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Facultatea de Automatic? ?i Calculatoare

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CALCULATOARE NUMERICE

Proiect de semestru – anul III

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Tema proiectului: Sistem de alarma pentru locuinta

Abstract in limba romana

Proiectul reprezinta un sistem simplu de alarma pentru o locuinta, care afiseaza mesaje de atentionare in cazul primirii unor semnalede la niste senzori. Mesajele de atentionare sunt specifice combinatiei de semnale primite. Pentru implementare s-a folosit o placuta programabila Xilinx Spartan2E, care a fost programata in Verilog HDL.

Abstract în limba englez?

Our project presents a simple alarm system for a household, which displays warning messages in case it receives input from several sensors. The warning messages are specific for each combination of inputs. For implementation we used a programmable Xilinx Spartan2E board, which was programmed using Verilog HDL.

C U P R I N S

System overview

The security system implemented in our project is a basic security system, which can be used to protect a household. It accepts inputs from eight sensors (which are simulated by the switches on the DigilabIO board). According to the given signals, the system displays a warning message on the LCD display.

The system is implemented in a very simple way, using only one module, which displays a different message for each combination of input signals.

User interface

The hardware user interface consists of the following inputs:

- the eight switches on the DigilabIO board, which simulate inputs from different sensors:
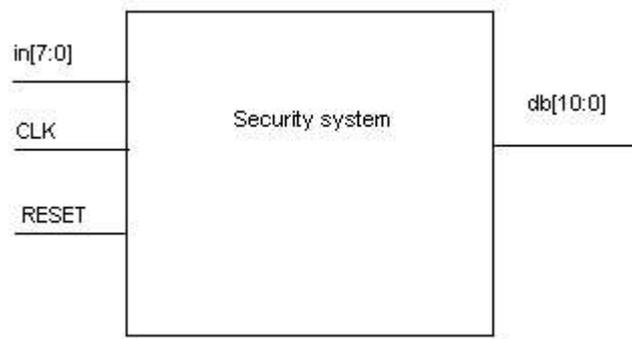
  1. the first door

  2. the second door

  3. the first window

  4. the second window

  5. the fridge

  6. the water tap

  7. the gas cooker

  8. the electric switch board

- the first button on the DigilabIO which is the RESET button

the LCD display on which all the messages are shown

Structure

The system is structured as a single module which has 3 inputs and 1 output, as in the following figure:

Based on the received inputs (the in vector), the system selects which message to display.Then the message is displayed on the LCD. It is synchronous, working on the upper edge of the clock signal(CLK). The RESET signal can be applied asinchronously, by pushing the first button on the DigilabIO board. The RESET signal resets the LCD and the counter which is used to slow down the clock on the board, to allow the LCD display to function properly.

The db vector represents the output of the module, which controls the LCD display. When the RESET button is pushed, the diplay is initialized, then the appropriate message is displayed.

The messages are different for different input signals and for combinations of signals. If there is only one active input, the message warns the user about the source of potential danger. For eaxmple: "Inchide usa 1" - "Close first door" or "Inchide frigiderul"- "Close the fridge". If there are two active signals, the message specifically warns about each of them (e.g.: "Inchide usa

1 si 2"- "Close first and second doors" or "Stinge aragazul si lumina"- "Turn off the gas cooker and the electricity"). For three or more active signals at the same time, the message is the same ("Alarma generala"- "General alarm").

A problem we encountered in using this approach of creating a single module (which we chose for its simplicity) is that this module has grown quite extensive and it takes up a lot of the computer's resources (CPU and memory) during synthesis.

Results

The results we obtained in simultions are presented in the following images (the simulations were made using a copy of the module in which the counter for slowing down the clock was not used).

The first image presents the output obtained for a sigle active input (the third bit in "in" - which signifies the first window).
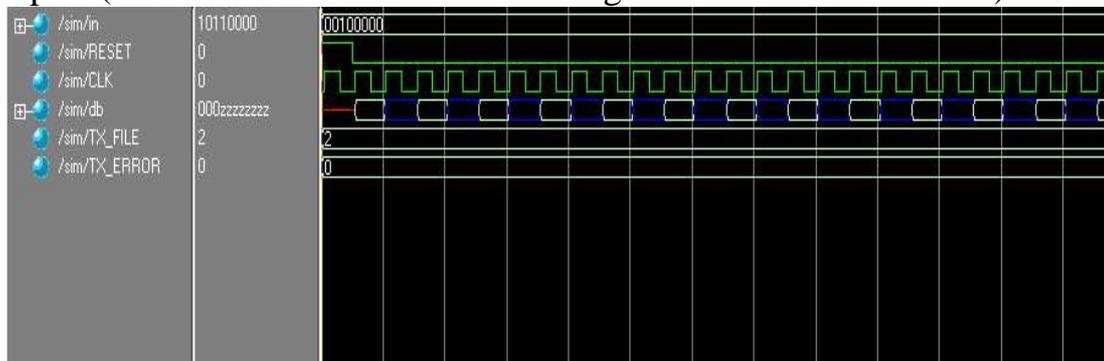
The second image presents also the case of only one active input. As the message to be displayed is short, after the last valid character of the message is displayed the LCD is disabled.
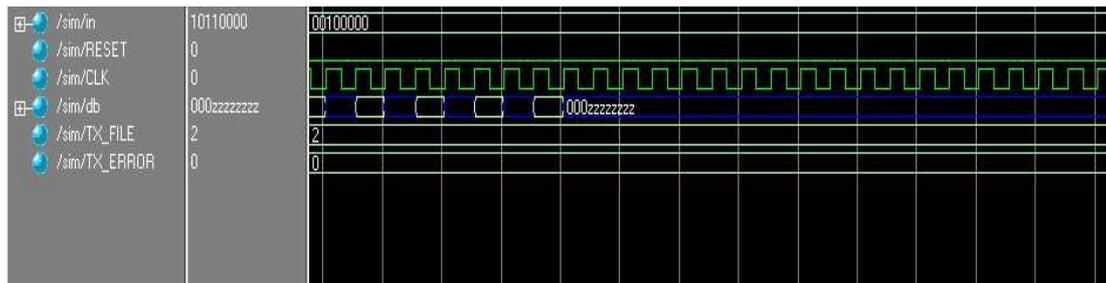
The third image presents the case of three active inputs (the first door and the two windows).
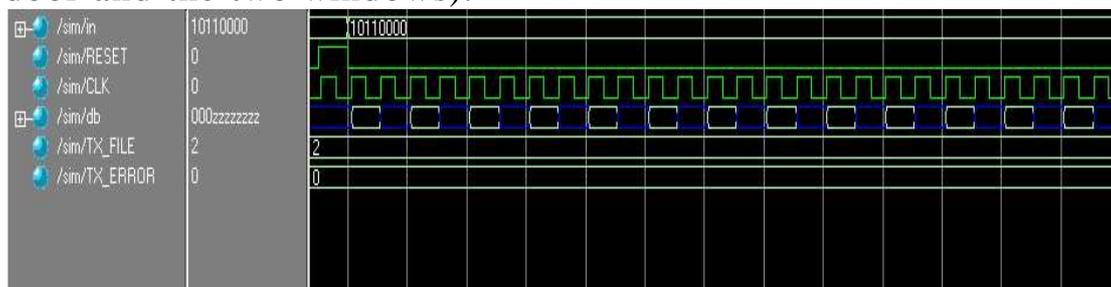
Conclusions and further developments

In today's unsafe world, everyone would like to have at least a little security, to be sure that his household can not be attacked by anyone. And in this quest, technology has come to play a very impoartant role. People are designing everyday new and more performant gadgets which are present in every aspect of our life and without which we cannot concieve to live any more. And security is a field in which technology can definitely play a key role.

Our project is a first step in that direction. It can be used to display warning messages to the user if the user is near the display. One important development which can be added to the project would be a means to deliver these messages to the user

when he is not near the display of the alarm. One possible idea to obtain this would be using a software which would send messages over the internet to a mobile phone or to a computer and which would allow the user to find out what is going on in his house, which would make him feel a lot safer.

And safety is something everyone looks for.