SHORT COMMUNICATIONS:

BALTGRAF: Engineering Graphics in the Baltic States

Rein Mägi

Tallinn University of Technology
Ehitajate tee 5,
Tallinn 19086, Estonia
e-mail: rmagi@hot.ee

On 5 November 1991, after revolutionary political events (the collapse of the Soviet Union), representatives of engineering graphics departments in the three Baltic States summoned at the Vilnius Technical University. They declared the following:

Considering

- the changed political status of our states,
- the necessity to coordinate our efforts in engineering education,
- the necessity to assure concordance of diplomas (bachelor's and master's degree) of our states,
- we have decided to found the International Association BALTGRAF of engineering graphics departments in Estonia, Latvia and Lithuania.

The aims of BALTGRAF are

- to coordinate our efforts in methodical and program equipment of departments of engineering graphics,
- to coordinate research in our departments in the sphere of engineering and computer graphics,
- to coordinate our efforts in adaptation of international standards of technical drawings,
- to organize international conferences that refer to problems of engineering graphics departments,
- to consolidate our efforts in the sphere of named problems with other universities in the Baltic region.

Professor Petras Audzijonis from the Vilnius Technical University was elected the first president of BALTGRAF.

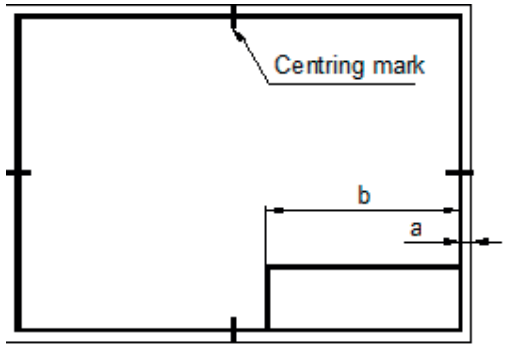
Founders of the association decided to regularly (every two years) organize international conferences on engineering graphics.

The first conference of BALTGRAF took place in 1992 at the Vilnius Gediminas Technical University (BALTGRAF, 1992). At the conference, 17 papers on descriptive geometry, technical drawing and computer drawing were presented. It is pointed out in the introductory note to the volume of the conference proceedings that the main goal of engineering graphics is *graphic literacy* – the ability to create and understand technical drawing. This ability is indispensable for hand-drawing and also for computer-drawing. The serious problem for all the conference participants was the increasingly tenuous grasp of subjects of graphics among students at technological universities and secondary schools.

The second BALTGRAF conference took place in 1994, also at the Vilnius Gediminas Technical University (BALTGRAF, 1994). 18 papers were presented. One of the conference topics was the transition from GOST standards (technical standards of the Soviet Union) to international ISO standards. Adoption of all GOST standards was absolutely obligatory and refusal to adopt them was sanctioned (*Nesobliudenie standarta presleduetsia po zakonu*). ISO standards are, in principle, voluntary to use, but they are obligatory for developing European and national standards.

Although not all standards contain detailed argumentations, every requirement should, nevertheless, be reasoned. But the conception of any argument may change due to the fast technological progress. For example, according to the ISO 5457 standard, a technical drawing must have borders and a frame, a title block and centring marks. At the same time, the distance of the frame line from the edge of the sheet must be at least 10mm for sizes A4, A3 and A2, but at least 20mm for sizes A1 and A0 (Fig. 1).

Figure 1. Comparison of title block's dimensions according to different standards.



Standard, norm	Format A4, A3, A2		Format A1, A0	
	Dimension, mm			
	a	b	a	b
ANSI (USA)	10-19	159	13-25	193
DIN (Germany)	5	187	5	187
GOST (Russia)	5	185	5	185
JIS (Japan)	10	130	20	130
ISO	10	170	20	170
RT (Finland)	7	178	7	178

Such a large distance is motivated by better fixing the sheet when plotting. In this connection, the maximum horizontal dimension of a title block is 170mm. Centring marks facilitate better cropping in microcopying. Nowadays these arguments, and therefore also requirements, have lost their practical importance. Some comparative dimensions (a, b) of different standards or norms are shown in Figure 1. Some of these variants are offered in AutoCAD template files. Which of them to use? There is no single answer. In design practice, the agreement has to be achieved with the client of the project. According to the draftsmen's opinion the title block should contain the scale and format of the drawing due to their connected character in printing or copying.

The 3rd BALTGRAF conference was organized in 1996 by the Tallinn Technical University (BALTGRAF, 1996). 18 presentations discussed didactic research, international standards and also the present and future of computer graphics. Rein Mägi from the Tallinn Technical University was elected the second president of BALTGRAF.

The next, 4th BALTGRAF conference took place in 1998, traditionally at the Vilnius Gediminas Technical University (BALTGRAF, 1998). 22 papers were presented at this conference. The aim of some papers was to study specific features of CAD (Computer Aided Design) for making CAD-process not only a modern but also a comfortable, quick and economic one.

At the 5th BALTGRAF conference (2000) at the Tallinn Technical University, 22 papers were presented: 14 from Lithuania, 7 from Estonia and 1 from Latvia (BALTGRAF, 2000). The majority of presentations (80%) were connected with computer graphics. Lithuanian technical drawing standards based on ISO were developed.

At BALTGRAF-5 the conference participants arrived at the general resolution:

> *Resolution of the International Conference on Engineering Graphics BALTGRAF-5*
>
> *The Conference BALTGRAF-5 took place on 15–16 June 2000 at the Tallinn Technical University and consisted of 22 reports by authors from the Kaunas University of Technology, the Vilnius Gediminas Technical University, the Riga Technical University, the Tallinn Pedagogical University (now Tallinn University) and the Tallinn Technical University (now Tallinn University of Technology). The collection of reports was published (BALTGRAF, 2000). The reports tackled the actual issues in teaching several fields of engineering*

graphics: descriptive geometry, technical drawing and computer graphics. The problems were, in principle, the same for all the conference participants. While the role of engineering graphics in modern technology (for instance in CAD/CAM systems) is increasing, the number of lessons in technological universities has been dramatically reduced. Furthermore, about one-third of secondary school-leavers have never studied drawing disciplines. As a consequence, engineering graphics lecturers at technical universities have to waste the already limited teaching time to explain elementary projection principles. Instead, it would be more rational to devote the study time for teaching more contemporary subjects, particularly new trends in computer graphics.

The International Association BALTGRAF (founded in 1991) decided

- *to contribute to enhancing the teaching level of engineering graphics disciplines in secondary schools,*
- *to stop the catastrophic decrease of the number of engineering graphics lessons in technical universities,*
- *to develop the effective trends of more contemporary information technology. In this case it is necessary to regularly update computer graphics software and hardware,*
- *to continue and expand the present successful activities of the International Association BALTGRAF,*
- *to organize the next conference BALTGRAF-6 in the summer of 2002 at the Riga Technical University.*

June 16, 2000, Tallinn

As decided, the next conference, BALTGRAF-6, took place in 2002 at the Riga Technical University (BALTGRAF, 2002). It was the most prolific conference with 44 presentations. The papers were divided into four subsections: 1) CAD in Engineering (14 papers); 2) Graphics Education (20 papers); 3) Descriptive Geometry and Engineering Drawing (6 papers); and 4) Standards of Technical Graphics (4 papers). Professor Modris Dobelis from the Riga Technical University was elected the third president of BALTGRAF. The new logo of BALTGRAF was chosen (see Fig. 2) and the BALTGRAF homepage (available at http://bf.rtu.lv/%7Egrafika/BALTGRAF) was set up.

The 7th BALTGRAF conference was organized by the Vilnius Gediminas Technical University in 2004 (BALTGRAF, 2004). 41 presentations were divided into four subsections: 1) Theoretical Aspects (8 papers); 2) CAD and CAD Applications

(12 papers); 3) Graphics Education (16 papers); 4) Standards in Engineering Graphics (5 papers). The new trend was the application of e-learning tools in teaching graphics subjects. E-learning will open up new opportunities for lecturers and students due to wide applications of Internet today.

Figure 2. The logo of BALTGRAF.

The 8th BALTGRAF conference took place in June 2006 at the Tallinn University of Technology (BALTGRAF, 2006). 37 presentations were divided into five subsections:

1) Descriptive Geometry (6 papers);
2) Technical Drawing (6 papers);
3) Engineering Computer Graphics (15 papers);
4) Standards of Technical Graphics (3 papers);
5) Graphics Education (7 papers).

Quite a topical theme was visualization. Visualization in engineering graphics can better help to understand the taught subject. Speakers demonstrated PowerPoint presentations (Mägi, 2005a), screen videos (Mägi, 2005b), educational videos (Mägi, 2006b) and animating possibilities of AutoCAD (Mägi, 2006a). Command '3D-ORBIT' can move only camera but not objects in relation to each other (see Fig. 3). For moving objects on screen the AutoLISP program could help (see Fig. 4).

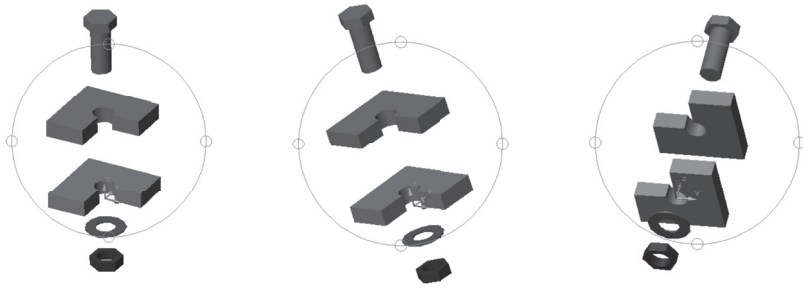


Figure 3. Visualization of the spatial situation with 3D-ORBIT in AutoCAD.

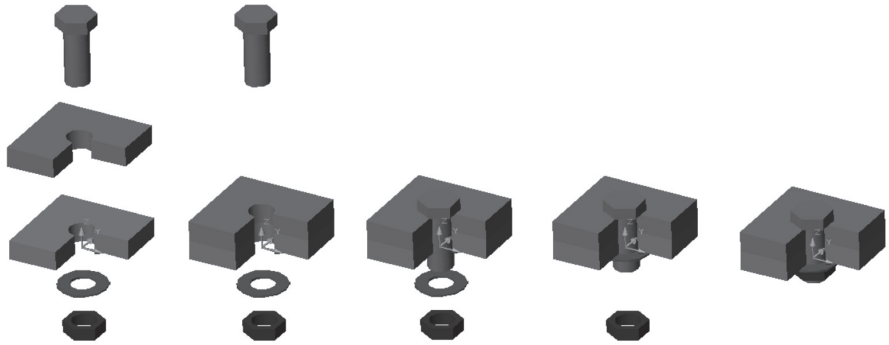


Figure 4. Animation of assembling process of two plates, a bolt, a disk and a nut.

At the 9th BALTGRAF conference at the Riga Technical University (BALTGRAF, 2008), 43 papers were presented: twenty-one by speakers from Lithuania, eight from Estonia, six from Latvia, six from Poland, one from Slovakia and one from Germany. The range of subject matter was quite broad, covering teaching methodology of fundamental engineering graphics subjects, various graphics programs as well as technical drawing standards. Professor Daiva Makutėnienė from the Vilnius Gediminas Technical University was elected the fourth president of BALTGRAF.

The 10th BALTGRAF conference was organized extraordinarily in 2009 in Vilnius, the 2009 European Capital of Culture (BALTGRAF, 2009). Perhaps due to the economic crisis, only 31 papers were presented: sixteen by speakers from Lithuania, five from Latvia, five from Poland, four from Estonia and one from Slovakia. The conference participants held an undivided view that the "superstructure" of future engineers must be supported in the knowledge of the subject of basic graphics. Unfortunately, due to poor preparation in secondary school, the dropout rate of university students reaches nearly 40% by the end of the first academic semester.

The next, 11th BALTGRAF conference will take place in 2011 in Tallinn, this year's European Capital of Culture. All participants are welcome to celebrate the 20th anniversary of BALTGRAF!

The International Association BALTGRAF, which was founded twenty years ago, is seen as a symbol of the re-establishment of independence in Lithuania, Latvia and Estonia. Regularly organized conferences are a meeting point for lecturers and specialists of engineering graphics to review the present situation and plan new developments for future.

Long live the 20-year BALTGRAF!

Figure 5. The dynamic development of BALTGRAF.

References

BALTGRAF (1992), *Inzhenernaia i komp'iuternaia grafika*. (Engineering and Computer Graphics) [in Russian] Vilnius: VTU 'Technika'.

—— (1994), *Engineering and Computer Graphics 2*. International association BALTGRAF, Vilnius: VTU 'Technika'.

—— (1996), 3rd Baltic Conference on Engineering and Computer Graphics, Tallinn Technical University, Tallinn, 20–21 June.

—— (1998), *Engineering and Computer Graphics-4*. Vilnius: 'Technika'.

—— (2000), *Engineering Graphics BALTGRAF-5*. Abstracts of the International Conference Tallinn, Estonia, June 15–16, 2000, Tallinn: Tallinn Technical University Printing Office.

—— (2002), *Engineering Graphics BALTGRAF-6*. Proceedings of the Sixth International Conference, Riga, Latvia, June 13–14, 2002, Riga: Riga Technical University Printing Office.

—— (2004), *Engineering Graphics BALTGRAF-7*. Proceedings of the Seventh International Conference, Vilnius, Lithuania, May 27–28, 2004, Vilnius: 'Technika'.

—— (2006), *Engineering Graphics BALTGRAF-8*. Proceedings of the Eighth International Conference, Tallinn, Estonia, June 8–9, 2006, Tallinn: Tallinn University of Technology.

—— (2008), *Engineering Graphics BALTGRAF-9*. Proceedings of the Ninth International Conference on Geometry & Engineering Graphics, Riga, Latvia, June 5–6, 2008, Riga: Riga Technical University.

—— (2009), 10th International Conference on Engineering Graphics BALTGRAF-10. Conference Proceedings. Vilnius Gediminas Technical University, Lithuania, June 4–5, 2009. Vilnius: VGTU Publishing House 'Technika'.

Mägi, R. (2005a), Kujutiste liigid tehnilistel joonistel. [in Estonian; PowerPoint presentation] Retrieved from http://www.hot.ee/rmagi/Exi0.pps [accessed Feb 2011]

—— (2005b), Detaili eskiisi valmistamine. [video] Retrieved from mms://media.ttu.ee/YGK3350/Eskiis_1.wmv [accessed Feb 2011]

—— (2006a), AutoLISP video. [video] Retrieved from mms://media.ttu.ee/YGK3350/AutoLISP1.wmv [accessed Feb 2011]

—— (2006b), Klamber.dgn. [animation] Retrieved from http://www.hot.ee/rmagi/Klamber_SC1018.html [accessed Feb 2011]