
Software Reverse Engineering in Education Using VB2ALGO Tool

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Abstract

In recent years programming languages have been included in the curriculum for Libya's secondary schools. It is one of the basic skills taught to computing students and visual basic is one of the tools applied when the students are unfamiliar with programming languages. Often students experience difficulty in terms of understanding and then executing certain programs, and the program procedures to show the results. With the growth in software reverse engineering where the practice of analysing a software system help to extract design and implementation information.

We present a new tool named *VB2ALGO* that generates an algorithm (a flow chart and pseudo code) of the source code of Visual Basic program to help students and teachers using this algorithm to understand the program or to build the same program in other languages.

General Terms Education, Algorithms, Design

Keywords Revers Engineering, Framework

1. Introduction

Many software systems have been constructed and are widely used today. These systems are so important that their failure would have a very serious impact on the operations of the organization they serve. Therefore, it is vital to keep these systems running. Over time, these systems become more complex and increasingly difficult to understand, maintain, and evolve to meet the user's needs due to changes they go through during the software's life-time.

Technology has been used in development of education and for revolutionising of systems of learning, and this is of vital significance here. Technology produces and changes teaching and educational methods, introducing new opportunities to the education system [1].

Entered to learn programming languages in high school in Libya in recent times were among the materials that will be taught in secondary Schools in Libya are a substance programming Visual Basic language. The programming languages in general, are new to high school students in Libya. Therefore, the student finds it difficult to understand the programs and the manner of implementation and the steps based on the implementation of these programs.

A computer program is composed of individual modules, understandable by a computer, that solve specific tasks. Computer programs these days offer a wide range of techniques for solving problems using programming languages. A technique means the methodology or approach taken to solve a problem rather than being a programming style of language[3].

An Algorithm is a process to achieve a specific task. It is the idea behind any computer program? The algorithm is to solve a large, well-defined problem. An algorithm problem is identified as a full range of cases, it should work on what property the output must be the result of working on one of these cases [2].

The process of aiding a better understanding for software systems is called software reverse engineering. Reverse engineering pertains to

any action which is aimed at determining the workings and discussing the basics involved in the function achieved by the system. With regards to the products, an earlier stage of high-level, detailed or a functional specification stage of the development and design process is the aim [4,5].

In this paper we focus on reverse engineering techniques that produce results by analyzing the source code. The application of these optical techniques through the analysis of any source code and the application of the basic rules will generate algorithms (flowchart and pseudo codes).

Any computer program depends on an algorithm to describe the steps for building that program to find the solution for the problem. Therefore we propose a new tool named *VB2ALGO* that generates an algorithm (a flow chart and pseudo code) of the source code of Visual Basic program to help any programmer using this algorithm to understand the program or to build the same program in other languages.

We have chosen VB language for its simplicity, flexibility and it's used as a teaching language and learning aid in Libyan high schools and all around the globe.

The contributions of this paper can be summarized as follows:

- Design and implement a new tool that transforms a Visual Basic Source code into an algorithm.
- A review of algorithms and how they are constructed and represented. This will establish a baseline for the future work.
- Evaluation of the implemented tool using a collection of test cases and questionnaire in Libyan high schools.

2. Related Work

The programming tools used in Education have a very limited scope, since not much information has been found over the topic. Hence, the intention of this paper is to enhance the scope of the programming tools in the Education sector by revolutionizing teaching and learning systems.

2.1. Discussion

In most of high schools of the country, the Visual Basic Code is taught as part of the national curriculum. To thoroughly develop this code, an Enterprise Systems Sequence needs to be developed efficiently. Thus, the purpose of this study is to develop a teaching tool which can be used by instructors for the purpose of helping the students understand Visual Basic language.

There are two main reasons why this concept was investigated by the researchers. At first, we are highly knowledgeable and skilled in the field of software programming and the teaching of it, since the subject has been taught in our education system over recent years. Secondly, we are very much interested in acquiring further knowledge about programming tools in view of the increasing trend in favour of computing in today's innovative and modern world.

We conducted research into the tutoring of the pupils for the sake of comprehending the objects of Visual Basic, this being part of the module requirement, Enterprise tool programming development, so that we can easily control and confirm the functional specifications for the project. In order to sum up the data gathered, a questionnaire has been created which later fostered the production of an outline for a tool that could be created for the project, as shown in Figure1.

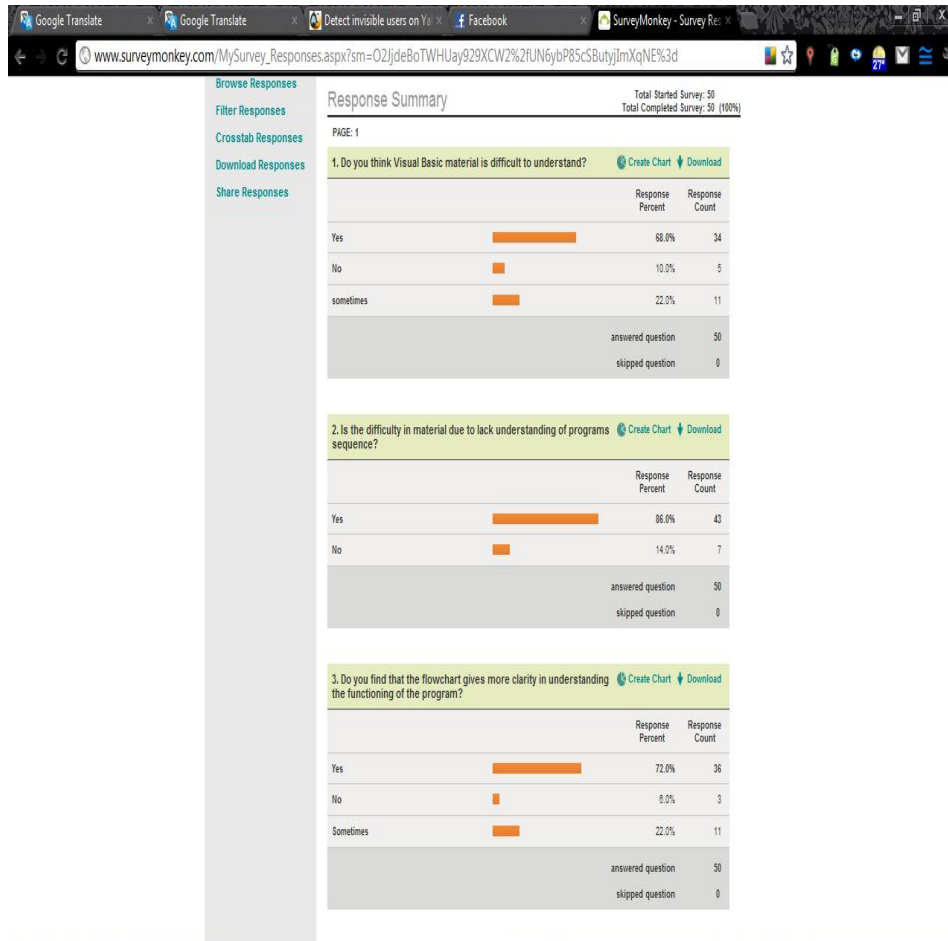


Figure 1: Questionnaire for requirements

So the new tool will help to develop the education system as present in the country by providing an efficient means for teaching. And also the material presented in this paper will be beneficial to readers since it would enhance their academic, professional and practical lives.

3. Proposed VB2ALGO Tool

As shown in Figure2, VB2ALGO tool takes a Visual Basic 6 source code file as an input and produces an algorithm (flowchart and VB6 pseudo-code) as an output.

It uses static analysis techniques to extract an algorithm, where "static analysis produces results that are valid for all executions and for all inputs".

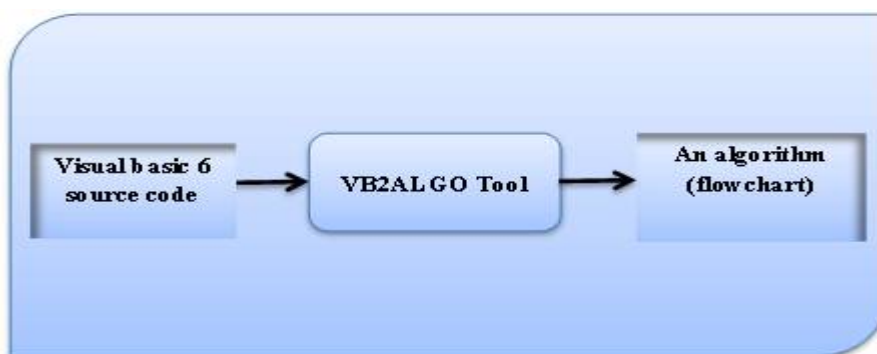


Figure 2: The preliminary architecture of VB2ALGO system

3.1. Methodology

Our research strategy would ordinarily focus on understanding the process of teaching and learning when involved in computer programming. Four cycles were used in this study from March 2013 to July 2014. A pre-exploratory study was conducted in the second half of the school year 2013/2014, the first and second cycles in the first half of 2013/2014, and the third and fourth cycle in the second half of that academic year. The data collection was provided at the beginning of the investigation. This procedure involved some reflections after lessons were carried out. The observations of the relevant lessons were focused on and involved also issuing questionnaires with the aim of establishing participant's intuitive ideas about the difficulties and possible tasks to be developed.

3.2.VB2ALGO Tool's Algorithm

The interface of the tool has been designed in three stages and each stage depends on the preceding. These stages are: loading the source code file, analyzing the code and drawing the code. And the algorithm in Figure 3 shows the general block diagram of the tool.

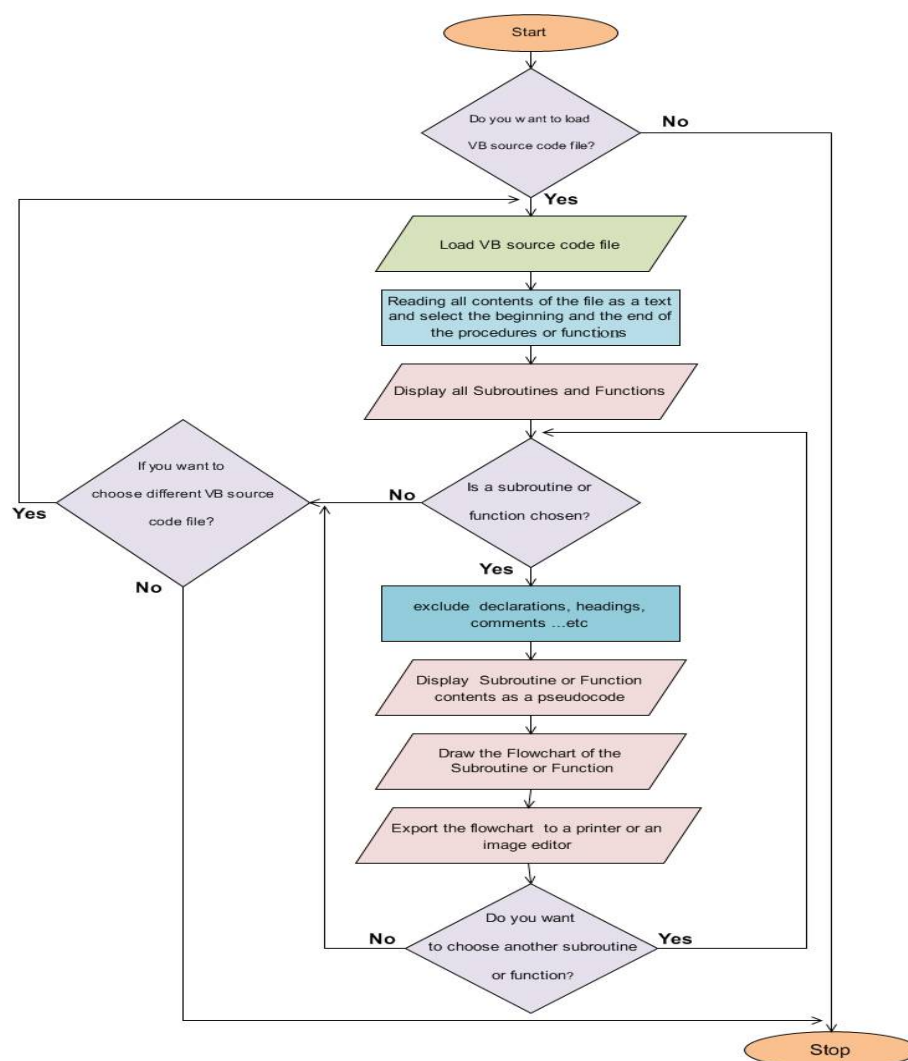


Figure 3: The Tool's Algorithm

4. VB2ALGO Implementation

System implementation describes the development tools that have been used in developing the proposed tool.

Given the main screen of the tool in Figure 5, we see that it consists of three sections: the first contains the source code, and the second section contains subroutines and functions that are found in the source code after analysis. The third section contains a summary of the code after choosing the function or the subroutine.

Therefore, the implementation of the algorithm has three main steps:

- 1- Loading the source code file "Load VBCODE".
- 2- Analyzing the code "FUNCTIONS AND ROUTINES".
- 3- Drawing the flowchart "Draw".

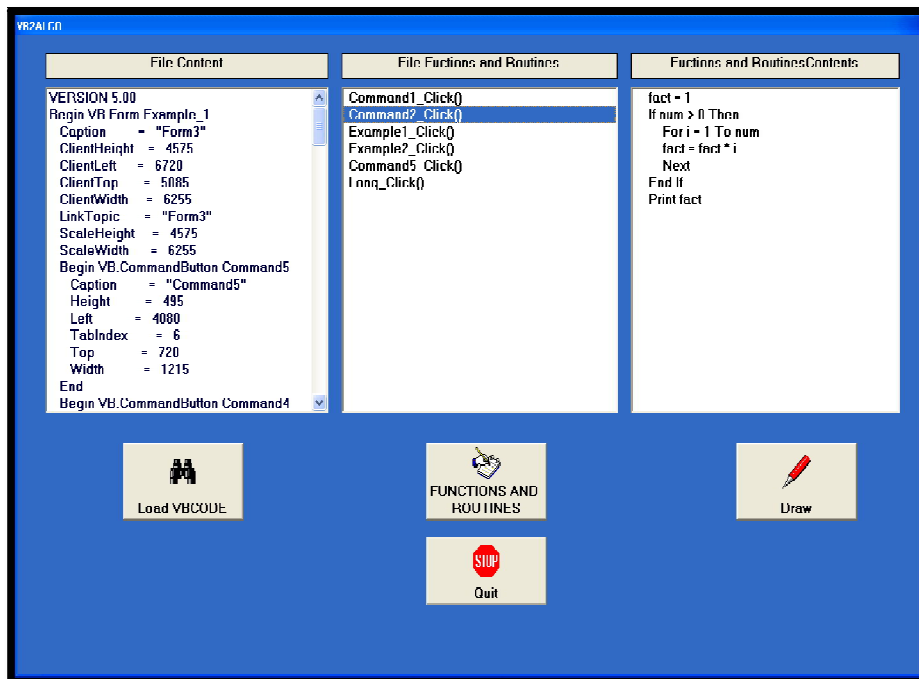


Figure 4: The main screen for the tool VB2ALGO

Figure 5 shows a flowchart generated by the tool. The flowchart depicts a transformation of a function code to print text.

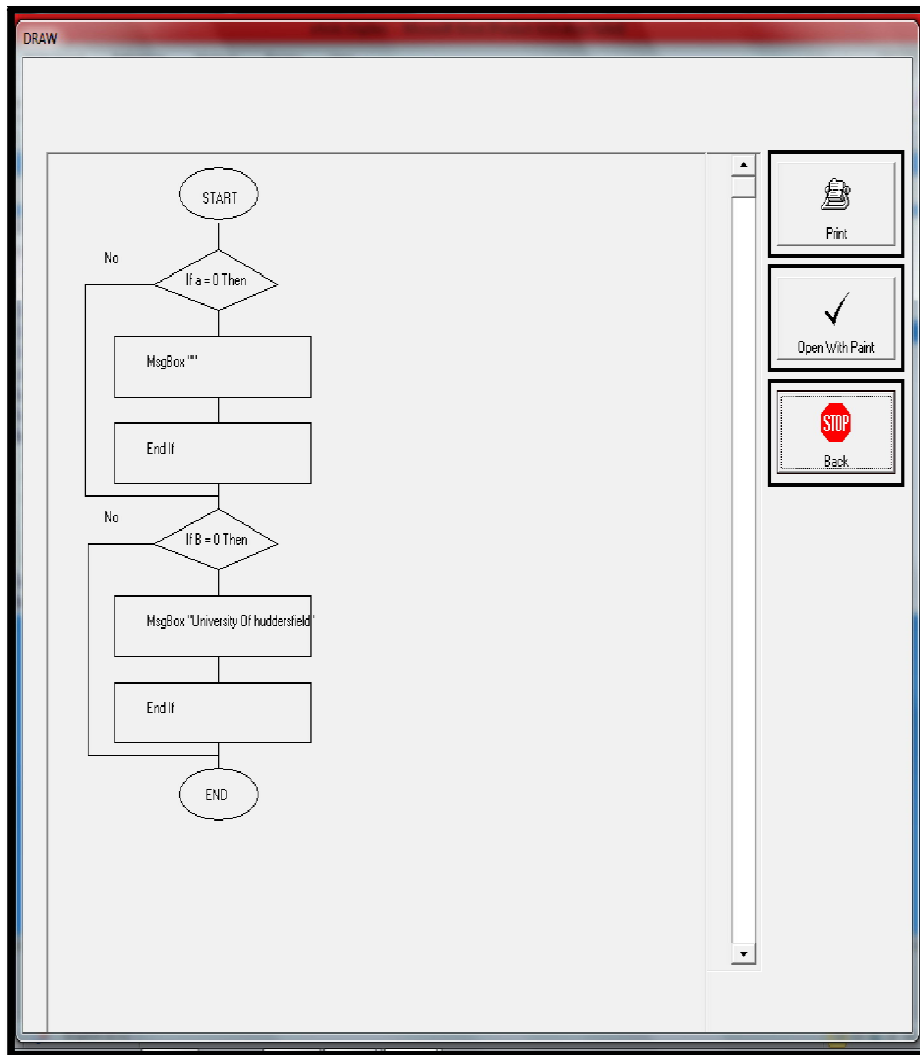


Figure 5: Drawing the code

5. VB2ALGO Evaluation

The questionnaire was distributed to students in the faculty of science at the University of Zawia, Department of computing. The total number of students who participated was 125 and the results online are as shown in Figure 6 and Figure 7:

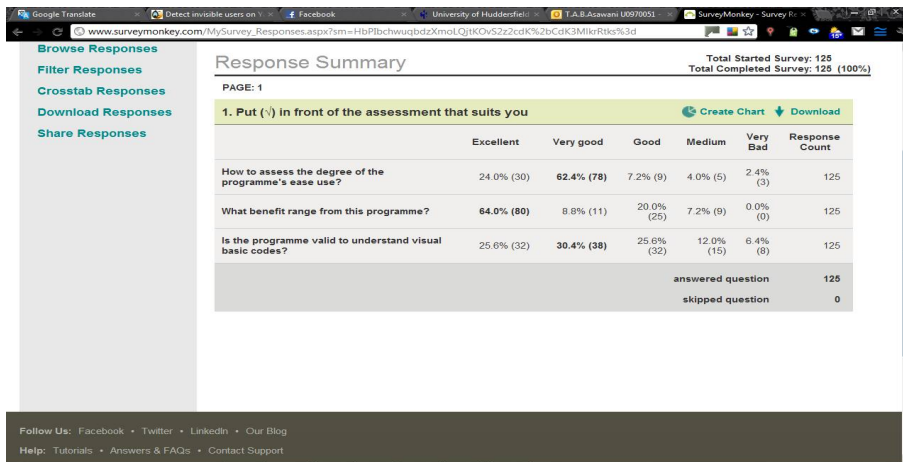


Figure 6: Results from the third question on the questionnaire

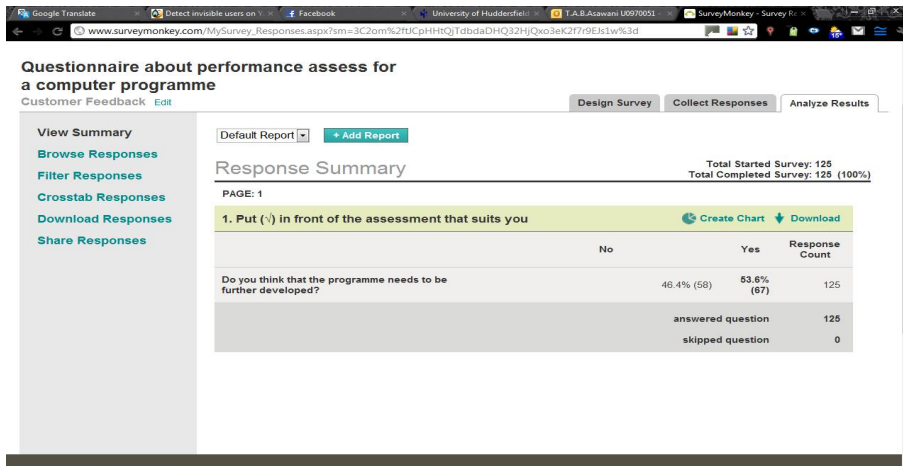


Figure 7: Results from the fourth question on the questionnaire

Table 1 shows the distribution of a sample of students on the criteria proposed. Figure 8 shows the distribution of the sample

Table 1: Distribution of a sample of students for three questions

Criteria	Excellent	Very good	Good	Moderate	Very Poor	Sample size	Average
	4	3	2	1	0		
Usability	30	78	9	5	3	125	3.016
Benefits	80	11	25	9	0	125	3.296
Understanding	32	38	32	15	8	125	2.568

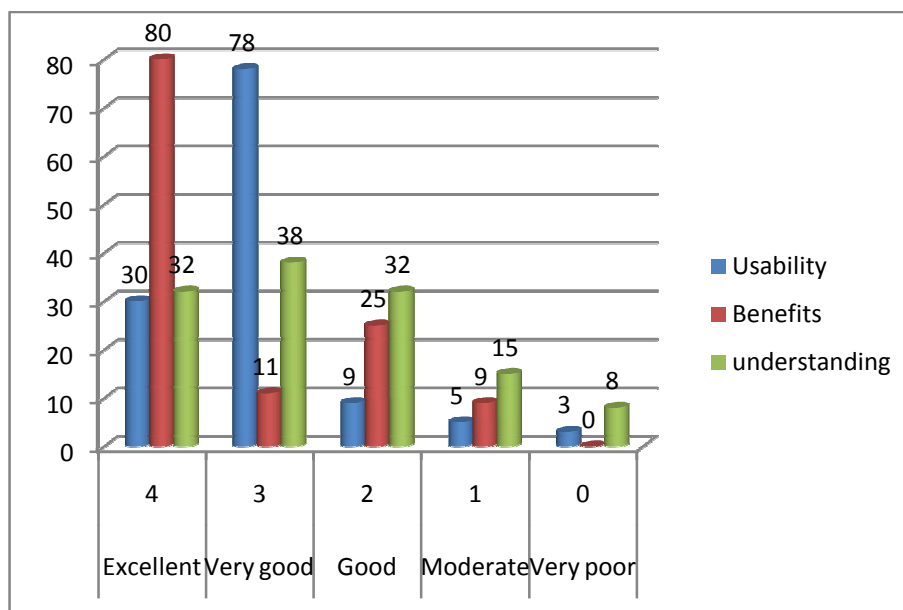


Figure 8: The distribution of the sample of students for three questions.

Table 2 shows the distribution of the sample as criteria stating: "Need development". Figure 9 shows the distribution of the sample.

Table 2: Distribution of the sample for the criteria, "Need development".

Criteria	No	Yes	Sample size
Development	58	67	125
	46.4%	53.6%	%100

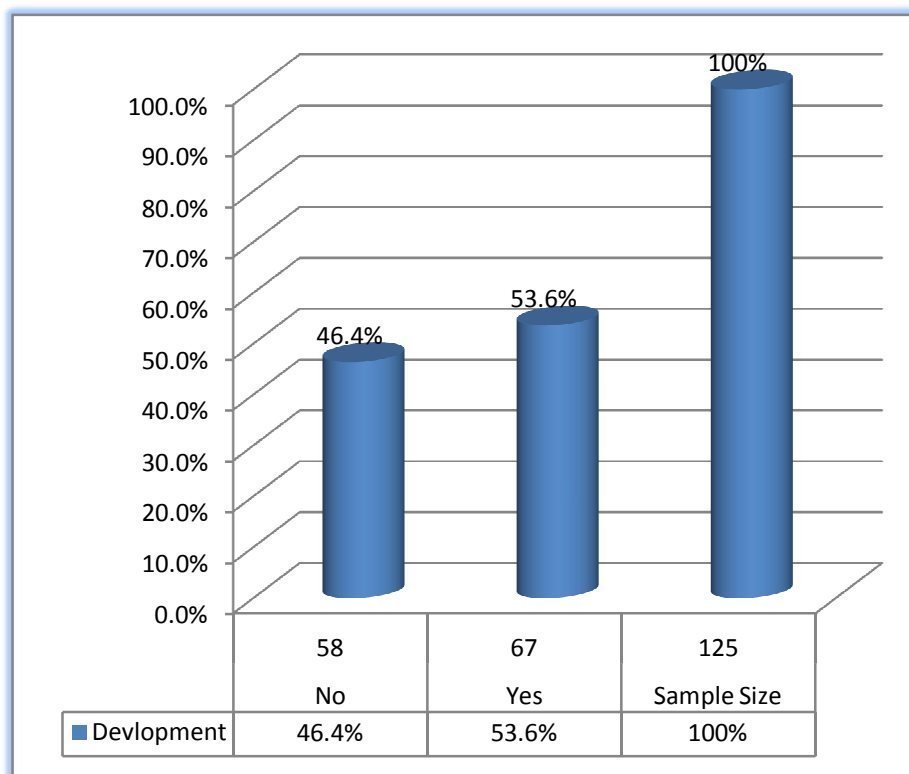


Figure 9: The distribution of the sample for the criteria, "Need development".

Table 3 shows the distribution of a sample of students on "Need support" criteria. Figure 10 showing the distribution of the sample in relation to the "Need support" Criteria.

Table 3: Distribution is ample in terms of “Need support”

Criteria	I do not need	Sometimes need	Often need	Need	Sample size	Average
	3	2	1	0		
Need to Support	45	42	20	18	125	1.912

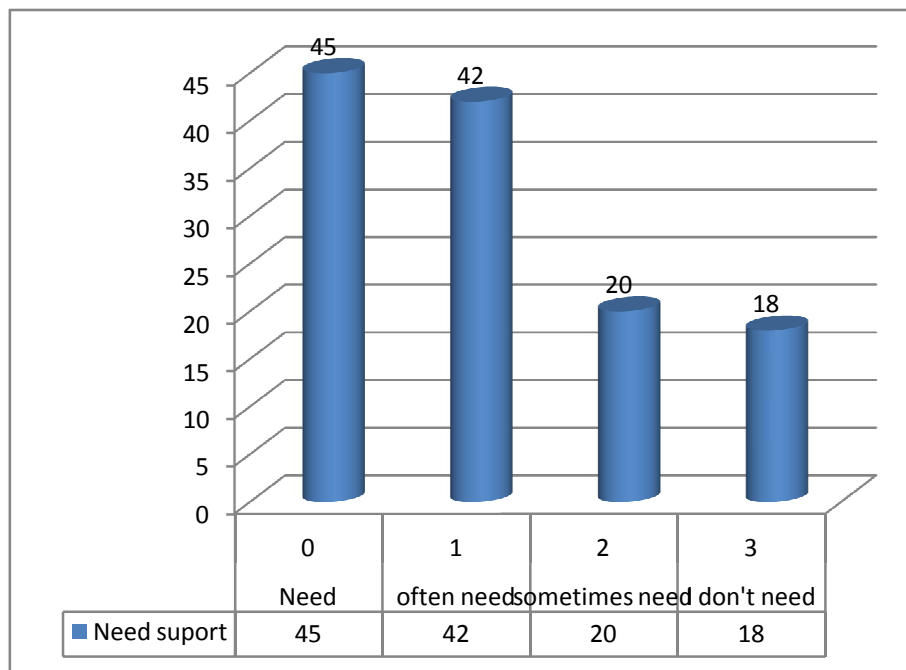


Figure 10: The distribution of the sample on "Need support".

Based on previous results from the questionnaire, and according to the analysis, it can be observed that the results were very good in terms of ease of use, interest earned, and understanding the VB language. Concerning the development of the tool, the results have shown a requirement for some development, such as: developing a user's guide as well as more examples for well-known computer algorithms to illustrate the ability of the tool for converting from a source code into an algorithm. Also, the results show that some professional assistance is required in order to help the user interact better with the tool.

Overall, it can be concluded that the tool can be utilised in the field of education and can help students, as well as the instructors to understand the Visual Basic language.

6. Conclusions and Future Work

In this paper, we have presented a new tool (VB2ALGO) that transforms a Visual Basic Source code into an algorithm.

The proposed tool is to provide a vital resource for teachers, instructors and those students who are involved in programming in their academic lives.

The basic concern of the paper and the main contribution it has been able to provide is in relation to the development of a software tool designed and implemented for students and instructors in a school setting. This would help us to thoroughly understand the application of both Pseudo-code and flowcharts.

The proposed tool does not require any kind of training and existing systems may provide the users with the ability to carry out system analysis and design.

Our work has a number of limitations, which we propose to address in future work:

- New features such as a user guide should be added to provide general information about the facts and figures relating to the algorithms.
- The tool should have the ability to export the flowchart to Excel, PowerPoint, MS Visio and Word.
- All visual basic statements should be managed by the software.
- It should be able to function on a local network.
- A higher version of Visual Basic 6 and its features should also be able to function.
- Each step of the flowchart should be traced by running a source code over the displayed flowchart.
- The tool should be capable of handling all programming languages.

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