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RASTER TO VECTOR

A Short Guide to Converting Images and PDFs

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Introduction

This document describes how to perform image vectorization in progeCAD, using the tools available within the program, in particular the integrated Raster Draw toolset or the integrated WinTopo application.

Vectorization is the process of converting raster images (such as TIF, BMP, JPG files, or images embedded in PDFs) into editable CAD geometric entities.

Vectorization programs trace the geometry of a raster image by detecting edges and contrast variations. The result is a vector representation of the image, composed of lines, arcs, and other geometric entities that can be directly modified within the CAD environment.

This procedure is particularly useful in several scenarios, for example, when a floor plan or drawing is only available in paper format and needs to be converted into a CAD drawing, or when a technical image (TIF, BMP, JPG, or extracted from a PDF) must be transformed into vector geometry.

Raster to Vector Conversion Process

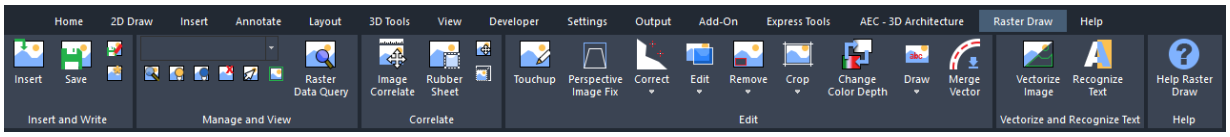
Regardless of how the image was obtained, by scanning a paper document, extracting it from a PDF, using a graphic file, or including it from an existing DWG drawing, once available, it can be converted into vector entities using progeCAD tools.

For this purpose, two main approaches are available:

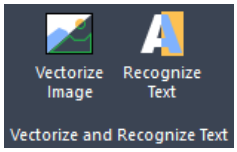
1. **Managing the image within the CAD drawing**: the image, either to be inserted or already included in a DWG drawing, is handled using the **Raster Draw** toolset. This approach allows tracing or editing vector elements directly on the image.
2. **Managing the image as a standalone file**: the image is treated as a separate file and converted into vector format using **WinTopo**, producing a vector drawing that can then be imported into the CAD environment and further edited with precision.

The following sections provide a detailed explanation of the procedures for each method, showing step by step how to achieve the desired vectorization using both **Raster Draw** and **WinTopo**.

Raster Draw



Raster Draw is a specialized toolset for managing images and converting raster data into DWG objects. It allows you to process images directly within progeCAD, with features for resizing, scaling, cleaning, and quality adjustment. Raster Draw is particularly advantageous when importing mixed PDFs containing both vector and raster elements (see *Example: Vectorizing a Non-Vector PDF*). It is also ideal for working directly in progeCAD, eliminating the need to modify the image separately before importing it into the drawing.

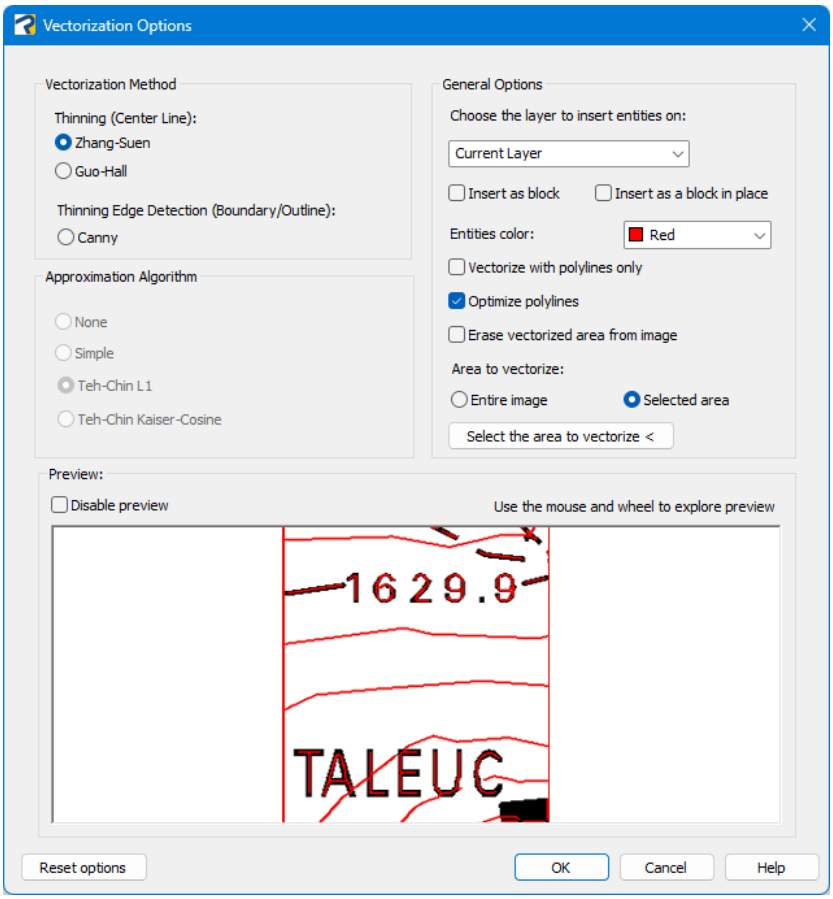


Raster Draw offers two dedicated vectorization tools. **Vectorize Image** converts raster images into editable vector entities, while **Recognize Text** identifies text within raster images and transforms it into editable CAD text.

Note: Raster Draw does not support OLE objects.

When working with a raster image, vectorization can be done as follows:

1. From the Raster Draw ribbon, select **Vectorize Image**, or type **VECTORIZEIMAGE** and press Enter.
2. Select the image you want to work on by clicking its frame.
3. Select the area to be vectorized, or press Enter to process the entire image.
4. Choose the desired options in the “Vectorization Options” dialog box.



Note: for detailed instructions, see the Raster Draw manual in progeCAD

5. Press OK to confirm the operation; the vectors will be generated and automatically inserted into the drawing according to the selected settings.

If the image contains raster text, it can be converted into editable vector text using the “Recognize Text” command.

1. From the Raster Draw ribbon, select **Recognize Text**, or type **IRCTEXT** and press Enter.
2. Select the image you want to work on by clicking its frame.
3. Select the area containing the raster text, according to its orientation.

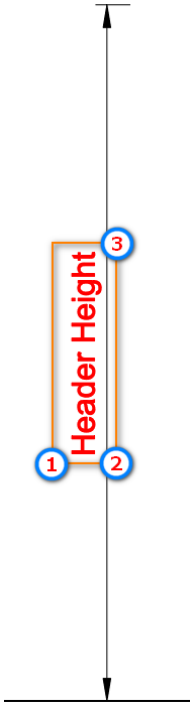


Figure 1- Incorrect Selection

Figure 2- Correct Selection

4. Select the desired options in the “Verify Text” dialog box to improve the recognition process by adjusting the available settings.

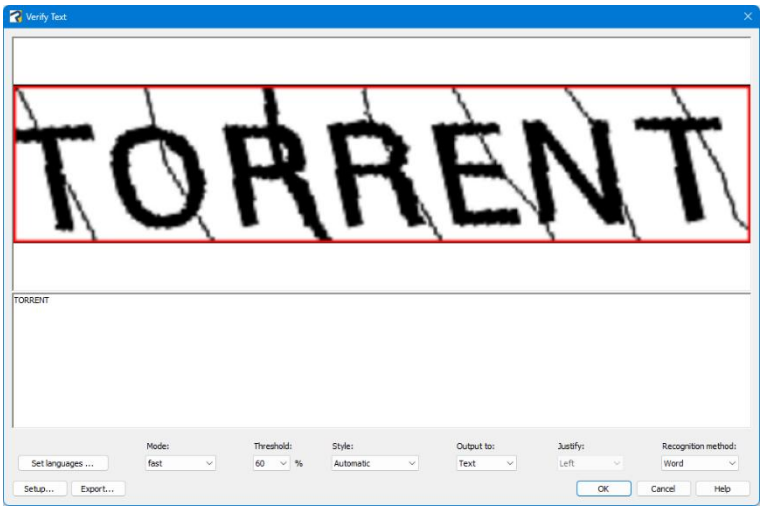


Figure 3 - Options available in the Verify Text dialog box.

See the Raster Draw manual for more details

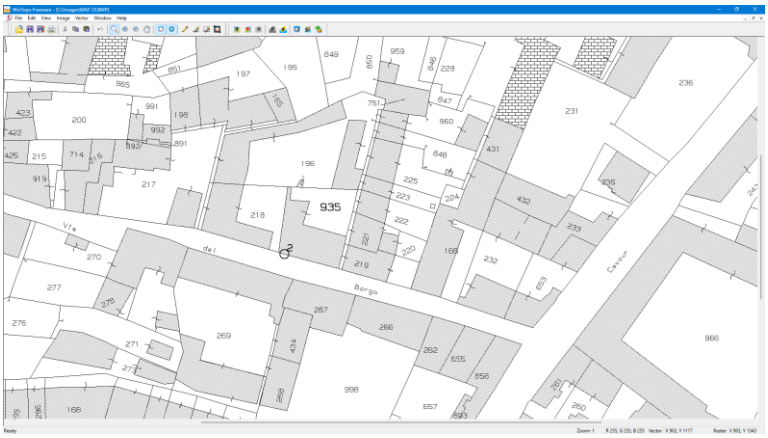
5. Press OK to execute the command; the raster text will be converted and automatically added to the drawing according to the defined settings.

WinTopo

WinTopo is a specialized tool for converting raster images into vector data. It is mainly used when images need to be handled as independent files, without being immediately inserted into a CAD drawing.
Once vectorization is complete, the resulting file can be saved separately as a vector drawing and later imported or inserted into a CAD project for further editing and integration.

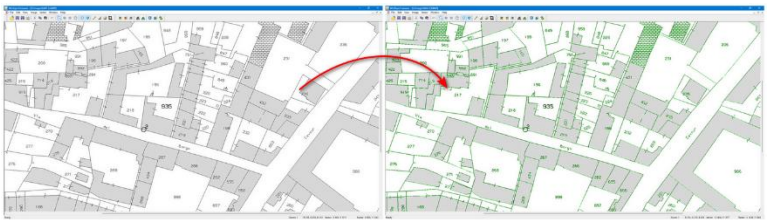
The vectorization procedure consists of the following steps:

1. Launch WinTopo (Add-On > Import > Raster to Vector)
2. In WinTopo: File menu > Open Image

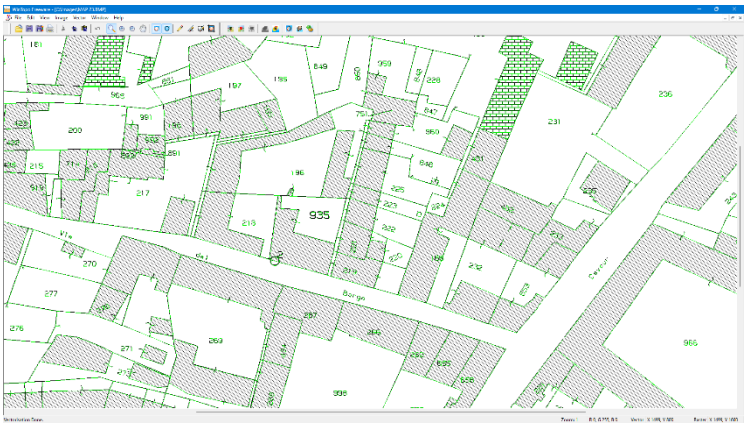


3. Vector menu > *One-Touch Vectorization*

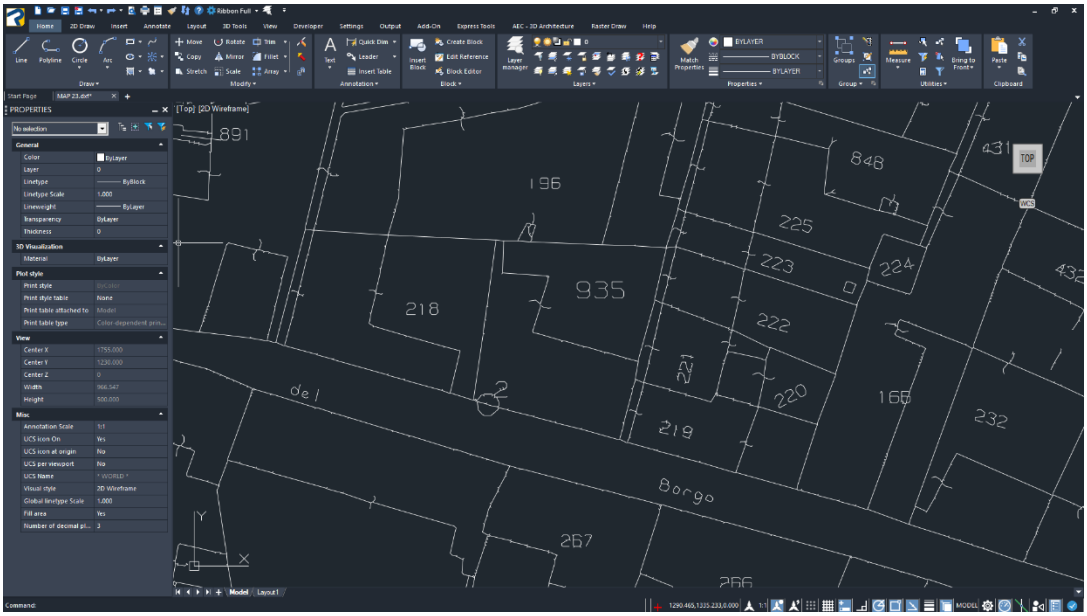
4. Wait for the process to complete



5. File menu > Save Vectors As, then save the file in DXF format (default format)



6. Open the resulting file in progeCAD



Note: for more information and details on the features, refer to the official WinTopo manual.

Non-CAD drawings and documents

To convert an image into a CAD drawing, you need to start from a reference file. Typically, one of the following situations may occur:

- A raster image (TIF, BMP, JPG, PNG), such as a scanned map or a technical detail downloaded from the web. In this case, vectorization can be performed using one of the two methods described in the *Raster to Vector Conversion Process* section.
- A PDF file containing images, see the *PDF Types* section.
- A DWG drawing that contains images, see the *Raster to Vector Conversion Process* section.
- A paper drawing, see the *Scanning of Paper Drawings* section.

PDF Types

It is now common practice to send technical documentation in PDF format. These files can be categorized into three types:

Vector PDFs: generated directly by a drawing program via “Print to PDF.” In this case, the file already contains usable vector elements, and no vectorization process is required.

Raster PDFs: often derived from scanning paper documents and saved directly as PDF using scanner management software. In this case, the PDF is non-vector and contains a raster image, which can be handled and converted into vectors either directly within the CAD drawing using Raster Draw, or as a separate file using WinTopo.

Mixed PDFs: in some cases, such as brochures or complex documents, the PDF may contain a mix of vector elements, text, and images. In these situations, it is recommended to use Raster Draw, which allows vectorizing only the images or specific parts needed, while keeping other elements, such as a logo in the title block, as raster.

Note: To extract an image from a PDF file, see the appendix Extracting an Image from a PDF File.

PDF to CAD Conversion

To convert PDF files, progeCAD provides the PDF2CAD command (Add-On > Import > PDF to DWG), which allows the entire document to be converted into a CAD drawing.

In this way, the vector parts of the PDF are automatically converted into CAD objects, while raster images are inserted into the drawing as external references; these images are also saved in the same folder as the DWG file.

Note: for more information, refer to the progeCAD manual.

Example: Vectorizing a Non-Vector PDF

This is a practical example of importing and vectorizing a non-vector PDF. In this situation, the file may contain either only raster images or a combination of raster images and vector elements. In this case, the procedure in progeCAD can be carried out as follows:

1. Importing the PDF into progeCAD.

   Select Add-on > Import > PDF to DWG

   PDF files can be converted using three different modes: Insert, File, and Batch, each designed for a specific workflow requirement.

In progeCAD 2026 and earlier versions, the dialog box layout is slightly different, but the import procedure remains essentially the same.

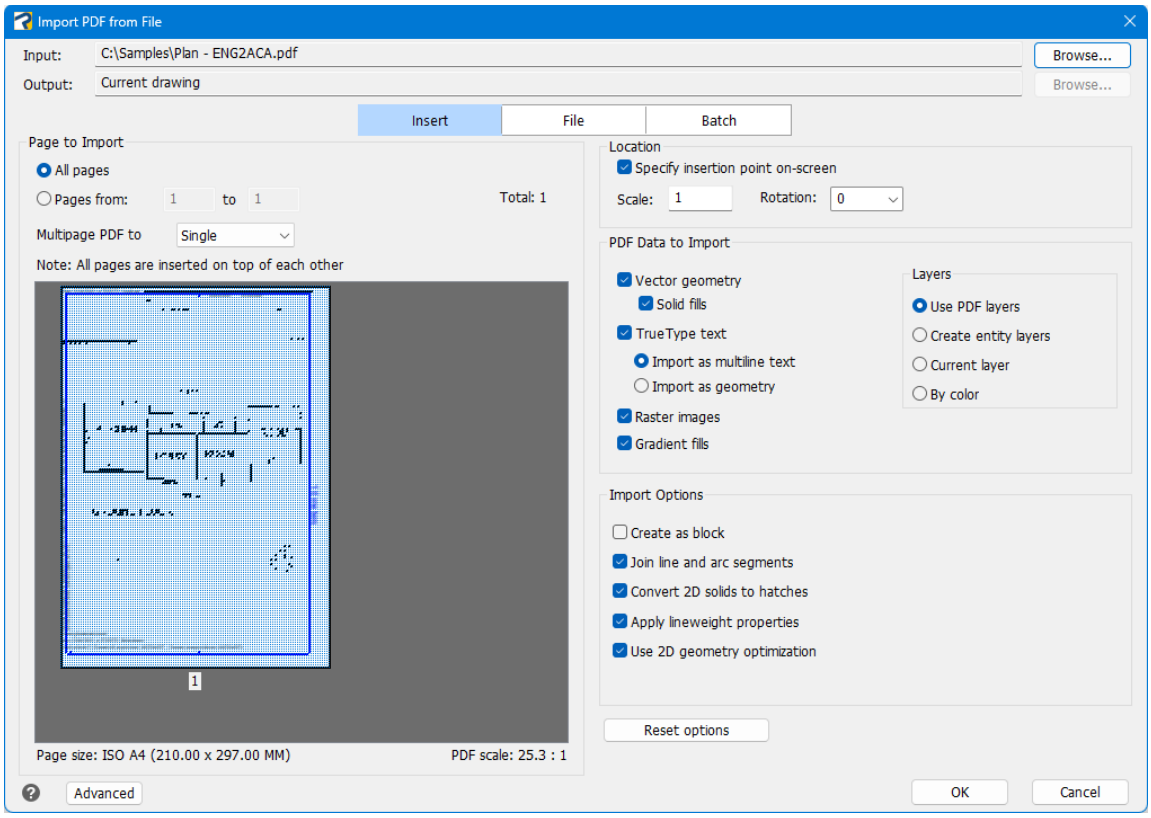


Figure 4- PDF import dialog box

Note: For more details about importing PDFs, see the progeCAD manual.

2. Vectorization. Once the PDF has been imported, you can see the file and note that it contains images. We will now focus on vectorizing the image using the Raster Draw toolset.

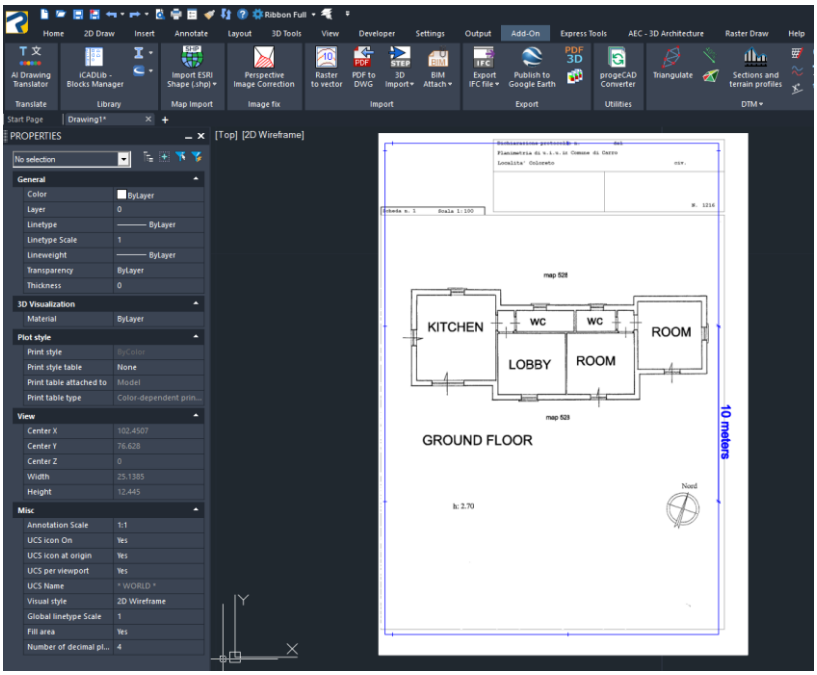


Figure 5 -PDF file after import

The vectorization process can then be carried out as follows:

a. From the Raster Draw ribbon select the Vectorize Image command.
b. Click on the frame of the image to be vectorized.
c. Select the part of the image you want to vectorize, or press Enter to process the entire image.

d. In the “Vectorization Options” window, choose any desired options based on the type of image and the specific requirements of the project. Press OK to confirm.

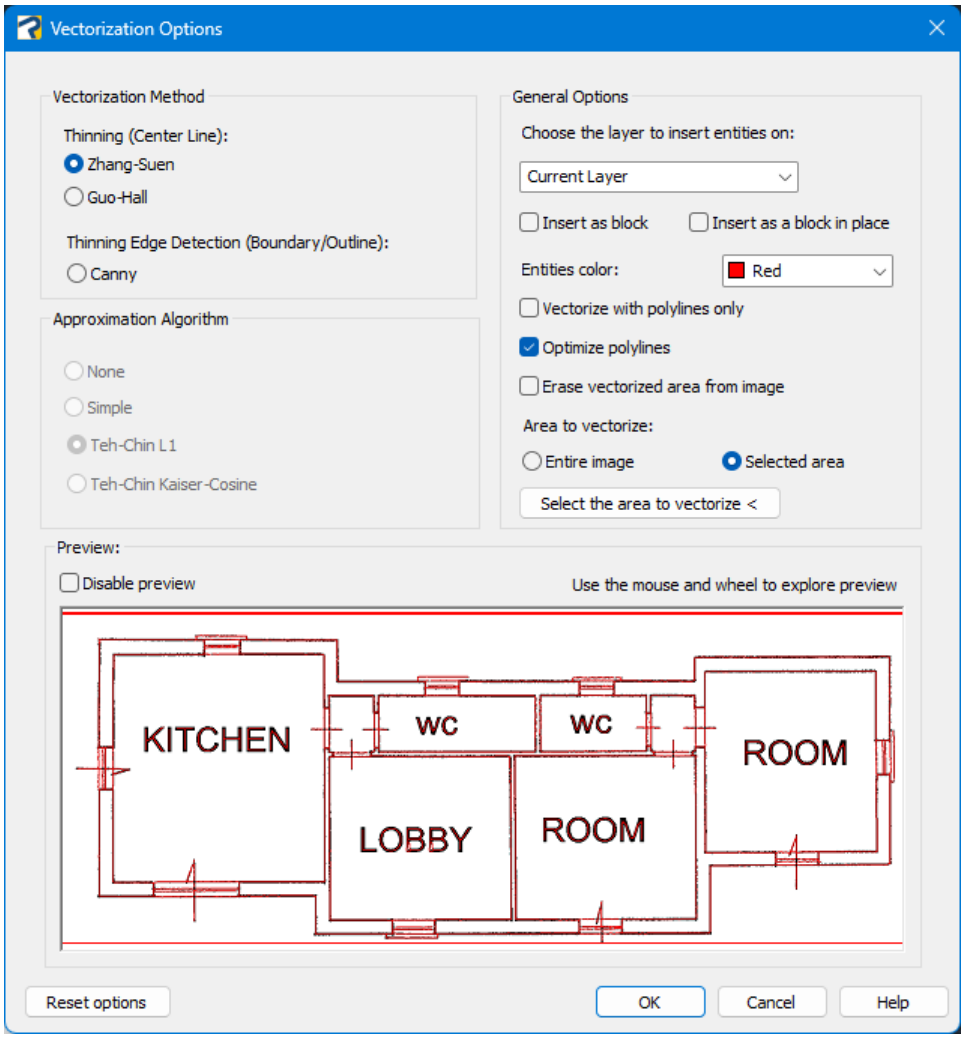


Figure 6 - Vectorization Options

Note: For more details about Vectorization option, see the Raster Draw manual.

e. Once confirmed, the resulting vectors will be inserted into the drawing according to the selected settings. If the corresponding option was enabled, the vectorized area will be removed from the original image.

3. Text Recognition. The floor plan has been vectorized, but vectorization alone is not sufficient for text recognition. progeCAD provides a specific command that allows the text present in the image to be converted into CAD text elements.
   a. From the Raster Draw menu, select the Recognize Text command.
   b. Click on the frame of the image to be vectorized.
   c. Select the area containing the text according to the text orientation. For more information, see the Raster Draw manual.

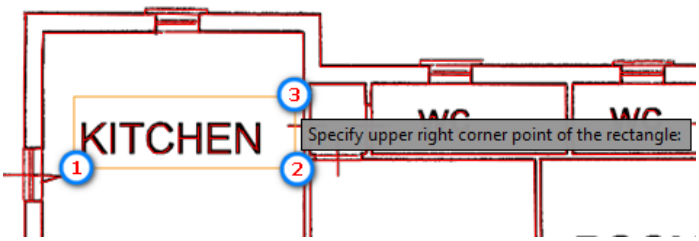


Figure 7- Selecting the Text Area with the Correct Order.

d. In the “Verify Text” window, choose any desired options and press OK to confirm.

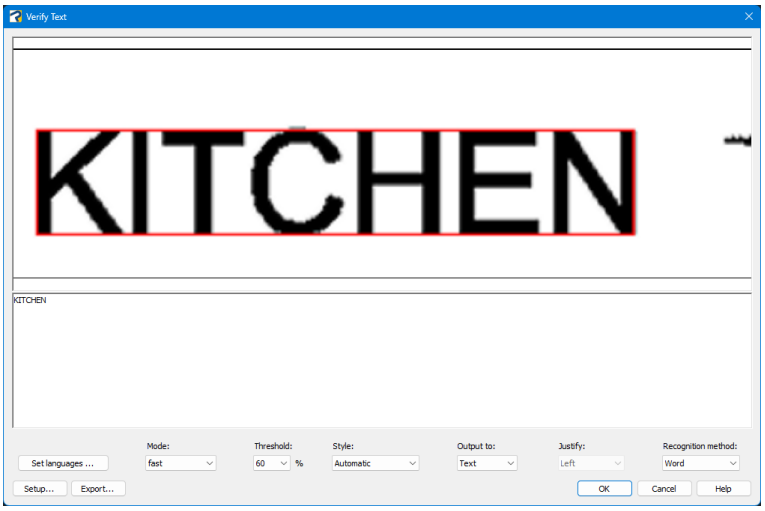


Figure 8 - Verify Text Option

4. The text is now editable and can be treated like any other CAD text in the drawing.

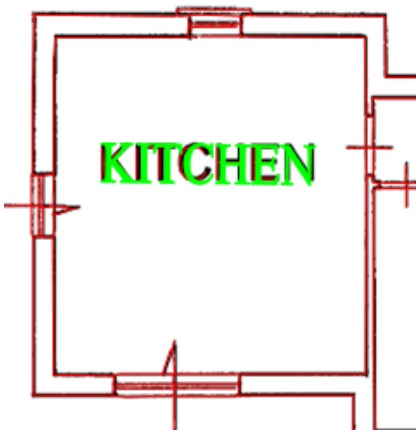


Figure 9 - Text as a CAD Entity

Scanning of Paper Drawings

When working with drawings originally created on paper, it is necessary to scan them and convert them into a digital format. To achieve the best possible quality when vectorizing a paper document, the following precautions should be taken during scanning:

- Remove folds and imperfections from the sheet to ensure clean, well-defined lines.
- Select the output format: .TIF or .BMP are recommended; .JPG and .PDF are not recommended, as they may reduce image quality.
- Set the color mode to bitonal (black and white), avoiding color or grayscale scanning, to maximize the contrast between lines and background.
- Choose a high resolution: the minimum recommended value is 600 dpi to ensure precision and line detail.

Following these guidelines will produce an optimal image for vector conversion, ensuring maximum accuracy of the digital drawing. PDFs generated directly by the scanner typically contain only raster images, usually at low resolution. For vectorization, see the Raster to Vector Conversion Process section.

Notes on Resolution, Image Quality, and File Formats

Scanners and printers operate at resolutions expressed in **dpi** (dots per inch) or **ppi** (pixels per inch), i.e., the number of dots or pixels per inch. These parameters determine the quality of the scanned or printed image.

The overall image resolution is obtained by multiplying the number of pixels along the width by the number along the height.

Example: Scanning an A4 sheet (21 × 29,7 cm, i.e. 8,3 × 11,7 inches) at 600 dpi produces an image file of:

(8,3×600) ×(11,7×600) ≈ 35 Mpx

Main image File Format:

- **TIFF (Tagged Image File Format)** – uncompressed format, ideal for vectorization.
- **BMP (Windows Bitmap)** – uncompressed format, compatible with most CAD software.
- **JPG (Joint Photographic Experts Group)** – compressed format; not recommended for vectorization, as compression may degrade image quality.

Appendix

Extracting an Image from a PDF File

If you want to extract an image from a PDF file to handle it as a separate file, you can proceed as follows:

1. Open the PDF file with Adobe Acrobat Reader (or another equivalent software).
2. Select the image and right-click to choose “Copy Image” or “Save Image” if using the Pro version. In this case, simply choose where to save the image and the format (TIF or BMP recommended).
3. If you used “Copy,” open an image editing program (e.g., Paint) and paste the image.
4. Save the image in TIF or BMP format.

Basic Concepts of Raster Images and File Formats

A raster image consists of a grid of pixels, which are small square elements representing the smallest unit of a digital image.
A vector image, on the other hand, is composed of geometric entities such as lines, arcs, polylines, and curves, mathematically defined from points with specific coordinates. Vector drawings are used in CAD and GIS systems, and more generally in all applications that require high geometric precision and accuracy in graphic representation.
A raster-to-vector converter allows you to transform a raster image into its corresponding vector representation. The result of this process can vary

significantly and depends on several factors, among which the quality of the original raster image is particularly important.

To achieve good vectorization, the original drawing must have adequate characteristics. In particular, the printed sheet should be of high quality, with lines that are sharp, well-defined, and clearly distinguishable from the background. In general, the best results are obtained with black-and-white drawings, where the contrast between lines and background is stronger.

During the digitization phase, it is also necessary to set the resolution of the file to be scanned, i.e., the number of pixels that make up the raster image generated by the scan.

Considering the image as a rectangle composed of a pixel matrix, the overall resolution is obtained by multiplying the number of pixels along the width by the number of pixels along the height of the image.

Examples:

- 2048 × 1536 ≈ **3.15 MPx**
- 3008 × 2000 ≈ **6 MPx**
- 3264 × 2448 ≈ **8 MPx**

As the number of pixels increases, the image detail improves, but the file size also grows.