PMC Precision MicroControl Corp.

TechNOTE

Title: MultiFlex Trapezoidal Trajectory Control
Products(s): All MultiFlex ETH and PCI motion controllers
Keywords: Trapezoid, Trajectory, Pulse Axis, On-the-Fly, MCCL
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Summary

PMC's MultiFlex 1000 Series motion controllers provide versatile motion trajectory generation, including trapezoidal trajectory generation (type 0) with on-the-fly position change. An alternate trajectory generator (type 1) has limited on-the-fly position change capability. It has the advantage of greater pulse axis precision under conditions of very short moves with high accelerations and velocities.

More Information

MCCL On-the-Fly Trajectory Command

An MCCL command provides support for controlling on-the-fly trapezoidal trajectory planning with arguments as follows:

aFYn Trapezoid On the Fly control (a - pulse axis)
(n – otf mode)

The motor variable **otfmode** is set by the command argument, **n**, and controls the behavior of the trapezoidal trajectory generator as shown in the table.

mtr->otfmode	Trajectory generator	on-the-fly trajectory
0	0	on
1	1	on
2	1	off

Usage examples:

```
5fy0    ;axis 5 trajectory generator type 0
3fy1    ;axis 3 trajectory generator type 1 otf on
```

Example Trajectories

The plots shown below are motion data collected from a MultiFlex controller executing the following macro sequence

```
5sa3600000,5ds3600000,3sv200000,3mv20000,3mn
;
3mr30,ws0,3mr-30,ws0,3mr-30,ws0
```

Very short moves (30 counts) performed, under conditions of extremely high acceleration and velocity, can result in overshoot and oscillation of the optimal position, as shown in Figure 1. Pulse axes are particularly susceptible to these corner cases due to the discrete nature of the command signal and typical open-loop configuration on the pulse output.

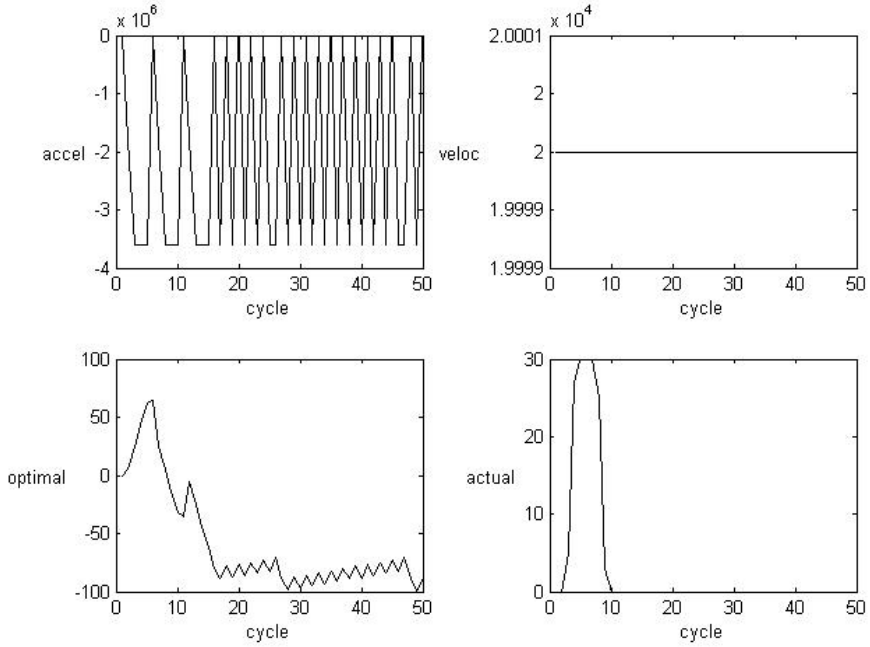

Figure 1 On-the-Fly trajectory enabled

Through the selective use of the FY command, system performance can be improved with no sacrifice in performance. For example, Figure 2 illustrates the same sequence of position moves after disabling On-the-Fly trajectory planning for moves less than 50 counts with the command sequence:

```
5sa3600000,5ds3600000,3sv200000,3mv20000,3mn
 5FY50
 3mr30,ws0,3mr-30,ws0,3mr-30,ws0
```

As shown, the trajectory is very monotonic and exhibits no overshoot past the target position.

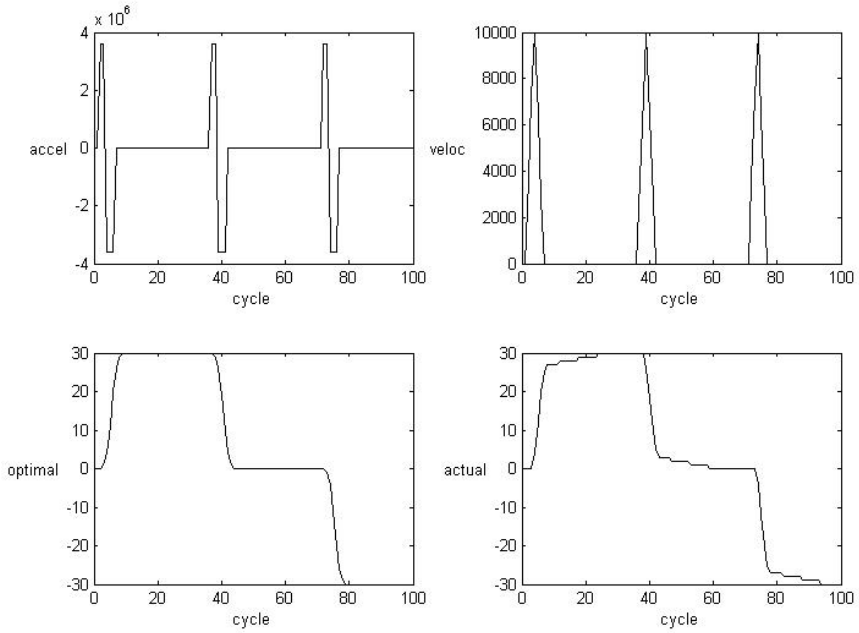

Figure 2 On-the-Fly trajectory disabled