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Adaptive control of scanning stages

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Scanning motion axes are increasingly becoming key components to many beamlines. The velocity control requirements raise challenges at hardware and software control levels. Tracking a velocity profile with the required precision and stability can be a challenging task for the motion systems. It is not unusual to see motion stages, motors and sensor working close to their technical limits so hardware shall be design and configured very precisely. On top of the hardware configuration, we usually require a very fine-tuned controller to achieve the tracking and disturbance rejection performance required.

In addition to that, the scanner stages are usually expected to perform at the same level of precision and stability, over a very wide range of velocity and accelerations. Assuming that requirements are achievable for different conditions (velocities) with different tunings, it is usually very difficult to achieve adequate performance with one tuned controller.

One approach to cover a wide dynamic velocity range is to apply an adaptive tuning to cope with changing conditions.

In this poster, the problem is demonstrated with examples and test cases of wide scanning velocity range, using our modelling framework and real stages with GeoBrick pmac controllers to prove the concept and feasibility of this approach.

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Motion Control, GeoBrick, PMAC, Modelling, adaptive control, Trajectory scanning

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