Tony Denault <anthonydenault@gmail.com>

Dome Servo Update 08Feb

1 message

Anthony Denault <denault@ifa.hawaii.edu> Fri, Feb 8, 2013 at 10:53 AM
To: Alan Tokunaga <tokunaga@ifa.hawaii.edu>, TechGroup <irtftechgroup@ifa.hawaii.edu>, Randy Chung <rchung@ifa.hawaii.edu>

An update on the recent dome work.

On Feb 5/6, EricW, TonyD, and an IRTF hired servo consultant, Bob Hastie worked at the IRTF with the new dome servo system using E100 Drives. This system was installed on Jan 31. This would be the first time we would run the new system on the dome.

Our old system is basically a velocity PID controller commanding 3 torque Drives (amplifier/motors). The new E100 Drives cannot be configured in this manner. So our primary goal was to test various servo strategies provided the E100 configurations.

Position Followers - During the time in the lab, we setup the system as 1 Velocity Master, and 2 Position followers, This mode was able to move the dome, but it's biggest problem was that the master needed to move in order for the slave to follow it. The master could be stuck (at max current) and the slave not helping since there is nothing to follow. It took us a while to under stand this failure mode.
We think that by adding a virtual axis as a master, and having all E100 follow the virtual axis might work better. We tried to do this on the 1st day but could not program the controller correctly. Bob Hastie consulted with **B**aldor on this, but they were unable to help us.

Torque Followers - Because our old system ran using torque followers, we tried to figure out a way to have our slaves match the torque of the master. I believe this is not a supported mode of operation of the E100 Drivers, but we tried to hack up at test using their MINT interpretive language. We were able to make the dome move, but the interpreter runs too slow to do any real management of of the drives, and the master end up fighting with the slaves.

Independent Velocity - Next we tried running the controllers independently, giving each the same velocity demand to following. In this mode, each controller manages it's own torque, just trying to maintain it's demanded velocity. The torques are not synchronized between any drives. One of the drive (West/Slave01) kept disabling itself due to over current.

All of the testing was done with at 0.4 deg/s or about 20% Full Speed (2.0 deg/sec).

Bob Hastie also tried to figure to how to tune the system. This is kind of a difficult problem, since a moved is needed to tune a drive, but all 3 drives needs to work together to do a move. He tried changing various parameters, but did not see any improvement in the short time (1.5hrs) he had left.

Conclusion

The equipment we purchased is not the ideal system for our applications. We can not copy the servo strategy of our current working systems, and the E100 Drive themselves is quite complex. However, I think we can make it work.

The "Position Followers" work was unfinished due to us not being able to configure the virtual axis. But in this mode each drive is still independent as far as managing it's PID, and current is not synchronized over the 3 drives. Plus in position mode, following error would accumulated. I don't see any advantages

over Independence Velocity. But if we have time, we could try to get the virtual axis to work, and see to it behaves.

I think the Independent Velocity mode is our best option.We should implement a solution using this setup.

Todo

Thur/Fri: Review options, Clean up after hacking (we have 6 different MINT programs), and lots of parameter changes - get back to a sane mode, with known parameters.

Next week:
Tue/Wed/Thur (TD) - Tony to continue with Independent Velocity mode testing.
Insure full current is used by drives, stop current trip (use fold back response),

Need to test very slow velocity (10inches/min) for dome rain grinding.
Need to test 2.0 deg/sec (dome slew speeds).

Also:
TCS to provide a velocity ramp up/down to be used for tuning?
Schedule remote tuning time with Bob Hastie.

--
Tony Denault
Phone: (808) 932-2378
Email: denault@ifa.hawaii.edu

--
Tony Denault
Phone: (808) 932-2378
Email: denault@ifa.hawaii.edu