Instrumental Platform for the Development of Specialized Computing Systems

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The development of machines for solving highly complex application specific problems is currently a difficult and expensive task, inaccessible to ordinary engineers and amateurs. The introduction on the market of an instrumental platform that supports all stages of the development life cycle of specialized computing systems will solve this problem. To implement the project, it was necessary to study the structure of various computer architectures and their assemblers, existing solutions, and identify their disadvantages. During the creation of architecture modules using SystemVerilog, their frequency indicators and resource requirements were studied in the Quartus Prime Lite Edition development environment. The following were created: a technical architecture standard, a library of hardware components that implement processor nodes and additional functionality, assembly language tools that implement a specific set of machine commands, development environment. The functioning of the created development environment and processor modules was checked by the created software tests. A reference implementation was developed with usage of the instrumental platform and took about 2500 4-input LUTs working with the frequency of 160 MHz on FPGA EP4CE6E22C8N. This indicates the suitability of the platform for implementation on cheap FPGAs and ASICs. Developed description of the microprocessor architecture standard gives a comprehensive understanding of the principles of operation and application of the project. The flexibility of the assembler language and platform code, its compactness, the ability to implement compatibility at all levels guarantee the ease of development and use by any interested developer.

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