ABSTRACT

MOREIRA, Marcelo Luiz de Carvalho Moura. *Adaptive Backstepping Controller based on Global Differentiator with Dynamic Gains.* 50f. Master Thesis (Master in Science of Electronic Engineering) - Engineering Faculty, State University of Rio de Janeiro (UERJ), Rio de Janeiro, 2019.

The present dissertation proposes the application of the higher-order sliding mode ($HOSM$) based on global differentiator with dynamic gains in adaptive *backstepping* control for nonlinear uncertain systems of *strict-feedback* type. The use of this type of differentiator in the closed loop system control law allows it to be globally uniformly stable for any initial conditions, since it is an exact differentiator with dynamic gain. In addition, asymptotic output tracking is also guaranteed. In order to illustrate our new Theorem, the proposed controller is applied to a third order *wing-rock* system by comparing the results with the linear differentiator, the differentiator $HOSM$ with fixed gain and the differentiator $HOSM$ with dynamic gain. In these simulations we analyse the state variables, the control signal, the phase plane as well as the main differences between the differentiation schemes.

Keywords: *Backstepping*; Adaptive control; Global differentiator; Nonlinear Systems.