QuickMotion and Tuning Parameter Sets

Changing tuning parameters on the fly

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In many motion applications the dynamics are such that it is advantageous to be able to use different sets of tuning parameters for different parts of a machine cycle and to automatically change these parameters on-the-fly. For example, during one part of a cycle, a vertical load is being lifted fighting gravity, while in another part of a cycle that same load is being lowered with the aid of gravity. Another common example is with hydraulic cylinders where the system gain is greater during extension than retraction due to the area taken up by the cylinder rod.

CTC's QuickMotion language can easily accommodate these types of applications by changing tuning parameters on-the-fly. Tuning parameter sets can be switched by using a foreground MSB (motion sequence block) to change parameters as needed. Other foreground (and background) MSBs trigger this "listening" MSB to change parameters before entering a different part of the machine cycle. This technique is described below and when combined with QuickMotion's deadband control (pdead parameter) the user can easily optimize a machine's performance cycle.

Torque-mode systems

Before coding up the tuning parameter change MSB, the user should tune the system by use of the tuning wizard for each part of the cycle. The user should mark down the resulting parameters to be entered as part of the parameter change MSB. Once each part of the cycle is tuned, the parameters can be assembled into the "listening" parameter change MSB that will automatically update the tuning parameters at the appropriate points of the machine cycle.

Velocity-mode systems

Velocity-mode systems use only 2 parameters ('ppg' and 'pff') and do not use the tuning wizard. The method for parameter change is the same, although the number of parameters is significantly less and therefore even easier to configure.
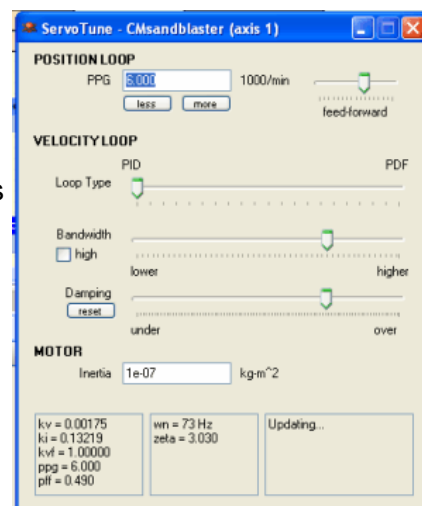
An example of this parameter change MSB for torque-mode:

```
[top]
// clear loadparams
loadparams = 0;

[wlp]
// loop until loadparams is non-zero
if loadparams == 0 goto wlp;
// find out which set to load, and load it
if loadparams == 1 goto param1;
if loadparams == 2 goto param2;
if loadparams == 3 goto param3;
// loop if an invalid parameter set # was specified
goto wlp;

// parameter set 1
[param1]
kv = 0.015;
ki = 0.178;
kvf = 0.9;
kd = 0.001;
ppg = 6.5;
// clear loadparams by heading to [top]
goto top;

// parameter set 2
[param2]
kv = 0.019;
ki = 0.183;
kvf = 0.95;
kd = 0.002;
ppg = 7.5;
// clear loadparams by heading to [top]
goto top;

// parameter set 3
[param3]
kv = 0.031;
ki = 0.128;
kvf = 0.74;
kd = 0.001;
ppg = 3.25;
// clear loadparams by heading to [top]
goto top;

// additional parameter sets are added here...
```

An example of this parameter change MSB for velocity-mode:

```
[top]
// clear loadparams
loadparams = 0;

[wlp]
// loop until loadparams is non-zero
if loadparams == 0 goto wlp;
// find out which set to load, and load it
if loadparams == 1 goto param1;
if loadparams == 2 goto param2;
if loadparams == 3 goto param3;
// loop if an invalid parameter set # was specified
goto wlp;

// parameter set 1
[param1]
pff = 0.000;
ppg = 6.5;
// clear loadparams by heading to [top]
goto top;

// parameter set 2
[param2]
pff = 0.010;
ppg = 7.5;
// clear loadparams by heading to [top]
goto top;

// parameter set 3
[param3]
pff = 0.000;
ppg = 3.25;
// clear loadparams by heading to [top]
goto top;

// additional parameter sets are added here...
```

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An example on how to use this parameter change MSB:

```
[top]

// load set #1
loadparams = 1;
wait until loadparams == 0;

// do + move
move in 2.5 to 11.25;
wait for in position;
delay 1000;

// load set #2
loadparams = 2;
wait until loadparams == 0;

// do - move
move in 2.5 to 0;
wait for in position;
delay 1000;

goto top;
```