

# Programming Graphical Objects and Information in Engineering Drawings

Algirdas Sokas

Dept of Engineering Graphics,  
Vilnius Gediminas Technical  
University, Sauletekio al. 11,  
LT-10223, Vilnius, Lithuania

[algirdas.sokas@fm.vtu.lt](mailto:algirdas.sokas@fm.vtu.lt)

## ABSTRACT

This article introduces you to graphics programming in the AutoCAD environment. Using Visual Basic Application programming language prepared methods and procedures for solving these design problems: attaching, reading and fulfilling mathematical operations with information extended data of a graphical objects. All information about drawing in the AutoCAD system is in the drawing database. We will study it in Drawing Interchange Format (DXF), which is in many graphical systems. Algorithms are formed to attach database record information to a graphical object, to read the information from graphical objects and to create objects specification in the drawing. The prepared example shows framework drawing with specification and database with steel information written in Visual Basic Application programming language. The general purpose of this paper is to contribute to such a debate about possibility of Visual Basic Application graphics programming in engineering education..

## Keywords

Data exchange technology, extended data, graphics programming, Visual Basic Application.

## 1. INTRODUCTION

First computer-aided design (CAD) product Line Drawing System was created by David Evans and Ivan Sutherland in 1969. The first articles about engineering drawings are written about specifications, materials and amounts.

Formulation of problem. Prepare methods, algorithms and procedures for solve these design problems: attach information to a graphical object being drawn, read information from certain graphical objects of a drawing, formation of specification in engineering drawing.

We will study all information about drawing in DXF format, which is in many graphical systems. Data that describe entity is a list. It is made of different

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee.

*Posters proceedings ISBN 80-86943-04-6  
WSCG'2006, January 30-February 3, 2006  
Plzen, Czech Republic.  
Copyright UNION Agency – Science Press*

DXF group codes. Each such group separated by brackets also form a list from code, dot and meaning. Code defines property, dot is a distinctive sign, and meaning is property's parameter. For example, a list (0 . "LWPOLYLINE") informs that code equal to zero and defines entity type, meaning is entity name. Code "-3" means that the next long list is user extended data. We can append additional data, which are named extended data (xdata), to the graphical entities.

Much has been written in the last years on methods for adaptation of graphic exchange formats: very good adaptation of DXF exchange format structure was presented in geometric modeling of box girder deck for integrated bridge graphical system [Sam03a]; feature-based design of extrusion shapes [Kum04a]; reconstruction of 3D models from 2D orthographic views [Cic04a]; finite element analysis and data creating system with CAD data [Yam05a].

## 2. OBJECTS AND DATABASE

Programming graphical objects can produce many different graphical results depending from parameters. We can prepare these parameters in another application that is different from the one we draw in. We can draw in the CAD system but access parameters in the database. To prepare VBA project, first we have to create an instance of the application

and to declare a variable that will represent the connection with other application. Second, we have to create a set of statements with declared variables and open database table. Programming with Visual Basic for Application language in the AutoCAD environment. Prepare database with geometrical and other information about concrete graphical object. All concrete information of steel pivot as class, diameter, tension, press all graphical objects we found in the one field of database.

We draw with information from the database. The first procedure selects one graphical object record with all fields in the database of graphical objects' parameters and creates extended data of the new graphical object. There are three types of extended data: a class of steel, length and diameter of a pivot, which are found by a programming method. Information is registered by name "Steel framework". Names and values are attached with codes "1000" and "1040". The next procedure selects graphical objects with extended data in the drawing and writes information to a matrix. The next design problem is formation of specification in an engineering drawing [Sok04a]. We form the matrix with graphical object's information as the steel class, stick's length and diameter. Then we have to sort this information by class, by diameter in the same class, and by length in the same diameter. The next algorithm finds graphical objects with the same length, matching class and diameter in the matrix and calculates their number. This new information is written to a specification table in which the first column has the number of graphical objects in the drawing, the second column has the steel class, stick's diameter and length, and the last column has the corresponding number of these matching objects.

### 3. RESULTS AND CONCLUSIONS

Prepare methods, algorithms and procedures for solving these design problems: attach information from database to a graphical object being drawn, reading information from certain graphical objects of a drawing and fulfilling sorting and mathematical operations with read information for formation of specification in engineering drawing. Form an algorithm to attach database record information to graphical object: select one graphical object record in the database, create extended data new graphical object, draw programming graphical object depending on extended data and scale in the drawing. Form algorithm to read the information from graphical objects and to collect extended data in the matrix: select graphical objects in the drawing, take first object from beginning, verify whether object has

extended data, collect sorting extended data in the matrix.

Prepare example steel framework drawing with specification and database with steel information with program written in VBA language (Figure 1).

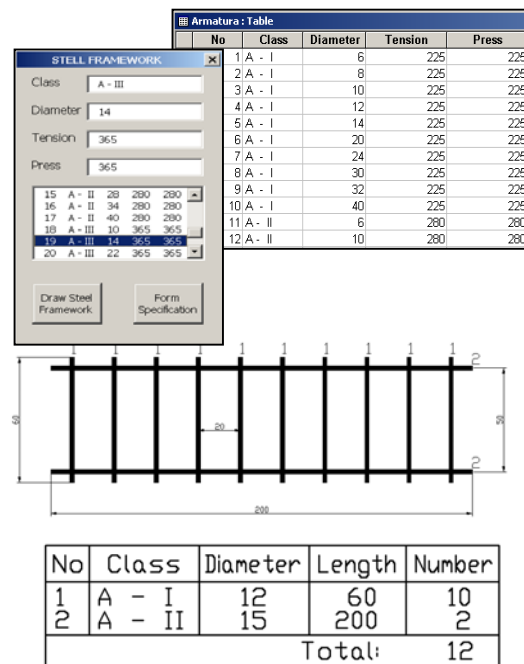


Figure 1. Program menu, database table, drawing and specification.

### 4. REFERENCES

[Cic04a] Cicek A., Gulesin M. Reconstruction of 3D models from 2D orthographic views using solid extrusion and revolution. Journal of materials processing technology, Vol. 152, No, pp. 291-298, 2004.

[Yam05a] Yamaguchi T., Kawase Y., Nishimura T., Naito H. 2D finite element analysis data creating system with CAD data. Journal of materials processing technology, Vol. 161, No 1-2, pp. 311-314, 2005.

[Kum04a] Kumar S., Prasad S. K. Feature-based design of extrusion process using upper-bound and finite element techniques for extrudable shapes. Journal of materials processing technology, Vol. 155-156, pp. 1365-1372, 2004.

[Sam03a] Sampaio A.Z. Geometric modeling of box girder desk for integrated bridge graphical system. Automation in Construction, Vol. 12, No 1, pp.55-66, 2003.

[Sok04a] Sokas A. Automatized formation of specifications in engineering drawings. The Journal of Polish Society for Geometry and Engineering graphics, Vol. 14, pp. 58-63, 2004.