ABSTRACT

This master's thesis presents the development of an animated visualization tool for SystemC simulations, utilizing a backend written in C++/SystemC and a frontend implemented with JavaScript, specifically employing the library p5.js. The objective of this research is to create a visually intuitive and interactive environment that facilitates the analysis and comprehension of complex SystemC designs.

The thesis provides an overview of SystemC and its significance in hardware and software co-design, with explanations of the general idea and usefulness of the theorized tool. It also goes over existing works and highlights the challenges associated with understanding the behavior and dynamics of SystemC simulations, due to their inherent complexity. To address these challenges, an animated visualization tool is proposed, which leverages the capabilities of JavaScript and p5.js to create an engaging graphical representation of the simulated SystemC models.

The backend of the tool is developed in C++/SystemC, creating a C++ sublibrary, that builds on top of SystemC leveraging its capabilities for modeling and simulating digital systems and adding specific logging functionality to them. The backend incorporates features such as logging of SystemC (primitive) channels reads/writes, simulated behavioral actions through the use of the wait() function, activity of SystemC processes, etc. This enables the accurate representation of dynamics in the SystemC models.

The frontend of the tool is implemented using JavaScript, taking advantage of the p5.js library to create interactive and dynamic visualizations. The tool's frontend offers a user-friendly environment, allowing users to control the simulation parameters, observe the state of the system at various simulation times, and visualize the flow of data through the design. The visualization elements, such as the timeline, visible values within channels, FIFO and RAM occupancy visualizations, etc. aid in understanding the complex interactions within the simulated SystemC models.

To evaluate the effectiveness of the developed tool, a series of tests on SystemC designs are conducted. The thesis presents the results of the tests, demonstrating the tool's capability to enhance the understanding of SystemC simulations and improve the debugging process.

In conclusion, the combination of SystemC backend and JavaScript-based frontend, powered by p5.js, provides an unique approach to visualizing and comprehending complex system designs. The tool offers significant potential in aiding system designers, researchers, and educators in better understanding the behavior and interactions of SystemC models, leading to improved system development processes and outcomes.