FPGA MODELLING AND REAL-TIME EMBEDDED CONTROL DESIGN VIA LABVIEW SOFTWARE: APPLICATION FOR SWINGING-UP A PENDULUM

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Abstract- In this paper, Real-Time embedded control is designed via LabVIEW software for swinging-up a pendulum from its pending position to its upright position. Since the pendulum system has a typical nonlinear instable model, the control problem is achieved using the Astrom-Furuta energy control strategy. To overcome the complexities for the design and the real-Time implementation of the controller of the nonlinear system, FPGA and Real-Time Modules of LabVIEW software are used. A validation test is finally achieved using Proteus software via its Virtual Simulation Models (VSM). Simulation results show the capabilities of LabVIEW FPGA and Real-Time modules to customize control applications with flexible time control without VHDL coding or board design.

Index terms*: Field programmable gate arrays, Programmable control, Software design, Inverted pendulum.