Lab exercise 1

Øyvin Richardsen, Sandor Zeestraten, Stian Habbestad

oyvinric@stud.ntnu.no

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Abstract

Contents

1 Introduction

The objective of this exercise was to become familiar with GNU development tools, AVR32 assembly code programming and its architecture, the use of interrupts and general I/O programming. The task was to create a simple program in assembly code that enables the manipulation of LEDs with a pair of switches using interrupt based code. As the goal of this course is energy efficient computer design, the main focus is on creating interrupt-based systems.

2 Description and methodology

LEDs First off we start with trying to turn on all the LEDs. Thereafter we try to turn LEDs on and off, for example by only leaving one LED on.

Switches We activate the switches as inputs and we also enable the pull-up resistors to make the input signals from the switches logically high. Now we assign two of the switches for left and right movement of the LEDs. If the LED is pushed off the edge, it returns on the other side due to some code we have implemented. The switches actually sends two signals for each complete press, one on pressed and one on released. We fixed this problem with an alternating state so that it only takes in one press.

Interrupts Now that we had a working program we saved this as a lights.s file. The next step is to implement interrupt, specifically for reading the switch status. Otherwise we want the program to go into a sleep mode to save energy.

3 Results

During this exercise we have become acquainted with assembly coding and how to use interrupts. We have also learned about the AVR32 architecture and used the GNU debugger tools extensively.

We have managed to program the development board to satisfy exercise 1. The LED's are easily moved with the switches.

4 Tests

Name	Preconditions	Description	Expected result	Test result
Steady-state test	Power is on, and the board is connected	Upload program to card, push reset switch	The board is powered and LED 7 should be on	Passed
Move LED right test	Program is active, only LED 7 is on	Push switch 6	LED 7 should be turned off and LED 6 should be turned on	Passed
Move LED left test	Program is active, only LED 6 is on	Push switch 7	LED 6 should be turned off and LED 7 should be turned on	Passed
Left LED wrap-around test	Program is active, only LED 7 is on	Push switch 67	LED 7 should be turned off and LED 0 should be turned on	Passed
Right LED wrap-around test	Program is active, only LED 0 is on	Push switch 6	LED 0 should be turned off and LED 7 should be turned on	Passed
Long push test	Program is active, only LED 7 is on	Push and hold switch 6 for a few seconds	LED 7 should be turned off and LED 6 should be turned on as soon as the switch is pushed	Passed

5 Evaluation of assignment

The assignment gives valuable insight to how.. Sometimes the debugger gave different results than a test run, which we found rather confusing.

6 Conclusion

7 Acknowledgements

8 Appendix

References

[1] A. Patwardhan, J. Parker, A. Joshi, M. Iorga, T. Karygiannis. *Secure Routing and Intrusion Detection in Ad Hoc Networks.* Third IEEE International Conference on Pervasive Computing and Communications (PerCom 2005), pp. 191-199. IEEE, 2005 .

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