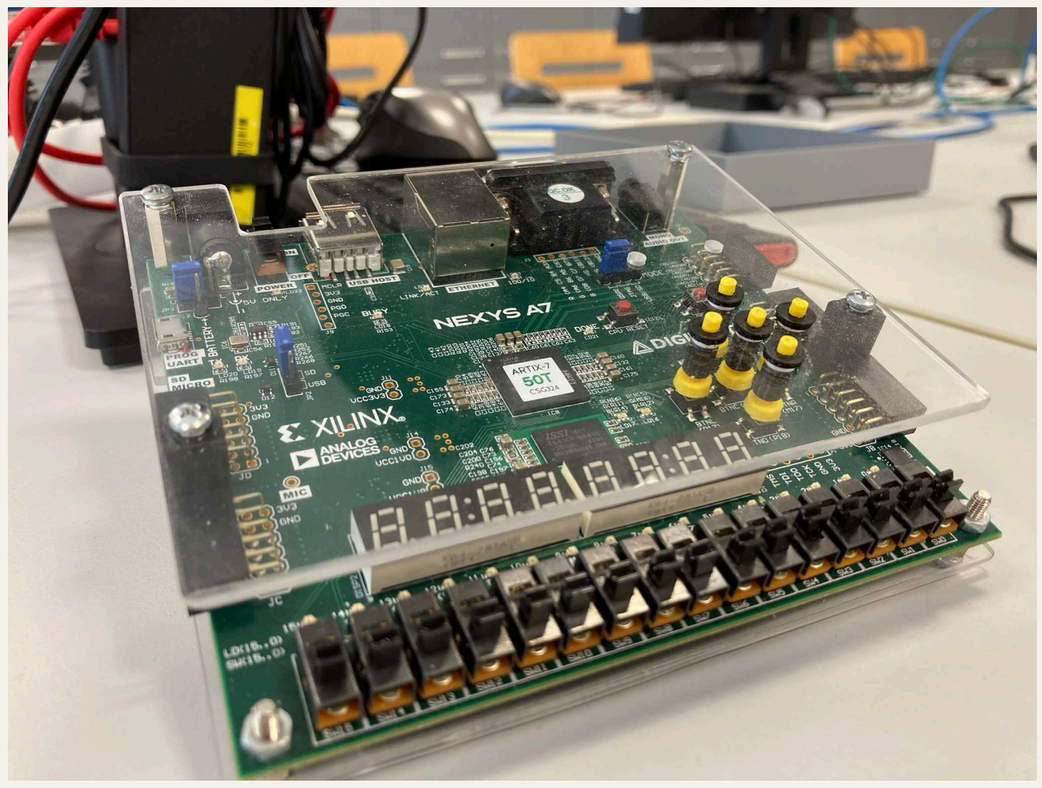
FAKULTA ELEKTROTECHNIKY A KOMUNIKAČNÍCH TECHNOLOGIÍ

VHDL Project
PWM Servo



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Related literature

Nexys A7 Reference Manual
IEEE Standard VHDL Language Reference Manual
"FPGA Prototyping by VHDL Examples"
SG90 Servo Motor Datasheet

XILINX VIVADO

Description

The aim of the project was to develop a PWM-based servo motor controller using VHDL on the Nexys A7 FPGA board. Also, we wanted to utilize the FPGA's PWM output capability to generate signals for controlling servo motor connected to the Pmod connectors. And also to implement algorithms to adjust the angle of the servo motors based on user input received from buttons. We also implemented LED signals, which will offer visual feedback on the servo controller status.

EXPECTED OUTCOMES

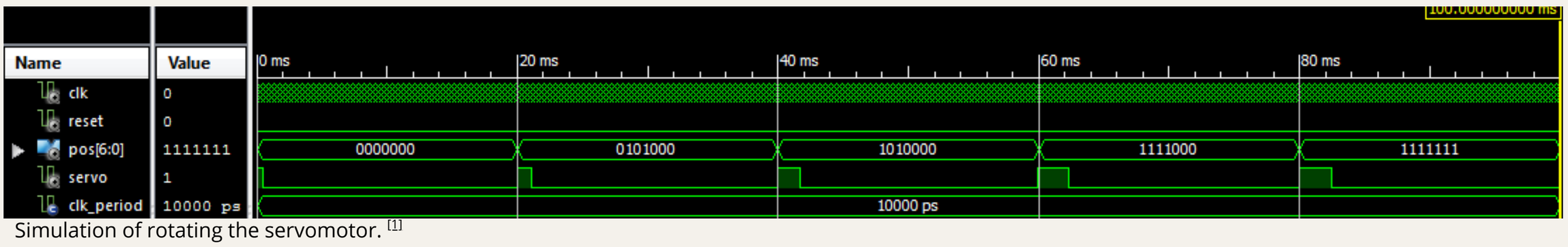
Develop a PWM-based servo motor controller using VHDL on FPGA that generates 50Hz PWM signals (20ms period), adjusts pulse width (1000–2000µs) via buttons, provides LED visual feedback and controls standard servo motors.

WORK PROCESS

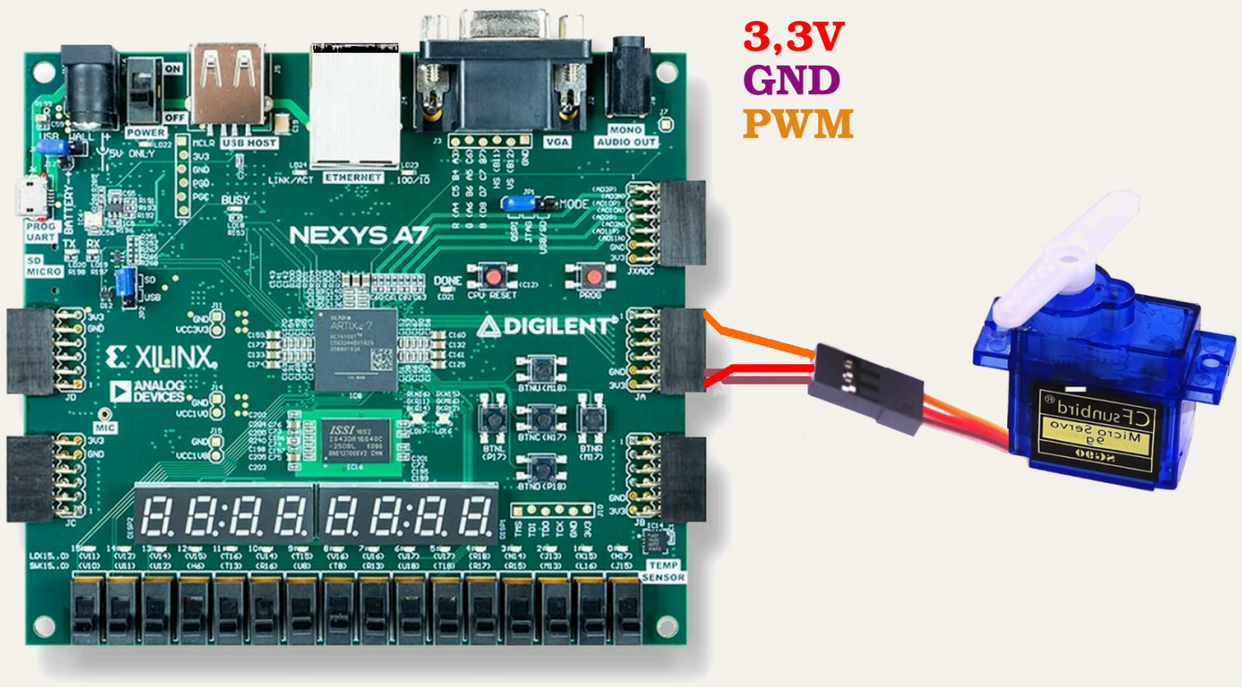
Throughout the project, we adopted a collaborative approach that emphasized teamwork and open communication. Regular meetings allowed us to discuss our progress, address challenges, and brainstorm solutions. This structured methodology fostered a productive work environment and ensured that we remained organized and focused on our goals.

ACTUAL RESULTS

We are generally satisfied with the outcomes of our project; however, we were unable to successfully implement the control system for multiple motors. It is possible to control one motor. Nonetheless, we achieved functionality with the LEDs , and the motor are capable of rotating in a single direction.



Simulation of rotating the servomotor. [1]



Conclusion

We intended to control several servomotors using switches for our project. However, due to time constraints and unforeseen challenges, we were unable to implement this control system. Ultimately, we had to focus on other aspects of the project, leaving our original plan unrealized, but we are generally satisfied with our work. Throughout this project, we gained significant knowledge and skills in both technical and collaborative aspects of engineering.

This opportunity allowed us to enhance our problem-solving abilities and learn how to work effectively as a team under time constraints. Ultimately, the experience has deepened our understanding of project management and the practical application of VHDL programming language.