

リスト1 サーボモータを制御するためのPWMパルス信号の生成

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//-----ステートマシン開始-----

case(rState)
//---Idle & Wait Start---
ps0://スタート信号が入力されるまでは
      モータを動かさない
begin
  rCounter <= 0;
  rPWMDATACount <= 0;
  rPWMDATANo <= 0;

  roCTRL <= 0;
  roREFRESH <= 1;
  roFIN <= 0;

  if(iSTART)
    rState <= ps1;
  else
    rState <= ps0;
  end

//---Start & Format---
ps1://レジスタの値を初期化
begin
  rCounter <= 0;
  rPWMDATACount <= 0;
  rPWMDATANo <= 0;

  roCTRL <= 0;
  roREFRESH <= 0;
  roFIN <= 0;

  rState <= ps2;
end

//---Set PWMDATA---
ps2:
begin
  rCounter <= 0;
  //PWMDATAの値に最小幅の値112を加算して代入
  rPWMDATACount <=
    rPWMDATA[rPWMDATANo] + 112;
  rPWMDATANo <= rPWMDATANo;

  roCTRL <= 0;
  roREFRESH <= 0;
  roFIN <= 0;

  rState <= ps3;
end

//---Count PWMPulse ---
ps3:
begin
  if(clk160k)
    rCounter <= rCounter + 1;
  else
    rCounter <= rCounter;

    rPWMDATACount <= rPWMDATACount;
    rPWMDATANo <= rPWMDATANo;

    roCTRL <= 1; //PWMパルスの出力開始
    roREFRESH <= 0;
    roFIN <= 0;

    if(rCounter >= rPWMDATACount)
      //PWMDATAの示すパルス幅以上になったとき
      if(rPWMDATANo >= 7)
        //8個分の制御信号が出力し終わったとき
        rState <= ps5;
      else
        rState <= ps4;
      else
        rState <= ps3;
      end

    //---Wait Next Pulse cycle---
    ps4:
    begin
      if(clk160k)
        rCounter <= rCounter + 1;
      else
        rCounter <= rCounter;

      rPWMDATACount <= rPWMDATACount;
      rPWMDATANo <= rPWMDATANo;

      roCTRL <= 0; //PWMパルスの出力終了
      roREFRESH <= 0;
      roFIN <= 0;

      if(rCounter >= 400)
        //1個のパルス周期(2.5ms)待機
        begin
          rPWMDATANo <= rPWMDATANo + 1;
          rState <= ps2;
        end

      else
        begin
          rPWMDATANo <= rPWMDATANo;
          rState <= ps4;
        end
      end

    //---Refresh Signal and Fin---
    ps5:
    begin
      if(clk160k)
        rCounter <= rCounter + 1;
      else
        rCounter <= rCounter;

      rPWMDATACount <= rPWMDATACount;
      rPWMDATANo <= rPWMDATANo;

      roCTRL <= 0; //PWMパルスの出力終了
      roREFRESH <= 0;
      roFIN <= 0;

      if(rCounter >= 399)
        //2.5msで1サイクル終了
        if(rCounter >= 399)
          begin
            roREFRESH <= 0;
            roFIN <= 1;
            rState <= ps1;
          end

        //2.4ms以降にリフレッシュ信号
        //ディアサート
        else if(rCounter >= 390)
          begin
            roREFRESH <= 0;
            roFIN <= 1;
            rState <= ps5;
          end

        //2.3ms以降にリフレッシュ信号
        //アサート
        else if(rCounter >= 370)
          begin
            roREFRESH <= 1;
            roFIN <= 0;
            rState <= ps5;
          end

        else
          begin
            roREFRESH <= 0;
            roFIN <= 0;
            rState <= ps5;
          end

        end

      //---Invalid State---
      default:
      begin
        rCounter <= 0;
        rPWMDATACount <= 0;
        rPWMDATANo <= 0;

        roCTRL <= 0;
        roREFRESH <= 1;
        roFIN <= 0;

        rState <= ps0;
      end

      //-----ステートマシン終了-----
    endcase

```