Abstract:

This thesis focuses on the implementation of adaptive control on Remotely Operated Underwater Vehicles(ROVs). Adaptive control systems are systems that changes itself to generate the required output performance of the plant with minimum energy. This is a key necessity in ROV operation as they operate in highly unpredictable and dynamic environments making them loose robustness.

There are different types of adaptive control and the approach selected for this project is Model Reference Adaptive Control, where the actual output of the plant has to perform to the expected output given by a reference model. The thesis explains the building of a standard model reference adaptive control model and the later modifying it with the Loop Recovery approach to test and observe the advantages and improvements of its implementation.

The Loop Recovery model shows a lot of promise and tremendous performance over the baseline controllers which demonstrate high frequency oscillations in their control signal, which can lead to system crashes. The loop recover modification can be used in conjunction with other modification terms too, if further improvement is required.

Both the standard and ALR controllers were tested under several scenarios and output data was analyzed and evaluated. However, the real time application of the models is still in progress due to unfortunate hardware and technical issues. However, the thesis also explains the platform that is built for real time application and testing the control models using a Blue ROV.

Overall the application of the loop recovery modification for ROV operations reduces transient responses and demonstrates increased robustness in its reference output signal tracking by the actual output and maintaining clean and stable control signals which lead to optimization on power.