Laboratórios de Computadores: Apresentação
Computer Labs: Introduction

2º MIEIC

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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”

Several short lab assignments

- Each focusing on one I/O device
- Some of them take only one lab class, others take two lab classes
- Requiring a preparation of about 5 hours per lab class (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 assignments and project should be done in groups of 2 students.

Changes From Previous Years

What? There are no lab classes on the RTC or on the serial port (UART)

- However, we will still talk about them in the lectures
- Students wishing to get a grade of 16 or better, are expected to use these devices anyway

Why?

- Have more lab classes for the other I/O devices
  - Most of them now have 2 lab classes
- Remove some pressure out of the graded lab assignments

Expected results

- Less cheating
- Higher passing rate

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. Four lab assignments are graded.
   - Grading will be done off-line on code you submit to an SVN repository.
2. We will also grade your participation in the class, i.e. whether you have prepared the lab, whether you participate actively and your contribution to the work of your team
3. The final project must be demonstrated in a date in January to be announced.

Formula $\sum c_i * 0.15 + 0.45$ FP + 0.1 CP

where c_i is the grade of 3 graded-labs (out of 4) of your choice
BUT for a **final** grade of 19 or 20,
you **must** "choose" the mouse lab

I.e., we'll use the best 3 grades of the 4 graded lab assignments, except for **final** grades higher than 18.

Final Project Grading (1/2)

Execution: 45% + 5%

- 5% for demo in the last lab class

Code: 20%

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

Final Report: 20%

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

Tools: 5% (SVN) (We expect you to update the SVN repository at least once a week.)

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

Marketing Bonus

- of 1 valor for the participation in the Semana Profissão Engenheiro (SPE), sometime in March 2015
  - These students often become monitors in following years
- In recent years, we have selected about 3 projects per year

Final Project Milestones

Project proposal: Beginning of the 8th lab (week starting 17th 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 9th lab class

- Refinement of the proposal, identifying the modules to implement, their functionality and API.
- Should include planning of the project
- Must be rewritten in class, if the instructor does not accept it

First demo: At the last lab class of the semester.

Project submission: December 21st (no penalty until TBA)

Project presentation: TBA (likely January: 5th to 7th)

Project Examples

- Games (video, timer, keyboard and mouse)
- Two user games (video, timer, keyboard and serial port)
- Electronic calendar (video, keyboard, mouse, RTC and timer)
- Music composer/player (video, keyboard, mouse and timer)
- Text editor (video, keyboard, mouse, timer and RTC)
- Typing tutor (video, keyboard, mouse, timer)
- File transfer between PCs (video, keyboard, serial port)
- Chat between PCs (video, keyboard, serial port)
- Video player (video, keyboard, mouse, timer and RTC)
- Drawing/painting program (video, keyboard, mouse, timer, RTC and serial port)

TEs Grading

Labs 3 of the 4 graded labs, each with a weight of 15%

- 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 7 calendar days in advance
- Submission at the end of presentation/discussion

Project Similar ot that of the other students, but with a weight of 55%.

- 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 7 calendar days in advance
- Submission by the same deadline as other students
- Presentation/discussion in the same period as for other students (in January, dates TBA).

IMPORTANT Students wishing to be assessed as TE's must send me (`pfs@fe.up.pt`) email until the 22nd of September

- If I do not reply in 24 hours, please resend your email

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 7 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
  - Check the Despacho do Reitor Nº 08/09/2011
  - We believe that the majority of you follow the rules
- 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 similar code will be penalized
  - You may still help your colleagues, but you **cannot share code**

  That the lab assignments are identical to those of last year is no excuse
- The penalty may range:

  From a zero in that lab **and** a penalty of "3 valores" in your final grade;

  To failing the course

Important Dates

Labs

Lab	Week	Topic	Comments
Lab 0	22-09	Redmine and VM	Not graded
Lab 1	29-09	Video (text)	Not graded
Lab 2	06-10	Timer	Two classes
Lab 3	20-10	Keyboard	Two classes
Lab 4	10-11	Mouse	One class, but you are expected to work during Semana da FEUP
Lab 5	17-11	Video (graphics)	Two classes

Project

What	Week	Comments
Proposal	17-11	8th lab class
Specification	24-11	9th lab class
First demo	15-12	Last lab class
Submission	21-12	Official date
Presentation	5, 6 and 7 January, 2015	To confirm

- Project submissions up to TBA will not be penalized.

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  - Rui Fernandes (from previous years)
  - Nuno Sousa (from previous years)
- Staff of previous years
- Students from previous years

Thank You!

Questions?

Platform

MINIX 3

Unix-like 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.
  - As long as you do not abuse

Labs

- Start next week, i.e. September 22
  - All sections, but the ones on Monday, will have 12 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 1 day before, at http://web.fe.up.pt/ pfs/aulas/lcom2014/
  - 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's material available at http://web.fe.up.pt/ pfs/aulas/lcom2013/