

**Renata GÓRSKA**  
 Cracow University of Technology  
 Faculty of Architecture  
 Warszawskast.24, 31-155 Kraków  
 Phone No.+48 126282991 e-mail: rgorska@pk.edu.pl

## INTEGRATING MULTIMEDIA INTO THE TECHNICAL DRAWING COURSE

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Didactics of such courses as **Technical Drawing**, **Engineering Graphics** or **Computer Aided Design**, which belong to the group of professional subjects in the first year of engineering studies at all technical universities in Poland includes not only teaching the principles and the standards of designations used in technical and construction drawings but also becomes more challenging by including teaching of any CAD system, which in most cases occurs to be AutoCAD software [1]. A student in his/her 1<sup>st</sup> year of studies faces difficulty of such situation where he/she neither knows the basics of engineering design nor is able to work in the AutoCAD environment. Blended-learning systems, which are present at our universities today help our students become more flexible and take advantage of the content of the relevant courses. They can study and get experience through the Internet connection. The Moodle system (Modular Object-Oriented Dynamic Learning Environment) has been implemented at Cracow University of Technology to support e-learning. Moodle system is one of the most popular open-source systems used at universities. It is available free-of charge in frame of the GNU GPL license [2].

The goal of this work is to present the files, which have been created by the author and uploaded into the platform [7]. The files are of the \*.exe format. The files have been created and addressed to the students of the Civil Engineering Faculty at our university who have taken up the so called extramural studies i.e. for those who have the meetings with their tutors every second weekend. The students of that type of studies usually do not have enough possibilities to personally meet their teachers at regular office hours. The English version of the files has also been prepared and addressed to the students of the course „Technical drawing”, which is one of the courses of the studies organized within the EU program: „The development of the didactic potential of Cracow University of Technology in the range of modern construction”. The project has been realized within the Human Capital Operation Program 4.1.1 [7]. The studies are co-financed by the European Union within the confines of the European Social Fund.

### Dynamic blocks and their application in construction drawings

Dynamic blocks have been used to provide an easy example of the designations of rivets. Symbolic representation (Table 1) of various types and sizes of rivets and their application into construction and technical drawing has been included in the National Standard PN – 64/B – 01043 [5]. In AutoCAD software we create a basic drawing of a rivet’s symbol, which will be a circle of a specified diameter. We define and draw two mutually perpendicular diameters in a specified layer “axes”. Separately to each of the quarters of the circle, we can add a hatch of a “SOLID” type and black in color. We can also add the specific designations of the diameters as a textual piece of information (e.g. 11, 21, 31, 37). Finally we can save a block under the correct name (let’s choose the name: “**draw\_rivets**”). The first stage of our presentation has been created. This operation will become a single movie.

Let us now create a „dynamic block” of our rivet. Within the command “**bedit**”, we can add now the parameter “**linear**” and assign to this parameter the “**scale**” action. Before we make a **list** of the required **values** for a radius, we need to make one of the grips of the linear parameter to become non-active. Thus, we highlight the linear parameter and then we right-click on the mouse button. From the available menu, we can choose “show one grip” option. Now we can continue with the List edition. With the linear parameter highlighted, we can show the Properties Palette (combination of the buttons: CTRL+1) and we can insert the required values for different diameters of the holes.








Let us now use the “**Visibility state**” parameter to distinguish between various types of rivets. This is especially important if we consider all the symbols used for the rivets with no internal hatch applied (Table 1: please compare the rivets of diameters  $\varnothing 10$ ,  $\varnothing 20$ ,  $\varnothing 30$  and  $\varnothing 36$ mm). We can define various visibility states of hatch and text; to give an example the state “**none**” will be assigned to a rivet without hatching, “**all**” will be assigned to a “full” hatch, “**half**” will be assigned to a rivet, which has been only hatched by half, and a “**quarter**” will be assigned to the rivet  $\varnothing 16$  (Table 1). To provide an adequate visibility of the proper text to the various sizes of the rivets we will use the commands: **bvshow** and **bvhide**. Based on the blocks created earlier, we can distinguish between the visibility states: “none11”, “none21, none31, none37 by hiding or making visible respective sizes assigned with the certain rivet size.

Now we can create the **Lookup Palette**. In the **Lookup Palette** we can add the **Properties**, which have been earlier created as the **Linear parameter** (=distance) and the **Visibility parameter**. We assign correct terms to respective parameters to describe various types of rivets.

Various files have been created to demonstrate how we can use the dynamic blocks. Simple files such as: **draw\_rivets.exe** or **rivets\_bedit.exe** have been developed and uploaded to the Moodle environment. As these files are of the executable nature they are easy to handle by the students. The **TurboDemo** software has also been used to create other files. Not only the \*.exe files can be created within the program but also the Flash files (\*.swf) or the animated \*.gif files. To the list of possibilities we can add the files for the Windows Media Player (\*.asf), the avi-video files and the text files such as the files for Word editor and also the graphics files (\*.bmp, \*.jpg, \*.gif).

Table 1

Rivets: Symbolic Representation according to Standard[5]

Diameter of a raw rivet $d_n$ [mm]	10	12	16	20	24	30	36
Diameter of a hole $d$ [mm]	11	13	17	21	25	31	37
Designation in a top view							

Pusty wiersz wysokości 0,4 cm

Similarly, the educational files presenting how one can create and designate various types of bolts and their designation (file: bolts\_exe) have been created.

### Conclusions

Modern teaching technology has become more stimulating to our students than before. The students tend to actively explore the new than to passively acquire packages of new information during the traditional lectures in the school classroom. The students are open to so called "blended-learning" systems and they can sit voluntarily in front of their computers for a long time. The effect of "blended-learning" is significant in terms of teaching efficiency. The students of our university are stimulated to work with the support of the Internet and they are expected to expand co-operation with their teachers on the base of the Moodle system.

### Literatura:

- [1] Górski R.: European Standards for Construction Drawings. The Journal BIULETYN of the PTGiG, Vol.22, Gliwice, June 2011.
- [2] Jarońska E.: Wprowadzenie do e-learningu, Materiały szkoleniowe, <http://szkolenia.elf.pk.edu.pl/>
- [3] Błach A., Bizoń M., Dudzik P., Jarocki A., Kajrunajty J., Kalinowska E., Tytkowski K.T.: Dydaktyczne materiały pomocnicze do przedmiotu „Geometria i Grafika Inżynierska” – Rysunek Budowlany i CAD, Politechnika Śląska, 2009.
- [4] Miśniakiewicz E., Skowroński W.: Rysunek techniczny budowlany, Arkady, Warszawa 2009.
- [5] PN-64/B- 01043 Rysunek konstrukcyjno-budowlany. Konstrukcje stalowe.
- [6] PN-EN ISO 5261:2002 – Rysunek techniczny – Przedstawianie uproszczone prętów i kształtowników.
- [7] <http://www.elf.pk.edu.pl/>
- [8] <http://www.civ-eng.pk.edu.pl/>