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ChoosePanels a computer program for panels design in civil engineering

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Abstract: In this paper the authors present a computer program that runs in AutoCAD, designated to design some type of panels for civil engineering. The authors present some difficulties encountered in the process of computer program building and the solutions for them.
Keywords: AutoCAD, AutoLISP, civil engineering

1. INTRODUCTION

In the civil engineering the panels are often found. They have different shape and dimensions, and they are used in many situations. Because of the multitude of shapes and sizes is very difficult, or even impossible, to organise them in a clear structure with the aim to build a computer program for design them. If to the shape and size issues we'll join their reinforcement problems, we will find that we are facing a major challenge.

But you'll say that today, the reinforcement problems can be solved with different computer programs, like Revit. Then why we need another computer program? Well a lot of small companies working with AutoCAD and have problems when using different computer programs for reinforcement of panels and they want pass the obtained results in AutoCAD [1]. These companies would prefer to work from the beginning until the final form of the technical drawings in AutoCAD. In this way they have access to all the facilities offered by AutoCAD, that they mastered very well, of representation, dimensioning, and printing. So, many engineers have expressed the desire to have a computer program that runs in the AutoCAD environment and which allowing the design of panels used in civil engineering.

Stating from these we decided to try to build software design to obtain panels in civil engineering. But as explained above, it would be very difficult to address this problem in a global manner. Because it was impossible to imagine all the shapes of panels, from entire world, and taking separately each shape, to imagine all the possibilities offered by the sizes variations we decided to stop to the shapes of panels used, at one time, by a group of engineers. Those engineers asked us to find a solution that refers to the ability to design, from start to finish, a certain type of panels using only the AutoCAD software. Of course, they had in mind the opportunity to perform including the panels reinforcement activity. In fact, their problems started exactly from the reinforcement activity. They used a certain software for accomplish the panels reinforcement and that software gave results which cannot be used directly in AutoCAD. So, they needed extra time to rebuild the results obtained with the reinforcement software in AutoCAD.

We made a serious analyse of the general demands and we conclude that this task should be split in two parts. First part should refer to the design of shape and the second part should approach the reinforcement problems. The design of the panels shape is a very important step because starting from this we'll approach the reinforcement issues. At this time our efforts were directed towards to obtaining the contours of the panels and to the sections made in these. Thus we builded a software named ChoosePanels that offers the possibility to obtain the shape of certain types of panels and the necessary cross sections in these. But he cannot solve the dimensioning problems.

2. THE SOFTWARE STRUCTURE'S

Our goal was to build software that will produce three types of panels: base panels, simple panels, three-layer panels. The panels may have one or two doors and up to three windows. As noted above because the panels can have very different shapes and sizes were impossible to find a form of their systematization. So, the solution was to write a program for each type of panel. A decision block establishes the appropriate program, then running it. We agree that is not a very elegant solution but we emphasize that it has a great advantage. Working in this way we created a great opportunity for the second part when we'll solve the issues related from the panels reinforcement. It is known that the reinforcement of panels is a difficult problem because it depends from the shape of panels. So, even in this case, each panel must be treated in a distinct way. In Fig. 1 is presented the software structure.

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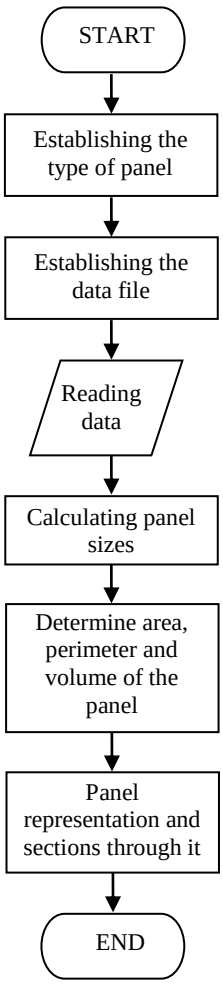

Fig. 1 The software structure

The user interface should be an easy one to understand. Also, she must have an intuitive shape so that can be used easily, when the user is in a hurry. For the engineer the problem is to easily and rapidly find desired panel and then to indicate him. That, because usually, in practice, there are a lot of panels that wait be designed in a project and what this software doing is just a small part of the whole.

For the reasons listed above resulted another idea, that interface should be very simple.

We decided to build as few dialog boxes as possible. Doing so, all the necessary information can be quickly provided to the software.

For example, the dialog box that offer the possibility, to the user, to indicate the panel type is shown in the Fig. 2. User only needs to tick to indicate the type of panel.

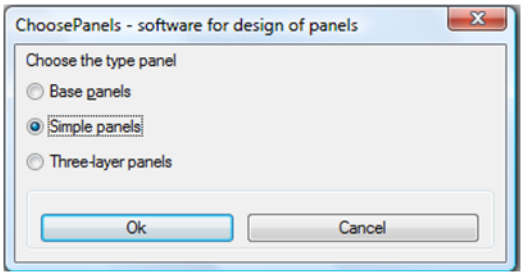

Fig. 2 The dialog box for choosing the type of panel

Starting from this dialog box, the user reaches that part of software where he can choose the desired panel. The Fig. 2 suggests that the engineer wants to design a simple panel. So, for an accurate description of how the software works, let's go in the direction suggested above and let's say that we'll design a simple panel. In this case we must press the Ok button. Pressing the Ok button appears the dialog box shown in Fig. 3. Looking at the dialog box from Fig. 3 we observe that we may choose from a set of five panels. First panel has no doors or windows. The second has only one door and has no windows. The third has two doors. The fourth has only one window and the fifth has two windows. If we carefully look on the dialog box shown in Fig. 3 we see, in the bottom right, the Next button that suggests there are more simple panels. Pressing the Next button appears a new dialog box, shown in Fig. 4, and we discovered a new set of five panels. On this dialog box we observe again the Next button, that suggest there is more sample panels, and we observe, also, the Back button, that tell us that we can go back, to the previous dialog box to choose, from there, the panel.

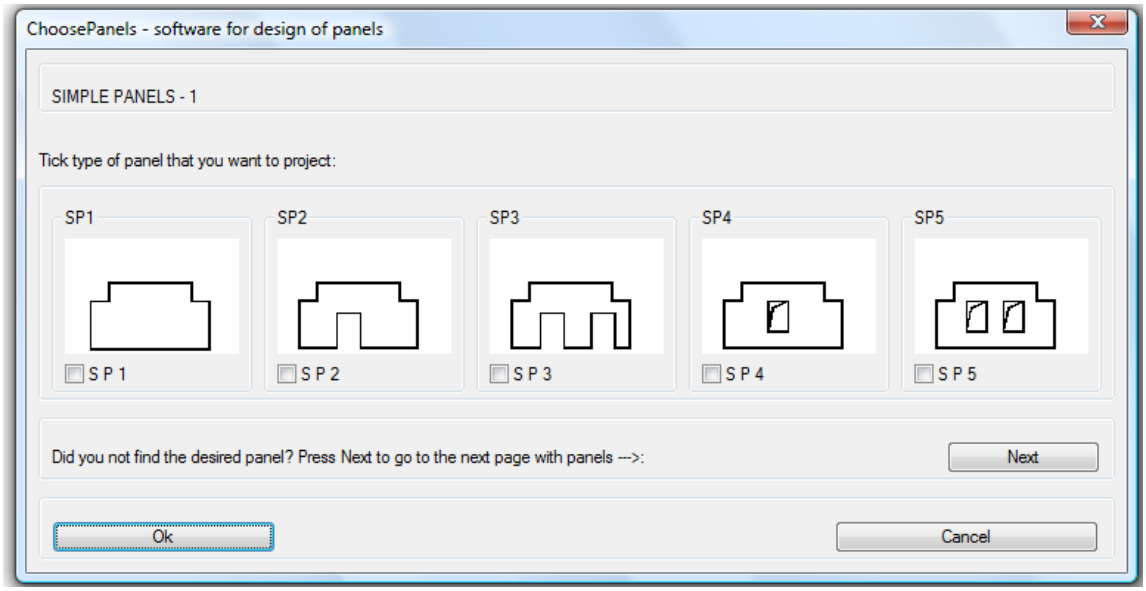

Fig. 3 Simple panels – first page

In our case there is another set of five simple panels that are shown, on the third dialog box. This dialog box is not shown in our paper because we consider that, the two dialog boxes presented before are enough for clearly understanding our idea. So, it can be added so many dialog boxes that are needed to present all the panels that can be designed. In this way, the user can browse through the dialog boxes and easily chooses the needed panel. The images that appear on the dialog boxes suggest how will look the panels. We concluded that is easier to find the desired panel, seeking through the pictures than searching through a list. It is true that a list with more than five names of panels can fit on a single dialog box and, doing so, we need only one or two dialog boxes but the probability to make mistakes is very high.

Going on with our example, we can see in Fig. 4 that we choose to design the panel named PS9. This panel has one door and one window. The radio button assigned to the PS 9 panel is already ticked and all that we have to do is to press the Ok button.

Once the Ok button is pressed the dialog box disappears and the software asks the user to indicate the insertion point for the graphical representation.

But before to make the graphical representation that is shown in Fig. 5, the software read the data and makes the necessary calculation.

The data are stored in Excel files. We choose this solution because the engineer has a lot of activities to be done in order to design a panel and he prefers to use an Excel file to retain the dimensions of the panel and other data which refers to it.

As we can see in Fig. 6 the Excel file containing the dimensional data and an image that explains the panel dimensions. An important advantage when using an Excel file to retain the data is that the

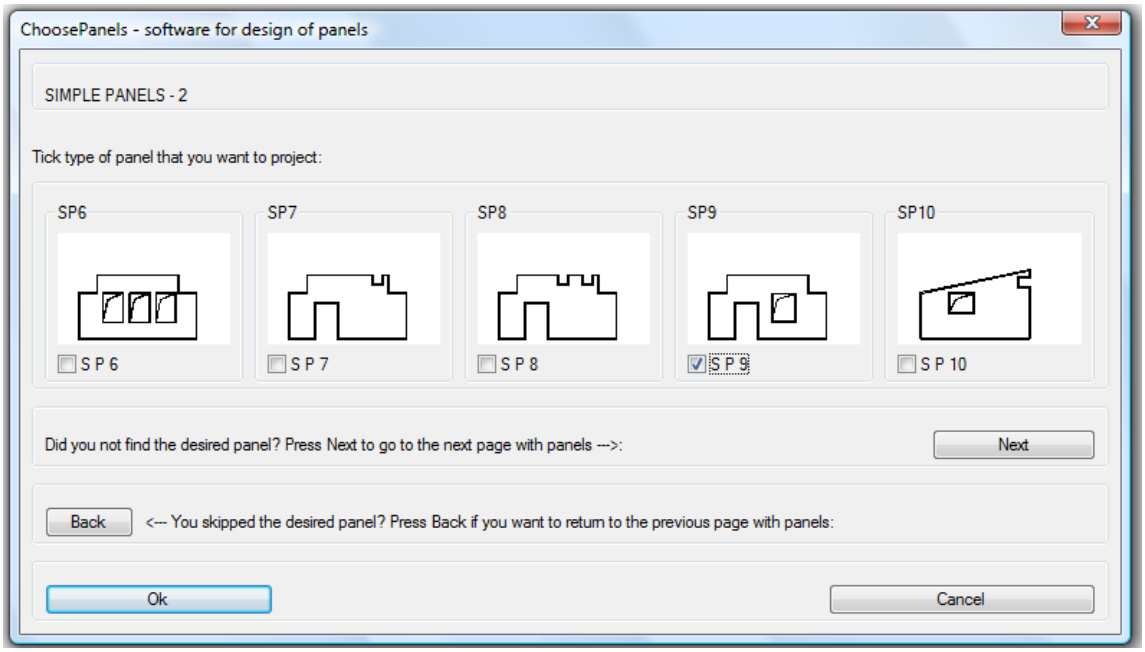

Fig. 4 Simple panels – second page

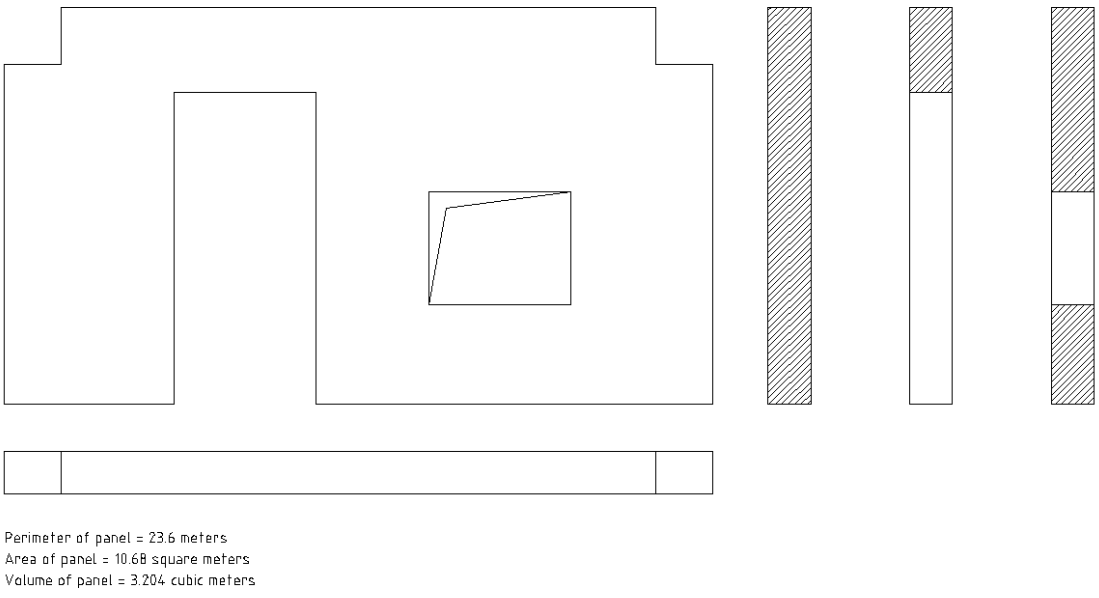

Fig. 5 The panel named PS9 drawing on scale 1:50; front view, top view and cross sections through full panel, door and window

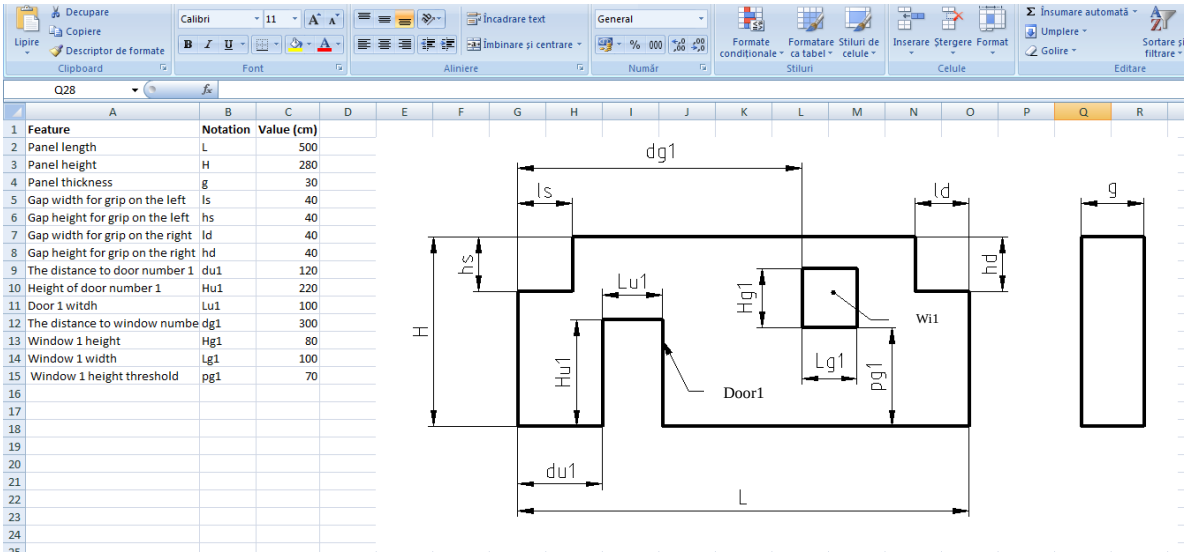

Fig. 6 The Excel file for PS9 panel

engineer may use in any time he wants the file for make different calculus or to store other data referring to the panel, with the condition do not make changes in those cells that contain the panel dimensions.

We can see, in Fig. 5 that in nearby of the graphic representation the software displays the perimeter, area and volume of the panel. These values were demanded by the engineers in order to be use, right away, in other calculations.

Our software was written in AutoLISP language [2]. But he interacts with DCL files that use DCL language for generating the dialog boxes, with DWG files for displaying the sketches of the panels and with XLSX files for reading data. Because, it is difficult to work with so many files we made a stand-alone AutoCAD application stored in a VLX file.

3 CONCLUSIONS

In this paper we presented software designed for obtaining different type of panels used in civil engineering, named ChoosePanels by us and we presented and discussed some constructive solutions of his.

Thus, we explained way it is impossible to systematize the information referring to the shape of the panels. We have shown that because of the complexity of operations such as the reinforcement, the separate treatment of each panel is actually an advantage.

We have shown that for reasons of practical operation of the program it is necessary that the user interface must be very simple. We concluded that, in the dialog boxes, it is preferable to be use images instead of text. Thus, in a complex process of design greatly decreases the likelihood of making wrong selections in dialog boxes. We have shown that it is preferable to read the input data from a XLSX files. In this way, in practice, the engineers may easily make a lot of other calculus starting from input data or which are related with the input data.

We have shown that, for achieving the software, we used the AutoLISP language and Dialog Control Language and we used different types of file. From these reasons we decided to transform all the files that are part from our software in a stand-alone AutoCAD application.

4 REFERENCES

[1] *D. Byrnes*, AutoCAD 2012 for Dummies, Wiley Publishing Inc, 2011

[2] *J.Panders*, The Ultimate AutoLisp Tutorial, http://www.jefferypsanders.com/autolisptut.html , Last Updated January 4th, 2012