p1(0)= 80; p2(0)= 80;  S1 = pi\*pow(d1, 2)/4;  S2 = pi\*pow(d2, 2)/4;  K1 = 0.000185\*exp(-0.000006\*pow(p1, 3))\*L1;  K2 = 0.000226\*exp(-0.0000057\*pow(p2, 3))\*L2;  V12 = K1\*sqrt(h1-(h2-H)\*B);  Vout = K2\*sqrt(h2);  B = 0;  L1 = 0;  L2 = 0;  h1'= (VInput - V12)/S1;  h2'= (V12 - Vout)/S2;  TIME'=1;  st = 0;  if (h2 > H) { B = 1; }  if (h2 <= H) { B = 0; }  if (p1 < 80) { L1 = 1; }  if (p1 >= 80) { L1 = 0; }  if (p2 < 80) { L2 = 1; }  if (p2 >= 80) { L2 = 0; }  if (p1 < 0) {set p1=0.00001; p1'=0;}  if (p2 < 0) {set p2=0.00001; p2'=0;}  //p1 = max(0, min(p1, 80));  //p2 = max(0, min(p2, 80));  state V12closed (TIME > 0) {  p1'= 0;  st = 1;  } from init;  state V12open (TIME > TIME1) {  p1'= -1;  st = 2;  } from V12closed;  state VoutOpen (TIME > TIME2) {  p1'= -1;  p2'= -1;  st = 3;  } from V12open;  state full (h2 >= L\_plus) {  p1'= -1;  p2'= -1;  st = 4;  } from VoutOpen, empty;  state empty (h2 <= L\_minus) {  p1'= -1;  p2'= 1;  st = 5;  } from full; |
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| 2 массы | |
| k1=1; k2=2;  n1=1; n2=2;  m1=1; m2=1;  x1=0;  x2=3;  separate [st<abs(k1\*n1-k2\*n2-x1\*(k1-k2))] is  st~=10;  x1'=v1;  v1'=k1\*(n1-x1)/m1;  a1~=k1\*(n1-x1)/m1;  x2'=v2;  v2'=k2\*(n2-x2)/m2;  a2~=k2\*(n2-x2)/m2;  from;  together [ (x1>=x2) and (v1>=v2) ] is  st=10;  v1=(m1\*v1+m2\*v2)/(m1+m2);  v2=v1;  v1'=(k1\*n1+k2\*n2-x1\*(k1+k2))/(m1+m2);  a1~=(k1\*n1+k2\*n2-x1\*(k1+k2))/(m1+m2);  x1'=v1;  v2'=(k1\*n1+k2\*n2-x2\*(k1+k2))/(m1+m2);  a2~=(k1\*n1+k2\*n2-x2\*(k1+k2))/(m1+m2);  x2'=v2;  st'=-st;  from separate; | const k1 = n1 = m1 = m2 =1;  const k2 = n2 = 2;  x1 '= 0;  x2 '= 0;  v1 '= 0;  v2 '= 0;  a1 = 0;  a2 = 0;  x1 (0) = 0;  x2 (0) = 3;  st '= 0;  state separate (st<abs(k1\*n1-k2\*n2-x1\*(k1-k2))) {  x1'=v1;  v1'=k1\*(n1-x1)/m1;  x2'=v2;  v2'=k2\*(n2-x2)/m2;    set st = 10;  a1 = k1\*(n1-x1)/m1;  a2 = k2\*(n2-x2)/m2;  st '= 0;    } from init, together;  state together( x1>=x2 && v1>=v2 ) {  set st = 10;  set v1 = (m1\*v1+m2\*v2)/(m1+m2);  set v2 = v1;  v1' = (k1\*n1+k2\*n2-x1\*(k1+k2))/(m1+m2);  v2' = (k1\*n1+k2\*n2-x2\*(k1+k2))/(m1+m2);  x1' = v1;  x2' = v2;    a1 = (k1\*n1+k2\*n2-x1\*(k1+k2))/(m1+m2);  a2 = (k1\*n1+k2\*n2-x2\*(k1+k2))/(m1+m2);  st'=-st;  } from init, separate; |
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| y1=2.0;  y2=0.0;  y1'=y2;  y2'=100.0\*(1.0-y1\*y1)\*y2-y1; | y1'=y2;  y2'=100.0\*(1.0-y1\*y1)\*y2-y1;  y1 (0)=2.0;  y2 (0)=0.0; |
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| pi = 3.1415;  Rs1 = 0.4753;  Rs2 = 0.4623;  Rr3 = 0.2970;  Rr2 = 0.293;  tj = 26.87;  a2 = 6.5109;  Mc = 0;  w1 = 1.0;  Lr = 3.496;  Ls = 3.456;  Lu = 3.4;  Fsx' = 1.0 - Rs1 \* Fsx + Rs2 \* Frx + Fsy;  Fsy' = -Rs1 \* Fsy + Rs2 \* Fry - Fsx;  Frx' = (1.0 - wp) \* Fry - Rr3 \* Frx + Rr2 \* Fsx;  Fry' = -(1.0 - wp)\* Frx - Rr3 \* Fry + Rr2 \* Fsy;  wp' = (1.0)/tj \* (a2 \* (Fsy\*Frx - Fsx\*Fry) - Mc);  s ~= (w1-wp)/w1;  d ~= (1.0)/(Lr\*Ls - Lu\*Lu);  Isx ~= d \* (Fsx\*Lr - Frx\*Lu);  Isy ~= d \* (Fsy\*Lr - Fry\*Lu);  Irx ~= d \* (Frx\*Ls - Fsx\*Lu);  Iry ~= d \* (Fry\*Ls - Fsy\*Lu);  Is ~= Isx \* sin(w1\*t + pi/2) - Isy \* sin(w1\*t);  Ir ~= Irx \* sin(s\*w1\*t + pi/2) - Iry \* sin(s\*w1\*t);  bugfix [s>0] is  from init; | const pi = 3.1415;  const Rs1 = 0.4753;  const Rs2 = 0.4623;  const Rr3 = 0.2970;  const Rr2 = 0.293;  const tj = 26.87;  const a2 = 6.5109;  const Mc = 0;  const w1 = 1.0;  const Lr = 3.496;  const Ls = 3.456;  const Lu = 3.4;  // equations  t '=1;  Fsx' = 1.0 - Rs1 \* Fsx + Rs2 \* Frx + Fsy;  Fsy' = -Rs1 \* Fsy + Rs2 \* Fry - Fsx;  Frx' = (1.0 - wp) \* Fry - Rr3 \* Frx + Rr2 \* Fsx;  Fry' = -(1.0 - wp)\* Frx - Rr3 \* Fry + Rr2 \* Fsy;  wp' = (1.0)/tj \* (a2 \* (Fsy\*Frx - Fsx\*Fry) - Mc);  s = (w1-wp)/w1;  d = (1.0)/(Lr\*Ls - Lu\*Lu);  Isx = d \* (Fsx\*Lr - Frx\*Lu);  Isy = d \* (Fsy\*Lr - Fry\*Lu);  Irx = d \* (Frx\*Ls - Fsx\*Lu);  Iry = d \* (Fry\*Ls - Fsy\*Lu);  Is = Isx \* sin(w1\*t + pi/2) - Isy \* sin(w1\*t);  Ir = Irx \* sin(s\*w1\*t + pi/2) - Iry \* sin(s\*w1\*t); |
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// Система ОДУ

w1'= 5 - 0.145\*pow(EQ1,2) - 0.0112\*EQ1\*EQ2\*sin(g1 - g2 + 2.034);

w2'= 5 - 0.245\*pow(EQ2,2) - 0.0112\*EQ1\*EQ2\*sin(g2 - g1 + 2.034);

g1'= w1;

g2'= w2;

Eq1'= 2.5 + 0.167\*EQ1 - 0.267\*Eq1;

Eq2'= 2.5 + 0.2\*EQ2 - 0.3\*Eq2;

// СЛАУ

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var ls EQ1, EQ2;

ls EQ1\*0.73 + EQ2\* (-0.0336\*cos(g1-g2+2.034)) = Eq1;

ls EQ1\*0.0672\*cos(g2 - g1 + 2.034) + EQ2\*2.14 = Eq2;

\*/

EQ1 = (2.14\*Eq1 + 0.0336\*cos(g1-g2+2.034)\*Eq2)/(1.5622 + 0.002258\*cos(g1-g2 + 2.034)\*cos(g2-g1+2.034));

EQ2 = (0.73\*Eq2 - 0.0672\*cos(g2-g1+2.034)\*Eq1)/(1.5622 + 0.002258\*cos(g1-g2 + 2.034)\*cos(g2-g1+2.034));

// Начадбные условия

w1(0) = 1;

w2(0) = 1;

g1(0) = 0;

g2(0) = 0;

Eq1(0) = 14.9003;

Eq2(0) = 42.1994;