

PRACTICE FPGA programming

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The aim of this practice consists in giving you some basics in LabVIEW programming and digital electronics. For that you will use the NI ELVIS platform and the dedicated DEFB module. This module contains a programmable chip called FPGA to which different input and output components like switches, push buttons or 7 segments displays are linked.

In this practice you will write 2 programs with the LabVIEW programming environment. Each program is then compiled in a bit file that is used to configure the FPGA chip of the DEFB module (See the tutorial *Introduction to LabVIEW*).

The applications are a counter and a binary adder.

First application: COUNTER

In this application you will build a counter which can count from 0 to 99 and start again when the value 99 is reached. The values are displayed on two 7-segment displays on the DEFB platform. Three other functions are also implemented in this counter. The first is the time basis whose value is entered from the computer. The second is a pause function that stops the counting operation. This function is executed when a defined switch button on the DEFB platform is moved. During the pause, one can read the moving word pause on the 2 7-segment displays. When moved to the previous position, the counting operation continues with counting from the state just before it paused. The third and last function stops the execution of the program and is done from a defined button on the DEFB platform. You will also have to find a way for measuring on an output of the DEFB platform the time between the displaying of each number (or execution time of the main loop).

Tips

1. Displaying a binary number value on the 7 segment displays

You can begin with writing a small VI that displays on one of the two 7-segment displays the values entered in a control of unsigned type. The values that are entered in the control are 0,...,9.

2. Modify this program in order to display on the two 7-segment displays values from 0 to 99.

Second application: 8 bits (1 Byte) adder for signed integer

In this application you will program an 8 bits adder for signed integer (2 complement coding). This adder reads the signed integer represented by the 8 switches on the DEFB to the signed value of a control in the VI and displays the value on the two 7-segment displays. If the result is smaller than -99 or bigger than 99, then OL for overload is displayed.

Tips

Displaying negative values

As you can observe, one need 3 7-segment displays to display negative numbers like -70, - 99 for example.

To represent the – symbol you can use an output on the DEFB like a LED that is switched on for negative values and off for positive ones.