EMPLOYMENT OF CAD SYSTEMS FOR MULTIMEDIA AIM

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Abstract. It is very important to communicate with listeners effectively, using variety of tools and medium. Today we have many power presentation tools (software) like Microsoft power point, Adobe presenter, Keynote, PhotoStory and others. These systems are popular all over the world and are frequently used for lecture delivering, conference report presentation. For presentation preparation, creators spend a lot of self-depended time, but some times, they cannot realize novel ideas without a special tools. The paper deals with AutoCAD, Autodesk Mechanical Desktop software subsystems creation, in order to adapt these systems to special user requirements, to replay 2D drawing creation process according to design operations order or according to required sequence. A new methodology, algorithm and special subsystem adapted to it were created. That subsystem recognizes 2D drawing creation process and allow replay it in the order of drawing created or according to required for presentation aim sequence. The described problems were solved using AutoLISP programming language. Required technical, geometrical and mathematical solutions performed by internal software database analysis with cooperation of AutoLISP equality, logical, conditional, list manipulation and other functions. Reviewed and analyzed Mechanical Desktop and Inventor software possibilities to visualize digital model of the final product by using exploded views and assembly process simulation.

Keywords: automated design systems, CAD/CAM/CAE, presentation.

1   Introduction

Presentation products have played important role in technical engineering world. It is particular sphere witch requires special design tools and products (systems) for presentation. Today Autodesk corporation product – computer aided design (CAD) systems are very popular in the world. These systems a most frequently used during the learning process in technical colleges, universities for today technical engineers preparation and later for design works in enterprises. The contemporary parametrical three-dimensional (3D) modeling systems has a snug presentation possibilities that can be adapted to multimedia purpose, however two-dimensional (2D) problem visualization is complicated [1].

Autodesk corporation creates several special visualization products including Autodesk Impression, VIZ, 3ds Max, Maya, Sketchbook Pro and Freewhell. Tying of these products together is the Autodesk DWG format. Anyway using of noted software related with expenditure of money additional special knowledge assigned to it handling [2].

Sometimes it is very important to recognize drawing creation process, simulate and visualize the final product. Knowing the way of drawing creation process, you can evaluate an appropriate knowledge of students (check the task-solving algorithm), prepare the presenta-

tion files with AutoCAD, Mechanical Desktop software just using 2D technical drawing. It is particularly important to visualize descriptive geometry and projection-drawing task solving process. In this paper we are presenting methodology and algorithm for presentation file preparation inside AutoCAD and Mechanical Desktop system using automated regime (designed drawing can replayed according to the order of its creation) or according to entities selection order regime. We analyzed assemblies' creation technique, its presentation visualization possibilities with standard MD and Autodesk Inventor systems.

All the described techniques are adapted to learning process in the Kaunas University of Technology for technical trend student's preparation. It allows improve students imagination experience, lightens learning process in classes and out of it.

2   Theoretical outline for drawing creation process recognition

Autodesk Corporation In 1982 licensed file extension DWG as the basis for AutoCAD. Therefore, AutoCAD's, MD's native file format, DWG, and its interchange format, DXF, have become de facto standards for CAD data interoperability. The DWG format is probably the most widely used format for CAD drawings. Over one billion active DWG files are in the world today [2].

All data concerning design drawing are presented by drawing exchange format (DXF) code. It provides an exact representation of the data in DWG format. Information concerning graphical objects located inside DWG file can be extracted using AutoLISP programming language. By means of it, you can address to AutoCAD's file internal graphical database and extract required information using DXF code analysis [3].

The DXF format is a tagged data representation of all the information contained in an AutoCAD and MD drawing file. Tagged data means that each data element in the file proceeded by an integer number that is called a group code. A group code's value indicates what type of data element follows. This value also indicates the meaning of a data element for given object type [3, 4]. DXF code specifications from AutoCAD Release 13 are presented on Autodesk Web site http://usa.autodeskcom/adsk/sevlet/item?siteID=123112&id=12272454&linkID=10808853. Graphical object recognition inside DWG file can be realized by its DXF codes analysis with AutoLISP programming language, as an integral part software.

During DWG file opening process AutoCAD and MD system loads an appropriate graphical database and for all graphical objects assigns unique label: <Entity name: 7edf5d10>. An entity name is an alphanumerical label assigned to objects in a drawing. This label can be referenced by AutoLISP standard functions to allow selections of objects for its processing in various ways. During files opening process all graphical objects are loaded in a sequence of its creation process. So the first drawn entity in the graphical database can be recognized by AutoLISP standard object-handling function ENTNEXT (function without arguments returns name of the first graphical object located inside database) [5].

By AutoLISP program fragment (setq en (entnext)) and later by (setq en (entnext en)) we have a possibility to extract all names of the graphical objects located inside drawings internal database and locate it inside list with unlimited number of sublists with drawing entities names inside. Having all names of the graphical objects located in a drawing, we can create a data list (with sublists) with all information concerning entities and later reconstruct drawing just using mentioned information (by using AutoLISP object handling function ENTMAKE).

Imperfection of presented methodology for presentation files preparation, that during drawings creation process we need follow meticulous considered path of drawing creation. Correction of data list is complicated process through the great number of entities and problems with its label recognition. However, it can be solved by switching up automatic entities

selection regime, determination name of an appropriate entity and relocation of the data concerning entity inside sublist to another place of the general list. Anyhow this methodology fits for drawing creation process recognition and can be used for students experience evaluation. Lists with the graphical objects data inside can be used separately for new drawing creation by automated (step-by-step) regime.

The problems solution algorithm presented in Fig. 1. It covers two ways of presentation fragment creation: current and independent to time and drawing.
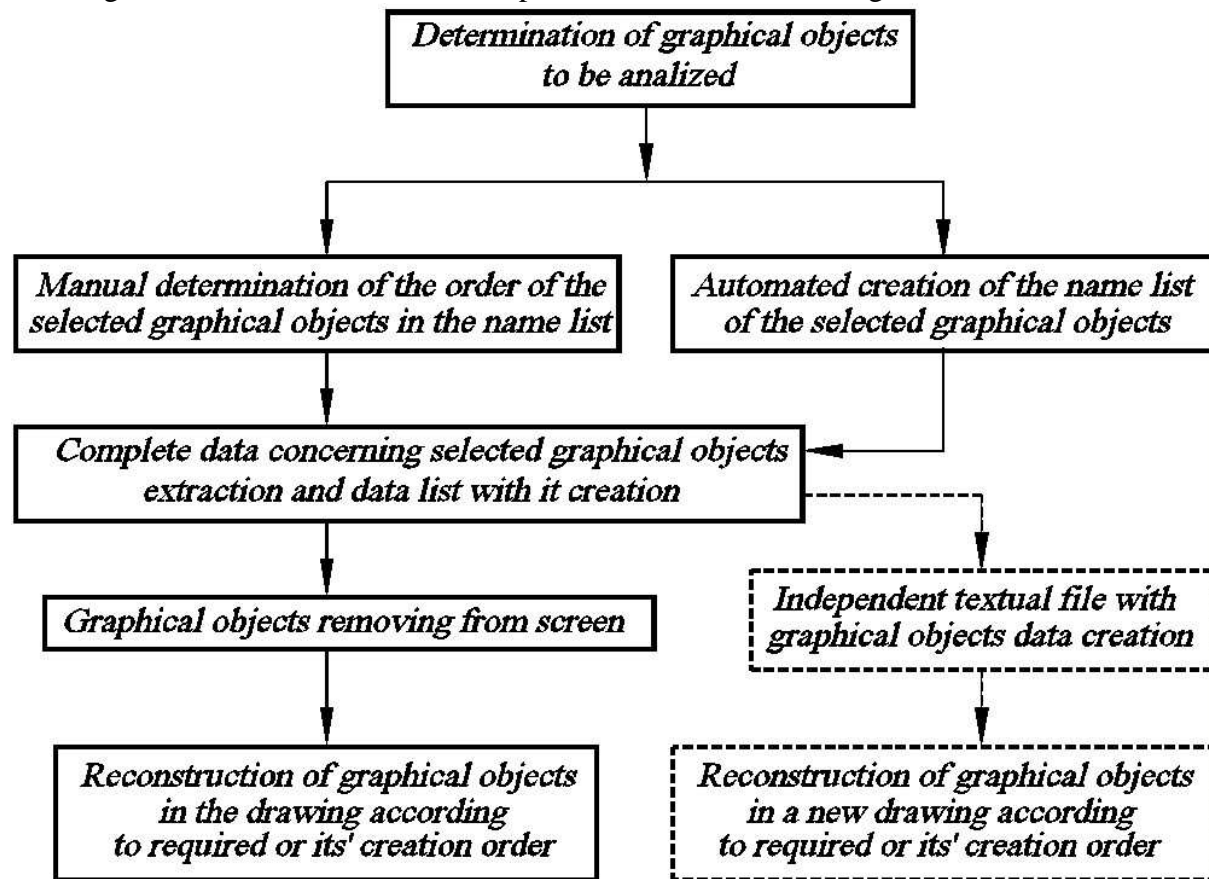

Fig. 1: The algorithm of problem solution

3 Standard tools and possibilities for technical material presentation and visualization

For technical material presentation, it is very convenient to use AutoCAD script file. Sripts are the files, which lists a sequence of AutoCAD commands, one on each line. This file can be used to automate any AutoCAD command sequence. Scripts provide an ideal method for automating the process of displaying a number of slide files in a predetermined sequence. For script file creation fits any text editor, which provide save file in a plain ASCII format, scripts file extension – SCR. The simplest way for SCR files creation – to use AutoCAD integrated text editor Notepad. Short script file, created for slide presentation, can be written like it seen in the Fig. 2. Where DELAY command setups delay time in milliseconds (5000 equal to 5 seconds); REDRAW command regenerates view and displays normal view. If vice REDRAW, RSCRIPT command will be used, slide show will be repeated.

```
VSLIDE   Slide-1
DELAY    5000
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VSLIDE   Slide-N
DELAY    3000
REDRAW  (or  RSCRIPT)
```
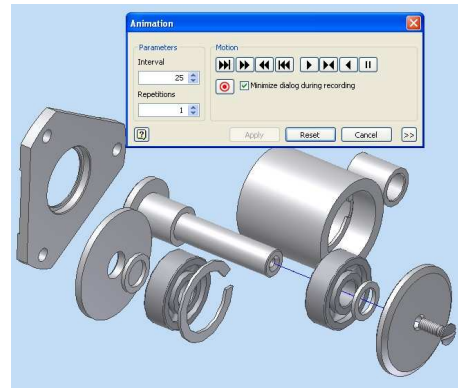

Fig. 2: Example of script program　　　　Fig. 3: Exploded view of the unit

AutoCAD slide files contain snapshots of the AutoCAD drawing area and can be created with AutoCAD command MSLIDE. You can save any type of view (shaded or simple), slide file extension – SLD. AutoCAD command VSLIDE can be used to view any slide file created with MSLIDE command.

MD and Autodesk Inventor are 3D parametric solid modeling software for 3D mechanical models design. Designed 3D models can be used for assembly creation, 2D technical drawings and documentation assigned to it preparation. MD software founded on the AutoCAD software base, so all the presentations described over fits for it, all the auxiliary possibilities of the presentation related with 3D objects, scene creation. A scene is an exploded view that separates the parts of an assembly to show how they fit together. Scene does not affect model file and updates automatically when the assembly you change. Trails indicate the path of the assembly explosion. Scenes can be viewed with SCR file.

Autodesk Inventor is the foundation for the digital prototyping solution at Autodesk. It has a special tools and possibilities for presentation files preparation: creates exploded view files for presentation with extension IPT and video files with extension WMV (see Fig 3). Additionally system allows to create motion constrains i.e. specify the intended motion between assembly components and record it. Parts that are constrained using motion constrains will drive according to the direction and ration specified.

4   Conclusions

1. The proposed algorithm and methodology allow prepare presentation files of technical drawing inside AutoCAD and MD systems, using native files with extension DWG;
2. *Whereas these systems are the base systems for 2D drawing creation in the world it fastens and improves quality of presentation files assigned for technical solutions.*
3. **It** is very important present the final product for customer, tout it in to market using contemporary presentation tools, which are coming to standard computer aided design system like integrated part of software.

References:

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[3]   AutoCAD 2006. *DXF reference*, Autodesk, Inc. 2005. - 267p.

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ZASTOSOWANIE SYSTEMU CAD DLA CELÓW MULTIMEDIALNYCH

Bardzo ważne jest, aby skutecznie komunikować się ze słuchaczami, wykorzystując różne narzędzia i środki. Obecnie mamy wiele narzędzi prezentacji PowerPoint Microsoft, prezentery Adobe, Keynote, PhotoStory i inne. Systemy te są popularne na całym świecie i często są wykorzystywane do realizacji wykładów, prezentacji sprawozdań z konferencji. W celu przygotowania prezentacji, twórcy poświęcają wiele czasu i często nie mogą sobie pozwolić na nowe rozwiązania bez specjalnych narzędzi. Niniejsza praca dotyczy adaptacji programów Auto-CAD, Autodesk Mechanical Desktop do specjalnych wymagań użytkownika. W tym celu stworzone zostały nowe metody, algorytmy i implementacje rozpoznające proces tworzenia rysunku dwuwymiarowego zgodnie z wymaganiami programów do prezentacji. Opisane problemy zostały rozwiązane przy użyciu języka programowania AutoLISP. Wymagane, przez program do prezentacji, techniczne, matematyczne i geometryczne rozwiązania wykonywane są przez wewnętrzną analizę danych programu przy współpracy z funkcjami interpretera Auto-LISP. Dokonano analizy możliwości wizualizacji numerycznego modelu gotowego produktu programów Mechanical Desktop i Autodesk Inventor za pomocą dekompozycji obiektu na widoki (rzuty) a następnie montażu w celu symulacji wizualizacji.