Designing algorithms using CAD technologies

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A representative example of eLearning-platform modular application, 'Logical diagrams', is intended to be a useful learning and testing tool for the beginner programmer, but also for the more experienced one. The problem this application is trying to solve concerns young programmers who forget about the fundamentals of this domain, algorithmic. Logical diagrams are a graphic representation of an algorithm, which uses different geometrical figures (parallelograms, rectangles, rhombuses, circles) with particular meaning that are called blocks and connected between them to reveal the flow of the algorithm. The role of this application is to help the user build the diagram for the algorithm and then automatically generate the C code and test it.
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This new environment created by the eLearning technology is considered by most students an unreliable one, caused especially by preconceived ideas regarding the capabilities of this newly developed teaching process in relation to the traditional one. Students are afraid that the new subjects cannot be understood through lifeless computer-driven methods as well as from a teacher, thus giving up to a socially-oriented system that combines the humanity of a face-to-face tutoring method with state of the art networking and communications technologies.

eLearning platforms must draw the students to the computer and make their journey through the new world of teaching as pleasant as possible, in order to win the battle with the traditional learning methods. This can be achieved by providing a user friendly software interface, with rich informational content delivered in a modern new look. We then realize that the most important components of an eLearning platform are the software applications included within, because they have the power of making the difference between a useful learning tool and a non-viable alternative learning method.

A very representative example of eLearning integrated software application is 'Logical diagrams', which is intended to be a useful tool for the beginner programmer, but also for the more experienced one. The problem this application is trying to solve concerns young programmers who forget about the fundamentals of this domain, algorithmics.

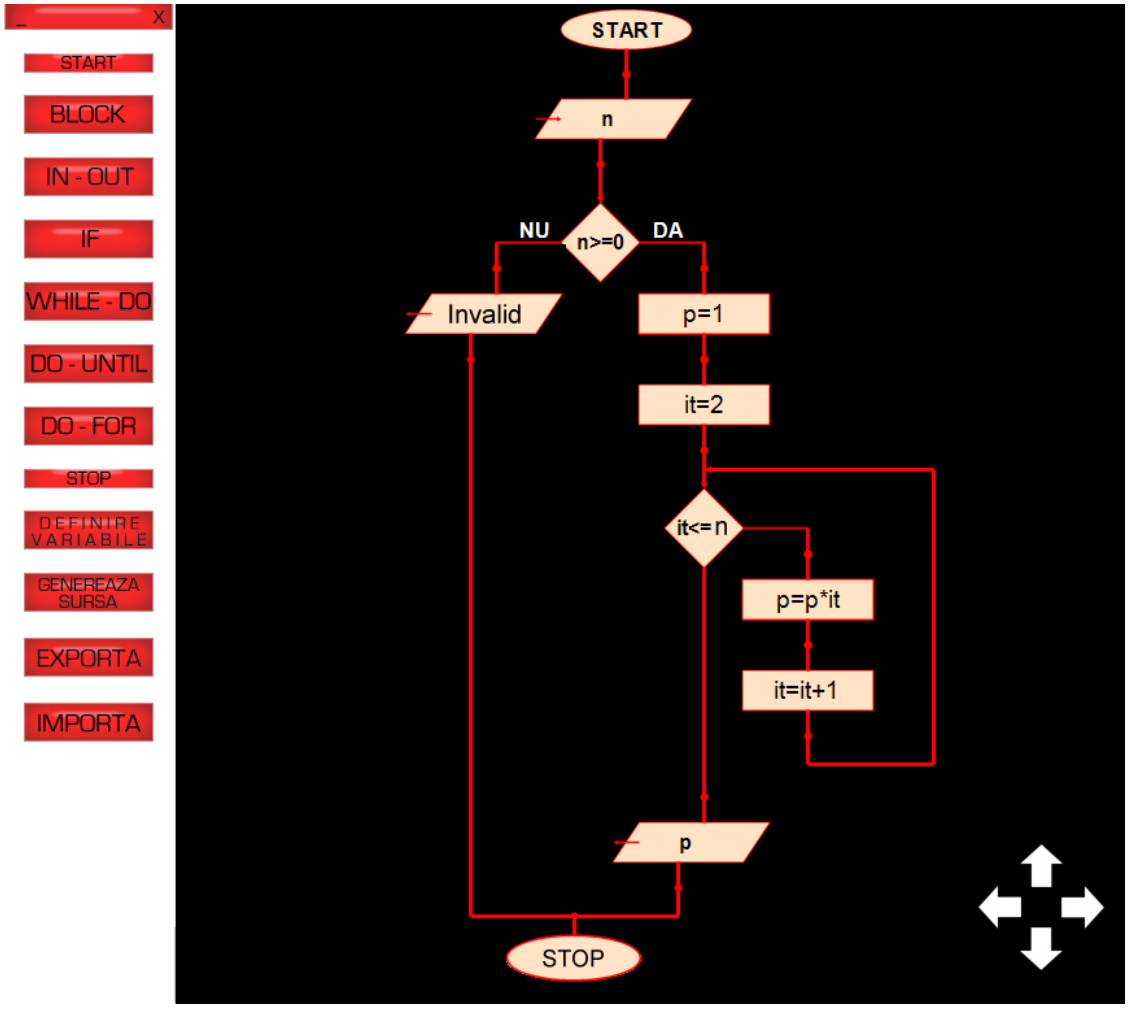
Working in the software development business implies a lot of risks, considering, for example, that a logical error in a financial application can have disastrous consequences for both the company that used the application but also for the development team. Therefore, programmers should have a serious training in the field before starting to develop, in this way protecting themselves from the risks above presented.

A remarkable initiative has been taken by some university teachers who insistently ask their students to design the algorithms by using logical diagrams.

Logical diagrams are a graphic representation of an algorithm, which uses different geometrical figures (parallelograms, rectangles, rhombuses, circles) with particular meaning, called blocks and connected between them to reveal the flow of the algorithm. The main types of blocks are the start-stop blocks, the input-output blocks, the assignation and decision blocks.

Considering homework of this type, imagine that it would be really hard for a student to 'edit' a diagram on paper. Another fact is that in most cases, a complex diagram does not fit on a normal sheet of paper and connectors are used, which reduce the legibility of the diagram. All these problems are solved through the innovative 'Logical diagrams' application which overcomes the traditional learning issues.

Considered the problem of determining the factorial of the number n, given from the standard input device, the logical diagram build in 'Logical diagrams' looks like this:



The algorithm is extremely simple: the number n is read from the keyboard and then compared to zero to determine if it's a positive or negative number, case in which a message is being displayed on the screen to let the user know that the operation is not possible. If 'n' is a positive number the algorithm continues with the initializations of the variable 'p', which will carry the result of the product, and the iterator variable 'it', which will count the number of loops processed. It then follows the while loop, where the product is being determined step by step, through the incremental behavior of the 'it' variable. When this variable reaches then upper bound of its range the cycle stops and the product 'p' is displayed.

Even though the example is very simple, the utility of this application can be easily detected; the user had only to place a few object on the workspace, edit their properties and declare two variables.

The ease in building as complex as possible logical diagrams and the endless editing possibilities is what makes this application stand out. The fact that you can delete or add blocks to the diagram and not be afraid of not understanding a word of that diagram is what should draw the student to study. Further more, these capabilities offer the possibility of optimization and development of the algorithm in the context of emerging innovative solutions.

Another approach of this application in the programmer's teaching process is the C code generator module, which is very useful for the novice but also for the more experienced, considering the amount of time he saves with the coding work.

The generated C source code of the previous algorithm:

The source code can be easily launched in a C compiler, which will compile and run the source, allowing the user to test his algorithm and make the necessary changes in case it fails to deliver the expected results.

The Import-Export module helps the user share his results with others, thus creating an interoperable network between students. The information sharing concept in an eLearning platform is extremely important because it helps the students with difficulties in understanding certain modules of the lesson and assures that they will not fall behind.

'Logical diagrams' is based on the graphs theory, more specifically, the trees category. A tree is an unoriented graph, connected and without cycles. Trees are the simplest graphs and are frequently used in practice. The diagram is mapped on such a tree and by traveling it in preorder and parsing the visited nodes, the source code is being easily obtained.

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