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RAPID PROTOTYPING AND SYNTHESIS OF DIGITAL ABS CONTROLLER FOR GROUND VEHICLE USING VHDL

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Abstract

This paper reports simulation, synthesis, and eventual layout an overview of how the tire force can be modeled with the Pacejka's Magic tire formula and looks at the analysis and design of an automotive Anti-lock Brake System (ABS) digital controller onto FPGA technology, and the potential, migration of the design onto ASIC technology. ABS aims to control the skid and slip of the wheel to arbitrary set points provided by a higher-level control system such as the electronic stability program (ESP). Thus, maximum friction force can be obtained together with a vibration free braking. Examination of its functionality, real-time response, implementation, and testability is performed in an attempt to measure the usefulness of higher-level design entry facilities such as VHDL in a rapid prototyping environment. Continuous online testing is included using periodic sample injections where the resultant generated values are compared to signatures known a priori, without compromising functionality. Conclusions are drawn from the design's simulation and synthesis using VHDL onto FPGAs, ASIC migration, and CAD Tool capabilities/ requirements/limitations, with respect to real-time, data path synthesis for general controller applications involving asynchronous elements.

Keywords: Rapid protype , ABS , ground vehicle , ASIC.