Laboratórios de Computadores: Apresentação
Computer Labs: Introduction

2º MIEIC

Pedro F. Souto (pfs@fe.up.pt)

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Staff

Instructors

- Bruno Pimentel
- João Fernandes
- Pedro Silva
- Tiago Fernandes
- 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 8 hours per week (during 4 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 class is graded. The grade depends on:
   - Lab preparation (20%);
   - Objectives met (80%);
2. The final project must be demonstrated in a date to be announced in the first week of January.

Formula $\sum c_i * 0.05 + 0.4\ \text{FP} + 0.10\ \text{AP}$

where c_i is the ith grade (assuming decreasing order)
of the lab classes, and
i ranges from 1 to 10

That is, we'll use the best 10 grades of the lab classes.

Final Project Grading (1/2)

Execution: 40%

Code: 25%

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

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: 15%

Final Project Grading (2/2)

- To the grade obtained by applying the above criteria, we'll apply a difficulty and **originality** factor.

Difficulty Factor

- Based on the I/O devices used

60% For the following devices which are **mandatory**:

- Graphics card (in text mode);
- Timer
- Keyboard

10% For each of the remaining I/O devices:

- Graphics card in graphical mode;
- RTC
- Mouse
- Serial Port

Final Project Milestones

Project proposal: Beginning of 7th lab class

- 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 (will be used in the evaluation of the corresponding class)
- Must be rewritten in class, if the instructor does not accept it

Project submission: December 16th

Project presentation: In a date to be announced in the first week of January.

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)

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  - 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
- ACK compiler and assembler
- Other SW development tools
  - `make`
  - `ar`
  - `SVN`
  - `diff/patch`

Announcements

Classes

- Start 10 minutes after the hour, i.e. 14:40.
- We'll make a 10 minutes break around 15:30.

Labs

- Start next week, i.e. September 19.