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// "A very easy and simple inverted pendulum balancing robot"
// You need only half a day to make it, if you have some Materials.
// (This sketch is ver.2.0)
// No timer library is used in this version.
// But stability of robot is more improved than earlier version.
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//#include <MsTimer2.h>  //01 (This line is omitted in this version.)
int i = 0;//02
byte countS = 0;//03
long zeroOmegaI = 0;//04
int  recOmegaI[10];//05
int omegaI = 0;//06
long thetaI = 0;//07
long sumPower = 0;//08
long sumSumP = 0;//09
const int kAngle = 54;//10
const int kOmega = 170;//11
const long kSpeed = 60;//12
const long kDistance = 60;//13
long  powerScale;//14
int  power;//15
long vE5 = 0;//16
long xE5 = 0;//17

void setup () {  //18
Serial .begin(115200);  //19
  pinMode(4, OUTPUT);  //20
  pinMode(5, OUTPUT);  //20-a
  pinMode(6, OUTPUT);  //21
  pinMode(7, OUTPUT);
  pinMode(8, OUTPUT);
  pinMode(9, OUTPUT);
  for ( i = 0 ; i < 10 ; i++ ) { recOmegaI[i] = 0; }//25
  delay(300);
  training();
//  MsTimer2::set(5, chkAndCtl);  // (This line is omitted in this version.)
//  MsTimer2::start();  // (This line is omitted in this version.)
}  //30
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void loop () {  //31
  chkAndCtl();// NL1 (This is a new line in this version.)
  if ( power > 0 ) {
    analogWrite( 6, power );
    digitalWrite( 4,HIGH        );
    digitalWrite( 5,LOW   );//35
    analogWrite( 9, power );
    digitalWrite( 7,HIGH        );
    digitalWrite( 8,LOW   );
   }else {
    analogWrite( 6, - power );//40
    digitalWrite( 4,LOW        );
    digitalWrite( 5,HIGH   );
    analogWrite( 9, - power );
    digitalWrite( 7,LOW        );
    digitalWrite( 8,HIGH   );//45
  }
  delayMicroseconds(3600);  // NL2 (This is a new line in this version.)
}  //47

void   training(){//48
  delay (1000);
  for ( i = 0 ; i < 500 ; i++ ){//50
    zeroOmegaI = zeroOmegaI +analogRead(A5);
  }
  zeroOmegaI = zeroOmegaI / i;
}  //54

void  chkAndCtl()   {//55
   omegaI  = 0;// NL3 (These 6 lines, NL3-NL8, are added in this version.)
  for ( i = 0 ; i < 10 ; i++ ) {//NL4
    omegaI = omegaI +analogRead(A5)  -  zeroOmegaI;//NL5
    delayMicroseconds(10);  //NL6
    }//NL7
   omegaI  = omegaI / 10;//NL8

//  omegaI = analogRead(A5) - zeroOmegaI;  // (This line is omitted in this
  if  (abs( omegaI ) < 3 ) { omegaI = 0; }// (The lower bound is less than
  recOmegaI[0] = omegaI;
  thetaI = thetaI + omegaI;
   countS  = 0;//60
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```
    for ( i = 0 ; i < 10 ; i++ ) {
      if  (abs( recOmegaI[i] ) < 8 ) { countS++; }
    }
    if ( countS > 9 ) {
      thetaI  = 0;//65
      vE5 = 0;
      xE5 = 0;
      sumPower = 0;
      sumSumP = 0;
      }//70
    for ( i = 9 ; i > 0 ; i-- ) { recOmegaI[ i ] = recOmegaI[ i-1 ]; }
    powerScale = ( kAngle * thetaI / 200 ) +  ( kOmega * omegaI / 78 ) + ( k
     power =max  (min ( 95 * powerScale / 100 , 255 ) , -255 );
    sumPower = sumPower + power;
     sumSumP  = sumSumP + sumPower;//75
//   vE5 = ???  //76
//   xE5 = ???  //77
}  //78
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```