

# Changing the Learning Process of the Input/Output Topic Using a Game in a Portable Console

Edurne Larraza-Mendiluze  
University of the Basque Country  
Manuel Lardizabal Pasealekua, 1  
20018 Donostia-San Sebastián  
edurne.larraza@ehu.es

Nestor Garay-Vitoria  
University of the Basque Country  
Manuel Lardizabal Pasealekua, 1  
20018 Donostia-San Sebastián  
nestor.garay@ehu.es

## ABSTRACT

The issue addressed in the following lines is that of the learning of the Input/Output (I/O) subject in computer engineering. It is a subject that is taught in many different ways, although it appears in virtually every curriculum. The next two sections aim to describe the changes applied to this topic due to the introduction of a collaborative game for portable consoles, and the three different parts of the game itself.

## Categories and Subject Descriptors

K.3.2 [Computers and Education]: Computer and Information Science Education – *computer science education*.

## General Terms

Human Factors, Experimentation

## Keywords

Computer Input/Output, Computing Curricula, Face to face collaborative learning.

## 1. THE CHANGES

In our previous courses, during the theory lectures of the I/O topic, concepts such as peripherals, polling, interrupts, interrupt vector, I/O controller, direct memory access, etc, were introduced, along with the specific case of the personal computer (PC). To enhance the theory concepts, a few laboratory sessions were carried through, where students could control the standard peripherals of a PC (mainly monitor, keyboard and clock). This is problematic nowadays since current operating systems do not allow access to most of these structures.

The new educational strategy will directly situate students in front of a game console, where the theoretical concepts will be learned collaboratively through a question and answer game. PCs and Nintendo® DS (NDS) consoles (it could be others) will be compared, and students will program the NDS peripherals.

The problems posed during the practical sessions, where students had to program the polling or interrupt routines to achieve a specific performance of the peripherals in a given case (e.g. a vending machine) will remain the same. However, the automata used to design those systems will also be introduced in the game proposed.

## 2. THE GAME

The game is composed of the following three parts:

First thing, students play on each machine, face to face [2] in a collaborative team, in order to learn the theory of the topic through a question and answer game. The first time the question arises, no answer is offered. After analyzing course and other material, students will make the machine know that they are ready to answer. Then, a list of four possible answers is given to students, who have a small time limit to choose one.

The system requires a unanimous correct answer. However if any player gives a correct answer without it being unanimous this will be taken into account and she will earn all the points related to the question, only if in the next trial a unanimous correct answer is reached. Otherwise the system will consider this player being not sure enough of her answer, since she couldn't convince the rest of the team. Therefore, incorrect answers or non answered questions will make students earn fewer or no points.

Questions are organized in difficulty levels. When teams have successfully completed all the questions of a level, the game comes to a second part, where teams have to construct an automaton. They will acquire the required I/O knowledge by selecting from different starting states, middle states and transitions. Finally, they have to connect states together. Every possibility will be previously programmed and depending on the selections different branches of the program will be executed. Thus, the console will play the automaton designed and students will receive direct feedback of the design, where they may note whether it is correct or not.

The third part is known as single mode. Here students can play with the questions that have previously been answered correctly by the team. These questions are organized in different containers, following Leitner's system [1]. Every question starts in the first container. When the player answers a question correctly, it will move to the next container. Otherwise, no matter which container the question is in, it will go down the first one. This way, well assimilated questions will be stated only a few times, while the questions that become problematic for the student will be repeated until she remembers it correctly.

## 3. REFERENCES

- [1] Leitner, S. 2003. So lernt man lernen. Der Weg zum Erfolg. Herder, Freiburg.
- [2] Zurita, G., Nussbaum, M. 2004. Computer supported collaborative learning using wirelessly interconnected handheld computers. *Computers & Education*, 42, (pp. 289-314).