

STUDY ON DESIGNING A PRODUCT THROUGH TWO DIFFERENT COMPUTER-AIDED DESIGN PROGRAMS

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Abstract

In getting the results described below we chose to design a commode, in two different computer-aided design programs, tested by a classic design method, starting from a 2D sketch and reaching volumetric design to highlight the strong points and weak points of making the product as well as the similarities and the differences between the two programs.

The computer-aided design programs used in this article are different; the result of the performance testing which subject were the two programs is informative and largely depends on the user experience and skills.

This short presentation helps the user to decide what is the choice to be done when it is about computer-aided design program, using useful design information, depending on the domain and industry on which s/he focuses. Choosing the correct design program will result in time and resource savings, which are necessary for optimum performance.

Key words: AutoCAD, Inventor, 3D, optimization

INTRODUCTION

This article is dedicated to production practice and provides an overview of two of the many computer-aided design programs, such as: AutoCAD, VS Inventor Professional, so that the user may be able choose the program that will meet his/her requirements.

The paper provides below both an adequate know-wow, the strong points/ weak points, similarities/ differences, and guidance for choosing the ideal design program in order to create the object studied in this example, as shown in the Fig. 1.



Fig. 1. The object studied

MATERIAL AND METHOD

The design of the product presented was carried out using the same method by means of two different computer-aided design programs that were installed on a single laptop device.

Program A - AutoCAD 2015

Program B - Inventor Professional 2017²

Working Method - Getting the drawn parts in a 2D Sketch.

1. The work stages are different, taking into account that the design programs work differently.
2. Year of the computer-aided design programs version does not influence the work itself.

Work stages:

- Concept - gauge dimensions - 2D;
- Prototype - Version 0 (zero) - 3D;
- Volumetry – Version 1 (one) - 3D
- Optimization - Final version - 3D;
- Assembly of parts - 3D;
- Documentation work - 2D with 3D reference;
- Assembly instructions;
- Exporting DXF files - 2D.

Differences

AutoCAD is geometry based computer-aided design program in which the user can create different design parts starting from 2D sketches to complex 3D sketches; instead, Inventor Professional is a specific design program more used in the industry. The working method and the stages to get the final result of the design applications are also different.

Execution time is different in some work stage too. Volume optimization is much faster in Inventor, since all files in an assembly communicate with each other; in AutoCAD these operations take much longer because there is no communication between the drawn components and documentation of the parts making the assembly.

RESULTS AND DISCUSSION

After running the analysis of the computer-aided design programs, the following results were obtained and materialized in the charts and tables below.

Example: In Table 1 below the differences may be noticed; a change incurred during the same work stage i.e. file optimization: in AutoCAD's it takes 45 minutes while in Inventor everything is done in only 10 minutes.

Table 1

Work stages		
	Program A	Program B
Concept	15 min	30 min
Prototype	60 min	60 min
Volumetry	60 min	20 min
Optimization	45 min	10 min
Assembly of parts	120 min	45 min
Documentation work	240 min	120 min
Assembly instructions	60 min	90 min
Exporting DXF files	90 min	120 min

In terms of time spent the difference between two programs in making the same product is high, resulting in a 2-hour difference. In Program A - AutoCAD it took 11 hours of work while in Program B - Inventor it took only 9 hours of work for making same product. Taking into account the fact that Inventor provides communication between the files that make up the assembly, the parts and the product drawings, this is an important strong point which is an essential thing for the user.

In Fig. 2 and 3 below one can see how much of the time is devoted to each work stage, taking into account that there is aforementioned difference of 2 working hours between the two programs.

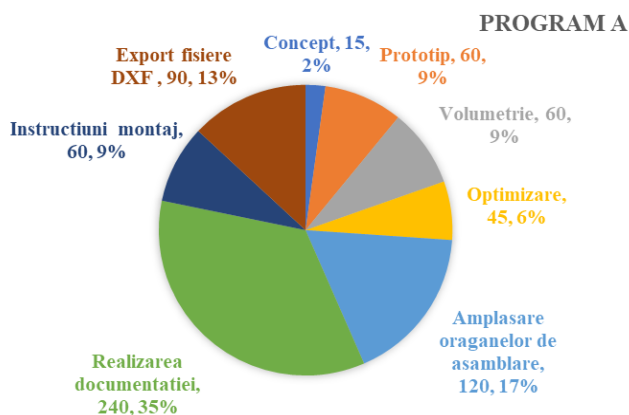


Fig. 2. Program A

Legend translation:

PROGRAM A – PROGRAM A

Concept - Concept

Prototip - Prototype

Volumetrie – Volumetry

Optimizare – Optimization

Amplasarea organelor de asamblare - Assembly of parts

Realizarea documentației - Documentation work

Instructiuni montaj – Assembly instructions

Export fisiere DXF – Exporting DXF files

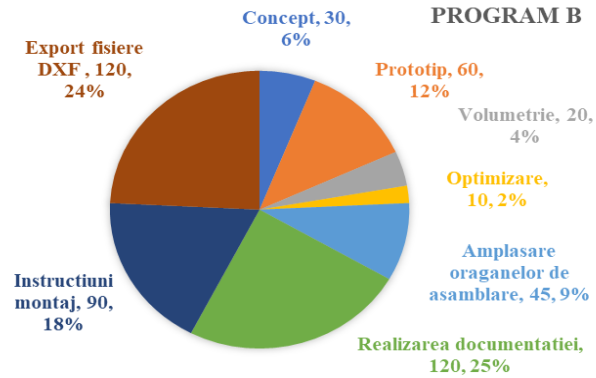


Fig. 3. Program B

Legend translation:

PROGRAM B – PROGRAM B

Concept - Concept

Prototip - Prototype

Volumetrie – Volumetry

Optimizare – Optimization

Amplasarea organelor de asamblare - Assembly of parts

Realizarea documentației - Documentation work

Instrucțiuni montaj – Assembly instructions

Export fișiere DXF – Exporting DXF files

In terms of difficulty in carrying out the work through these two computer-aided design programs which were selected to be put to test, this parameter is represented graphically, and you can find the related information in Table 2 below. Regarding the difficulty scale, we used the values "1" for a low level of difficulty and "9" for a high difficulty level. The table below is consistent with this work and based on the work stages shown in Table 1 above.

Table 2

	Difficulty level	
	Program A	Program B
Concept	1	3
Prototype	4	3
Volumetry	4	4
Optimization	6	1
Assembly of parts	8	4
Documentation work	3	1
Assembly instructions	5	2
Exporting DXF files	1	2

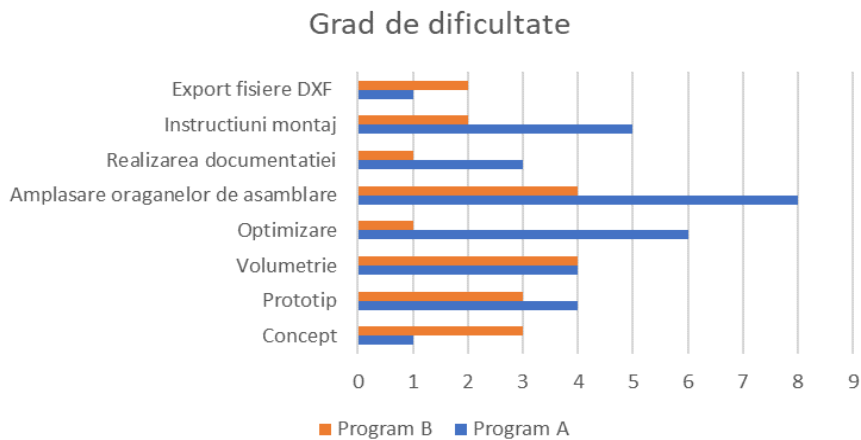


Fig. 4. Degree of difficulty

Legend translation:

- Export fișiere DXF – Exporting DXF files
- Instrucțiuni montaj – Assembly instructions
- Realizarea documentației - Documentation work
- Amplasarea organelor de asamblare - Assembly of parts
- Optimizare – Optimization
- Volumetrie – Volumetry
- Prototip - Prototype
- Concept - Concept

After calculating the average degree of difficulty, it turns out that the work with Inventor program is approximately twice as easy. One should add that user experience in using Auto CAD and Inventor software is correlated with his/her experience in the furniture industry as well.

Technology used:

- a. Semi-automatic machines.
- b. Classic technology, not involving machines of any kind.
- c. Computer numerical control machines – CNC.

In the case of works that are included in the "a" and "b" categories, both programs are able to provide the information needed to design the parts.

When it comes to CNC, the work done with AutoCAD is much faster and more accurate, with the same interface and command bars for all DWG or DXF files. In the case of Inventor there is also the possibility to import and import DWF files, with the drawback that this stage, especially the import sub-stage, that it is a time consumer, which is a weak point.

CONCLUSIONS

After running experiment described above, the following conclusions related to the strong points, the weak points, similarities and differences between the two design programs were reached:

The first and most important conclusion is directly addressed to the design time relative to one year of work from which the strong point can be

highlighted when using the Program – B namely professional Inventer program in the design work.

The great advantage of using the Inventor professional computer-aided design program consists in the correlation between the files of a product, since it requires a single change to the part or assembly in order to subsequently change and update that assembly anywhere. We refer strictly to the unit on which the program is installed. The strong point lies in major economic differences in the industrial field.

If design is limited to a small workshop, the AutoCAD is more beneficial because in the same workspace you can have all the documentation required for the design. This is not a setback to using Inventor Profession in a small company too.

The weak point when using the AutoCAD computer-aided design program is that any change requires at least two operations. For example, if it is necessary to modify the 2D drawing of a part, it is also necessary to change it in any file or workspace where the newly modified part has been shown or added.

In the presented application, although the user experience was much larger in the AutoCAD computer-aided design program, he succeeded in making the product in a shorter time using the Inventor professional design software, which demonstrates the speediness and smoothness of design work when using this program.

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