CSCE351 Project 1

Designing a Timer Interrupt Handler for My Prototype OS

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Introduction:

The goal of this project is to take the first step to design a prototype OS. In this project, the prototype OS needs to be designed to interact with the DE-2 board (Figure 1) through manipulating the timer on the DE-2 Board via an interrupt handler.

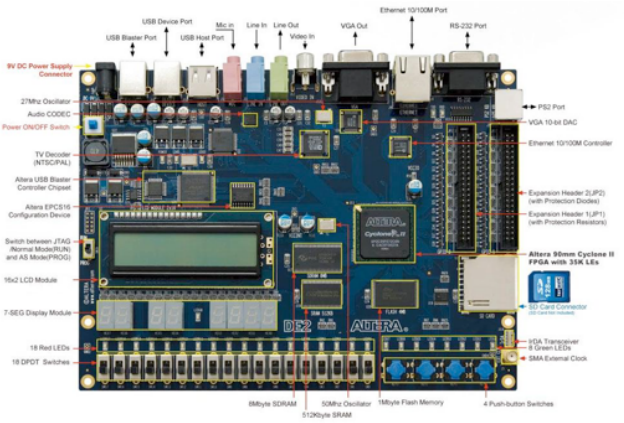

Figure 1

Description:

In this project, the program is written in C language. An interrupt handler needed to be designed for this program. Then, the interrupt handler will periodically interrupt the execution of the prototype function.

Steps to Complete the Project:

This project can be divided in to five steps to complete:

1. Download the NIOS-II CPU to the DE-2 Board
2. Open a new project
3. Writing the program in C
4. Debug the program
5. Write the final report

The instruction of how to download the CPU to the board and how to open a new project can be found on the course website.

Writing the program is the main part of this project, it will be discussed in details in the following section.

The Details of the Program:

As mentioned above, the program of this project is written in C. Table 1 shows the components of the program.

Function Name:	Return type	Function Usage
main()	void	This is the main function of the program. The prototype function will be called in it.
myinterrupt_handler()	void	This function is used as a call back function, which will be used to interrupt the execution of the protorype_os function
prototype_os()	alt_u32	When this function is executed, it will be periodically interrupted by the myinterrupt_handler function.

Table 1

As the table 1 shown, this program have 3 functions, which are the main function, the interrupt handler function and prototype OS function.

Among the three function, the main function is the easiest one to be designed, because only the prototype OS function is being called in the main.

The interrupt handler function is served for the prototype OS function. This function will be called periodically by the prototype OS function for interruption. In this function, a sentence "Interrupted by the timer!" is printed as an interruption signal.

For the prototype OS function, it will continuously print a sentence "This is the prototype os for my exciting CSCE351 course projects!" Then, the interruption signal will interrupt the execution of this function periodically. To accomplish this, a function called "alt_alarm_start()" will be used. This function can schedules an alarm callback upon an alarm interrupt. And the alarm callback function here is the interrupt handler function.

Figure 2 is the output of this program:

```
This is the prototype os for my exciting CSE351 course projects!
This is the prototype os for my exciting CSE351 course projects!
Interrupted by the timer!
This is the prototype os for my exciting CSE351 course projects!
This is the prototype os for my exciting CSE351 course projects!
Interrupted by the timer!
This is the prototype os for my exciting CSE351 course projects!
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Interrupted by the timer!
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Interrupted by the timer!
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This is the prototype os for my exciting CSE351 course projects!
Interrupted by the timer!
This is the prototype os for my exciting CSE351 course projects!
```

Figure 2

Summary:

This project is simply the first step of designing a complete operation system. However, this project is a base of the following project.

In this project, a program that make the prototype OS successfully interact with the DE-2 Board is accomplished. The way of interact is through manipulating the timer. Although this is the easiest way to make an interaction. However, it shows an important concept of how the board interact with the system. Also, learning how to use the Quartus II is also covered in this project.

Improvements of This Project:

In my opinion, this project is good but there are still one point that can be improved. In this project, we only print out the message on the console. It seems a little boring. If the project can make the message showed on the screen of the DE-2 Board would be better.

Reference:

- http://cse.unl.edu/~witty/class/csce351/Project/Part1/project1.htm