

Sommario

OT21PidReg	3
IMPLEMENTATION	3
Errors	3
Definition of controller	4
PID regulator	4

OT21PidReg

O = Digital Output

T = Control functions

The OT21PidReg function implements a generic PID controller. In addition to providing the regulation value, the function operates two digital signals are modulated pulse width to handle positive and negative representation of control output.

IMPLEMENTATION

OT21PidReg (aswParReg , aswParUsr, gwSetPoint, gwMeasure, gfEnaReg, aglOutReg)

Parametri:

IN/OUT	VARIABLE TYPE	EXAMPLE NAME	DIM	
IN	ARRSYS	aswParReg [1]	W	Sample time PID controller (msec) [0÷32767].
IN	ARRSYS	aswParReg [2]	W	Maximum scale limit of process variable (UM) [-32768÷32767]
IN	ARRSYS	aswParReg [3]	W	Minimum scale limit of process variable (UM) [-32768÷32767]
IN	ARRSYS	aswParReg [4]	W	Maximum value control output [-32768 ÷ 32767]
IN	ARRSYS	aswParReg [5]	W	Minimum value control output [-32768 ÷ 32767]
IN	ARRSYS	aswParUsr [1]	W	Proportional gain.(%) [0÷9999]
IN	ARRSYS	aswParUsr [2]	W	Integral time (msec) [0÷9999]
IN	ARRSYS	aswParUsr [3]	W	Derivative time (msec) [0÷9999]
IN	ARRSYS	aswParUsr [4]	W	Sample time of the derivative [0÷255] 0=sample time PID controller 1=2*sample time PID controller n=(n+1)*sample time PID controller
IN	ARRSYS	aswParUsr [5]	W	Derived filter time constant (msec.) [0÷9999]
IN	ARRSYS	aswParUsr [6]	W	Feed Forward (%) [0÷2000]
IN	GLOBAL	gwSetPoint	W	Adjustment setpoint (UM)
IN	GLOBAL	gwMeasure	W	Value of the process variable (UM)
IN	GLOBAL	gfEnaReg	F	Enabling regulation [0÷1] 0=regulator disabled 1=regulator enabled
OUT	ARRGBL	aglOutReg[1]	L	PID output log
OUT	ARRGBL	aglOutReg[2]	L	Proportional output log
OUT	ARRGBL	aglOutReg[3]	L	Integral output log
OUT	ARRGBL	aglOutReg[4]	L	Derivative output log
OUT	ARRGBL	aglOutReg[5]	L	Feedforward output log
OUT	ARRGBL	aglOutReg[6]	L	Error log
OUT	ARRGBL	aglOutReg[7]	L	Regulator states: bit 0 = State pwm output for positive adjustment bit 1 = State pwm output for negative regulation bit 2 = positive saturation state bit 3 = negative saturation state bit 4 + executing state regulation
OUT	ARRGBL	aglOutReg[8]	L	Error code

Errors

Once call the function, the “Error Code” variable in aglOutReg[8] assumes certain values, the meaning of these values is summarized below:

- 0: No error
- 1: Error setting sampling time
- 2: Error setting lower limit and/or greater of scale
- 3: Error setting value proportional gain
- 4: Error setting integral time
- 5: Error setting derivative time
- 6: Error setting feed-forward percentage value
- 7: Error setting minimum and/or maximum value regulator output
- 8: Error setting sampling time derivative
- 9: Error setting derived filter time constant

Example

```

;-----
; Example
;-----
aswParReg [0]=500          ; Sampling time = 500ms
aswParReg [1]=10000        ; full scale over = 10000
aswParReg [2]=0           ; full scale less = 0
aswParReg [3]=500         ; Maximum value output regulator
aswParReg [4]=0           ; Minimum value output regulator

aswParUsr[1] = 100         ; Proportional gain = 0.1
aswParUsr[2] = 200         ; Integral time = 0.2 sec.

gfEnaReg = 1              ; Enable regulation

MAIN:
  gwSetPoint = 800
  OT20PidReg ( aswParReg , aswParUsr, gwSetPoint, gwMeasure, gfEnaReg, aslOutReg )
  ofOutPow = aslOutReg[7] ANDB &H01

WAIT 1
JUMP MAIN

```

Definition of controller

A regulator reads an (gwMeasure) input variable, compares with to a reference signal (gwSetPoint) and change the value of the (aslOutReg[7]) output to achieve equality of the variable with the reference.

PID regulator

One of the most popular types of regulator is the PID (Proportional, Integral, Derivative).

Proportional action

This control action establishes a relationship of direct proportionality between the error (aglOutReg[6]) and the value at the regulator output. The gain proportional parameter (aswParUsr [1]) defines the degree of proportional controller; It's expressed in milliseconds for which to set a gain of 0.5 it should enter the value 500.

The rule that establishing the output value (aslOutReg[7]) defines: with unity gain (1000), the control output will be maximum when the error is equal to the difference between "Maximum scale limit" and "Maximum scale limit" that is the result between aswParReg [2] - aswParReg [3].

Integral action

The integral action of the PID regulator calculates the integral of the error on a user-settable time interval through the aswParUsr [2] parameter (in ms). The output signal is updated in a particular way: whenever the Integrator give an output value This is added to the value that is on the register, then it will continue to increase or decrease (Depending on the sign of the error). The output value is calculated as follows: with unit proportional gain, the integration time (aswParUsr [2]) is the time it takes for the integral log (aglOutReg[3]) reaches the registry value proportional (aglOutReg[2]). From this last statement shows that the integral action is related to the proportional action.

Derivative action

The derivative action try to "anticipate" the behavior of the system being monitored. The output produced is proportional to the change of the input signal. The amount of the derivative effect is adjustable via the time derivative (aswParUsr [3]) parameter. Computing the derivative action is based on the following convention: the derivative time is the time it takes for, with constant error variation, the derivative log (aglOutReg[4]) reaches a value equal to the proportional log (aglOutReg[2]). As for the integral action is understood that for the derivative action is there a link with the proportional action. The higher the time of derivation of error and the faster the transient error recovery system. It is evident that the derivative action may never be used alone because in the presence of constant mistakes its effect would be null.

Feed-forward action

In addition to the PID controller is also the feed-forward action: it generates an output proportional to the setpoint value (as can be inferred from the name doesn't exploit any error feedback). Its function is to reduce the system response time providing an output already close to what the regulator should reach. The contribution of this action is adjustable via the feed forward parameter (aswParUsr [6]): This parameter is expressed as a portion to one thousandth (for example, to introduce 98.5% you must set the value 985).

DIFFERENCES FROM THE OLDER RELEASES

- (from 20 to 21) Added a running state regulation. (Avoided an error“ “division by zero” the first time you run) Avoided to reset the integral output OUTI if $t_i=0$. This enables you to suspend execution of pid and return without the full log is altered.

Documento generato automaticamente da **Qem Wiki** - <https://wiki.qem.it/>

Il contenuto wiki è costantemente aggiornato dal team di sviluppo, è quindi possibile che la versione online contenga informazioni più recenti di questo documento.