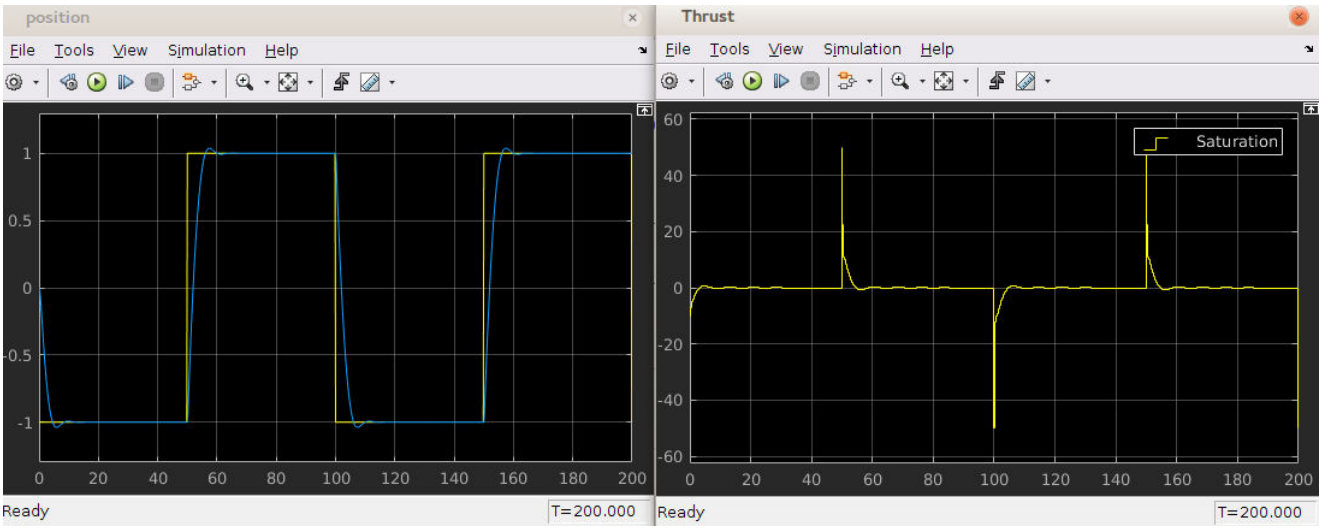
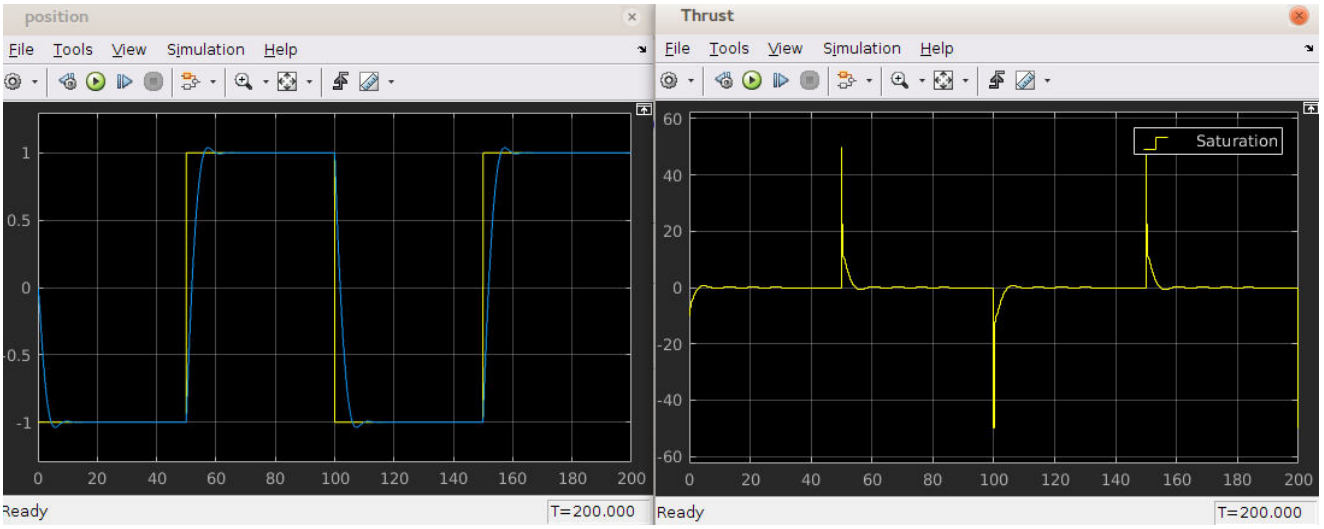
ECEn 774
Final
Jae Lee

1. PD controller

No parameters change



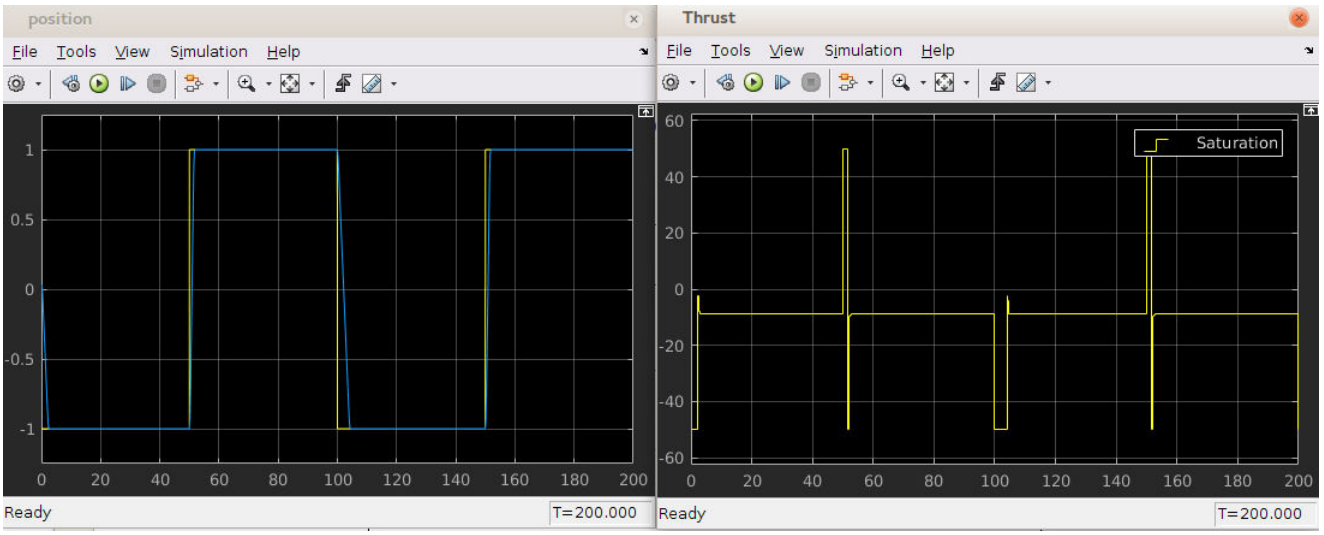
Possible 100% change in parameters



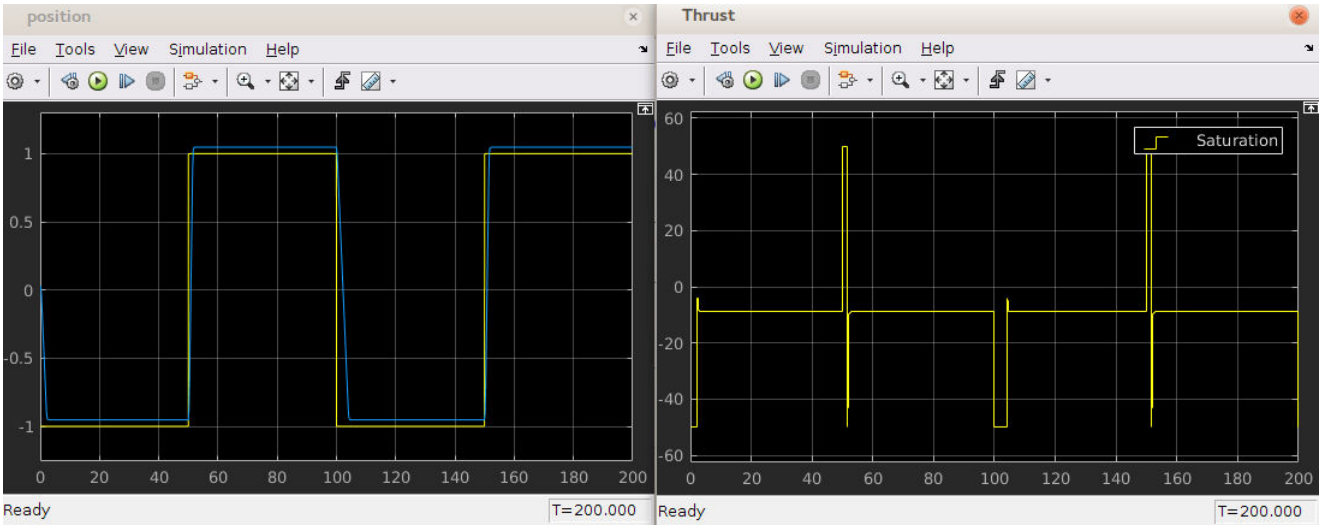
PD controller seems to be very robust in parameter changes. As shown above, parameter changes didn't make any noticeable difference on performance of the controller.

2. Backstepping

No parameters change



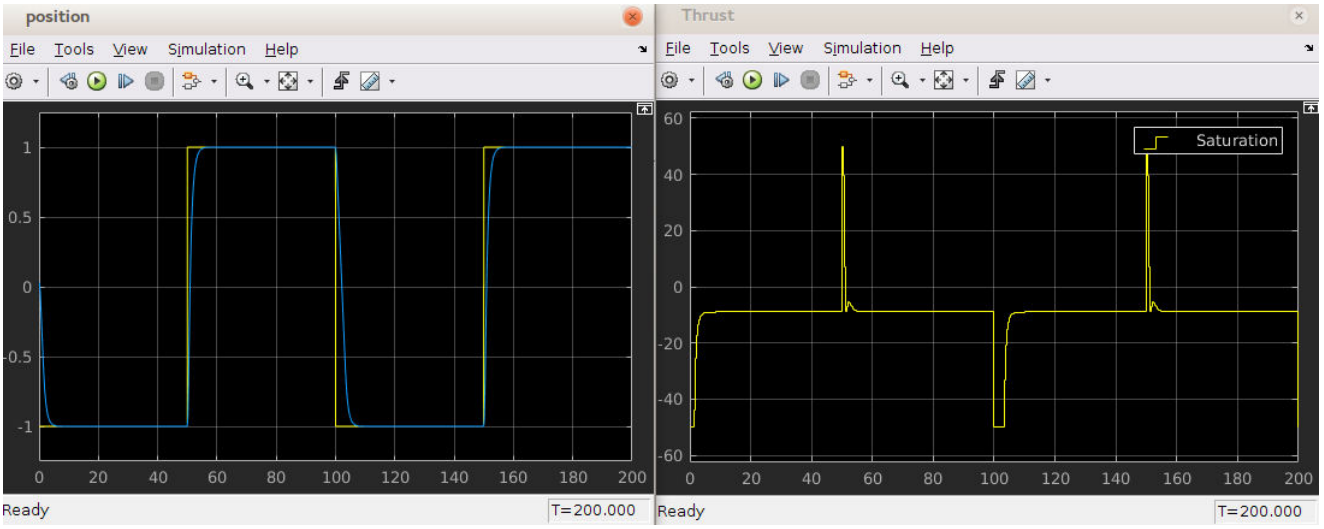
Possible 50% change in parameters



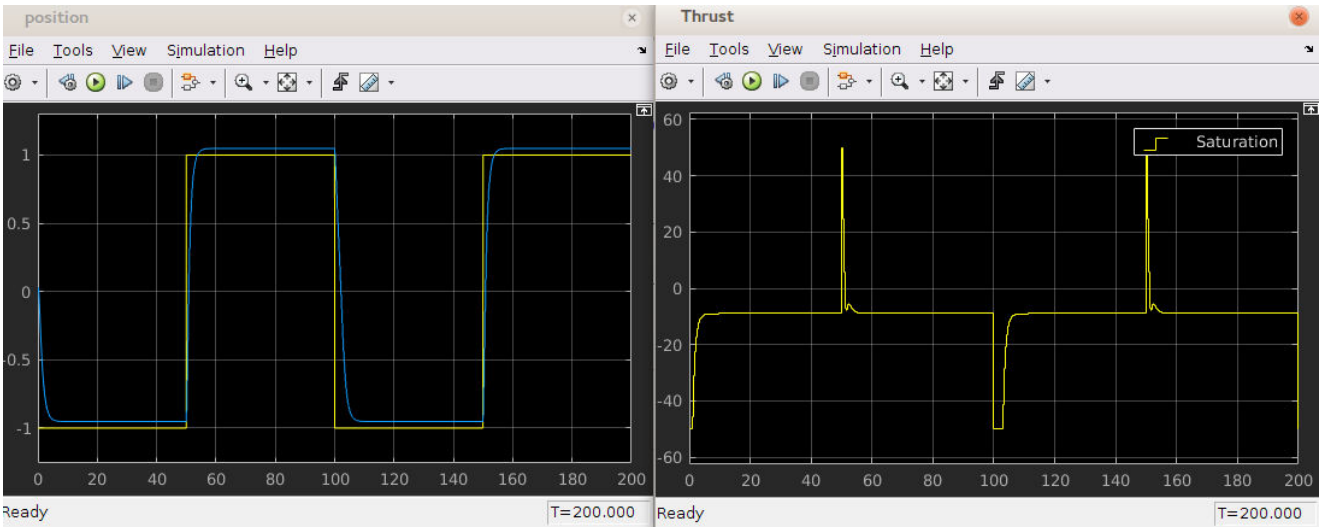
Backstepping can't handle the uncertain parameters very well. The higher uncertainty is, the more steady-state error generated.

3. Feedback linearizing controller

No parameters change



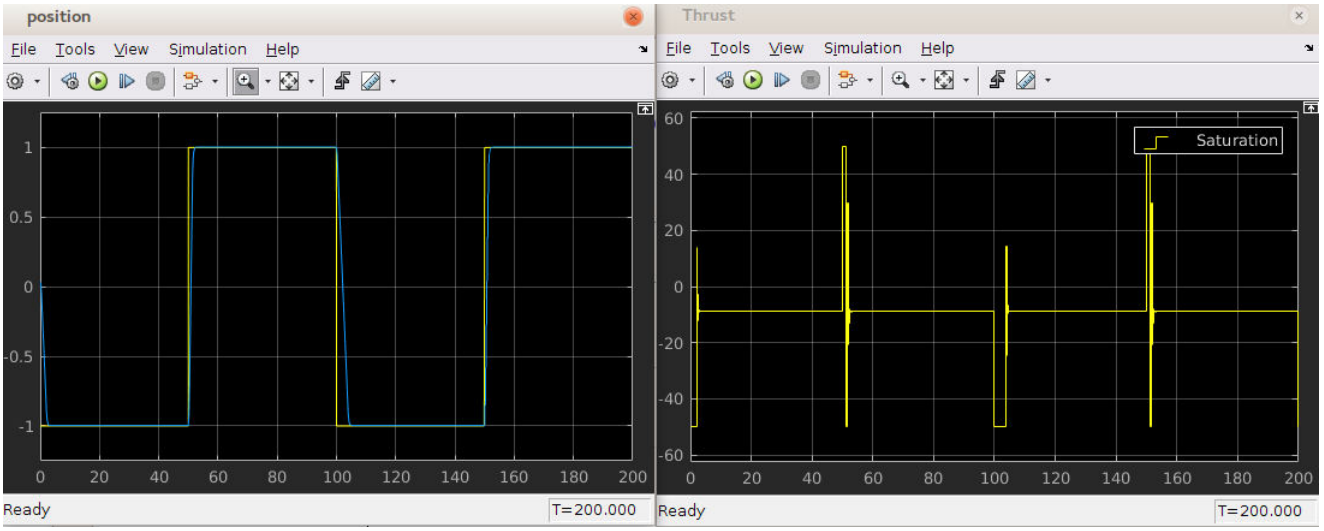
Possible 50% change in parameters



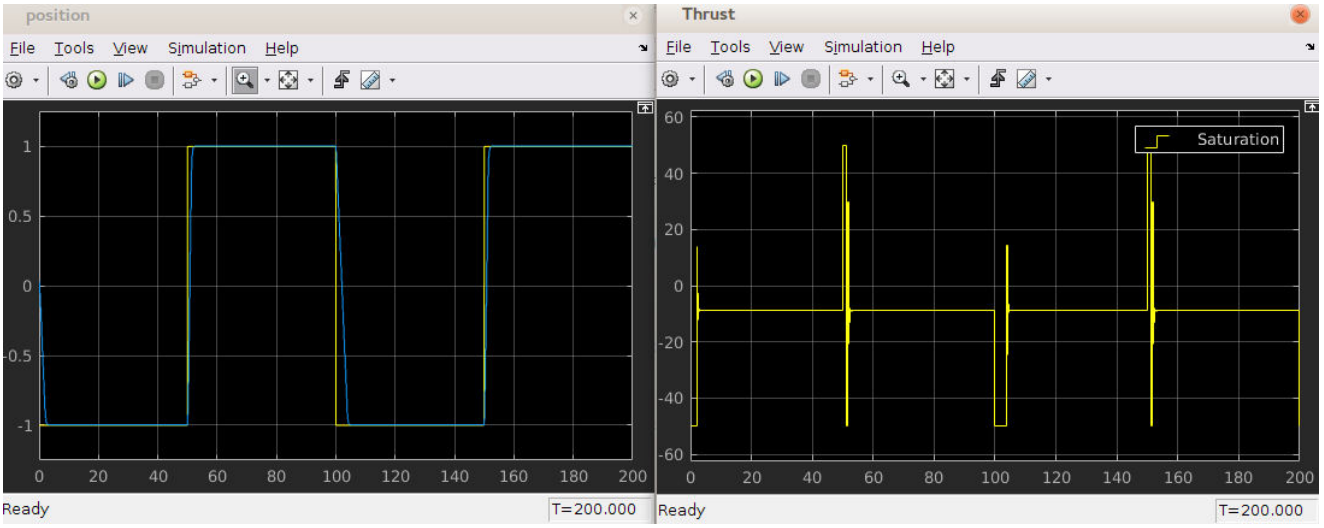
Feedback linearizing controller can't handle the uncertain parameters very well. The higher uncertainty is, the more steady-state error generated. It is behaving similar to backstepping.

4. Sliding mode

No parameters change



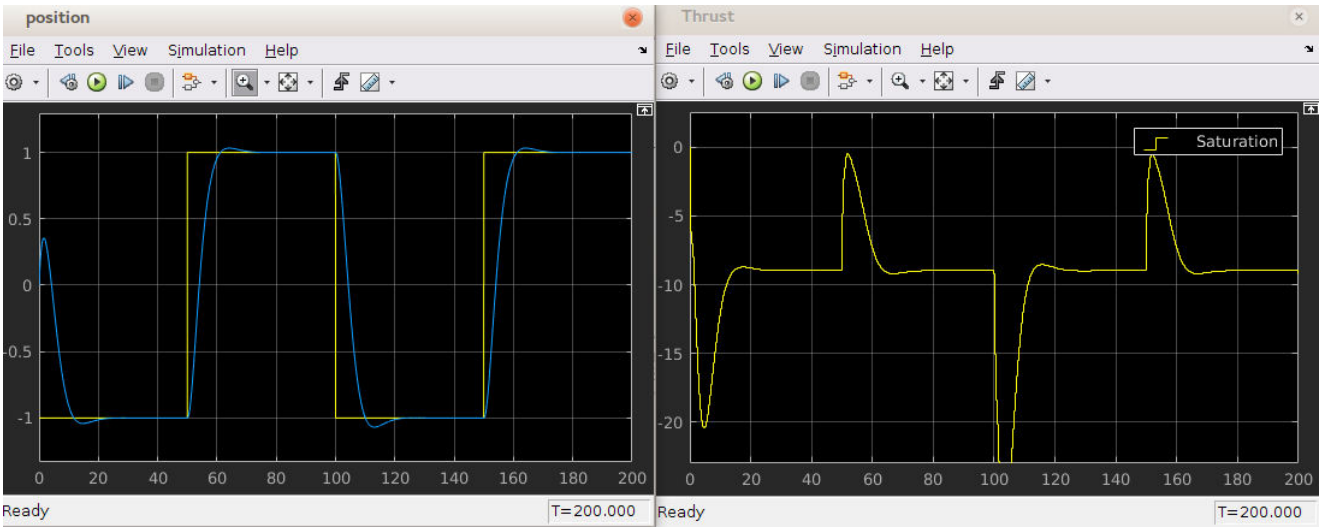
Possible 50% change in parameters



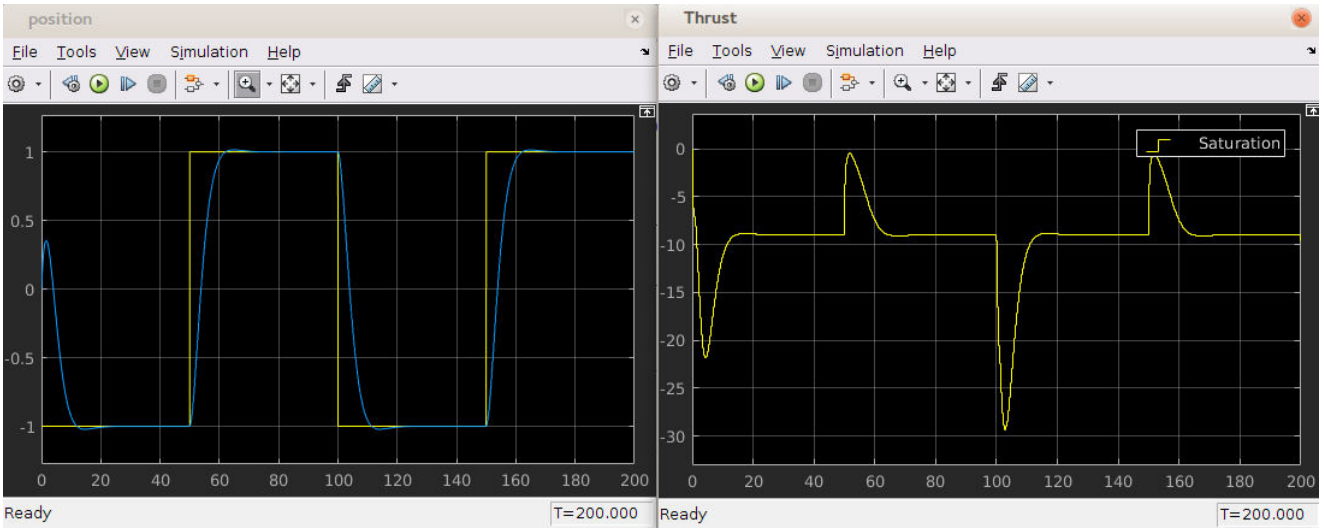
Sliding mode is quite robust in uncertainty because the controller is usually designed based on the maximum or minimum values that the uncertain parameters can possibly be. It did a lot better in dealing with not precisely known parameters than backstepping or feedback linearizing controller.

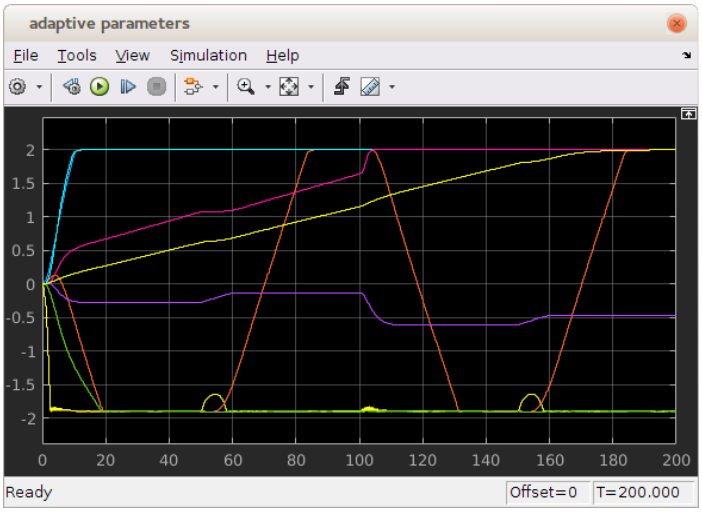
5. Baseline + adaptive controller

Only baseline controller

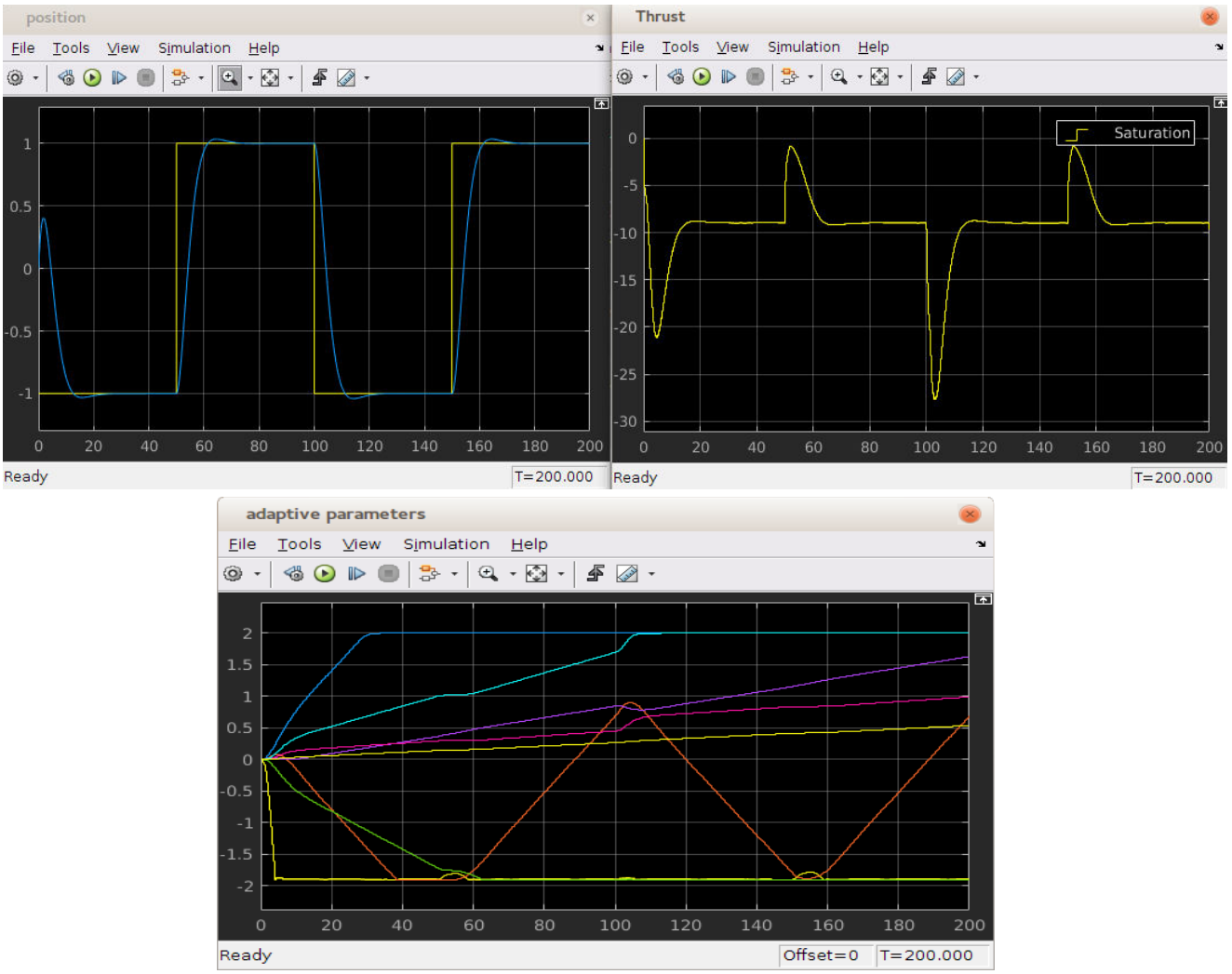


Baseline + adaptive





Possible 50% change in parameters



Adaptive controller is very robust to uncertainties in parameters. The baseline controller itself is quite robust, but the baseline+adaptive is even better.