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# METHODS OF USING THE VERILOG PROGRAMMING LANGUAGE FOR LOGIC DEVICE PROGRAMMING

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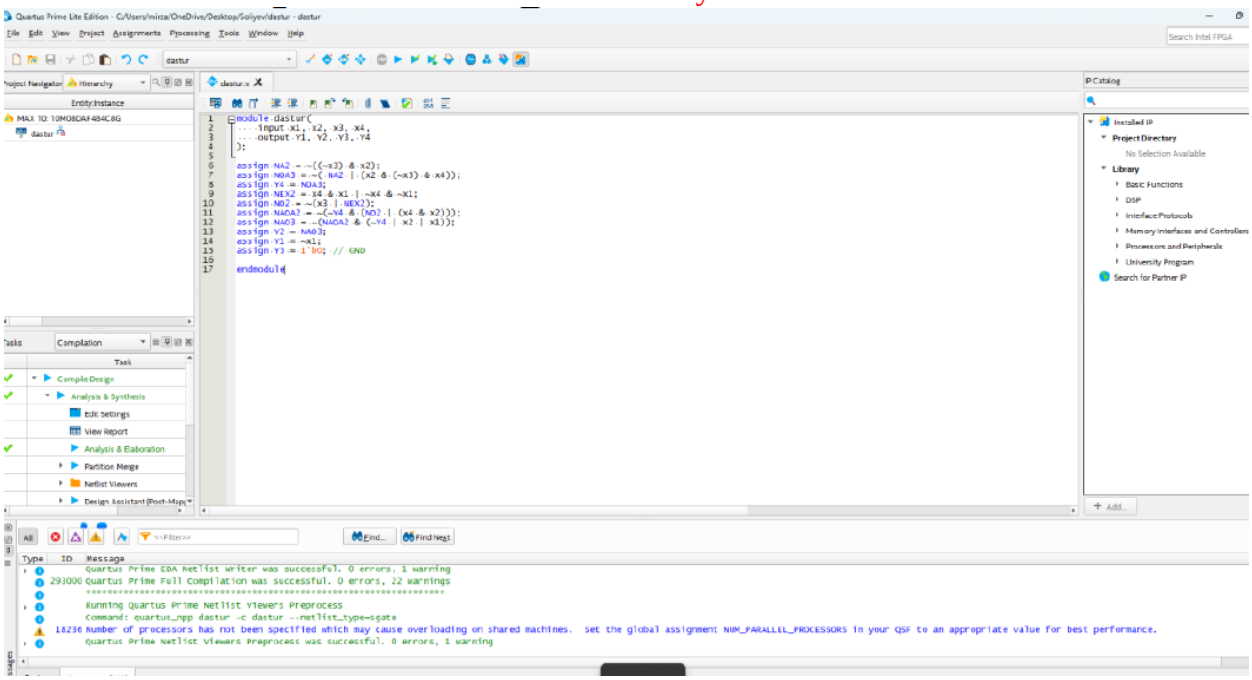
**Abstract:** This article discusses methods for programming and controlling logic devices using the Verilog HDL programming language in the Quartus II environment. It explores virtual design capabilities and loading these designs onto real hardware. The article also covers methods for linking device pins and ports to program variables, allowing for signal control and modification.

**Keywords:** Integrated circuit, logic elements, Verilog HDL File, Assignment, pins.

Interest in programming is steadily growing in Uzbekistan, supported by government policies, legal regulations, and initiatives like the "One Million Programmers" project. Among various programming fields, logic device programming is particularly significant, encompassing software for automated machines, industrial robots, and smart buildings. In many cases, a digital circuit consists of a central processing unit (CPU), a microcontroller (MC), and switching circuits that connect peripheral devices to the CPU or MC.

While developers often seek to integrate multiple ICs into a single package, the uniqueness of each device's components and connections makes direct integration difficult. Instead, programmable logic circuits, known as Field-Programmable Gate Arrays (FPGAs), provide a flexible solution by allowing customizable interconnections through programmable switches and standard components.




Verilog employs an independent device description method, facilitating high-mobility system design and portability across different hardware platforms. Once a project is developed, it only needs to be compiled for the target hardware system. However, one drawback of high-level languages is their limited ability to account for hardware-specific characteristics. Verilog, as a Hardware Description Language (HDL), is designed for describing, verifying, synthesizing, and testing digital electronic systems while also supporting project documentation and maintenance. It enables structural, functional, and flow-level descriptions of digital systems, collectively referred to as a Verilog device model.

Differences Between Verilog and VHDL:

1. Programming Basis – VHDL is based on the ADA language, whereas Verilog is derived from C programming.

2. SystemVerilog Evolution – Verilog HDL developers expanded capabilities by introducing SystemVerilog, which became the first HDVL (Hardware Description and Verification Language).

3. Error Handling – VHDL detects more errors during development, while Verilog allows for quicker model descriptions.

The proposed method allows for managing not only logic elements but also arbitrary pin groups, improving control and monitoring. Previous methods required separate control signals for each pin, whereas this approach enables more flexible management.

The primary difference between FPGAs and microcontrollers lies in programmability: microcontrollers execute operations sequentially as defined by their programs, whereas FPGA blocks operate in parallel and independently. Due to this fundamental distinction, their clock speeds are not directly comparable. By utilizing Verilog, designers can explore different device configurations and identify challenges before detailed implementation, reducing design iterations. However, precise and complete

descriptions are essential. When writing models in Verilog, three key objectives must be met: correct functionality, fast simulation and efficient synthesis. These requirements often conflict, necessitating careful balancing for optimal results.

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