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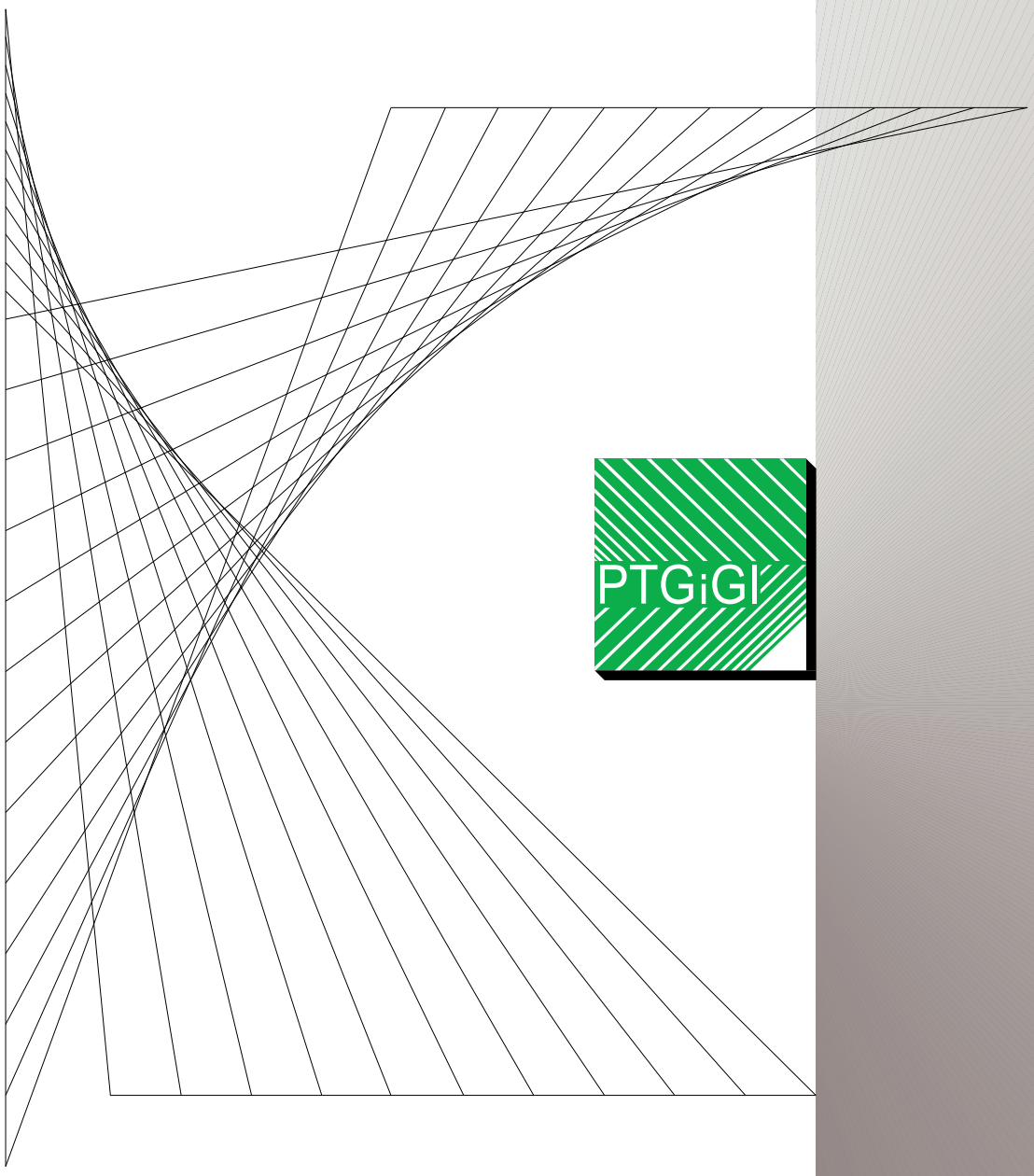

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GRAPHICACY ELEMENTS WITHIN TECHNICAL SUBJECTS

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Abstract. Individual predisposition to be able to recognize graphical images and symbols is an indispensable trait required in engineering practice and deciding on a success in studying technical contents. Categorization of graphic images participating in engineering studies has been provided here, based on taxonomy introduced by Danos (2008). Individual examples in particular categories have been made by the author.

Keywords: graphicacy research, visual literacy, spatial skills development, curriculum planning for engineering studies

1 What is "graphicacy"?

Individual predisposition to be able to recognize graphical images and symbols is an indispensable trait required in engineering practice. Research conducted in the field of perception and recognition of graphic images and their correct interpretation have been carried out not only by psychologists (Wilmot, 1999) but also by educators (Sorby et al., 1998, Leopold et al., 2001, Górska, 2005, Norman and Seery, 2011). The term graphicacy, similarly to those of literacy, numeracy and articulacy, has been tailored by Frey (1974) to express the natural human's ability to read and write (or draw) graphs. Further on, the term has been extended to mean understanding all the range of graphical images and also being a key-stone within a design process (Fig. 1 after Norman et al., 2011 and Barr, 1994). Specifically, it has been decided that graphicacy plays a special role in a modeling phase of a design process when we want to represent design ideas in a form of a three-dimensional model and/or realistic renderings of a structure. In addition, it has been proved that the spatial skills and thinking can be developed when taking up special courses to conceive the relations existing in a three-dimensional space between three-dimensional objects (Sorby et al., 1998).

Research undertaken earlier aimed at understanding of how graphicacy can affect student's learning. Danos (2008 and 2014), based on classification provided by Aldrich and Sheppard (2000), developed a new taxonomy to classify various types of graphical images that can be found in all types of documents (see Fig. 2). This part of research aimed at understanding what skills are needed by the students so that they were able to create drawings and how these skills can affect student's learning abilities.

Let us also mention here that in the UK there was built and introduced a Basic Graphicacy Test (1985) by the Associated Examining Board. One of the objectives of the test was to evaluate the skills in using various methods of representing three-dimensional objects in two dimensions. The tests were withdrawn from the usage as unexpectedly as they appeared in practice. No other European countries have used analogous test to do research on graphicacy levels until now.

In this paper we will provide some examples of particular classes of graphical elements, the ones that can be found within graphic subjects, especially in descriptive geometry, CAD modeling and visualization at technical universities.

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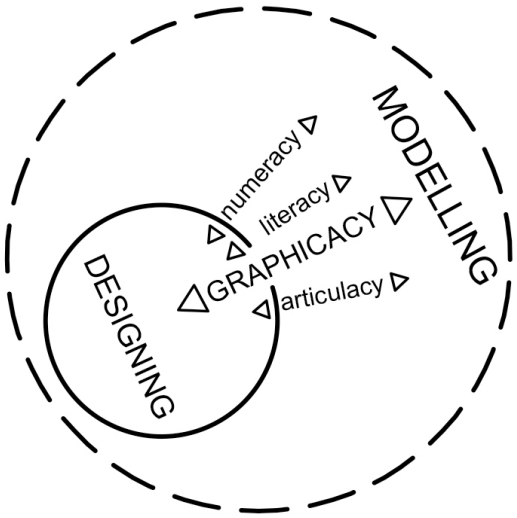


Figure 1: Graphicacy relationship between designing and modeling (after Norman et al, 2011 and Barr, 1994)

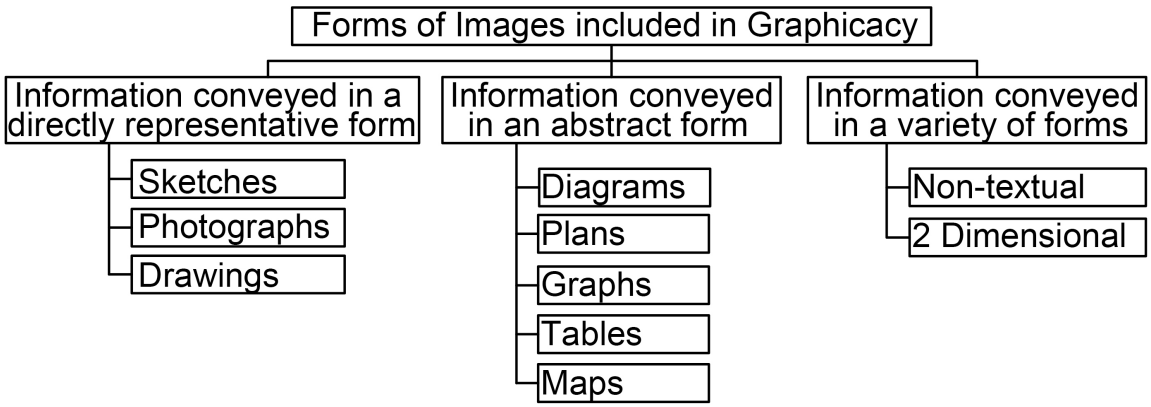


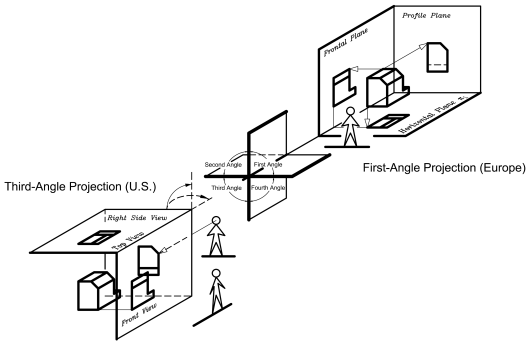
Figure 2: Graphic forms included in graphicacy: classification presented by Danos (after Aldrich and Sheppard, 2000)

2 Examples of graphical elements within descriptive geometry course

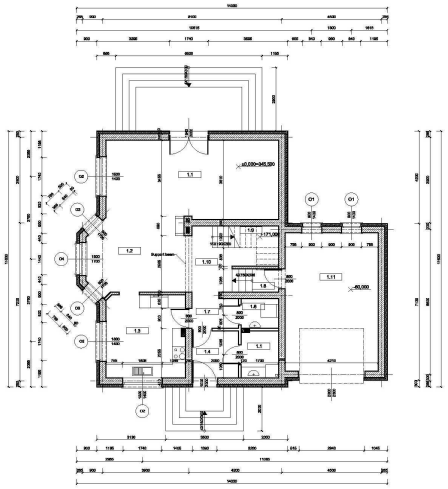
Danos (2008) provides **seven** categories of graphical images to assign particular images into classes: 1/ Graphic art; Pictorial, 2/ Drawing; Pictorial, 3/ Diagrams; Pictorial, 4/Sequential; Lineal, 5/ Symbolic; Quantitative/ Abstract, 6/ Symbolic; Spatial, 7/ CAD. In a category been numbered as the "third" one, there are included all the types of pictorials and diagrams. This category includes: 1) annotated drawings, 2) architectural drawings, 3) engineering/ technical drawings, 4) exploded drawings, 5) perspective, 6) projections (orthographic, oblique, isometric). Figure 3 provides some examples (Górska, 2013) of drawings which are contained in particular categories.

Diagrams; Pictorial

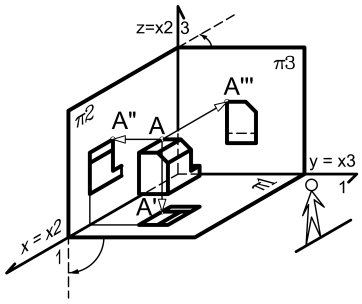
EXPLODED

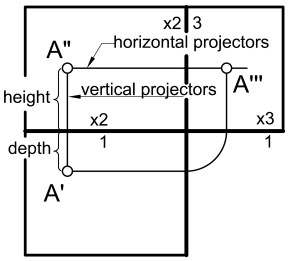


ARCHITECTURAL

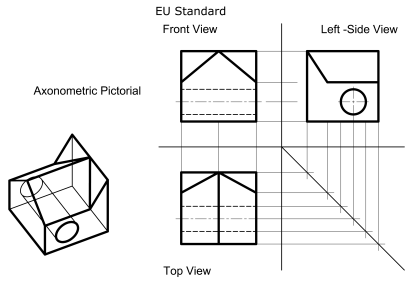


ANNOTATED DRAWINGS

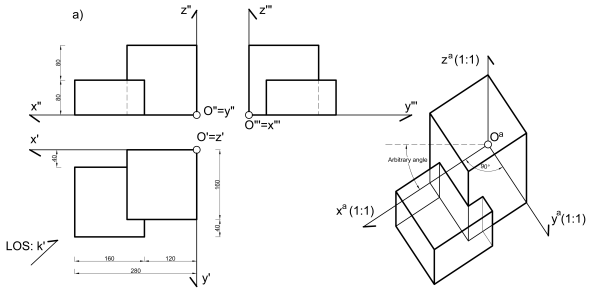




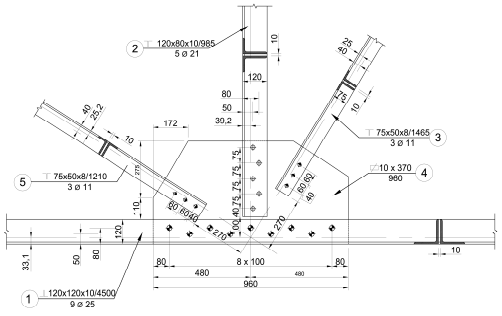
PROJECTIONS: Isometric and orthographic



PROJECTIONS: Orthographic and oblique



ENGINEERING / TECHNICAL



PERSPECTIVE

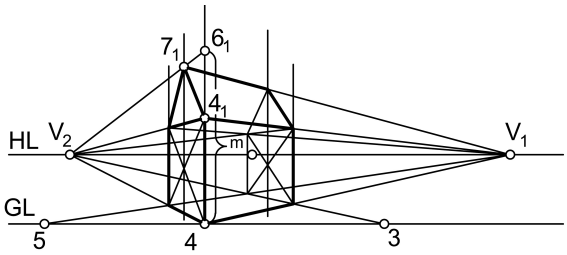


Figure 3: Graphic examples of the category “Diagrams; Pictorial” (after Danos, 2008; drawing examples: Author)

Within the category that has been numbered as the "seventh" one in the provided above list, there are included all the types of CAD visualization and renderings. These will be shown in continuation.

3 Conclusions

The emergence of a new discipline of research which is graphicacy (Danos, 2014) widens up the horizon in the field of engineering education. Categorization of graphical images into specific groups reflects how much the problem is complicated if regards building a testing instrument to evaluate the levels of graphicacy skills among the students. In this paper the author not only introduces a new idea of graphicacy into educational; society but also provides examples of various graphical images categorized into specific groups. Such categorization will make a helpful tool to construct a modern test.

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ELEMENTY BADANIA UMIEJĘTNOŚCI ROZPOZNAWANIA OBRAZÓW GRAFICZNYCH W PRZEDMIOTACH TECHNICZNYCH

Badania w zakresie rozpoznawania obrazów graficznych, czyli w dziedzinie określanej jako „graphicacy" języku angielskim, są prowadzone w środowisku międzynarodowym od niedawna. Problematyka rozważna w tym zakresie dotyczy relacji między zdolnością rozpoznawania i interpretacji znaków graficznych a uczeniem się i/lub studiowaniem. W pracy przedstawiono aspekt kategoryzacji różnorodnych obrazów graficznych w kontekście ich uporządkowania w grupy. Podstawą kategoryzacji jest taksonomia zaproponowana przez Danos (2008) na podstawie wcześniejszych prac Frey'a (1974). W publikacji wykorzystano autorskie rysunki pochodzące z podręcznika p.t. „Descriptive Geometry" (Górska, 2013).

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