Laboratórios de Computadores: Apresentação
Computer Labs: Introduction

2º MIEIC

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Staff

Instructors

- Claudia Chituc
- Tiago Boldt
- Pedro Ferreira do Souto

Lab Technicians

- Rui Fernandes
- Nuno Sousa

Objectives

Upon successful completion of this class you should be able to:

1. *Program at the HW interface level of the most common PC I/O Devices*
2. *Develop system-level programs*
3. *Use software tools typical of large programming projects*

Prerequisites

- *Programação*
  - *You'll program a lot, mostly in C*
- ***Microprocessadores e Computadores Pessoais***
  - *but also in assembly*
  - *... for the IA-32 architecture*
- *Arquitectura de Computadores*

Syllabus

I/O devices

C programming with assembly

Programming tools

Method

Learn by doing

"I hear, I forget. I see, I remember. I do, I understand"

Seven short lab assignments each of which

- On a different I/O device
- In one lab class
- Requiring a preparation of about 5 hours (excluding classes)

One integration project

- Must use at least 3 different I/O devices
- Must use interrupts
- Must use both C and assembly
- Should require about 9 hours per week (during 5 weeks)

Note: Both lab assigments and project should be done in groups of 2 students.

Work Load

- LCOM has 6 ECTS, i.e. about 160 hours
  - Assuming 1 ECTS equal to 27 hours
  - Check out the European Credit Transfer and Accumulation System (ECTS)

Bibliography and Other Resources

- PC HW is well documented on several books and online resources
- Book mentioned in SIFEUP

  ***Mazidi, Muhammad**, The 80x86 IBM PC and Compatible Computers: Assembly Language, Design and Interfacing, 4th Ed., Prentice-Hal*

  Note that it does not cover all the subjects, and that, on the other hand, it has a lot more material than needed for this class.

Grading

1. Each lab assignment, but the first, is graded. The grade depends on:
   - Lab preparation (20%);
   - Objectives met (80%);

   Grading will be done off-line on code you submit to an SVN repository.
2. The final project must be demonstrated in a date to be announced in the 2nd, 3rd and 4th of January.

Formula $\sum c_i * 0.1 + 0.4$ FP $+ 0.10$ AP

where c_i is the ith grade (assuming decreasing order)
of the lab assignments, and
i ranges from 1 to 5

That is, we'll use the best 5 grades of the 6 graded lab assignments.

Final Project Grading (1/2)

Execution: 40%

Code: 25%

- Modularity
- Documentation (use Doxygen)
- Names and comments
- Indentation
- Compilation warnings

Final Report: 20%

- Summary of what is and what is not implemented;
- Usage instructions
- Description of the program's architecture
- **Relevant** aspects about the implementation
- Function call diagram

Tools: 10%

Project Specification: 5%

Final Project Grading (2/2)

- To the grade obtained by applying the above criteria, we'll apply:

Difficulty Factor

- Several aspects
  - number and type of I/O devices
  - features used of the I/O devices
  - the techniques used (interrupt vs. polling)
  - use and extent of assembly programming

Originality Factor

Final Project Milestones

Project proposal: Beginning of 7th lab class (week starting 12th November)

- Half to one page description of the functionalities desired, of the devices used and their role in the program
- Must be rewritten in class, if the instructor does not accept it

Project specification: Beginning of 8th lab class (1st project class)

- Refinement of the proposal, specifying the work to be carried out in the remaining classes
- Should include the objectives to be met at the end of each of that and of the remaining classes
- Must be rewritten in class, if the instructor does not accept it

Project submission: December 15th

Project presentation: January 2nd, 3rd and 4th.

Project Examples

- Games (graphical mode and mouse)
- Two user games (text mode and serial port)
- Electronic calendar (text mode, keyboard, mouse, RTC and timer)
- Music composer/player (graphical mode, keyboard, mouse and timer)
- Text editor (text mode, keyboard, mouse, timer)
- Typing tutor (text mode, keyboard, mouse, timer)
- File transfer between PCs (text mode, keyboard, serial port)
- Chat between PCs (text mode, keyboard, serial port)

TEs Grading

Labs 4 of the 6 graded labs, each with a weight of 12.5%

- Submission until the last lab class of that lab
- Presentation/discussion in the week of that lab class
  - Student must get in touch with me (pfs@fe.up.pt) to arrange for an hour, at least 5 days in advance

Project Similar ot that of the other students, but with a weight of 50%.

- Presentation/discussion of proposal and specification in the same week as that of the other students
  - Student must get in touch with me (pfs@fe.up.pt) to arrange for a date and hour, at least 5 days in advance
- Submission by the same deadline as other students
- Presentation/discussion in the same period as for other students (from the 2nd to the 4th of January).

Grading in “Época Especial”

Project Similar to that of the other students, but with a weight of 100%

- Presentation/discussion of proposal and specification
  - Student must get in touch with me (pfs@fe.up.pt) to arrange for a date and hour, at least 5 days in advance
- Submission and presentation/discussion within 7 days of approval of the specification

Academic Integrity

- The UP and we take this issue very seriously
  - We believe that the majority of you follow the rules
  - But, one “bad apple” is enough to risk the credibility of a whole course
- You are allowed to discuss the labs
  - For each lab and for the project, there will be a discussion forum on Moodle
- However, all code submitted should be either:
  - Developed by the group members
  - Provided by me
- We will use tools to automatically detect common code
  - All groups with common code will be penalized
  - You may still help your colleagues, but you should not share code
- The penalty may range:

  From a zero in that lab **and** a penalty of “2 valores” in your final grade;

  To failing the course

Important Dates

Labs

Lab	1st class	Last class	Comments
Lab 1	20-09 (Thu)	25-09 (Tue)	No classes Mon. and Tue.
Lab 2	27-09 (Thu)	02-10 (Tue)	
Lab 3	04-10 (Thu)	12-10 (Fri)	5 Oct. is holiday
Lab 4	11-10 (Thu)	19-10 (Fri)	
Lab 5	18-10 (Thu)	02-11 (Fri)	FEUP's week: 22 Set.
Lab 6	05-11 (Mon)	09-11 (Fri)	
Lab 7	12-11 (Mon)	16-11 (Fri)	

Project

What	1st class	Last class	Comments
Proposal	12-11 (Mon)	16-11 (Fri)	Lab 7
Specification	19-11 (Mon)	23-11 (Fri)	
Submission	14-12	14-12 (Fri)	
Presentation	02-01 (Wed)	04-01 (Fri)	2013

- Project submissions up to 31-12 will not be penalized.

Acknowledgments

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- The lab technicians:
  - Rui Fernandes
  - Nuno Sousa

Thank You!

Questions?

Platform

MINIX 3

Operating system that allows privileged user processes to:

- Access every memory address
- Access directly I/O devices
- Process interrupts

Linux

- MINIX 3 is installed in a VMware Player VM
  - Can be used for development and testing

Software

- Eclipse with the Remote System Explorer plugin
- GNU C compiler and assembler
- Other SW development tools
  - `make`
  - `SVN`
  - `doxygen`
  - `ar`
  - `diff/patch`

Announcements

Classes

- Start 10 minutes after the hour, i.e. 9:10.
- We'll make a 5/10 minutes break around 10:00.

Labs

- Start Thursday next week, i.e. September 20.
  - All sections will have 11 lab classes

Advice

For Lecture Preparation

- Read the material before the lecture:
  - In the lecture that precedes the first class of each lab, I'll present:
    - The concepts and the information required to complete the lab
    - Provide hints to address the key issues of the lab
  - The class slides will be available since the beginning of the week of that lecture, i.e. at least 2 days before, at http://web.fe.up.pt/ pfs/aulas/lcom2012/
  - The lab handout will be also available at about the same time via the same URL

  so that you can:
  - Understand better the lecture
  - Participate more actively in the lecture
  - Get your questions answered before the lab class
- If I'm late and you cannot wait, use last year material available at http://web.fe.up.pt/ pfs/aulas/lcom2011/