ANALYSIS OF EXISTING TOOLS FOR CONVERTING TECHNICAL DOCUMENTS INTO ELECTRONIC FORM

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Abstract: *The article examines the available tools and their possibilities for transferring technical documents to electronic format. It is analyzed which method is the most convenient for keeping technical documents electronically, and the advantages of using their capabilities with new systems are described. There are a lot of benefits to be gained by storing technical documents through electronic means. Several objects have been created in electronic storage of various forms of technical documents through existing tools, and a user manual for Spotlight Tracing has been created. The internals of the vector generation and text selection processes are explained in detail.*

Keywords: *graphics, vector objects, raster images, drawings, maps, diagrams.*

АНАЛИЗ СУЩЕСТВУЮЩИХ СРЕДСТВ ПРЕОБРАЗОВАНИЯ ТЕХНИЧЕСКИХ ДОКУМЕНТОВ В ЭЛЕКТРОННУЮ ФОРМУ

Аннотация: *В статье рассматриваются доступные инструменты и их возможности для перевода технических документов в электронный формат. Проанализировано, какой способ наиболее удобен для ведения технических документов в электронном виде, и описаны преимущества использования их возможностей с новыми системами. Хранение технических документов с помощью электронных средств дает много преимуществ. С помощью существующих инструментов создано несколько объектов в электронном хранилище различных форм технической документации, а также создано руководство пользователя для Spotlight Tracing. Полностью реализованы внутренние процессы генерации векторов и выделения текста.*

Ключевые слова: *графика, векторные объекты, растровые изображения, чертежи, карты, схемы.*

INTRODUCTION

Spotlight - universal hybrid graphics editor and vector. The program is intended for processing scanned (raster) images: drawings, maps, diagrams, sketches and other graphic materials [1].

MATERIALS AND METHODS

You can do the following with Spotlight:

- scan documents, improve quality and de-skew bitmaps;
- create and edit raster and vector graphics;
- carry out semi-automatic and automatic vector of raster images or their fragments;
- Bitmap images are created by rasterizing vector objects. Spotlight is a powerful hybrid drawing editor.

Hybrid drawing consists of a monochrome, halftone and color bitmap overlaid with vector elements. Spotlight allows the user to freely place uploaded images in an unlimited workspace.

Basic spheres of application Spotlight - automatic projection systems, electronic document processing, reprographics.

Spotlight allows you to import files from AutoCAD, ESRI Shape, HPGL/2 Plot, raster image files to PDF, as well as vector data and file documents created in previous versions of Spotlight.

You can export the entire Spotlight document or selected objects to AutoCAD, MapInfo, ESRI Shape formats. You can select Spotlight objects from the current document and export them to a new Spotlight document, export bitmaps to PDF files.

Spotlight supports most raster formats including RLC, TIFF, PCX, CALS and BMP.

Spotlight is based on the following intelligent mechanisms.

• Vector - converting raster lines, arcs and circles into vector objects. Spotlight provides automatic bring vectors, selection and tracing operations.

• Raster - transformation of vector objects and raster images.

• Recognition of letters and bitmap symbols of arbitrary shape and varying degrees of complexity.

• The binary system - detection of points on a raster image that have a color that is identical or close to a given one, generating them into a monochrome image and placing them on a given layer.

• Calibration - elimination of linear and non-linear geometric distortions that existed initially or resulted from image scanning.

• Correction and filtering - operations for improving the quality of bitmaps.

• Layering - transferring the required information from one image layer to another using a specific operation or based on criteria for pixel color and object size.

• Creating new vector and raster objects.

To support all these technologies, Spotlight uses a large set of tools that simplify the processing of the document flow and allow you to solve complex and non-standard tasks.

By learning about the features and tools of Spotlight, you can significantly increase your productivity while avoiding time-consuming and boring tasks [2].

Below are created vector objects

• Create points, lines, circles, rays, guides, extension lines, rectangles, polygons, text, dimensions;

• creating lines of several types and thicknesses;

• create different types of arrows (markers);

• create multiple lines of text;

• filling closed vector fields with additions, filling them with arbitrary forms;

• generating arbitrary vector samples to fill closed-state vector fields;

• create blocks, each with its own name;

• defining the type of markers connecting the points corresponding to the characteristic parts of raster and vector objects;

• Thin line drawing tools consist of: polar snap, coordinate drawing mode, snap to grid, precise direction motion step [3].

RESULTS

It was created spotlight tracing user guide.

• Generated by automatic and mandatory object type recognition when converting raster data to vectors;

• tracing arbitrary raster curves through polylines;

• trace bitmap raster;

- Real raster saving, deleting, tracking modes with processing;
- Automatic detection of routing direction through polylines;
- The ability to coordinate polyline segments with predefined or automatically defined base direction;
- The ability to coordinate the lines during observation;
- Automatic setting of the thickness of raster primitives with the possibility of setting the thickness of the generated objects;
- Automatically extend lines and arcs by tracking;
- Distribution of created vector objects by different parts and colors;
- tracing the resulting contour;
- viewing different color and scale grey images;
- The parameters generated by observation and the accuracy of approximation are set [4].

The generation of vectors is considered
- detected raster characters and converting them to their vector equivalents;
- recognize its lines, arcs, circles, polylines, contour objects, points belong to the raster;
- recognize the type of lines of raster objects, arrows at the end of segments and arcs;
- Automatic determination of the thickness of raster primitives with the possibility of specifying the thickness of the generated objects;
- Mode of aligning vector segments to coordinate directions;
- Distribution of vector objects through layers and colors;
- Automatic vectors are generated by polylines of objects in images generated by colors;
- Automatic and interactive correction of polylines;
- Automatic correction of vectors obtained as a result of detection, generation of lines, smoothing the corners;
- Special commands for correcting vectors obtained as a result of vector;
- Auto correction of vectors;
- Combining identified objects into a line, arc, circle; it is possible to automatically determine the type of object closest to the selected fragments [5].

Text recognition
- Detect text in any direction;
- identify Cyrillic and Latin letters, numbers, punctuation marks, special characters;
- adapting the program to recognize new characters;
- using letter patterns;
- Procedure for checking and editing generated texts;
- Support for Fine Reader OCR text recognition module and external OCR modules.

Raster Desk - is a professional hybrid graphics editor and vector that runs as a program in the AutoCAD environment for Microsoft Windows. In this guide, AutoCAD refers to AutoCAD 2010/2011/2012/2013/2014 (32/64 bit).

The program is designed to process scanned drawings, maps, diagrams, sketches and similar graphic materials for engineering purposes in the AutoCAD environment.

Raster Desk offers modern technologies for processing color, scale of gray and monochrome raster images that allow full use of scanned images in CAD, GIS, electronic document circulation and other areas of engineering and technical activities [6-7].

Combining the capabilities of Raster Desk (intelligent raster and hybrid editing, interactive and automatic vector, text and character detection) with vector editing capabilities and

customization tools provided by AutoCAD creates a fully functional environment for processing scanned technical documents.

New raster processing tools, combined with new AutoCAD capabilities, expand the scope of scanned graphics in engineering. Hybrid technology significantly reduces labor intensity when working with scanned graphics.

We give examples of the use of hybrid editing and vector technology:

• Correction of linear and non-linear deformations in obtaining high-quality color and monochrome raster maps for GIS and cartography;

• Convert color raster images of maps and diagrams to multi-layer monochrome, which allows you to get structured images suitable for further layer vector;

• correcting and editing the scanned image in preparation for printing and archiving without converting it to vector form;

• making changes to raster drawings without redraw and full vector;

• Creation of raster-vector GIS and CAD projects in software products of the AutoCAD family using raster and vector graphics capabilities;

• convert raster images to vector AutoCAD drawings, save in formats accepted by CADD, Micro Station, MapInfo, ArcView.

Tracing is a semi-automatic procedure that allows you to approximate raster lines with vector objects, create smooth raster objects or replace them with vectors. The following types of observations are listed:

• tracking segments, arcs and circles with automatic object type detection;

• Automatic expansion of lines and arcs during tracing;

• tracking raster objects with a mandatory type specification;

• tracing of contour;

• Ability to trace your own arbitrary raster symbols according to the specified templates, create your own symbol templates;

• trace arbitrary raster curves along polylines with the option to automatically determine the most likely direction;

• Support for automatic insertion of edges.

DISCUSSION

Many things can be done while watching:

• rounding the line thickness of vector objects by given values;

• align segments and segments of polylines to a specific direction;

• Distribute vector objects corresponding to raster lines of different thickness on specified layers or assign different colors to them;

• ignore bitmap line breaks.

CONCLUSIONS

As a result of maintaining technical documents in electronic format, not only documents are safe, but they can be easily searched. The most important thing is the ability to store technical documents for a long time and in a low-capacity state. Currently, many pages of documents are in an unusable state and many documents are piled up.

The proposed process will eliminate many of the current problems and create the possibility of fully automating the process in the case of other systems. As a result of using existing tools, the process becomes very convenient and beneficial for all employees. The internal conditions of each

process have been fully analyzed and many of their system-compatible capabilities have been used in the electronic maintenance of technical documents.

REFERENCES

1. https://fotodizart.ru/rastrovaya-i-vektornaya-grafika.html
2. Astanaliev E. METHODS OF AUTOMATING CONTROL OF PROCESSES IN THE RAILWAY AUTOMATION AND TELEMECHANICS SYSTEM //Research Focus. – 2022. – T. 1. – №. 3. – C. 11-15.
3. OGLI A. E. T. Software for Electronic Document Management System of Technical Documentation on Railway Automation and Telemechanics //JournalNX. – 2021. – T. 7. – №. 1. – C. 204-209.
4. Astanaliev, E. The formalization of the electronic document in railway automatics and telemechanics on the basis of simulation modeling. *European Scholar Journal (ESJ)*, *2*(3).
5. Astanaliev E. ELECTRONIC MODEL OF TECHNICAL DOCUMENT MANAGEMENT PROCESS //Збірник наукових праць ΛΌГОΣ. – 2021.
6. Astanaliev E. Formalization of electronic technical document management of railway automatics and telemechanics //International Journal of Engineering and Information systems (IJEAIS). – 2020. – T. 4. – №. 12.
7. Astanaliev E. Important principles of innovative reforms in the process of electronic document management in railway automation and telemechanics //The American Journal of Engineering and Technology. – 2020. – T. 2. – №. 12. – C. 34-43.