

THE FLORIDA STATE UNIVERSITY
COLLEGE OF ENGINEERING

**A Design Methodology for the Implementation of Fuzzy Logic
Traffic Controller Using Field Programmable Gate Array**

By

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A Thesis submitted to the
Department of Electrical and Computer Engineering
in partial fulfillment of the
requirements for the degree of
Master of Science

Degree Awarded:
Spring Semester, 2004

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ABSTRACT

In this thesis, an approach is proposed for the design and implementation of fuzzy traffic controllers using Field Programmable Gate Arrays (FPGAs). The focus of this study is to develop an effective traffic signaling strategy to be implemented at a typical intersection with four approaches. Adaptive traffic control using fuzzy principles has been demonstrated and reported by the authors in the literature. Here a high-level design approach is suggested, which involves VHDL-based logic synthesis and the use of state diagrams with a VHDL backend for graphical design description. The operations of the fuzzifier and the defuzzifier of the fuzzy controller are described in VHDL. The fuzzy rule base for the controller is described using the state diagrams. Specifically, the fuzzy inference based on the fuzzy rules is implemented using MATLAB code. The output of the MATLAB program is stored in a ROM for use in the VHDL code. Once VHDL code is obtained then the hardware is implemented using the UP1 Education board. After the design was tested by using UP1 board the next step was to design a printed circuit board for this system. This was done by using Protel Design Explorer where the input to the circuit board comes from traffic sensors in the field and the output of the circuit board is given to the traffic controller.