

ABSTRACT

SANTOS, Sender Rocha. ***Adaptive Intelligent Systems applied to one two-wheeled robot***. 2015. 171f. Dissertação (Mestrado em Engenharia Eletrônica) – Faculdade de Engenharia, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, 2015.

The advances and the development of vehicles and autobalance robots make necessary the investigation of controllers able to meet the various challenges related to the use of these systems. The focus of this work is to study the equilibrium and position control of one two-wheeled robot. The particular interest in this application comes from its structure and its rich physical dynamics. Since this is a complex and non trivial problem, there is great interest in to analyze intelligent controllers. The first part of this dissertation discusses the development of a classic PID controller. Then it is compared with two types of intelligent controllers: On-line Neural Fuzzy Control (ONFC) and Proportional-Integral-Derivative Neural-Network (PID-NN). Also it is presented the implementation of controllers in a hardware platform using the LEGO Mindstorm kit and in a simulation platform using the MATLAB-Simulink. Two case studies are developed. The first one investigates the control of equilibrium and position of two-wheeled robot on a flat terrain to observe the intrinsic performance in lack of external factors. The second case studies the equilibrium and position control of the robot in irregular terrains to investigate the system response under influence of hard conditions in its environment. Finally, the performance of each controller developed is discussed and competitive results in the control of two-wheeled robot are achieved.

Keywords: Two-wheeled robot; Autobalance; Neuro-fuzzy control; PID control; Artificial neural net; Inercial sensors.