MATHMAGIC: THE ENCOUNTER BETWEEN COMPUTATIONAL AND MATHEMATICAL THINKING

Pedro Lealdino Filho; Christian Mercat;

Université Claude Bernard – Lyon 1; pedro.lealdino@etu.univ-lyon1.fr; christian.mercat@math.univ-lyon.fr;

Computer Science is becoming more present in the curricula of the schools. Some countries already have changed their programs to offer subjects like algorithms, logic and programming languages since the beginning of early cycles of fundamental education. However, the contents are strongly related with mathematics, and for this reason, mathematics teachers need to update themselves to be able to teach the fundamentals of computer science. For this reason, we offer on this workshop an introduction to the development of computational thinking from a mathematical trick with cards. At the end of the workshop, the participants will be able to write their own code, solving a mathematical problem.

Keywords: computer science; mathematics; algorithms; computational thinking; mathematical thinking;

THE PROBLEM

The problem to be solved during the Workshop will be to model a magic trick from the Figure below:

3	7	23	19
17	9	11	31
5	27	21	13
1	25	29	15

6	5	20	14
28	23	15	13
31	29	21	22
4	30	7	12

14	10	15	31
11	27	29	13
26	28	9	12
8	30	25	24

14	26	10	27
3	30	15	18
31	6	19	23
2	7	11	22

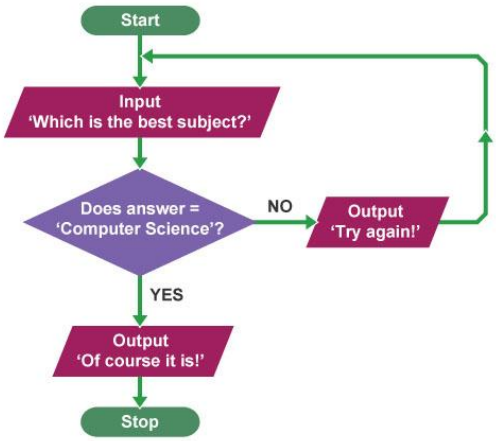
17	23	19	25
27	30	29	18
22	21	26	24
16	28	31	20

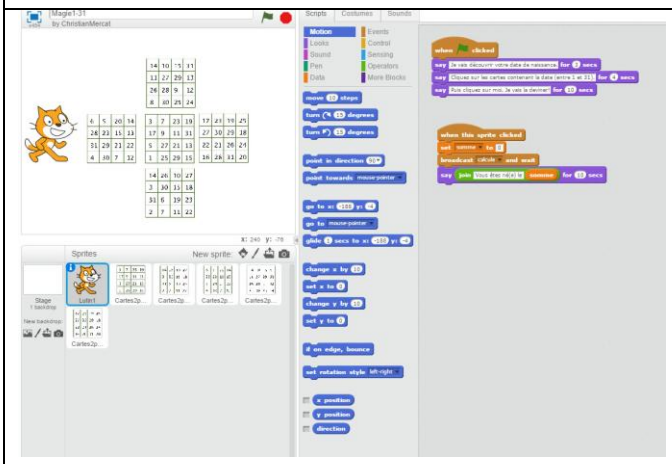
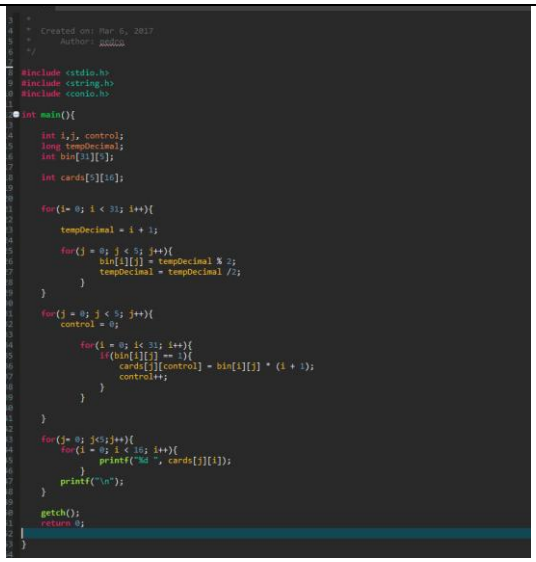
Figure 1: Cards

The magical trick is to guess a number between 1 and 31 indicating in which card the number is present. For instance, if one choses the cards: 1, 2, 3 and 5 in the previous order, it's possible to say that the chosen number was 29. Of course, I won't reveal the trick here. This is one of the exercises of the Workshop. Also, the participants will learn:

- Writing an algorithm in pseudocode: Describing the thoughts and steps to solve a problem in natural language, explaining the reasoning to achieve the solution;
- Creating an algorithm in visual language (Scratch): Understand the scope of a computer program, create variables, methods and operations and printing the result. At the end of this stage the participant will have the game in a digital version.
- Creating a program in programming language (Python): Going a little bit deeper the participant will be able to create the algorithm to generate the cards used in the magical trick writing down a Python program.

Then, is expected that participants achieve the following levels:

in pseudocode:
 	
REPEAT
OUTPUT 'What is the best subject you take?'
INPUT user inputs the best subject they take
STORE the user's input in the answer variable
IF answer = 'Computer Science' THEN
OUTPUT 'Of course it is!'
ELSE
OUTPUT 'Try again!'
UNTIL answer = 'Computer Science'
	

Pseudocode – Level 1	Flowcharts – Level 2
	
Visual Programming – Model – Level 3	Coding – Abstraction and Generalization – Level 4

The participants shall bring their own computers and the time expected is about 4 hours.

REFERENCES

images:

http://www.bbc.co.uk/education/guides/z3bq7ty/revision/2

https://scratch.mit.edu/projects/111975655/