PECULIARITIES OF COMPUTER – AIDED CREATION OF SECTIONAL VIEWS BASED ON 3D MODEL

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Abstract. Development of the engineering graphics performance technologies raises new questions concerning the methodology of the solution of this discipline's tasks. The article presents peculiarities of computer-aided detection of a simple section view projections based on a 3D model using AutoCAD and SolidWorks computer systems. Moreover, differences between results and standard requirements for sectional views and ways in which more accurate results can be obtained are discussed. Author shows inaccuracies of details sectional views created automatically and analyses the ways of correcting the drawing manually.

Keywords: AutoCAD, SolidWorks, sectional views, correcting manually, drawing requirements

1   Introduction

The course of engineering graphics is quite wide. Results of this disciplines tasks solutions partially depend upon technology which is used to perform a task. Real world is three-dimensional, but when the world objects have to be presented two-dimensionally, problems concerning transformation occur even when modern design tools are used. Notwithstanding the development of computer science and its influence upon engineering graphics, there are still problematic issues to address when solving graphics tasks and in some cases it is impossible to get a precise result without manual correcting. Such problems need professional interpretations about ways to achieve optimal results. The article presents inaccuracies of detail's sectional views created automatically and analyses the ways of correcting the drawing manually.

The first step in simple sectional view constructing automatically is a creation of a three-dimensional model of the detail. We face problems when trying to show thin elements of the detail (Fig. 1, 2) or the edge which coincides with the symmetry line of the view. Computer systems provide us with powerful modeling tools but their proper usage is impossible without understanding standard requirements for engineering graphics.

2   General principles of section presentation

During engineering activity larger amount of information is transmitted through drawings. One of the most important themes in the engineering graphics course is creation detail's sectional views. Future building engineers or machines manufacturers studying at university first of all must learn to render details as orthographical projections and sectional views. Drawing rules are explained using drawing requirements – standards which are set up by the law in this country [1, 2].

Basic issues for sections presentment:
- usage of half section;
- presentation of the edge which coincides with a symmetry line;

- presentment of ribs, fasteners, spokes and other thin elements in sections.

3   Computer – aided detection of detail's standard and sectional views in AutoCAD

It is not difficult to design 3D (three-dimensional) model of an object of any complexity using AutoCAD [3]. There is a set of tools for drawing and editing images which are especially practical in new versions. An even bigger advantage of this computer program is a possibility to produce images of the detail in an automatic way. However, we face a number of problems when trying to image detail's sectional views precisely. In order to get perfect results which meet standard requirements precisely enough, we must amend automatically formed images manually. What are the main computer actions in creating half section? If we look at commands which create sectional views we will notice that it is impossible to get standard and sectional views joined together. It means that it is necessary to create mentioned views separately and after that they could be joined (Fig. 2).
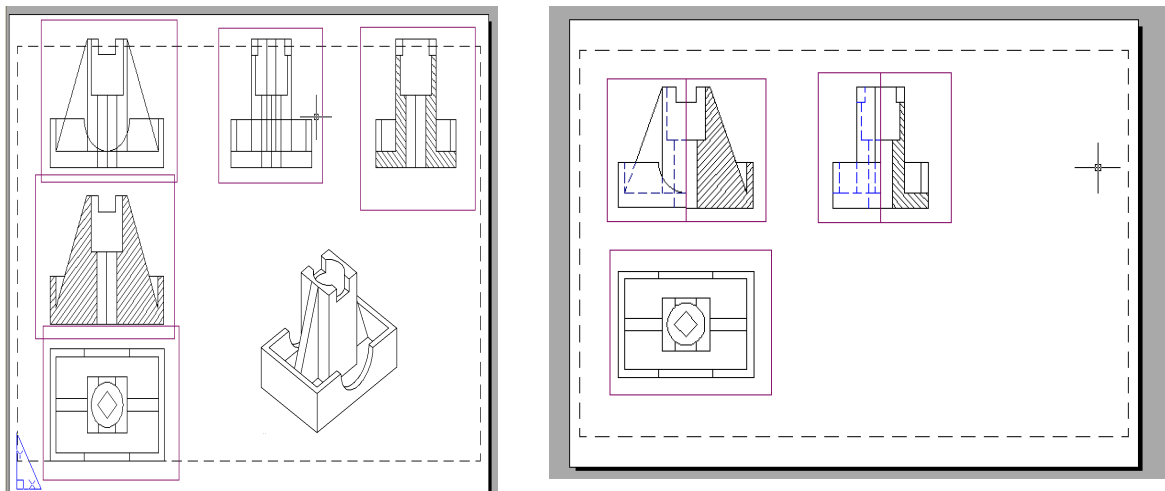
Fig. 1: Computer – aided detection of sectional views

More extra computer actions are need when the detail's edge coincides with a symmetry line. In this way a freehand line must be shown. According to the rules of sectional views it joins the standard and sectional views of the detail [4].

The second figure shows manual correcting of sectional view, because the interior edge coincides with a line which joins two created views. The sectional view is extended and freehand line is drawn to the left from symmetry line.
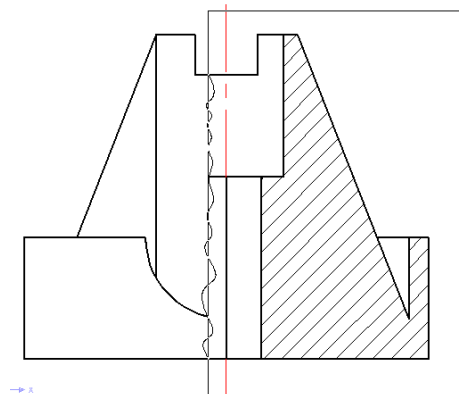
Fig. 2: Joined standard and sectional views

What is the main rule of presentment of thin cut elements? Ribs, fasteners, spokes and the like are not represented as sections. It means that hatches which were created automatically must be deleted. It is possible to get the desirable result using a few ways of correcting sectional views. Everyone can personally choose the sequence of steps to solve the problem.

One of the ways which can be used for right presentation of thin elements is to transfer the location of cutting plane (Fig. 3). In this case thin element is not hatched. But this process requires correcting the hole.

the edge of the hole is determined manually
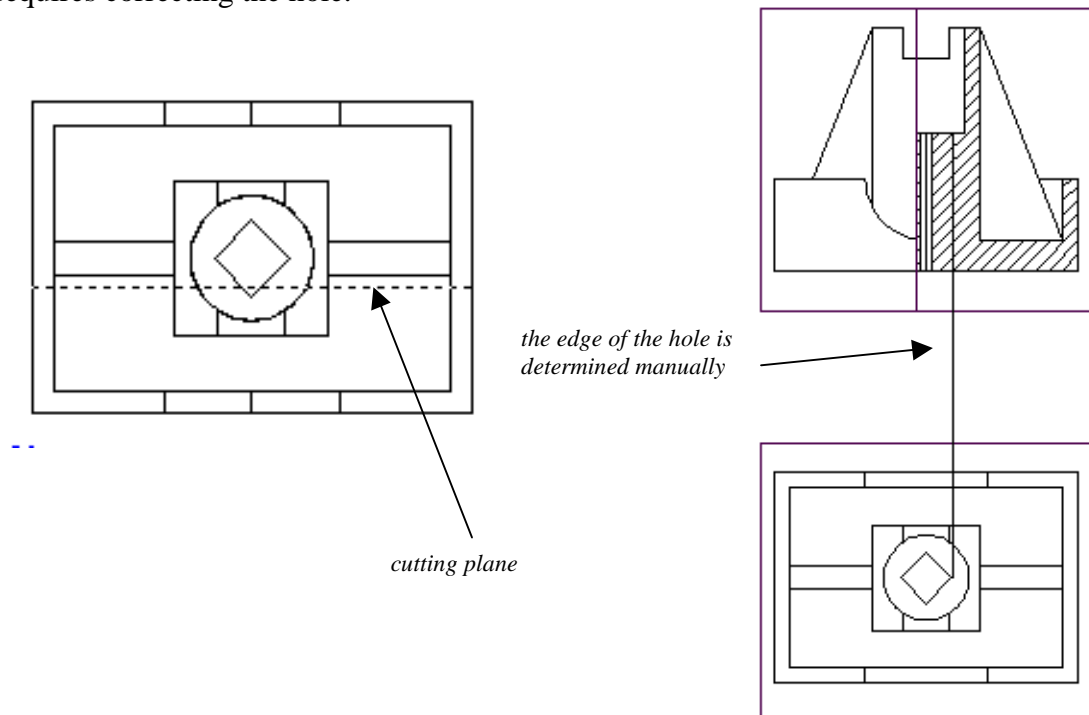
cutting plane

Fig. 3: Sectional view after change of cutting plane location

Sectional views can be created as standard detail's views. In this case it is necessary to form a quarter cutout of the detail. Such process is quite easy, but doesn't escape correcting views (Fig. 4). In this way the line created automatically must be changed into the symmetry line.
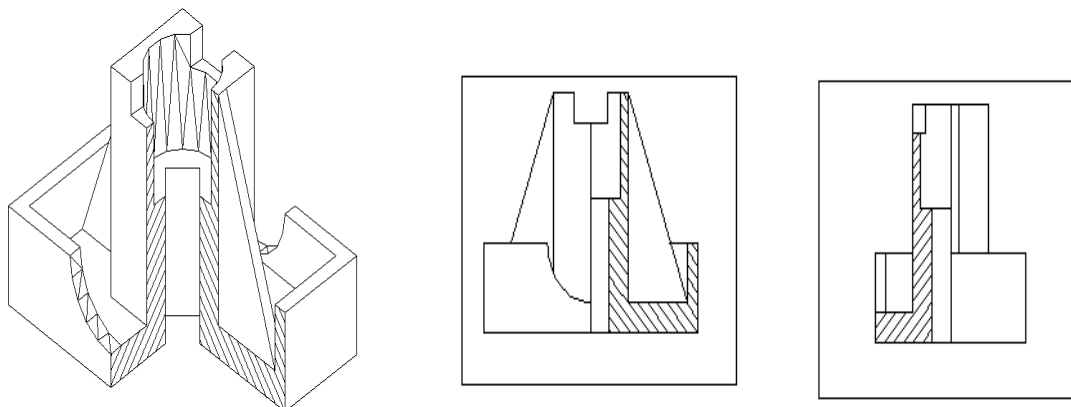
Fig. 4: Sectional views created as standard detail's views

4   Computer – aided detection of sectional views in SolidWorks

Solidworks is the leading supplier of CAD software, helping hundreds of thousands of users speed creation of their products [5, 6]. Despite of a lot of advantages of 3D model creation, computer-aided detection of sectional views based on 3D model faces some problems. Comparing with AutoCAD formation of views in SolidWorks is faster, because model's orthographic or sectional views can be got with only one mouse button click (it is necessary to indicate orthographic projection method Fig. 5). Thin elements are hatched too as in the previous examples (Fig. 6). It contradicts requirements of standards. So the result must be corrected manually using 2D drawing tools too. Furthermore, the position of the cutting plane must be changed into long-dashed dotted line (cutting line) according to standards.
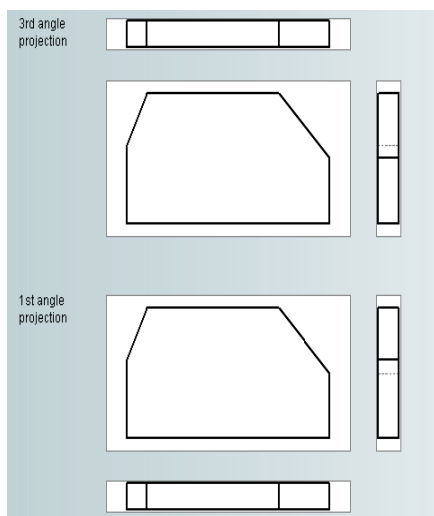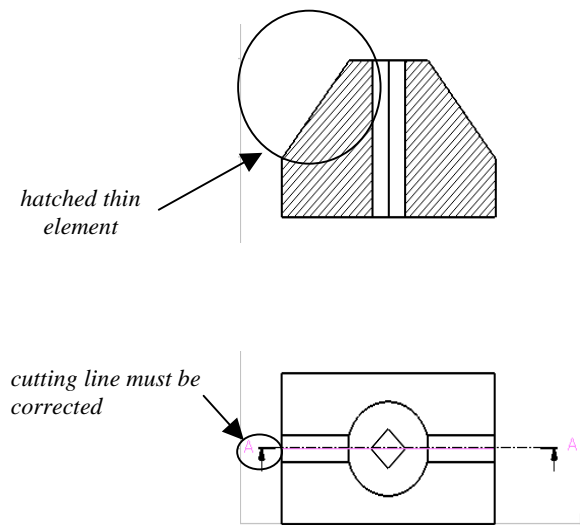
Fig. 5: Orthographic projection methods   Fig. 6: Computer – aided detection of sectional views in SolidWorks

5   Conclusions

- Though popular AutoCAD and SolidWorks computer systems supply a lot of modern modeling tools for solving graphics tasks, but computer – aided detection of sectional views is not precise enough and requires manual correcting of results.
- Everyone can personally choose the way to solve the problems.

References
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OSOBLIWOŚCI KOMPUTEROWEGO WSPOMAGANIA TWORZENIA PRZEKROJÓW OBIEKTU NA PODSTAWIE MODELU 3D

Wraz z rozwojem technologii grafiki inżynierskiej pojawiają się nowe pytania dotyczące metodologii rozwiązywania zadań tej dyscypliny. W artykule przedstawiono specyfikę komputerowego wspomagania określania (wykrywania) przekrojów na podstawie modelu 3D zrealizowanego za pomocą programów AutoCAD i SolidWorks. Omówiono różnice między wynikami wspomagania komputerowego a standardowymi wymaganiami dotyczącymi widoków przekrojów i zaproponowano sposoby otrzymywania bardziej dokładnych wyników. Autor pokazuje niedokładności szczegółów widoków przekrojów tworzonych automatycznie i analizuje sposoby korygowania rysunku ręcznie.

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