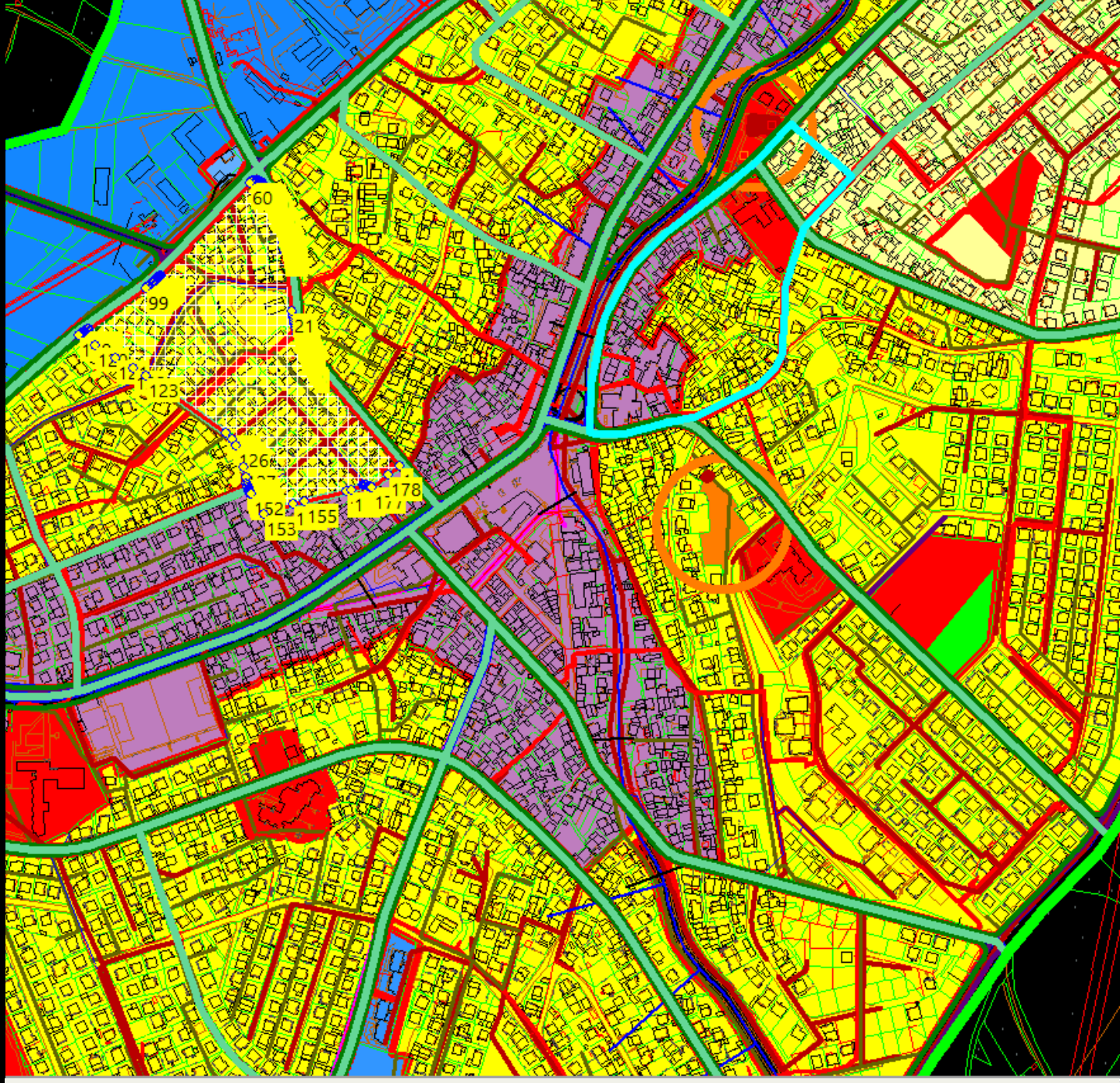


USER GUIDE

SGIS Desktop
Release Version 1.3

2024

Preamble

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Foreword

SGIS Desktop 1.3:
A Commitment to Sustainable GIS Technology

SGIS Desktop Software began as a solution to the labor-intensive challenges we faced in managing cadastral and infrastructure data, where data inconsistencies and time-consuming tasks were commonplace. This experience laid the foundation for SGIS, now at version 1.3, to redefine GIS capabilities with a focus on precision, efficiency, and environmental responsibility.

Our latest version, SGIS Desktop 1.3, like all previous versions, is built entirely on original algorithms developed without reliance on external libraries or frameworks, ensuring a fully self-contained and resilient system.

Each aspect of our technology is guided by sustainable, green software development principles that prioritize minimal resource usage and reduced energy consumption. The shift toward efficient algorithms reflects a deeper awareness of the environmental footprint of computational processes, and with energy costs and scarcity on the rise, our approach helps mitigate these concerns.

Sustainability isn't just a feature—it's a fundamental value at the core of our research and development. This green ethos offers valuable insights for future GIS advancements, underscoring the importance of mindful algorithm design that minimizes environmental impact while maximizing output accuracy and efficiency.

We believe that our work empowers users worldwide to tackle geospatial data projects with a blend of high efficiency and environmental consciousness.

By choosing SGIS, you're not only enhancing productivity but also supporting sustainable development.

Your feedback remains essential to us as we continue to improve and expand SGIS Desktop. Our team of dedicated developers has worked tirelessly to create a tool that empowers both new and experienced GIS users, and we hope this guide assists you in realizing the full potential of SGIS Desktop 1.3.

Sincerely,
Kiro Gjorgjiev and Elena Gjorgjieva,
on behalf of the SGIS Team

SGIS Desktop Release 1.3

Chapter 1

In the Context of GIS Technology, What Is Sustainable Development?



In the context of GIS technology, sustainable development encompasses the design, deployment, and continual improvement of GIS systems to support environmental, social, and economic sustainability. This approach emphasizes environmentally responsible practices throughout the lifecycle of GIS products and services, aiming to reduce environmental impact through thoughtful resource management and reduced energy consumption.

A crucial component of sustainable GIS development is refining algorithms to foster Green Software Development. In our digital era, where algorithms are the backbone of productivity-enhancing solutions, efficient algorithm design is paramount. By simplifying complex tasks while minimizing resource usage, these algorithms address the demands of a fast-paced environment. SGIS Technology, supported by extensive research, focuses on optimizing algorithms to improve resource efficiency, reducing both memory and processing power requirements. This optimization also significantly decreases solution times, underscoring the value of time in achieving successful outcomes.

As digital technologies continue to permeate every aspect of modern life, the adoption of environmentally conscious practices becomes essential to lessen technology's environmental footprint. Since 1990, CO_2 emissions have risen, and AI models, now ubiquitous, further highlight the environmental impact of large-scale computing. The SGIS project aims to demonstrate how software, data centers, and algorithmic efficiency collectively shape the environmental footprint of technology on a global scale.

The rise of big data has transformed industries, including GIS, which has expanded from government use to broader applications across sectors. However, high energy consumption remains a challenge across GIS, BIM, LiDAR, remote sensing, and telecommunications. As energy resources grow scarcer and more costly, optimizing algorithms for energy efficiency is crucial. This project aims to drive forward environmental sustainability and uphold legal integrity through Green GIS technology, responding to the pressing need for sustainable practices in technology and resource management.

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This help guide presents a concise overview of the extensive range of GIS functionalities offered by SGIS. These features are categorized into several general categories, each serving specific purposes. The following is a brief summary of the core features and functions available in SGIS.

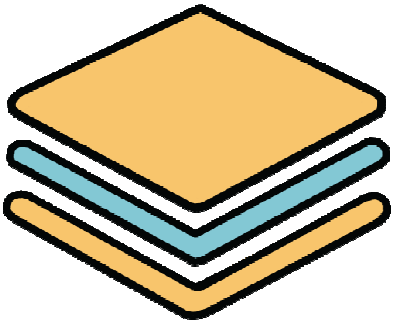
This user guide is official; however, it is not definitive due to ongoing improvements and potential introduction of new functions in the software. Any errors or issues identified will be rectified and reflected in subsequent versions of the PDF guide. The latest releases of the PDF guide will be regularly uploaded and made accessible on our official webpage.

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Chapter 2.1

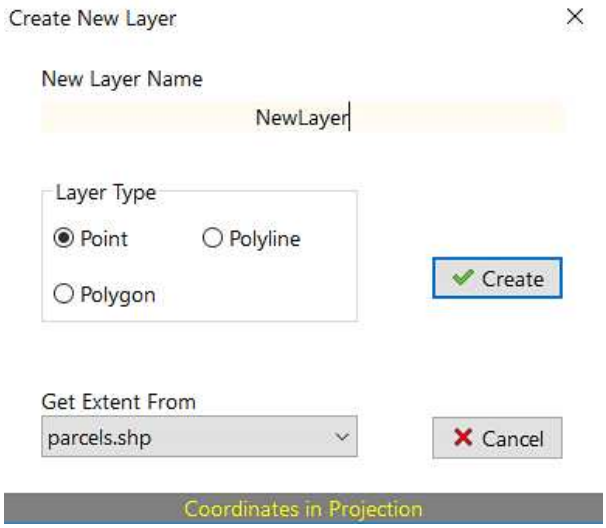
LAYER

In GIS, layers represent individual datasets or thematic components that are superimposed to create a comprehensive spatial representation. Each layer corresponds to a distinct information category and contains geospatial features or attributes. Layers can consist of points, lines, or polygons depending on the nature of the information being represented. By overlaying multiple layers, GIS users can analyze and visualize the relationships and interactions between different spatial elements. Basically, layers serve as the building blocks of all GIS analysis.



▪ Create New Layer

The "Create New Layer" function allows you to create a new blank layer by defining its properties and settings.



Follow these steps to create a new layer:

1. **Name the Layer**: Enter a name for the new layer in the provided text field.
2. **Select Layer Type**: Choose the desired layer type—*point* (default), *polyline*, or *polygon*—depending on your requirements.
3. **Set Layer Placement**: Optionally, place the new layer within your project by selecting a previously added SHP file or any compatible file format. This setting

ensures that the new layer's extent matches the view extent of the chosen file. By default, the "Extent Layer" setting uses the first layer in the Layers List, basing the new layer's extent on this layer.

To create the layer, click **Create**. This finalizes the creation based on the entered name and selected settings. To cancel, select **Cancel**; no layer will be created.

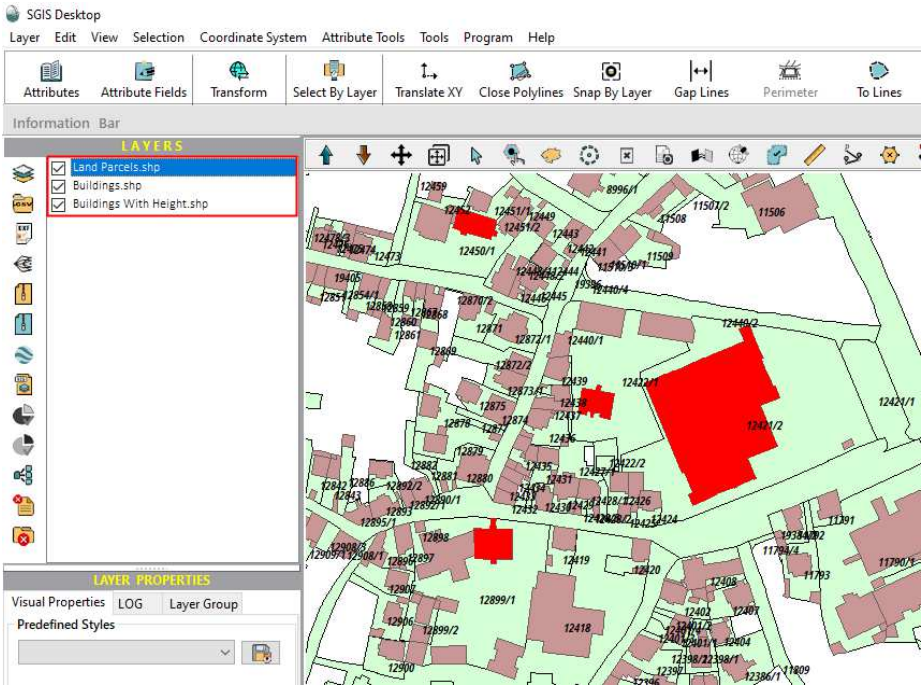
Note: The "Create New Layer" function is only available if there is at least one existing layer in the Layers List. Without any existing layers, this option will be disabled.

▪ Add Layer

The process of loading vector GIS files as layers in SGIS involves importing the files into the software to create corresponding layers. SGIS supports a variety of vector data formats, including:

- SHP format (Esri)
- GML format
- GMT file format (GDAL)
- MIF / MID format (MAPInfo)
- KML format (Google)
- GeoJSON format

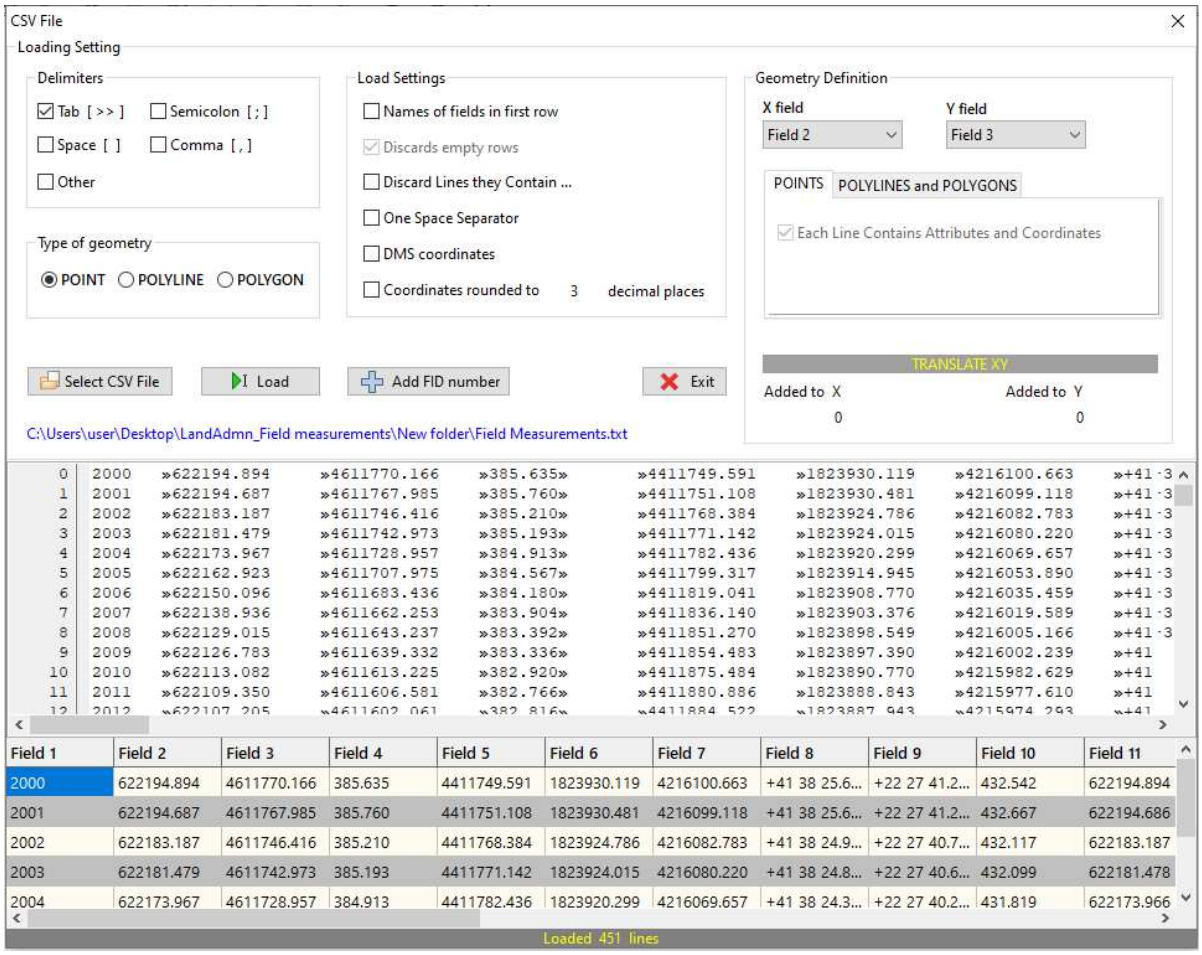
The **Add Layer** function in SGIS, allows you to load and import vector data in various file formats. This function provides a convenient way to incorporate external data into your SGIS project for analysis and visualization.
Using the "Add Layer" function in SGIS, you can load one or multiple files simultaneously; each loaded file will create a separate layer in the **Layers** list. Upon loading, the corresponding layers are automatically checked to indicate their visibility.



If the **Layers List** remains empty after loading files, the view will automatically zoom to the extent of the last loaded file, enabling focused exploration of the specific geographic area. This feature facilitates smooth navigation within the SGIS environment.
If a file fails to load, it will not appear in the Layers List. Instead, a message will display in the **LOG panel**, detailing the issue with the file or loading process to assist you in troubleshooting any potential problems.

▪ Load CSV Data

Creating a layer from text data.
Users have the option to select the geometry type - **point**, **polyline**, or **polygon** - for data loading.
The default type is set to point.



Prior to loading the text file or creating the layer, the user is required to select a separator or a combination of separators. Furthermore, in the "Load Settings" section, the user needs to configure the parameters for loading before initiating the process:

Names of fields in first row - when the option is checked, the column names in the table are taken from the first row of the data. Otherwise, generic column names are created;

Discards empty rows – the option in enabled by default;

Discard Lines they Contain … - when the option is checked (enabled), any lines in the text file that contain the specified text (entered in the corresponding field) will be disregarded;

One Space Separator – when the option is checked, and the "Space" delimiter is chosen in the "Delimiters" section to separate columns in the table, the default behavior is to treat any consecutive spaces as a single separator. However, when this option is enabled, each individual space is considered as a separate separator;

DMS coordinates – the option should be checked when loading coordinates in the format of degrees, minutes, and seconds. This ensures that the coordinates are correctly interpreted during the loading process;

Coordinates rounded to n decimal places – by checking the option, you can define the number of decimal places for the coordinates being loaded from the text file. This option is associated with the previous option mentioned;

Geometric element – Point

Choosing the point type entails specifying the column positions for the X and Y coordinates and creating a new layer consisting of points.
By default, all columns from the text file are assigned as attributes in the newly created point layer. Therefore, when loading a point layer, it is recommended to have the first row in the text file contain the field names separated by a delimiter.

Geometric element – Polyline or Polygon

Selecting the polyline or polygon type entails defining the position of the X and Y coordinate columns, as well as the position of the FID field (an integer) indicating the number of the polyline or polygon. When loading data for polygon type, an additional field indicating the hole (an integer) needs to be defined.
The default option is **Area Perimeter Polygon** when the Polygon element type is selected. This means that when creating a polygon layer, three fields are automatically generated in the attributes: FID field, which holds the sequential number of the polygon, an area field that represents the polygon's area, and a perimeter field that represents the polygon's perimeter. If this option is unchecked, the attributes are created from all columns in the text file.
If the text file does not have a field that defines the number of polylines or polygons, and we are dealing with a single element, clicking the Add FID Number button will append [1] to the end of each line in the text file. If the Polygon type is selected in the Type Of Geometry, this option adds [1 1]. The chosen separator is placed between the two numbers. The first number represents the FID number, and the second number represents the number of holes in the polygon. This addition applies to a single polygon without any holes. When working with data for multiple elements, they need to be entered before being loaded into this form.
During the loading of the text file, the default behavior is to preserve the order of lines or coordinates as a sequence of vertex points that define the polyline or polygon. It is important to note that the main geometric distinction between a polyline and a polygon is that a polygon has a closing point that coincides with its initial point.

Procedure:

First, in the **Delimiters** section, select the delimiter or delimiters used to separate the fields. If we are unsure about the delimiter in the file, we can define it after loading the file.

In the **Load Settings** section, define the loading options. If we are not familiar with them, we can define the options after loading the file.
Load the file from the disk by clicking the **Select CSV File** button.
During the coordinate loading process, you have the option to define an offset that will be applied to either the X or Y coordinate. This offset acts as a translation, effectively adding or subtracting a value from the coordinate value.
By clicking on the column in the loaded data table and selecting from the menu, you can define the position of the X coordinate as well as the position of the Y coordinate. If you have chosen the geometry type to be **Polyline** or **Polygon**, you will also need to define the position of the "FID" field, which represents the element number. When loading data of type **Polygon**, it is mandatory to define the position of the **Holes** field as well.
The order of the coordinates follows the mathematical convention of X and Y, or the geodetic notation of Y and X, where X denotes the coordinate towards the east and Y denotes the coordinate towards the north.
By clicking on the **Load** button, a new layer is created, data is loaded into it, and the CSV data loading form is closed.
When configuring the parameters for loading coordinates, you can define separators and other settings in the **Load Settings** section. Additionally, you have the option to save a configuration by right-clicking and load the same configuration for future use.

▪ Load DXF 

General
DXF, which stands for Drawing Interchange Format or Drawing Exchange Format, was initially developed to facilitate the exchange of drawings between CAD applications. It quickly gained popularity and became widely adopted as the standard format for sharing drawings. Reading DXF files involves parsing a predefined set of CAD elements or entities. These entities represent various geometric and non-geometric objects present in the drawing.

Supported ENTITIES
The following ENTITIES are supported:

POINT - is read as POINT element
POLYLINE - is read as POLYLINE / POLYGON element
LWPOLYLINE - is read as POLYLINE / POLYGON element
LINE - is read as POLYLINE element
TEXT - is read as POINT element
MTEXT - is read as POINT element
ATTRIB - is read as POINT element
ARC - is read as POLYLINE element
CIRCLE - is read as POLYLINE element
3DFACE - is read as POLYGON element
HATCH - is read as POLYGON element

Character Encoding
Normally DXF files are in the ANSI_1252, ANSI_1251, or some other encoding. When loaded, this is translated in UTF-8.

Procedure:

After selecting the desired DXF file, the software will proceed to read the HEADER and ENTITIES sections of the file. The HEADER section contains information about the drawing settings and properties. The ENTITIES section contains the actual graphical entities that make up the drawing. Depending on the specific entities present in the file, they will be organized into three layers within the software (as described in "Supported ENTITIES"). The layers are created to group similar entities and facilitate their management. The organization of entities into layers helps with visibility control, editing, and applying specific properties to groups of entities. The three layers typically used are:

- a point layer
- a polyline layer
- a polygon layer

Later on, if needed, the layers created from the DXF file can be separated or "unzipped" using the Separate GIS Layer By DXF Layers function. This function allows you to extract each layer from the DXF file and convert them into individual GIS layers within the software.

By using this function, you can access and work with each layer independently, making it easier to manipulate, analyze, and edit specific elements within the original DXF file. This provides greater flexibility and control over the imported data, allowing you to perform various GIS tasks and operations on a per-layer basis.

▪ Separate GIS Layer By DXF Layers 

This function allows the creation of new SGIS layers from existing DXF layers. The procedure can be executed on the selected layer.



*Example: 'The user loads a DXF file and in the Layers List the software creates three layers: the polygon layer, the polyline layer and the point layer.'

To continue with the execution of this function, the user will need to select a specific layer from the Layers List, such as the polygon layer. Upon selection, all polygon layers that were contained in the original DXF file will be created as separate layers.
The same process can be applied to the polyline layer and point layer, allowing for the creation of corresponding layers based on the geometry type.

After the procedure is finished and the new layers are created, the selected layer that was used for extraction will be closed and unchecked in the Layers List. This helps to organize the layers and remove any unnecessary duplicates, leaving only the newly created layers visible for further manipulation.

▪ Export Layer in DXF format 

The 'Export Layer in DXF Format' function allows you to save the active layer as a DXF format file. This function converts the vector data from the active layer into the DXF file format, which is commonly used in computer-aided design (CAD) software. By exporting the layer in DXF format, you can share or further manipulate the data in other compatible software or systems.

The DXF files are created by the following rules:

- POINT type elements are written as POINT entities;
- POLYLINE type elements are written as POLYLINE entities;
- POLYGON type elements are written as POLYLINE entities;

If the **Labels** option is checked when exporting the layer in DXF format, and there are labels associated with the features, a TEXT entity will be created in the exported DXF file to represent the labels. This allows for the preservation of label information during the export process.
During the export process of a layer in DXF format, the color of the lines will be converted from the colors available within SGIS to a corresponding DXF color. This ensures that the visual representation of the lines in the exported DXF file accurately reflects the original colors defined in SGIS.

▪ Load GML Files from ZIP Archive 

Loading a ZIP archive that contains multiple GML files, which are commonly used for storing vector data.

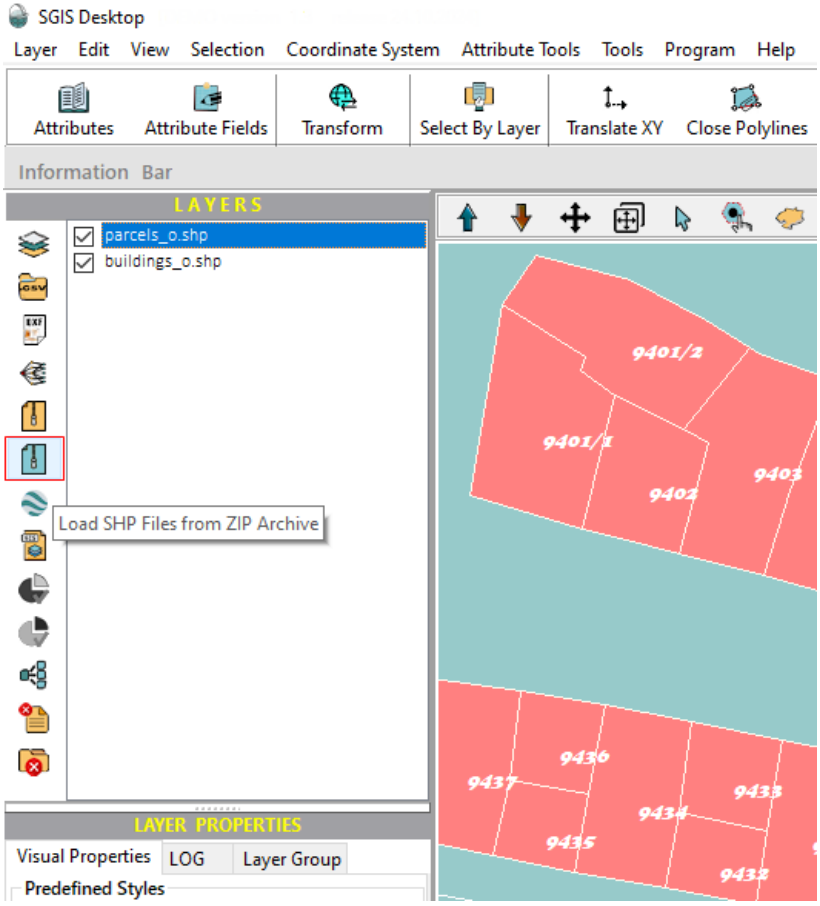
This feature enables you to access and work with the various GML files contained within the archive seamlessly.
To load a GML ZIP archive, the user needs to select the desired archive file. Upon loading, the data within the archive will be extracted, and each individual GML file will be imported as a separate layer. This allows for convenient access and management of the GML data within the archive.

If a specific layer within the GML ZIP archive cannot be loaded successfully, it will not be displayed in the **Layers List**. Instead, a concise message describing the nature of the issue will be shown in the LOG panel. This allows the user to identify any loading errors or problems with the GML data and take appropriate actions accordingly.

▪ Load SHP Files from ZIP Archive 

Load a ZIP archive that contains multiple **SHP** files (vector data).
To load a ZIP archive containing multiple SHP files, please follow these steps:

- Select the ZIP archive file that contains the SHP files you want to load.
- The software will automatically extract the contents of the ZIP archive.
- Each SHP file found within the archive will be treated as a separate layer.
- The layers will be added to the software's Layers list, allowing you to work with them individually.



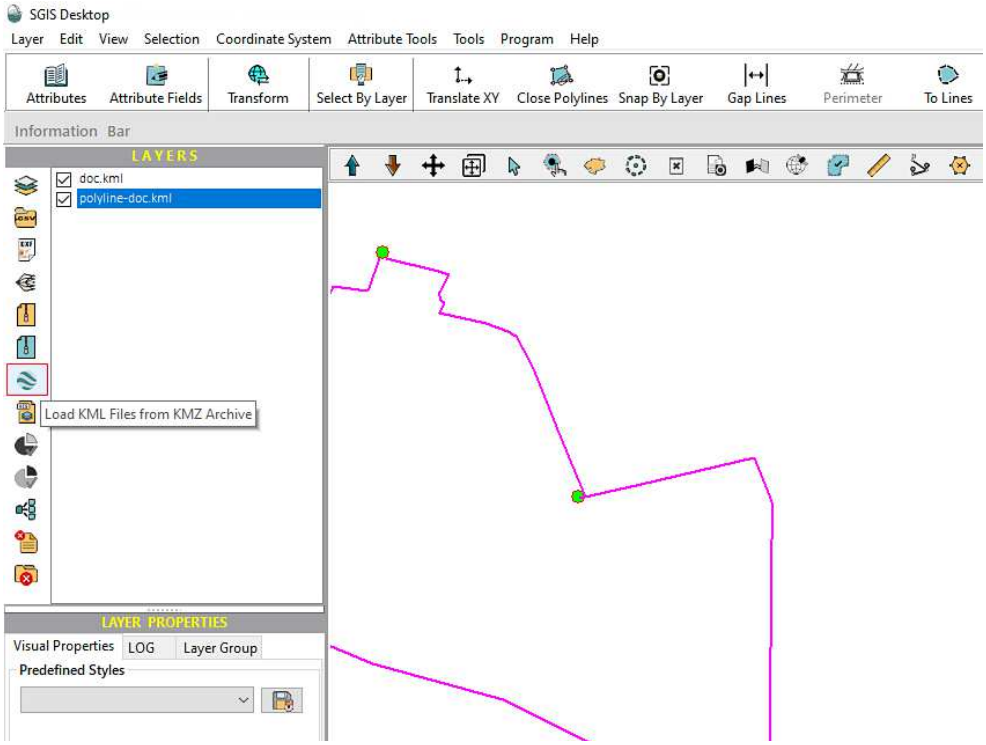
If any file within the ZIP archive cannot be loaded, it will not be displayed in the Layers list of the software.
You can refer to the LOG panel to find detailed information about the nature of the problem encountered while loading the file. The LOG panel will provide specific error messages or notifications that explain why a particular file could not be loaded.

▪ Load KML Files from KMZ Archive

This function enables the reading of KMZ archives containing KML files that store vector data in Google KML format.

To use this function, you need to select the KMZ archive file. Upon loading, the function will extract (unpack) all the files from the archive.

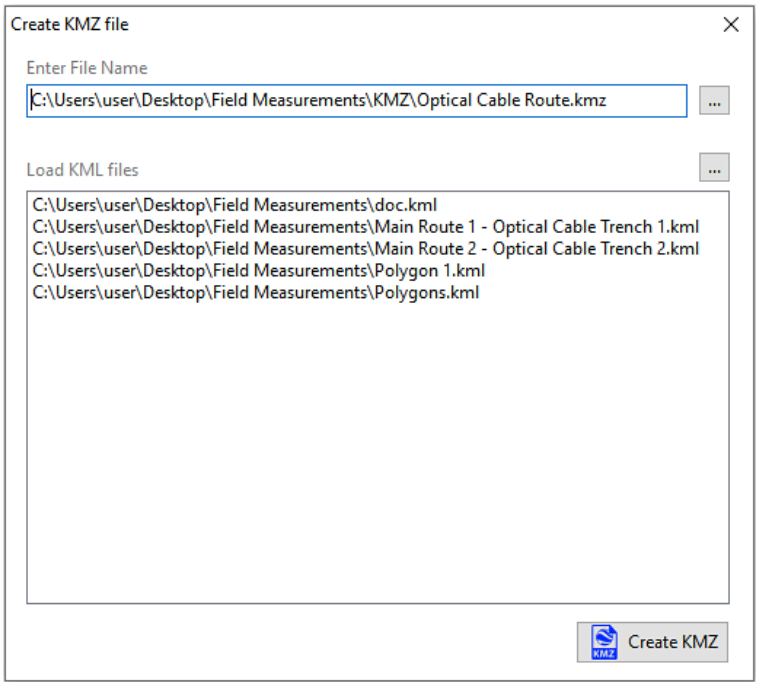
Each individual KML file within the KMZ archive will be separated and imported as a separate layer in the software.



If, for any reason, a selected file cannot be loaded from the KMZ archive, that particular file will not appear in the layers list within the **Layers panel**.
In the LOG panel, you will receive a short message providing an explanation of the nature of the problem that prevented the file from being loaded.

▪ Create KMZ Archive

The "Create KMZ File" function opens a dialog window, prompting you to select the directory where you'd like to save the new KMZ file.
Next, you'll be prompted to choose all the KML files you want to compress into a single KMZ.

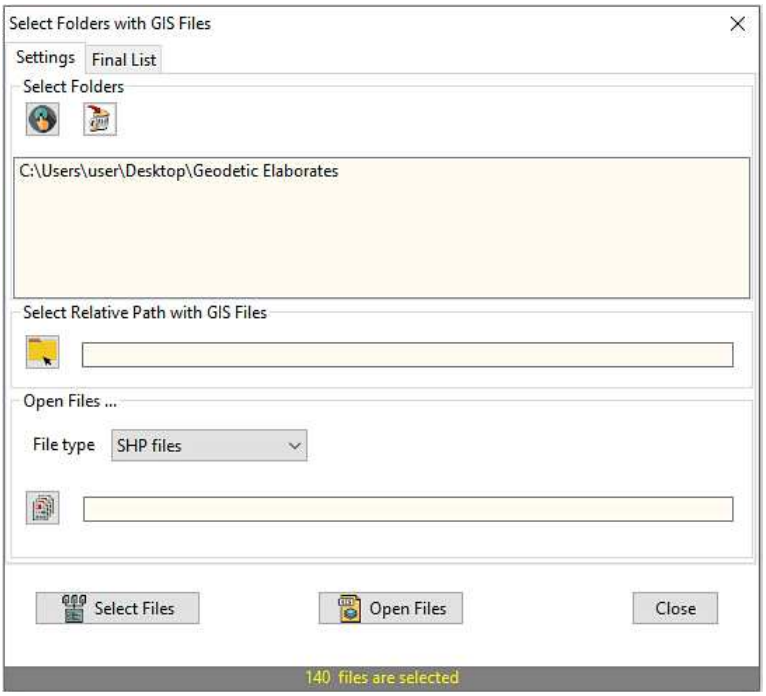


Once you've selected both the save location and the files, simply click on the **Create KMZ** button, and your KMZ file will be generated and saved in the specified directory.

▪ Open Folders

The Add Layer function is commonly used to load GIS files into the Layers List panel, allowing them to be displayed as separate layers. However, this process becomes time-consuming when multiple files or files from different folders need to be opened.

To address this issue, a new function has been introduced.



This function aims to streamline the process by enabling the simultaneous loading of multiple files from different folders. It eliminates the need to repeat the procedure for each file, saving considerable time and effort.
Clicking on the **Open Folders** function will open a new form with two main tabs:

- **Settings**
- **Final List**.

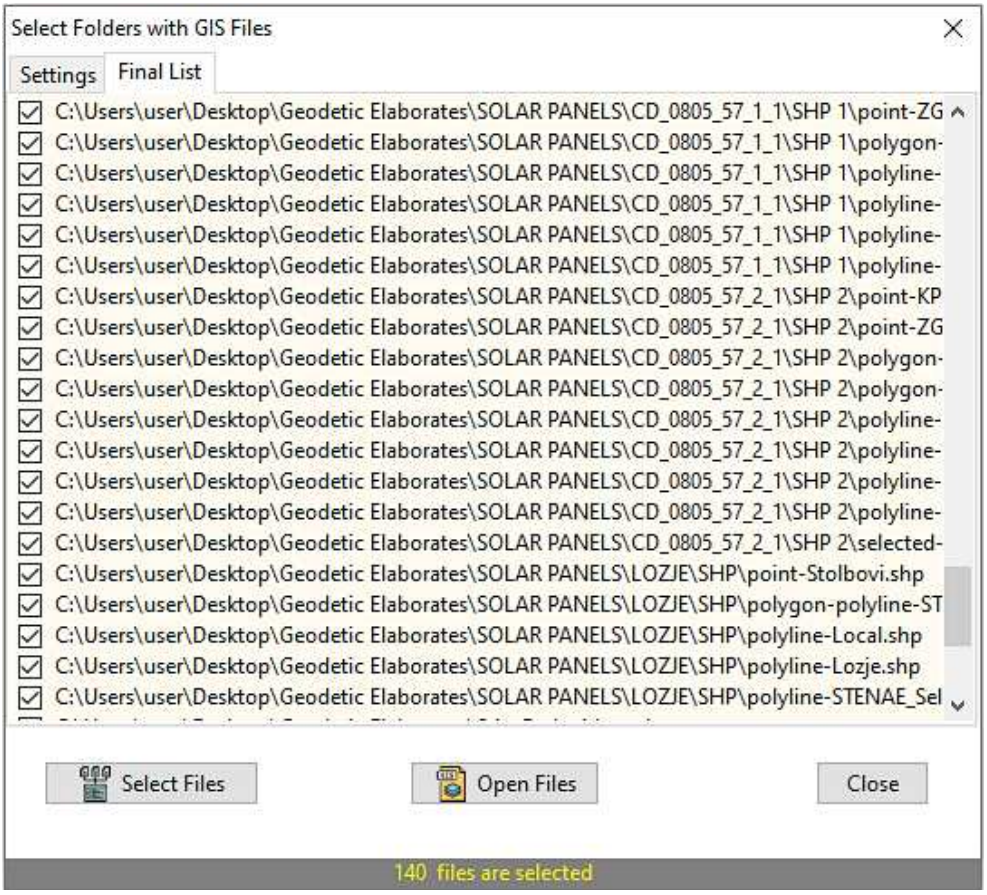
The "Settings" tab offers two primary operations: "Select Folders" and "Open Files".

In the Select Folders tab of the form, the Select Folder action allows you to choose a folder where the search for GIS files will be performed. You have the option to include or exclude subfolders within the selected folder.

On the other hand, the Remove Folder action is used to remove previously selected folders from the list.

Additionally, there is an option to specify a relative path where GIS files are located. This option limits the search to only those subfolders that are specified by the relative path.

In the **Open Files** section of the form, you can specify the type of data that will be loaded. The default format is SHP (Shapefile), but you have the flexibility to choose a different format from the dropdown list.
Additionally, there is an option to select pattern-files. If you are working with file formats that follow a specific pattern, the search will focus on files that match the defined pattern.



The **Final List** tab displays the files that meet the specified conditions set in the first tab. This list is populated after all the settings in the first tab are finalized, and the user clicks on the **Select Files** button. Each file that is discovered will be shown in this list, including the file name and its full file path. To load a file, simply check the box next to it. If there are any files that the user does not want to be displayed, they can uncheck the box, and the file will be removed from the list.

The **Open Files** function within the form allows the user to load the selected files into the main "Layers List" panel. By clicking on **Close**, the user can close the "Open Folders" form.

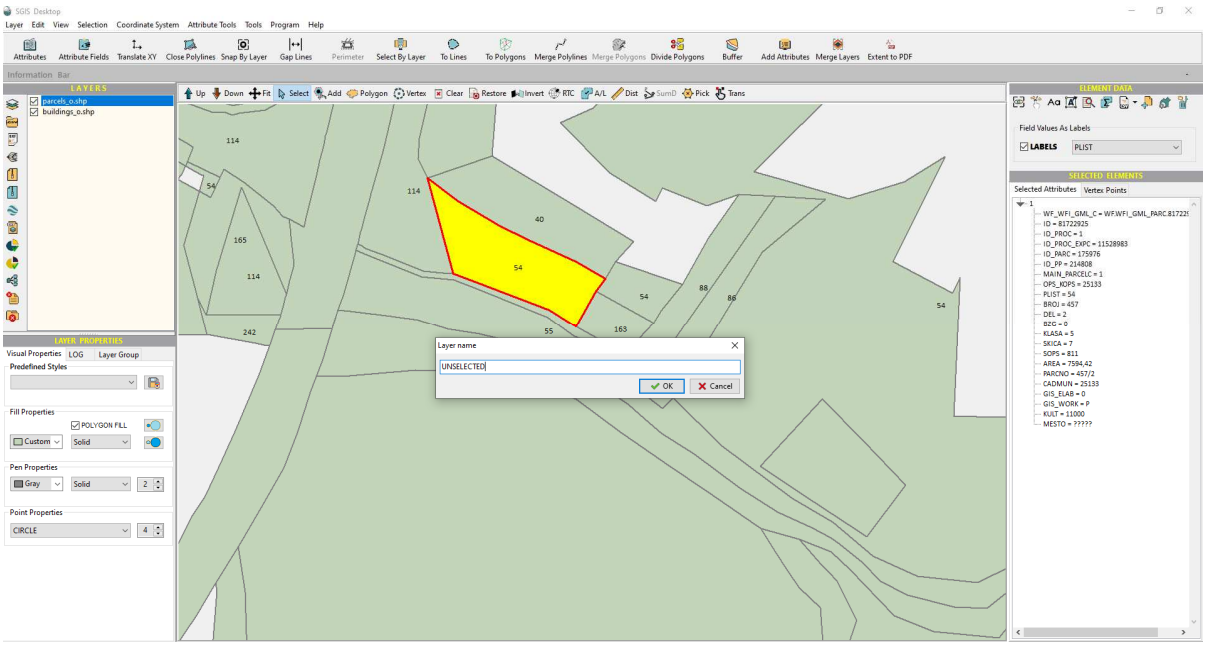
▪ Selected Elements In New Layer 

If the user has already made a desired selection, the Selected Elements In New Layer function enables the separation of those selected elements into a new layer. When creating the new layer, SGIS will prompt the user to provide a name for the layer.

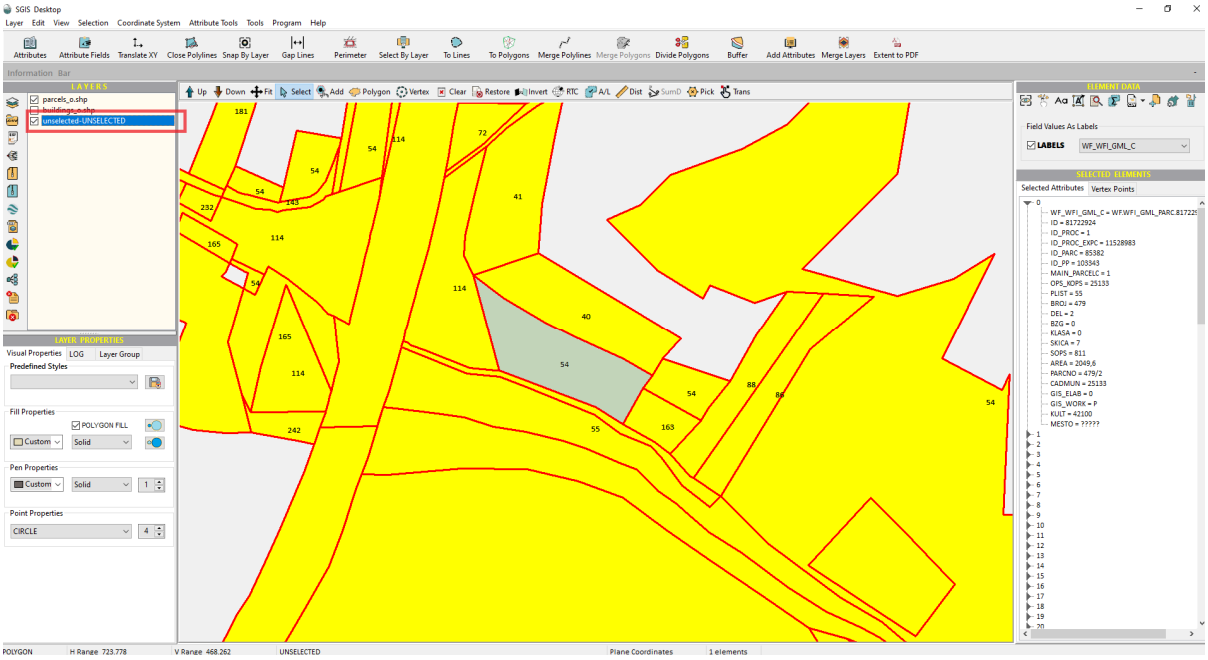
The new layer will have the same type as the original layer.

▪ Unselected Elements In New Layer 

If the user has made a selection of one or more elements, this function provides the option to export all the remaining elements (those not selected) into a new layer. When creating the new layer, the software will prompt the user to enter a name for the layer.



The layer type of the new layer will be identical to the layer from which the elements are being exported.



This allows for easy organization and separation of selected and unselected elements within the project.

▪ Save As 

The **Save As** function allows the user to save the selected layer in one of the following formats:

- **SHP** (Esri file format)
- **GML** format file
- **GMT** (GDAL format file)
- **MIF/MID** (MAPInfo format file)
- **KML** format (Google vector)
- **GeoJSON** format file

▪ Close Layers 

The **Close Layer** function allows you to close the currently selected layer. This action removes the layer from the display and frees up memory resources associated with it.

On the other hand, the **Close All Layers** function () enables you to close all layers that are currently open in the software. This action effectively clears the display of all layers and releases the memory occupied by them. It is a convenient way to start with a clean slate or when you no longer need the previously loaded layers.

If you have made modifications to the GIS data within a layer and you wish to close that layer, please note that the changes will not be automatically saved. In order to preserve the modifications, you can use the **Save As** function.

Certainly, when you attempt to close a layer that contains modified data, you will be presented with a warning message. This message serves as a reminder that the active layer has unsaved changes. It prompts you to confirm whether you want to proceed with closing the layer without saving the modifications or if you prefer to save the changes before closing.
This warning message is designed to ensure that you are aware of any unsaved modifications and gives you the opportunity to make an nformed decision about how you want to handle the changes before closing the layer.

▪ Close Unchecked Layers

With the **Close Unchecked Layers** function, you can close all the layers in the **Layers List** that are not currently checked. When you execute this function, it will automatically identify the unchecked layers and close them.

This function is useful when you have multiple layers loaded but only want to keep the checked layers open. It helps streamline your workspace by removing unnecessary layers from the Layers List, reducing clutter and improving performance.

The Close Unchecked Layers function is particularly valuable in scenarios where numerous layers are open and densely packed with geometric elements. It serves as a practical solution for users who need to manipulate geometric elements more efficiently and visually eliminate any unnecessary or unwanted elements.
This function proves highly beneficial when working with complex GIS projects that involve multiple layers containing overlapping or densely distributed spatial data. By selectively closing unchecked layers, users can declutter their workspace, simplify their view, and focus on specific elements or layers that require attention or further analysis. This functionality streamlines the user experience by reducing visual distractions and enabling smoother navigation and manipulation of geometric elements. It offers enhanced efficiency and improved organization, allowing users to work more effectively with their GIS data.

▪ Create Grid Layer 

The **Create Grid Layer** function, located in the Layer menu, allows you to generate a grid layer. When you select this function, a new form will open, prompting you to specify the width and height of the grid axis. Once you enter these values, the form will display the total width and height of the grid extent based on your inputs.

If the **For Selected Layer** option is checked, the grid extent will be aligned with the extent of the active layer.
On the other hand, if the **Ellipsoidal Coordinates** option is checked, the initial values for X spacing and Y spacing will be set to 0.05 units.

The procedure is executed by clicking on the **Create Grid Layer** button, which creates the grid layer accordingly.

▪ Merge Layers 

When you open the **Merge Layers** function, a new form will be displayed. There are certain conditions that need to be met in order to proceed with the merging procedure:

- The main **Layers List** panel should contain more than one layer. You need to have at least two layers available for merging.
- The layers can only be merged if they have the same geometry type.

This means that you cannot merge layers that have different types of geometry, such as merging points with polylines, points with polygons, or polylines with polygons. By ensuring that these conditions are met, you can proceed with the merging of compatible layers in order to combine their data into a single layer.

The central part of the form features a list displaying all the layers, referred to as the **All Layers** list. It is recommended that you check the layer that you want to use as the reference layer for the merging process. This reference layer will serve as the focal point for comparing and merging with other layers.
The merging procedure consists of three parts, specifically for the attributes of the layers being merged. These parts include:

- Same Fields
- Matched Fields
- Union Fields

Same Fields - The "Same Fields" type of merging involves merging layers that have the same structure of attribute fields. To select layers with the same attribute field structure, follow these steps:

- Check the reference layer that has the desired attribute field structure.
- Click on the "Control" button. This will initiate the process of identifying and selecting layers that have the same attribute field structure as the reference layer.

After the "Control" procedure, all layers that share the same attribute field structure as the reference layer will appear as checked in the list of layers. These checked layers represent the ones that can be merged together.

Matched Fields - The "Matched Fields" type of merging involves merging layers based on matching fields in the attribute table. In this case, only the fields that match the fields of the reference layer will be merged, while the other fields will be dismissed.
To perform a "Matched Fields" merge, follow these steps:

- Check the reference layer that contains the desired fields for merging.
- Click on the "Control" button. This will initiate the process of identifying and selecting layers with matching fields to the reference layer.
- After the "Control" procedure, all layers with matching fields to the reference layer will appear as checked in the list of layers. These checked layers represent the ones that can be merged together based on their matching fields. During the merging process, only the common fields among the selected layers will be merged, while the non-matching fields will be disregarded.

This allows for a more focused and targeted merging of layers, ensuring that only relevant attribute data is combined.

Union Fields - The "Union Fields" type of merging involves creating a merge where all fields from all layers will be retained and displayed in the attribute table.

If you have a checked layer within the list of selected layers and you want to view or preview the structure of the attribute fields for that layer, you can click on the Fields View button. This action will display the result in the Selected Layer Fields section.
Clicking on the "Fields View" button will provide you with information about the attribute fields of the selected layer. You can use this feature to examine the field names, data types, and other properties associated with each attribute field in the layer. By viewing the attribute field structure, you can gain insights into the available data within the layer and make informed decisions regarding the merging process.

To initiate the merging procedure, you need to click on the **Apply** button. Once clicked, a dialog will prompt you to enter the name for the newly created layer resulting from the merging process. After providing the name, the merging operation will be performed, and the newly merged layer will be displayed in the main **Layers List** panel.

By simply clicking on the **Close** button, you can close the Merge Layers form. This action will remove the form from the screen, allowing you to continue with other tasks or operations within SGIS Desktop.

SGIS Desktop Release 1.3

Chapter 2.2

EDIT

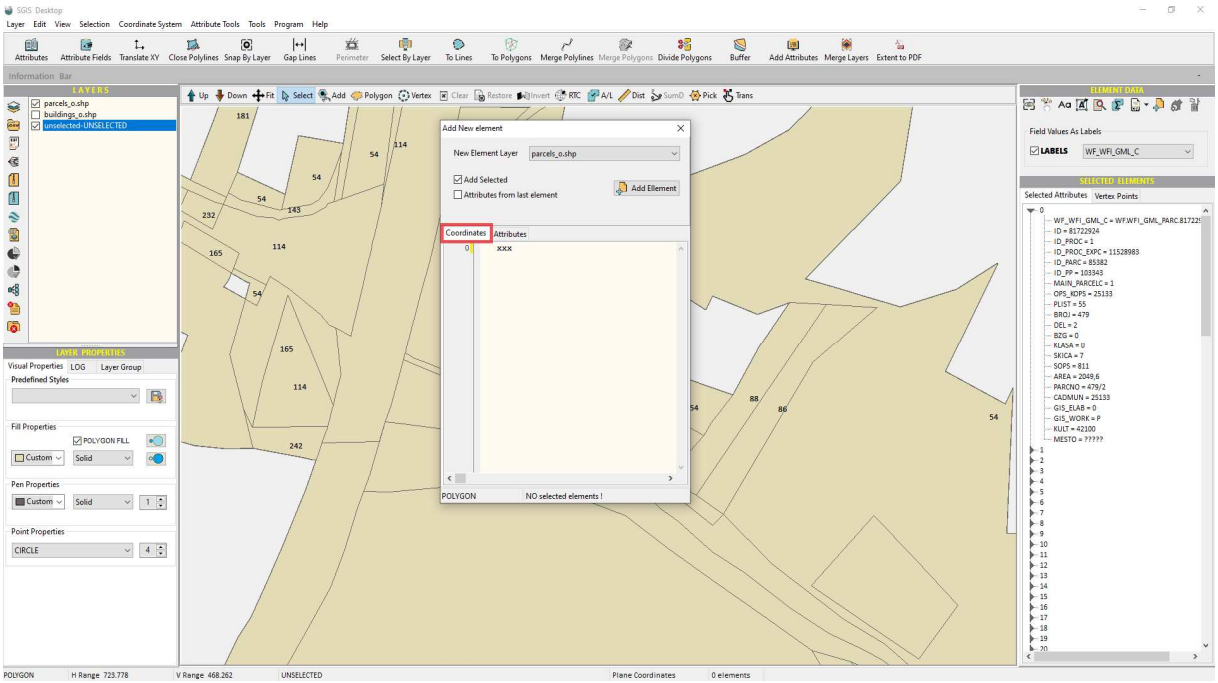
Edit tools in GIS refer to a set of functionalities designed to modify and update geospatial data. These tools play a pivotal role in the data editing process, allowing users to create, delete, move, reshape, and attribute geospatial features with precision and efficiency. By leveraging edit tools, GIS users can accurately reflect real-world changes, correct errors, and enhance the quality and integrity of their geospatial datasets. The importance of edit tools lies in their ability to support data maintenance, keep geospatial information up to date, and enable seamless integration of new information.



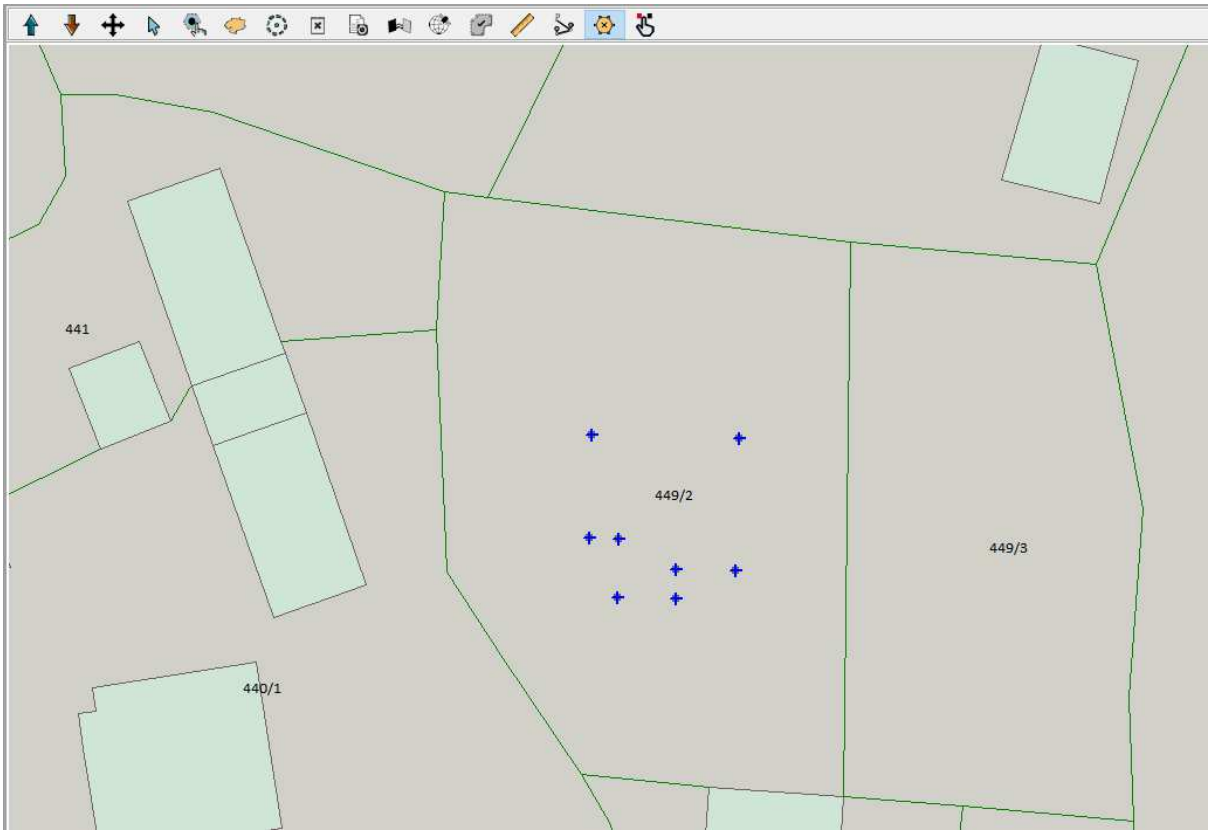
▪ Add New Element 

A new form is opened, and by default, the function is associated with the active layer. This means that the new element will be added to the active layer, unless the user selects a different layer from the **New Element Layer** dropdown list.

If the user has already selected one or more elements, the **Add Selected** checkbox will appear checked. This indicates that the coordinates of the selected element(s) will be shown in the Coordinates list. The user can uncheck this option or keep it checked and make modifications to the existing coordinates.



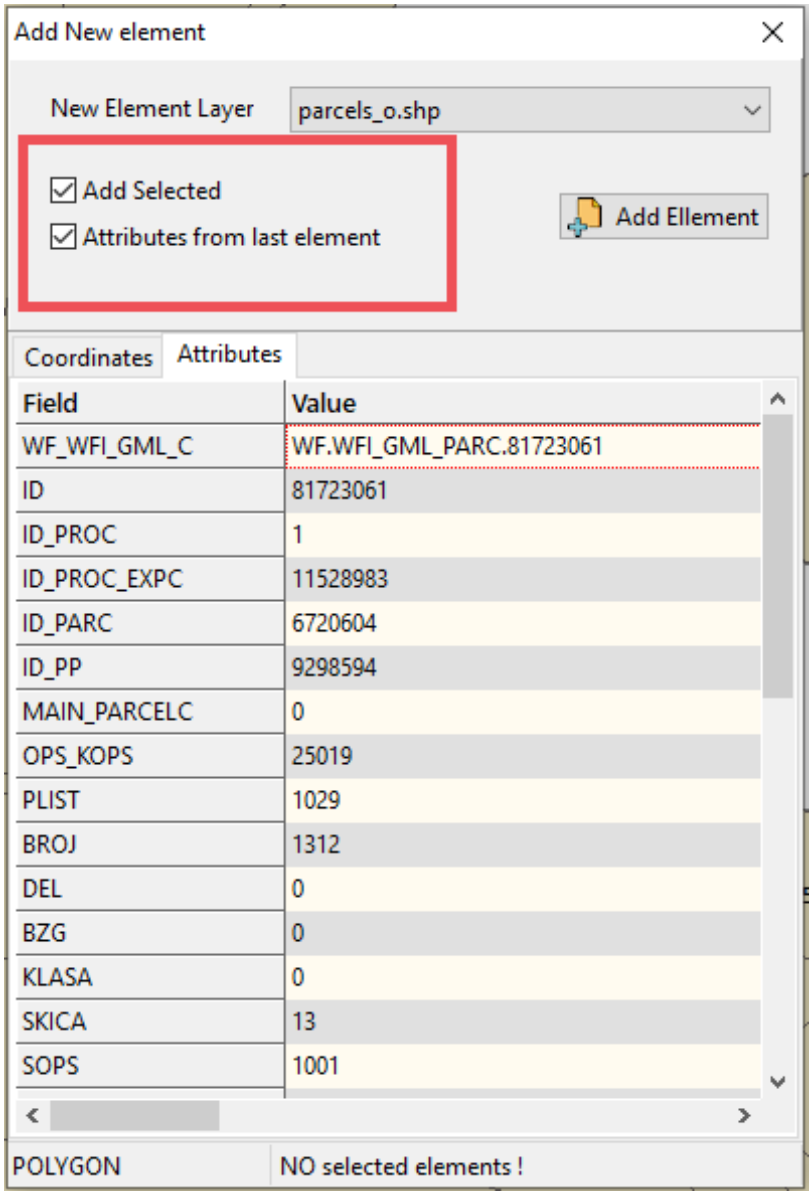
To add a new element to the active layer, you need to input the coordinates that define the element and provide its attributes. The coordinates can be entered manually through keyboard input or by copying and pasting from a previously saved file. The entry of coordinates is done through the designated tab called "Coordinates." The X and Y coordinates are separated by a space.



Furthermore, if the "Pick Points" button on the Window Graphics Toolbar is pressed and points are selected, the picked coordinates will be automatically populated as input when opening the form for adding a new element in the coordinate section.

To enter attributes, you can click on the Attributes tab. The first method of attribute entry is through keyboard input. In many cases, attributes for a section are identical across multiple elements, requiring only specific modifications.

As a result, the second method involves checking the option **Attributes from last element**.

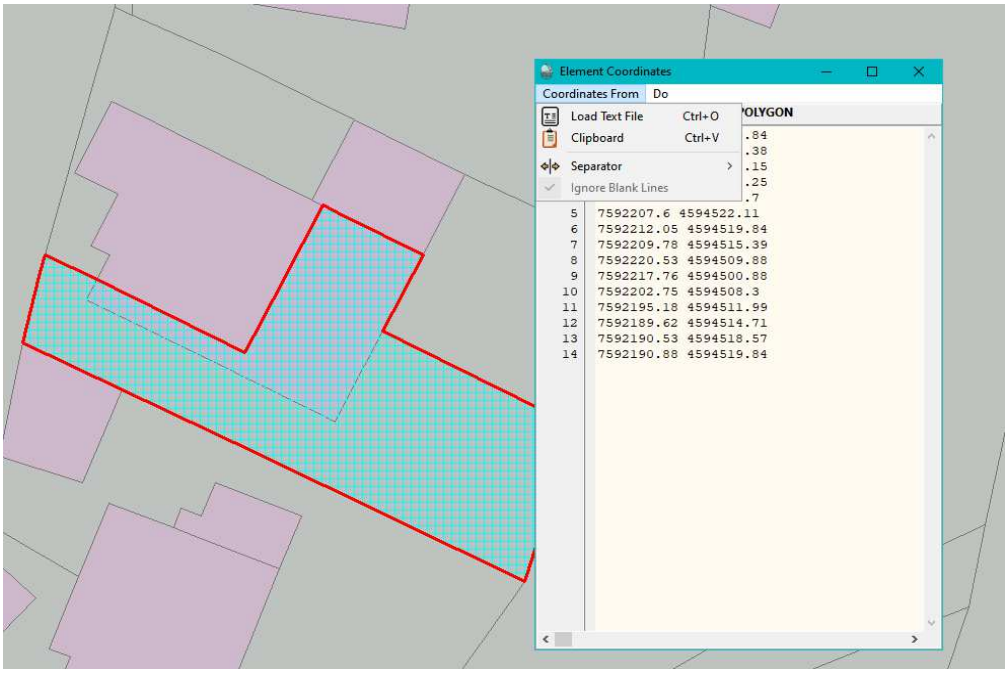


By doing so, the attribute table for the new element will be populated with attributes from the previous element, allowing for necessary modifications, at least in part.

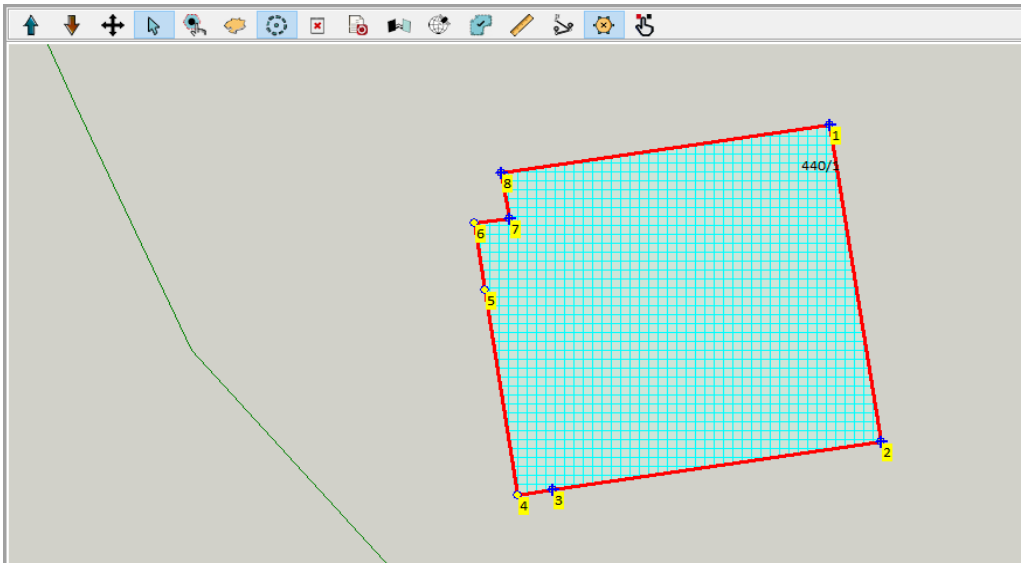
The type of elements present on the active layer determines the type of new element being added.

▪ Modify Element

The **Modify Element** function opens a new form that allows you to modify a selected element from the active layer. If you have multiple elements selected, the first element in the selection list will be chosen as the target for modification.



The Modify Element tool allows you to modify the geometry of an element by making changes to its coordinate values. This can be done by inserting new coordinates, modifying existing ones, or deleting specific coordinates using keyboard input.
The coordinates are displayed in a text editor, where you can manually make changes. In addition to manual modifications, you also have the option to import a new set of coordinates from a text file or by copying and pasting from the clipboard.
The coordinates in the text file or clipboard should be separated by spaces, as this is the designated separator for the X and Y coordinates.



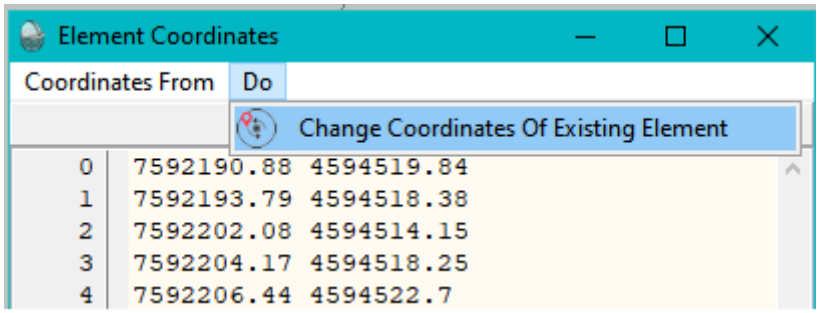
To modify an element using the "Modify Element" tool, you need to follow these steps:

- Select the element that you want to modify.
- Activate the "Vertex" tool, which will highlight all the vertexes of the element.
- Once the vertexes are visually highlighted, you can choose the "Pick Points" function.

Use your mouse cursor to directly pick points from the "Graphics" panel. By picking points, a new array of point coordinates will be created, and the geometry of the element will be redefined. Upon clicking the "Modify Element" button, the new and modified coordinates will be displayed for preview. This process allows you to interactively modify the element by selecting specific points and updating the geometry accordingly.

Once you have made the desired changes using the editor, follow these steps to save the modifications:

- Click on the **Change Coordinates of Existing Element** menu.
- Select the option to save the changes.



The modified coordinates will be updated and displayed in the active layer within the main **Graphics Window** panel.
By clicking on the appropriate menu and saving the changes, the modifications you made to the element's coordinates will be applied and reflected in the active layer for further viewing and analysis.

▪ Delete Element 

This function operates on selected elements within the active layer.

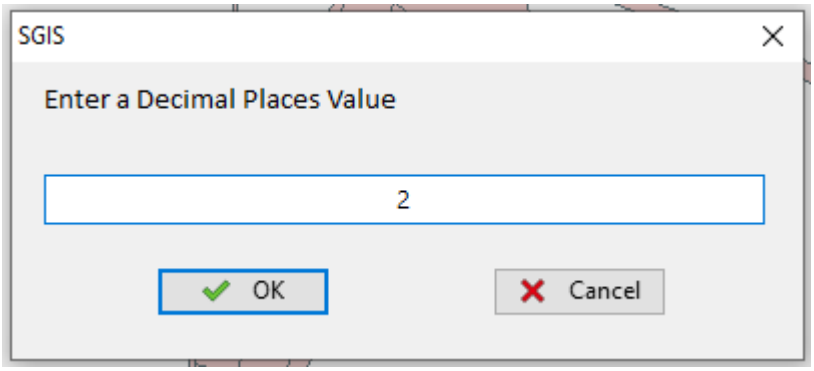
Within the **General** section of the **Options** menu, the default setting for **Confirmation When Deleting Elements** is enabled. This means that when performing a deletion action, the software will prompt the user to confirm the deletion. However, the confirmation prompt can be disabled if the user manually unchecks the "Confirmation" option box.

The function of deleting elements operates on the internal data structure, specifically removing data from the layer stored in the memory.

▪ Limit Decimal

The purpose of this function is to restrict the decimal places of the coordinates for all elements within a selected layer.

By default, the coordinates are limited to a specific decimal number, which is set to 2 in the software.



However, this value can be modified in the **Input Dialog** to suit your requirements.

▪ Limit All Checked Layer Coordinates

The function is designed to limit the decimal places of the coordinates for all elements within the checked layers.

By default, the number of decimal places is set to 2 in the Input Dialog. This means that the coordinates will be rounded to two decimal places.

▪ Change Orientation of Polygon or Polyline

This function operates on a selected element within the active layer. The element must be of type polyline or polygon.

If the orientation of the polygon element is initially clockwise, executing the function will change it to counterclockwise.

Similarly, if the orientation is initially counterclockwise, it will be changed to clockwise.

With each click on this function, the orientation of polyline elements will also change.

If the **Vertex Points** function is enabled, the user can visually observe the actual change in orientation by observing the altered order of the vertex points that define the polyline.

▪ Changing the Orientation of All Layer Elements

The purpose of this function is to change the orientation of all elements (polyline or polygon type) within the selected layer.

This means that if the initial orientation of the elements in the layer is clockwise, executing this function will change them to counterclockwise, and vice versa.

For polyline elements, the function will modify the direction of the coordinate array that defines each specific polyline.

▪ Set CW Polygon Layer Orientation 

The function sets the orientation of all elements inside a selected polygon-type layer to be clockwise (abbreviated as CW).

If the orientation of an element is initially set as counterclockwise, it will be changed to clockwise.

However, if the orientation of the vertex coordinates is already clockwise, it will remain unchanged.

▪ Set CCW Polygon Layer Orientation 

The function allows you to set the orientation of all elements in the selected polygon layer to be counterclockwise.

By executing this function, the orientation of the polygons will be adjusted so that their vertices follow a counterclockwise order. This ensures consistency in the orientation of the polygons and can be useful for various spatial analysis and processing tasks.

The function will convert the orientation of the elements from clockwise to counterclockwise, regardless of their initial orientation.

If the elements are already set to counterclockwise, the function will not alter their orientation.

▪ Repair Polygon With Holes 

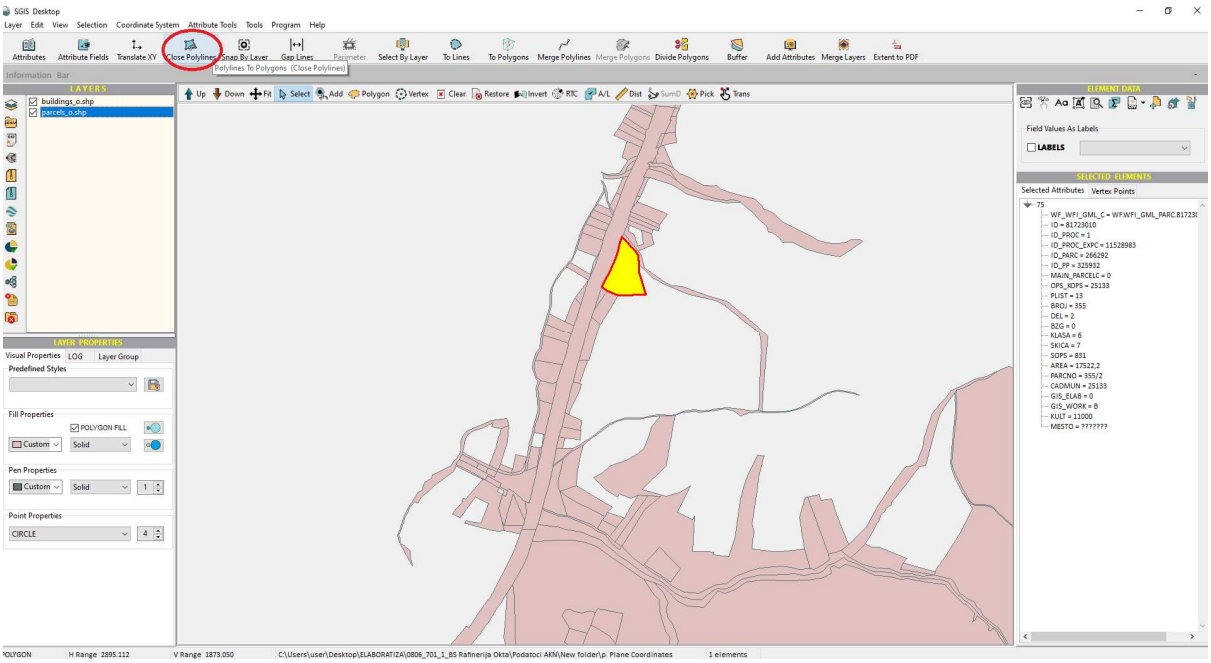
The purpose of this function is to repair the internal data structure of polygon features on the selected active layer. Specifically, it focuses on fixing holes within the polygon features.

By executing this function, any existing holes within the polygons will be repaired, ensuring the completeness of the polygon geometry.

▪ Close Polylines 

Frequently, we come across drawings that contain geometric shapes designed to depict polygons. However, it is common for these shapes to have their first and last vertices either not properly aligned (not snapped), or already closed as polyline features.

The purpose of the **Close Polyline** function is to seamlessly connect the first and last vertices of each element, effectively closing the geometry.



This procedure is applied to all elements within the active layer.

Upon execution, a new layer will be generated with the default name **ClosePL**.

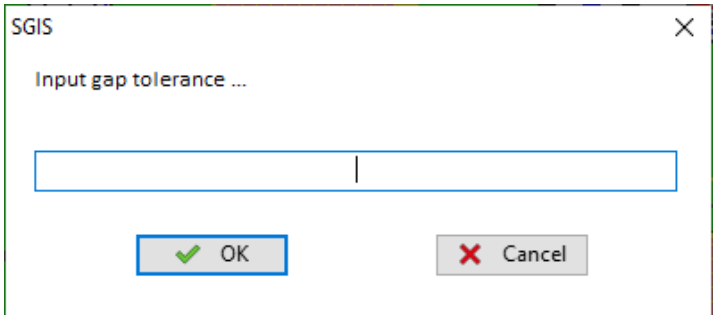
The resulting layer will consist of polygon features, as the geometry type will be automatically converted to POLYGON.

▪ Gap Lines

The action operates on a layer of polyline elements. These elements can be created using CAD software and imported using the Load DXF action.

During the process of drawing lines, it occasionally happens that they do not snap together, resulting in gaps instead of proper connections. Although these gaps may be visually insignificant, they can lead to errors in subsequent data processing procedures. The purpose of this action is to detect and identify the lines that are not properly connected to each other.

The action is always performed on the active layer itself. When activating the function, you will be prompted to define a tolerance radius, also known as the gap tolerance. This radius determines the distance within which SGIS searches for unconnected lines or polylines.



The **Gap Lines** procedure begins by inputting the desired radius value, typically a decimal number.

The execution of the procedure creates two new layers. The first layer displays unconnected and unclosed lines or polylines, which are highlighted with green lines. The second layer contains point elements representing the actual vertices where the gaps are visually located.

▪ Snapping Lines

The **Snapping Lines** function allows you to snap unconnected lines or polylines together. This operation can be performed on layers that contain line, polyline, or polygon elements. Prior to using this function, the user may visually identify the gaps or use the Gap Lines function to detect them.

The detection and snapping process is performed on the active layer.

The user needs to specify a tolerance gap radius as an input value to initiate the procedure. This input value determines the threshold for unclosed lines.

The outcome of the procedure is the movement and snapping of all lines within the specified layer to connect them together.

▪ Extent Snap Lines 

The function **Extent Snap Lines** is designed to snap unconnected lines within the current view extent. It allows the user to selectively apply the snapping operation to specific parts of the active layer, providing greater control and clarity in the connection of geometries such as lines, polylines, or polygons. This function can be applied to layers that contain any of these geometry types.

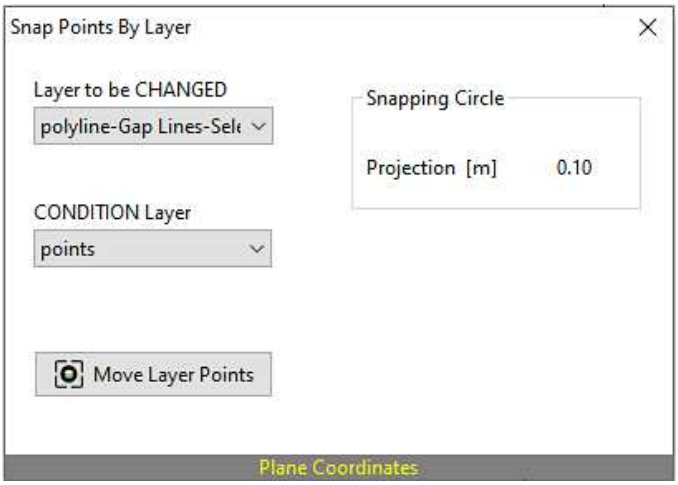
The detection and snapping process of the Extent Snap Lines function are performed exclusively on the active layer within the current view extent. This distinguishes it from the Snapping Lines function.

The procedure requires defining a tolerance radius, which represents the acceptable gap between unconnected lines. Providing an input value for the tolerance radius initiates the procedure, resulting in the movement and snapping of lines or polylines within the specified radius.

▪ Snap By Layer 

This function activates a new pop-up form and can be executed on layers that contain geometry features of the types line, polyline, and polygon.

The function moves all vertex points of a polyline or polygon if the distance between the **Condition Layer** and the **Layer To Be Changed** is smaller than the value specified in the **Snapping Circle**.

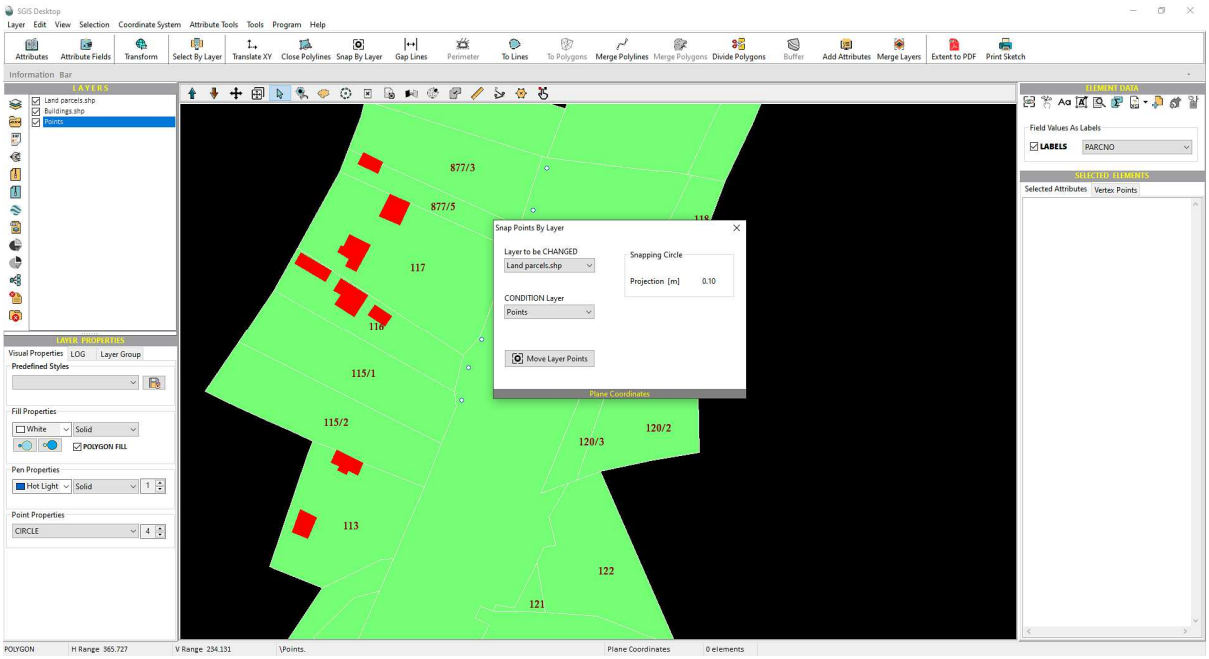


The user can modify this value by entering a different input value and pressing **Enter**.

The **Projection** field represents units from the actual Coordinate Projection.

If the layer to be modified contains polylines that are not connected, and vertex points are placed near those lines in the condition layer, the function will automatically move all the lines/polylines and snap them to the nearby vertex points. This ensures that the lines are connected to the vertex points, resulting in a snapped and connected geometry.

The execution of the function is initiated by clicking on the **Move Layer Points** button. The status bar within the new form displays the current number of points that have been successfully snapped. If the number of snapped points is greater than zero, a saving function is activated, allowing the user to save a LOG file containing the point data.



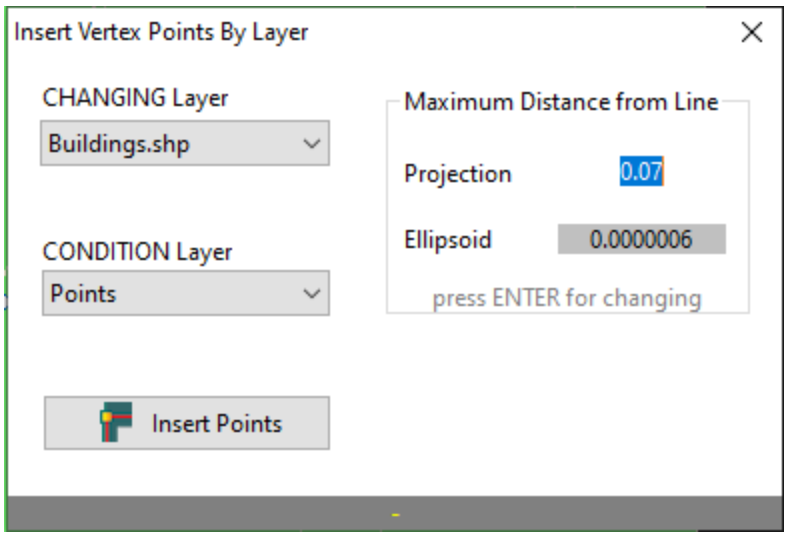
If there are any pre-selected elements within the **Layer To Be Changed**, only those specific elements will be affected by the execution of the command.

▪ Insert Vertex Points By layer

With the **Insert Vertex Points By Layer** function, you have the ability to insert additional vertex points along a polyline or polygon feature.

These new points will be added to the "CHANGING LAYER" while being derived from the "CONDITION LAYER." A crucial requirement for this operation is that the new vertex point must be positioned within a distance that does not exceed the **Maximum Distance From Line**.

The specific distance to be used depends on whether the coordinates from both layers are in a projectional or ellipsoidal format.



To insert vertex points, simply click on the **Insert Points** button.

The completion of the procedure will be indicated by a brief message displayed on the status bar.

▪ Change to AP Polygon

The **Change to AP Polygon** function modifies the fields in the attribute table and can only be applied to layers containing polygon geometry. The function adds two new fields:

- GEOMETRY_A (type double);
- GEOMETRY_P (type double).

GEOMETRY_A represents the area of the polygons, while GEOMETRY_P represents the perimeter.
When the function is executed, both fields will be automatically filled with their respective values.

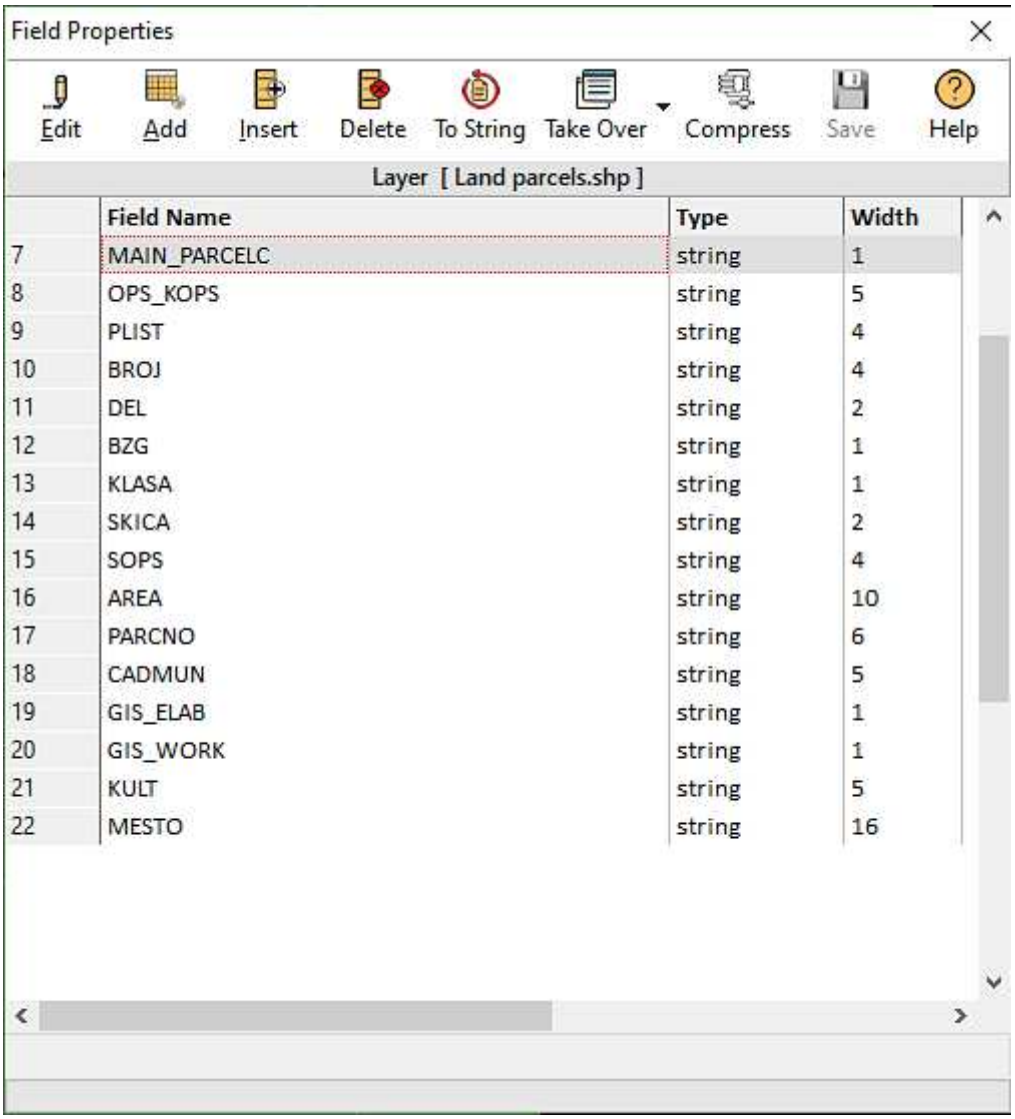
▪ Attribute Fields 

The function provides the ability to fully redefine the fields within the attribute table. This includes the option to modify field names, change field types, and, in the case of string fields, adjust field lengths.

The focal point of the form is the central table, where all the attribute fields are presented along with their corresponding data, such as the field number (in sequential order), field name, field type, and field width.

The layer name is displayed in a ribbon-like bar above the table, providing a clear indication of the active layer.

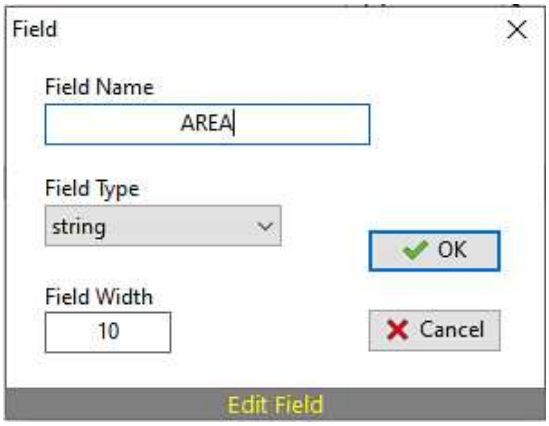
Located above the layer name, there is a toolbar that offers various options and functions, which we will explore in detail to provide a comprehensive understanding of their functionality and purpose.



	Field Name	Type	Width
7	MAIN_PARCELC	string	1
8	OPS_KOPS	string	5
9	PLIST	string	4
10	BROJ	string	4
11	DEL	string	2
12	BZG	string	1
13	KLASA	string	1
14	SKICA	string	2
15	SOPS	string	4
16	AREA	string	10
17	PARCNO	string	6
18	CADMUN	string	5
19	GIS_ELAB	string	1
20	GIS_WORK	string	1
21	KULT	string	5
22	MESTO	string	16

Each one of the actions **Edit**, **Add** and **Insert**, opens a new form that allows for making changes to the attribute fields.

Edit - This option allows for changing the attribute fields. When clicked, a new form is displayed. In the input field labeled "Field Name," you can make changes to the field name. From the dropdown list below "Field Type," you can select the desired field type. If the field type is set to "string," you can specify the desired field width in the "Field Width" input box. Clicking "OK" will save the changes, while clicking "Cancel" will cancel the action.



Add - This option allows for adding a new field. When clicked, a new blank row is created at the end of the table. The form for defining the field properties will then open. In the "Field Name" input field, you need to enter a name for the field. In the "Field Type" field, you can select the desired type for the field. If you are working with a string type field, you can specify the width of the field in the "Field Width" input field. Clicking "OK" will execute the procedure and add the field(s), while clicking "Cancel" will cancel the action.

Insert - This option allows for inserting a new field before or after a selected row. When clicked, a new field row is created before the previously selected row. The form for defining the field properties will then open. In the "Field Name" input field, you can specify the name for the field. In the "Field Type" field, you can select the desired type for the field. If you are working with a string type field, you can specify the width of the field in the "Field Width" input field. Clicking "OK" will execute the procedure and insert the field, while clicking "Cancel" will cancel the action.

Delete - deleting selected field.

To String - changes the field type of all fields into string.

Take Over - take over in several ways:

- From Another Layer - a layer is selected from which the field names, types and width will be taken over.
- From String List - In this option, you can select a text file that contains field names, with each name on a separate row. After selecting the file, you can manually set the field types and lengths.
- From Text File First Row (semicolon separator)- this is an option for loading a text file. The text file is defined according to the Add Attributes option. From this text file the first row that defines the names of the fields, is what will be taken over.

Compress - This checkbox is used to activate the compression feature for string fields in the table. When enabled, the maximum length of the string field will be automatically adjusted to match the length of the longest string value present in that field.

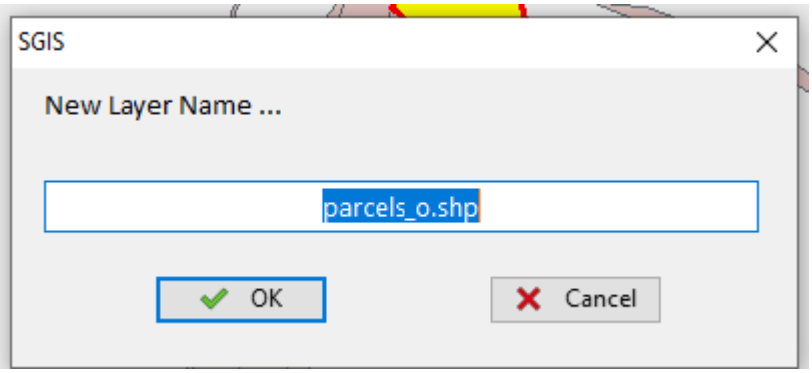
Save - Clicking this button will save all the modifications made to the attribute table, including changes to field names, types, lengths, inserting and deleting fields. These changes will be applied to the internal structure of the attribute table of the active layer.

Help - Clicking this option provides assistance and guidance on all the available options and functionalities within the "Redefine Attribute Fields" feature. It offers detailed

information and instructions to help users understand and utilize the various features effectively.

▪ Rename Layer

To rename a layer in the software, you can use either the right-click option or the shortcut **CTRL+R**.



By right-clicking on the desired layer name or using the shortcut, you can initiate the renaming process. The current layer name will be selected, allowing you to enter a new name for the layer. This functionality is particularly useful when dealing with duplicate layer names that may occur when loading GIS files or creating layers during specific tasks.

SGIS Desktop Release 1.3

Chapter 2.3

VIEW



This refers to the process of visualizing geospatial datasets and maps within a GIS software or application. This means, users can zoom in and out, pan across the map, and adjust the scale to focus on specific areas of interest. This enables them to examine the spatial patterns, relationships, and distribution of features represented in the data. SGIS software provides various tools for viewing data, including the ability to display different data layers simultaneously, change symbology and colors, adjust transparency, and customize labels. These features enhance the visualization of geospatial data, making it easier to interpret and analyze. By viewing data in GIS, users can gain insights into geographic phenomena, identify trends, and make informed decisions. It allows them to visually explore spatial relationships, such as proximity, clustering, or spatial patterns, which can reveal valuable information and support problem-solving in various fields, including urban planning, environmental management, disaster response, and business analysis.

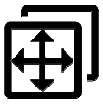
▪ Fit View 

This function aligns all layers that are checked to the center of the main Graphics Window panel.

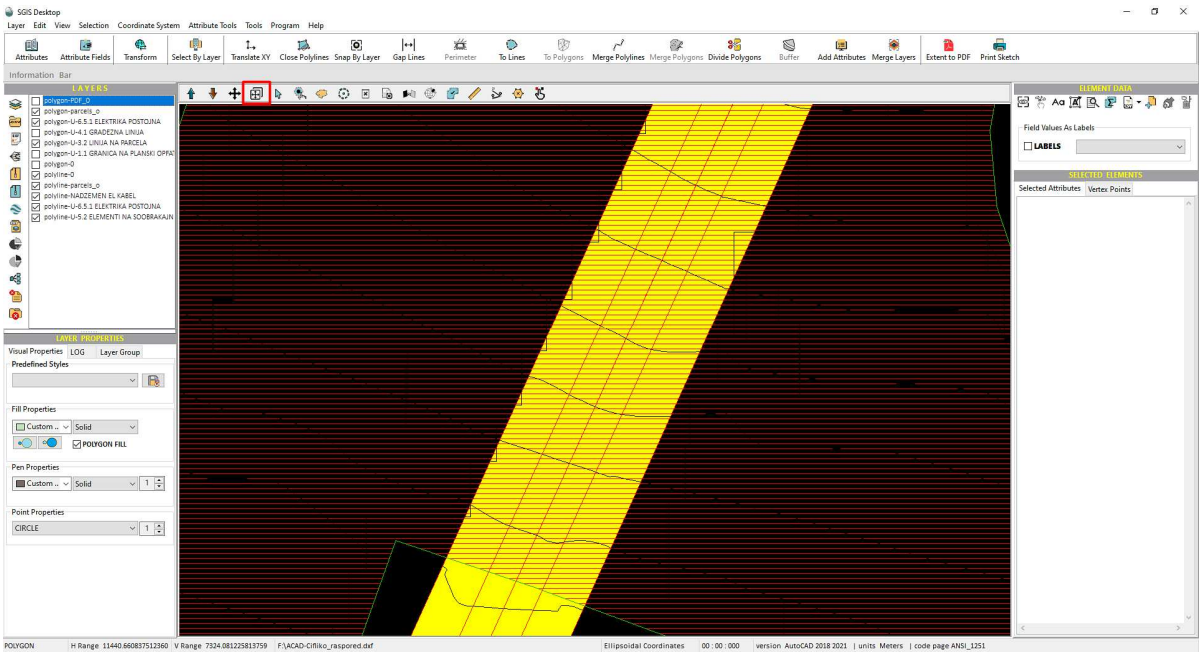
The content of each layer is positioned in the center, ensuring alignment along both the X and Y axes.

If the geometry of your layers is not closely positioned to each other, you can utilize the Fit Layer View function.

This function will adjust the view of the main Graphics Window panel to encompass the entire extent of the selected layer or layers.

▪ Fit Layer View 

The **Fit Layer View** function is designed to display only the selected layer in the center of the main Graphic Window panel.



When you activate this function, the view will automatically adjust to show the entire extent of the selected layer, ensuring that it is centered and fully visible. This can be useful when you want to focus on a specific layer and eliminate distractions from other layers in the view.

This function is especially useful when you are working with different layers that are located at significant distances from each other.

By using the "Fit Layer View" function, you can quickly and easily bring the selected layer into view, even if it is far away from the current view.

This helps improve the visibility and ease of navigation when working with spatially dispersed layers, allowing you to focus on the specific layer of interest without manually adjusting the view.

▪ Up (View Up) 

The drawing order of imported or created layers follows a chronological sequence.

This means that the layers are imported and displayed in the layers panel from top to bottom, denoting their visibility order. Consequently, one layer can be overlapped by another, or all layers can be covered by a single layer from the layers list.

This is particularly significant when working with polygon layers, especially those with filled areas. The order in which the layers are stacked determines their visibility and potential overlap, impacting the overall appearance and arrangement of the polygons.

To change the drawing order of layers in the layers panel, you can use the "UP" function.

This action allows you to shift the active (selected) layer one or more places up in the layers list. By moving a layer up in the list, its drawing order will change, and it will be displayed above the layers below it. This functionality is particularly crucial for polygon feature layers, as it determines which layer's polygons will be visible or overlapped by other layers.

Adjusting the drawing order ensures proper layer visibility and arrangement in your project.

▪ Down (View Down) 

The drawing order of imported or created layers follows a chronological sequence, meaning that the layers are displayed in the order they are imported or created.

This arrangement determines the visibility of the layers in the layers panel, with the topmost layer covering the layers beneath it. In the case of polygon layers with filled areas, the drawing order becomes particularly important as it determines which polygons are visible and which may be covered by other layers.

To change the drawing order of layers, you can use the "DOWN" function.

This action involves shifting the active (selected) layer down by one or more positions in the layers list. By using the "DOWN" function, you can adjust the layer order, which is particularly important for polygon feature layers.

This allows you to control the visibility and stacking of layers to ensure that the desired layers are displayed on top or in the desired arrangement.

▪ Save Extent 

The "Save Extent" function allows you to preserve the current view of a layer at a specific zoom level, enabling you to easily revisit that exact extent later on.

This feature is particularly useful when you want to capture and recall specific view settings.

You have the option to choose from a total of five available view extents.

Returning to a previously saved view extent is accomplished using the Get Extent n.

By clicking on the "Get Extent" function, you can retrieve and display the saved view extent on the main Graphic Window panel.

This allows you to conveniently revisit and review specific view configurations that you have previously saved.

▪ Get Extent 

The **Get Extent** function allows you to retrieve one of the five previously saved view extents.

By clicking on this function, the saved extent will be applied to the main Graphic Window panel, restoring the view to the specified extent.

This feature is helpful when you need to quickly switch between different predefined views or revisit a specific extent that you have previously saved.

▪ Background Color

The new "Background Color" feature in SGIS Desktop allows you to change the graphics panel background from the default white (labeled as *Light*) to *Silver* or *Dark*. This feature is especially helpful when working on detailed CAD modifications or advanced geometry editing, where a white background might make certain geometric features difficult to see.

To accommodate different viewing preferences and reduce eye strain during extendedwork hours, we introduced the options for a gray (*Silver*) and black (*Dark*) background. Switching to a black screen, for instance, can be easier on the eyes for those working long hours.

To change the background color, go to **View** > **Background Color**, then select *Light*,*Silver*, or *Dark*. The background will update immediately upon selection.

▪ Mark Visibility Limit 

Labels are used to display textual information on geometry features or maps. Each label corresponds to a specific field value from the attribute table of a selected layer.

To show labels on the main Graphic Window panel, you need to follow these steps:

- Select the appropriate layer from the layers panel.
- In the element data panel, locate the field labeled "LABELS" and check the box next to it.
- From the dropdown list, choose the field that contains the desired label values.

The function allows for the control of label visibility at different zoom levels on the main Graphics Window panel. By setting a scale extent, you can define the range within which

labels will be displayed. This feature is particularly useful when zooming out, as it prevents labels from overlapping and reducing visual clarity.

Once you have set the visibility limit for labels, when you zoom out beyond that limit, the labels will no longer be displayed. However, as you zoom in and reach the specified scale extent, the labels will become visible again, providing the desired level of detail and information.

This functionality ensures that labels are only shown when they can be easily read and understood, enhancing the overall clarity of the displayed content.

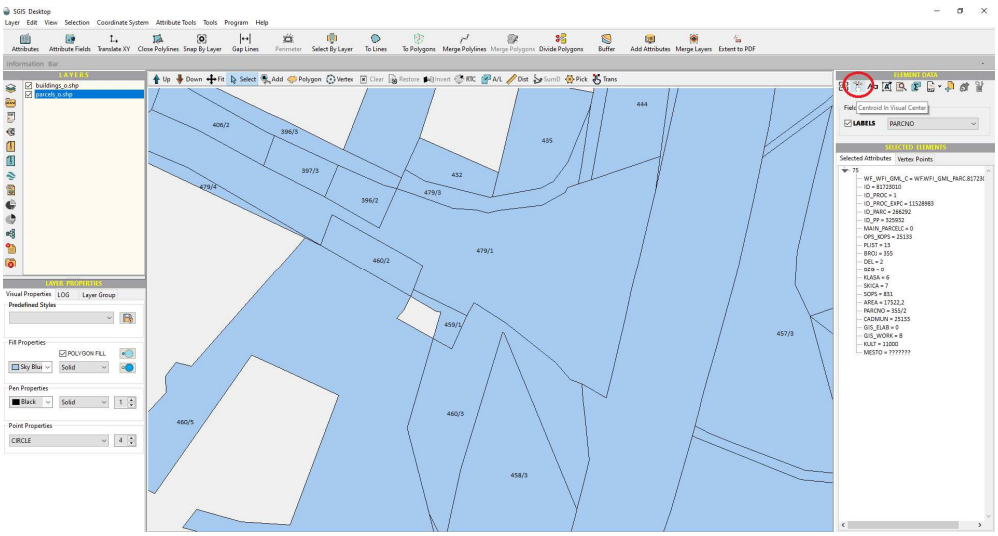
This function can be applied to any layer that has enabled the "LABELS" field. This means that as long as the "LABELS" field is checked (turned on) for a particular layer, you can use this function to control the visibility of labels based on the specified scale extent.

Important Note: The visibility limit scale can be set individually for each layer, allowing you to define different visibility limits for labels based on the specific scale of each layer. This provides flexibility in customizing the label display based on your requirements for each layer in your project.

▪ Centroid In Visual Center 

Labels are textual information that provide details about geometry features or maps. Each label represents the value of a selected field from the attribute table of a specific layer. To display labels on the main graphic window panel, follow these steps:

- Select the appropriate layer from the layers panel that you want to display labels for. Ensure that the layer contains the desired attribute field for labeling.
- In the element data panel, locate the "LABELS" field and mark the checkbox next to it.
- From the dropdown list in the element data panel, choose the appropriate label field value that you want to display as labels.



This function can be executed only on a selected and checked layer that contains polygons. It calculates and displays centroids for each polygon within the layer. However, it's

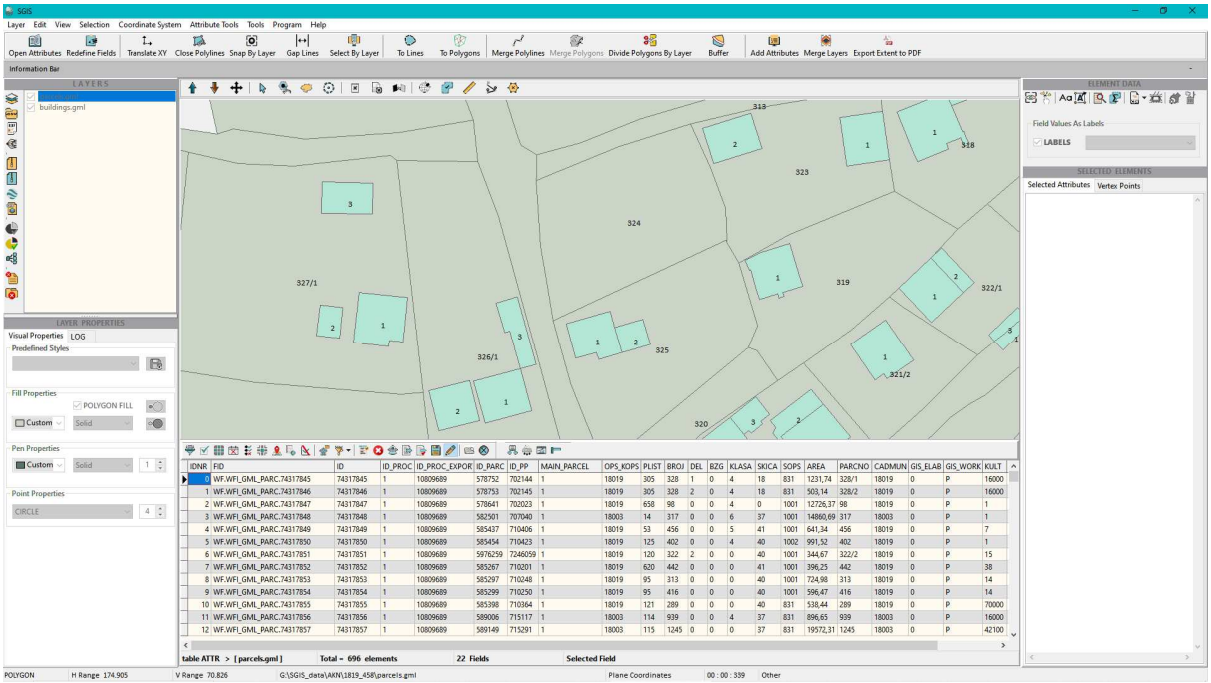
important to note that in cases where polygons have irregular shapes, the centroid point may fall outside of the polygon itself.

With this function, we can correct the position of centroid points that fall outside the frame of their respective polygons. The function ensures that all centroids are placed inside their corresponding polygons.

▪ Attributes

Spatial data encompasses both the geometric and attribute components. The attribute table presents details about the features within a selected layer.

By clicking on the **Attributes** form, you can access and modify information related to specific features within the attribute table. A selected layer refers to an active layer that has been checked for visibility. This form allows you to review and make changes to the attributes associated with the selected layer's features.



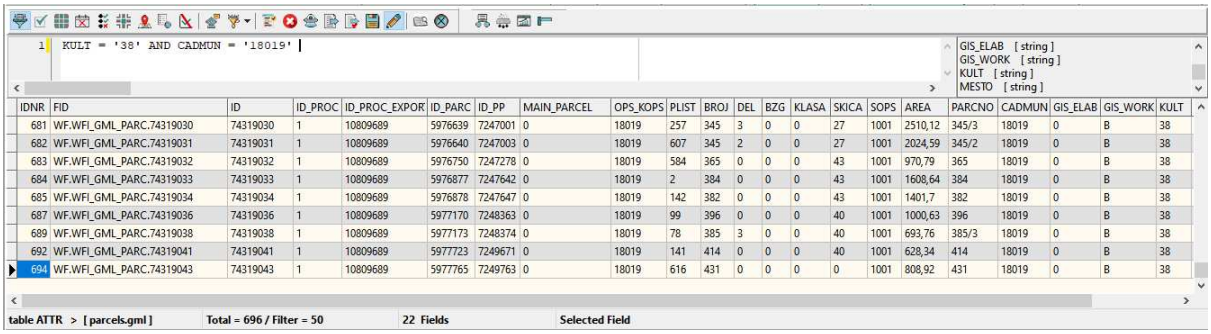
The attribute form includes a dedicated toolbar with various functions, grouped into several categories for easy navigation. These categories are:

- Data Filtering: Contains functions to filter and display specific data within the attribute table based on defined criteria.
- Selection of Elements: Provides options to select specific elements or features within the attribute table.
- Preview of Selected Elements: Enables visual preview of selected elements on the main graphic display by making selections within the attribute table.
- Changing Code: Allows for modifying or updating attribute codes or values for selected elements.

- Deleting Elements: Provides functionality to delete selected elements or features from the attribute table.
- Exporting Attribute Data: Enables exporting attribute data from the table in CSV format, which is a plain text document format that can be opened in various applications.
- Editing Fields: Offers functions to edit and modify field properties within the attribute table.

Each of these functions provides specific capabilities to manipulate and manage the attribute data within the form.

Open / Close Filter Attribute Data [1] - The "Open/Close Filter Attribute Data" function allows you to open and close the filter input box within the attribute form.



IDNR	FID	ID	ID_PROC	ID_PROC_EXPOR	ID_PARC	ID_PP	MAIN_PARCEL	OPS_KOPS	PLIST	BROJ	DEL	BZG	KLASA	SKICA	SOPS	AREA	PARCNO	CADMUN	GIS_ELAB	GIS_WORK	KULT
681	WF.WFI_GML_PARC.74319030	74319030	1	10809689	5976639	7247001	0	18019	257	345	3	0	0	27	1001	2510,12	345/3	18019	0	B	38
682	WF.WFI_GML_PARC.74319031	74319031	1	10809689	5976640	7247003	0	18019	607	345	2	0	0	27	1001	2024,59	345/2	18019	0	B	38
683	WF.WFI_GML_PARC.74319032	74319032	1	10809689	5976750	7247278	0	18019	584	365	0	0	0	43	1001	970,79	365	18019	0	B	38
684	WF.WFI_GML_PARC.74319033	74319033	1	10809689	5976877	7247642	0	18019	2	384	0	0	0	43	1001	1608,64	384	18019	0	B	38
685	WF.WFI_GML_PARC.74319034	74319034	1	10809689	5976878	7247647	0	18019	142	382	0	0	0	43	1001	1401,7	382	18019	0	B	38
687	WF.WFI_GML_PARC.74319036	74319036	1	10809689	5977170	7248363	0	18019	99	396	0	0	0	40	1001	1000,63	396	18019	0	B	38
689	WF.WFI_GML_PARC.74319038	74319038	1	10809689	5977173	7248374	0	18019	78	385	3	0	0	40	1001	693,76	385/3	18019	0	B	38
692	WF.WFI_GML_PARC.74319041	74319041	1	10809689	5977723	7249671	0	18019	141	414	0	0	0	40	1001	628,34	414	18019	0	B	38
694	WF.WFI_GML_PARC.74319043	74319043	1	10809689	5977765	7249763	0	18019	616	431	0	0	0	0	1001	808,92	431	18019	0	B	38

This filter input box is used to apply filters to the attribute data based on specific operators. When the filter input box is opened, you can access data from the attribute table and define filtering criteria using the available operators.

On the right side of the filter editor, there is a list panel that displays the names and types of each field in the attribute table.

If the field type is string, the input value for filtering must be written within single quotation marks.

If the value is of integer or double type, quotation marks can be omitted.

Complex expressions can be constructed using logical operators such as AND and OR.

Additionally, arithmetic operators (+ - * /) and comparison operators (< <= = > >=) can be used in the filter expressions.

By utilizing these operators and constructing appropriate filter expressions, you can perform advanced filtering operations on the attribute data within the attribute form.

Execute Filter [2] - The "Execute Filter" function is used to perform the actual filtering process based on the defined filter criteria.

After setting up the desired filters using the filter input box, clicking on the "Execute Filter" command will initiate the filtering process.

Once the filtering is executed, the attribute table will display the filtered output, showing only the data elements that satisfy the specified condition(s) set in the filter.

On the status linebar, you can find various information, including the total number of elements in the attribute table or the number of elements that have been filtered based on the applied conditions.

Select All Records [3] - The "Select All Records" function allows you to select all the records in the attribute table simultaneously.

When you click on this command, all elements in the table will be added to the selection list. The selected elements will be displayed in the main graphic canvas panel, providing a visual representation of the selected records. This can be helpful for better understanding and analysis of the data.

If you have applied any filters to the attribute table, only the filtered output will be displayed in the table. In this case, selecting all records will include only the filtered elements in the selection list.

If no filters have been applied, all elements from the active layer will be shown in the attribute table, and selecting all records will include all of these elements in the selection list.

Clear Selection List [4] - The "Clear Selection List" function allows you to clear the list of selected elements in the attribute table. When you click on this command, any previously selected elements will be deselected, and the selection list will be cleared.

In addition to clearing the selection list, this function also removes the visual representation of the selected elements from the main graphic canvas display. This helps to reset the selection and start fresh with a new selection process.

Select one element [6] - check button - The "Select one element" function is a check button that allows you to activate or deactivate the selection mode.

When this function is activated, it enables a direct link between the attribute table and the main graphics panel. In the selection mode, when you select a specific element in the attribute table by clicking on its corresponding row, that element will be highlighted in the main graphics panel. This provides a visual representation of the selected element, making it easier to locate and identify specific features.

Pan to Element [7] - The "Pan to Element" function allows you to bring the selected element to the center of the view extent.

This function is particularly useful when the selected element is not currently visible within the current view.

When you select an element in the attribute table or through the selection mode, and that element is not within the visible area of the main graphics panel, clicking on the "Pan to Element" function will adjust the view extent to center around the selected element.

This ensures that the selected element becomes visible and centered on the screen, providing a better view and facilitating further analysis or examination.

Add to selection list [8] - check button - The "Add to selection list" function is a check button that allows you to enter or exit the selection mode.

When this function is activated, you can add new elements to the selection list. By enabling the selection mode and clicking on individual elements in the attribute table or on the main graphics panel, you can add those elements to the selection list. Each newly added element will be selected and displayed on the main graphics panel, visually highlighting them for further analysis or manipulation.

Deselect element from selection list [9] - The "Deselect element from selection list" function allows you to remove a selected element from the selection list.

By clicking on this function, the currently selected element is deselected and automatically removed from the selection list.

Guess Encoding [10] - The "Guess Encoding" function provides information about the encoding of the data displayed in the table of attributes.

By clicking on this function, the system analyzes the data and attempts to determine the appropriate encoding used for the text.

In cases where the encoding of the data is not explicitly specified or known, the "Guess Encoding" function can be helpful in identifying the correct encoding.

This is particularly useful when dealing with text data that may have been saved or imported with different encoding formats.

Convert to Code Page [11] - The "Convert to Code Page" function provides a list of encoding options that you can choose from to convert the data in the attribute table to a specific code page or character encoding.

Replace String in Selected Field With New String [12] - The "Replace String in Selected Field With New String" function allows you to replace a specific string in a selected field or column of the attribute table with a new string.

To use this function, you first need to choose the field/column from the attribute table where you want to perform the string replacement. This field contains the values that will be modified. Once you have selected the field, a new form will appear where you can enter both the old string (the one you want to replace) and the new string (the replacement).

After entering the old and new strings, you can click on the "Change" button to execute the replacement procedure. The function will search for occurrences of the old string in the selected field and replace them with the new string.

Delete Element [13] - The "Delete Element" function allows you to delete a previously selected element from both the attribute table and the Graphics Window. Once you have selected the element you want to delete, you can click on the "Delete Element" button. A confirmation prompt will appear to ensure that you intend to delete the selected element. If you confirm the deletion, the element will be permanently removed from the attribute table, the Graphics Window, and the layer itself.

It's important to note that this action is final and cannot be undone. Therefore, exercise caution when using the "Delete Element" function to avoid unintended deletions. Additionally, this deletion is independent of the confirmation prompt that appears when closing the "Attributes" form, as it pertains specifically to the deletion of the selected element.

Unique Values [14] - The "Unique Values" function allows you to generate a list of unique values from a selected field in the attribute table.
To use this function, you need to first select the field by clicking on it in the attribute table. Once the field is selected, you can click on the "Unique Values" button. This will open a new form where the result will be displayed. The result will be a list of all values found in the selected field column, without any repetitions.

This is useful for quickly identifying the distinct values present in a specific field. By examining the unique values, you can gain insights into the variety and distribution of data within that field, which can be helpful for data analysis and decision-making.

Export attributes in CSV format [15] - The "Export attributes in CSV format" function allows you to export elements from the attribute table in a text-based CSV (Comma-Separated Values) format.

To use this function, you can click on the "Export attributes in CSV format" button. This will open an Open dialog form where you can define the path and name of the file to be exported. If you have applied any filters in the attribute table and the remaining output is only the filtered data, the export will include only the filtered data. This allows you to export specific subsets of data based on your filtering criteria.

By default, the separator used in the CSV file is a semicolon (;). This is a common separator used in CSV files, but you can choose a different separator if needed. Once you have specified the file path and name, and chosen the separator if necessary, you can click on the "Save" button to initiate the export process. The attribute data will be saved in the specified file location in CSV format, making it compatible with various data analysis and spreadsheet software.

Export of checked attributes in CSV format [16] - The "Export of checked attributes in CSV format" function allows you to export selected fields from the attribute table in a text-based CSV (Comma-Separated Values) format.

To use this function, you can click on the "Export of checked attributes in CSV format" button. This will open a table displaying all the fields from the attribute table, with all fields initially checked by default. You have the option to uncheck any unwanted fields that you do not wish to include in the export. This allows you to select and export only the specific fields that are relevant to your needs.

After selecting the desired fields, you can click on the button to proceed with the export. This will open an Open dialog form where you can specify the path and name for the exported file.

By default, the separator used in the CSV file is a semicolon (;). However, you can choose a different separator if needed, depending on the requirements of your data processing software or system. Once you have defined the file path, name, and chosen the separator if necessary, you can click on the "Save" button to initiate the export process.

The selected fields from the attribute table will be saved in the specified file location in CSV format.

Save the Attribute Changes [17] - The "Save the Attribute Changes" function is a dialog that appears to confirm whether you want to save all the changes made in the attribute table.

When you make modifications to the attribute table, such as editing values, adding or removing records, or making any other changes, these modifications are temporarily stored in memory and are not immediately saved to the original data source. Upon closing the "Attributes" form, if there are unsaved changes in the attribute table, the "Save the Attribute Changes" dialog will appear. It prompts you to confirm whether you want to save the changes before closing. You have the option to choose whether to save the changes or discard them. If you select "Save," the modifications made in the attribute table will be permanently saved to the original data source. If you choose "Discard," the changes will be discarded, and the attribute table will revert to its previous state. It's important to note that the "Save the Attribute Changes" dialog does not apply to the "Delete Elements" action. When you delete elements from the attribute table using the "Delete Elements" function, the deletion is final and does not require a separate confirmation for saving changes.

Edit Tools [18] - check button - The "Edit Tools" is a check button that enables additional tools for editing data within the table of attributes, specifically for editing data by columns.



When you activate the "Edit Tools" function by clicking on the check button, it provides you with a set of additional tools or options that allow you to perform various editing operations on the attribute table columns. These tools are designed to facilitate data manipulation and modification within the table.

Fill the Selected Column [20] - The "Fill the Selected Column" function allows you to fill a selected column in the attribute table with a specific value.
Here's how it works:

- Select the Column: Click on the column you want to change in the attribute table. This highlights the column and indicates that it is the currently selected column;
- Enter the Value: On the right side of the attribute table or in the input space provided, type the value that you want to fill in the selected column. This value can be a text string, a number, or any other appropriate data type for the column;
- Execute the Fill: Click on the "Execute" button or a similar button associated with the "Fill the Selected Column" function. This will trigger the action of filling the selected column with the specified value.

Once you execute the fill operation, the selected column in the attribute table will be updated, and all the cells within that column will be populated with the entered value.

Fill the Selected Column - filtered dataset [21] - The "Fill the Selected Column - filtered dataset" function is similar to the "Fill the Selected Column" [20] function, but it operates specifically on a filtered dataset in the attribute table.
Here's how it works:

- Apply a Filter: Before using this function, apply a filter to the attribute table to display only the desired subset of data. This can be done using the "Filter Attribute Data" [1] function or any other method available in the software to filter data;
- Select the Column: Click on the column you want to change in the filtered dataset of the attribute table. This highlights the column and indicates that it is the currently selected column within the filtered dataset;
- Enter the Value: On the right side of the attribute table or in the input space provided, type the value that you want to fill in the selected column. This value should be appropriate for the data type of the column;
- Execute the Fill: Click on the "Execute" button or a similar button associated with the "Fill the Selected Column - filtered dataset" function. This will trigger the action of filling the selected column with the specified value, but only within the filtered dataset.

Once you execute the fill operation, the selected column in the filtered dataset of the attribute table will be updated, and only the visible rows within that column will be populated with the entered value. The rest of the rows that are not part of the filtered dataset will remain unaffected.

Fill the Selected Column - increment field value [22] - The "Fill the Selected Column - increment field value" function allows you to increment the values in a selected column by a specified amount.
Here's how it works:

- Select the Column: Click on the column you want to change in the attribute table. This highlights the column and indicates that it is the currently selected column.
- Enter the Increment Pattern: On the right side of the attribute table or in the input space provided, enter the desired value with x placeholders indicating the positions where the value should be incremented. For example, if you have a column of numbers and want to increment them by 10, you can enter "x0x" where "x" represents the digit that will be incremented.
- Execute the Fill. Set the Initial Increment Value: In the dialog box, enter the initial value for the increment. This value will be used as the starting point for the increment.

- Confirm and Apply the Increment: After entering the initial increment value, confirm the action to apply the increment to the selected column. The column will be filled with the incremented values based on the specified pattern and initial value.

Once you execute the fill operation, the selected column in the attribute table will be updated with the incremented values. Each value will be calculated based on the provided pattern and the initial increment value.
This can be useful for tasks such as generating sequential IDs or applying incremental values to a dataset.

Fill Field with Lengt / Area [23] - The "Fill Field with Length/Area" function allows you to automatically populate a selected column in the attribute table with the corresponding lengths or areas of the features in your layer.

If the layer consists of polylines: The selected column will be filled with the lengths of the polylines. Each field in the column will contain the length value corresponding to the length of the respective polyline feature.

If the layer consists of polygons: The selected column will be filled with the areas of the polygons. Each field in the column will contain the area value corresponding to the area of the respective polygon feature.

The "Fill Field with Length/Area" function is useful when you want to quickly populate a column with the geometric measurements of your features. It saves you the manual effort of calculating and entering these values individually.

▪ Layer Statistics 

The Layer Statistics form provides comprehensive information about the selected layer, including:

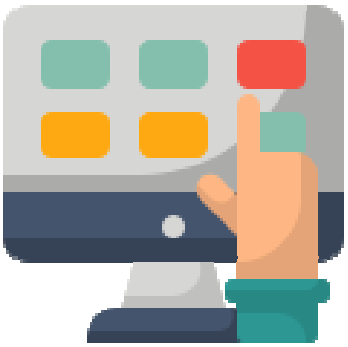
1.Element Type: Indicates the type of elements present in the layer, such as polygons, lines, or points.
2.Number of Elements: Represents the total count of elements in the layer.
3.Total Number of Points - Coordinates: Displays the total number of points or coordinates present in the layer.
4.Coordinate System: Indicates whether the coordinates are ellipsoidal (latitude and longitude) or projected (x and y) values.
5.Number of Fields in the Attribute Table: Shows the total count of fields or columns in the attribute table of the layer.
6.MinX and MaxX Coordinates and Difference from X-axis: Provides the minimum and maximum values of X-coordinate (horizontal axis) in the layer, along with the difference or range between them.
7.MinY and MaxY Coordinates and Difference from Y-axis: Displays the minimum and maximum values of Y-coordinate (vertical axis) in the layer, along with the difference or range between them.

In addition to accessing this function through the menu toolbar, you can open it using the keyboard shortcut CTRL+S. To close the function, you can simply press the Escape key.

SGIS Desktop Release 1.3

Chapter 2.4

SELECTION



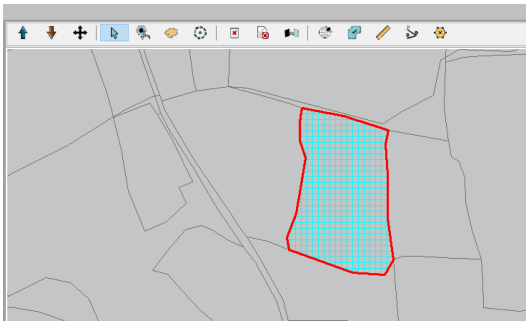
Selection tools are essential components in the geospatial world, providing users with the ability to choose and isolate specific features or subsets of data within geospatial datasets. These tools offer a range of functionalities that allow users to identify, highlight, and extract relevant information for further analysis or visualization. The benefits of selection tools are manifold. Users can select multiple features or datasets and compare their attributes, spatial relationships, or statistical properties. This capability supports data-driven decision-making by allowing users to identify similarities, differences, and patterns among selected features.

▪ Select 

The selection of elements is a fundamental aspect of working with GIS data. This versatile tool allows users to customize their selection process based on specific criteria.
The selection can be performed on individual features or elements with a simple click, or by defining a custom area through polygon selection. Moreover, users can select elements based on their attributes or other desired features.

It is important to note that the selection is limited to the active and checked layer, ensuring focused and precise selection within the GIS data.

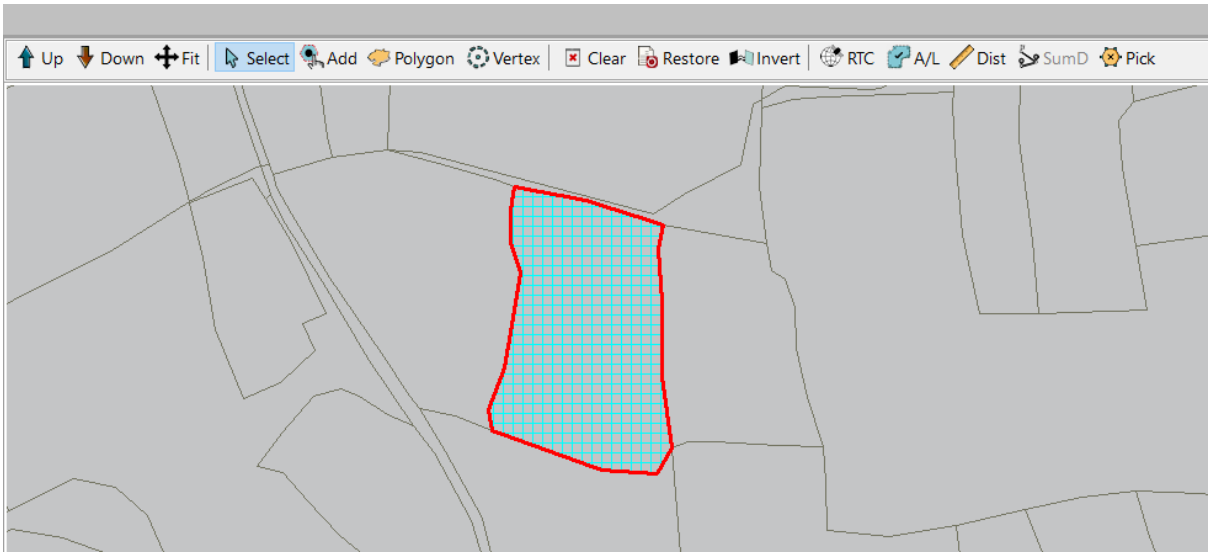
Graphics Toolbar without captions and one selection of choise:



To enable the selection of features from the Graphics Window Toolbar panel, the user needs to activate the **Select** option.

By clicking on a feature, one or more elements can be selected, especially if their geometries overlap. The selected features will be displayed in the selected attributes list, organized in a tree data structure. Each subsequent click on a new element will automatically add it to the selection list, allowing for iterative selection and analysis of multiple features.

Graphics Toolbar with captions and a selection of choise:



▪ Add (To Selection List)

When performing a selection by clicking on elements in the software, typically only one element is selected at a time, unless the elements completely overlap.
In such cases, multiple elements may be selected simultaneously, and they will appear as a list in the selection panel.

To activate this selection mode, the user needs to choose the **Add (To Selection List)** function. By selecting this option, any newly selected elements will be added to the existing selection list rather than replacing it.
This allows for the accumulation of selected elements.

In the selection list, the selected elements will be displayed with their unique identifier (ID) and their associated attribute values. This information is presented in the **Selected Attributes** section, providing a comprehensive view of the selected elements and their corresponding attributes.

▪ Polygon (Select With Polygon) 

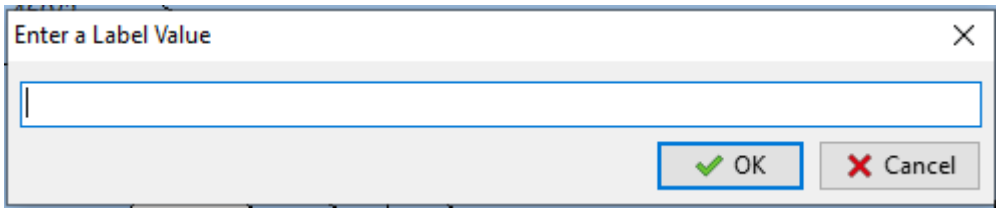
To select multiple elements within an active layer, there are two available methods: "Select + Add" and "Select with Polygon." With the "Select + Add" function, you can incrementally add elements to the selection.

Alternatively, you can use the "**Select with Polygon**" function by clicking on the corresponding icon and drawing a polygon on the main Graphics Window panel using the mouse.

The polygon is completed by right-clicking, which triggers the execution of the Select with Polygon function. The selected elements will be immediately highlighted on the Graphics Window panel and displayed in the "Selected Attributes" section.

▪ Select By Label Value 

To search through data based on the label value, you can utilize the following steps on the active layer:



- Check the "Labels" box, indicating that you want to search within the label values of the elements.
- From the dropdown list of label fields, select the specific label field that you want to search within. This field will determine the values displayed on the main Graphics Window panel.
- To perform the search, you have two options available in the "Selection" menu:
  a) Select by Label Value: This option allows you to input the exact value that you want to select. It will match the elements with the provided value in the selected label field.
  b) Select by Part Of Label Value: This option enables you to input a partial value that you want to match within the label values. It will select elements where the selected label field contains the specified partial value.

- After executing the selection, the matched elements will be displayed in the Selection Attributes List. This list shows the attributes of the selected elements, allowing you to view and analyze the corresponding data.

In case there are no elements that match the selection condition, the Information Bar will provide a message indicating that no matching elements were found.

When using the **Select by Part Of Label Value** option for searching based on a partial label value, you have several input value formats available:

- [starts with input value]: This format allows you to select elements where the label value in the selected attribute field starts with the specified input value. For example, if you input "ABC" as the input value, it will select elements with label values such as "ABC123", "ABCDEF", etc.
- [_ _ _ contains input value _ _]: This format enables you to select elements where the label value in the selected attribute field contains the specified input value. The underscores () represent any characters before or after the input value. For example, if you input "123" as the input value, it will select elements with label values such as "ABC123DEF", "XYZ123", "123456", etc.
- [_ _ _ _ ends with input value]: This format allows you to select elements where the label value in the selected attribute field ends with the specified input value. The underscores (_) represent any characters before the input value. For example, if you input "XYZ" as the input value, it will select elements with label values such as "ABCXYZ", "123XYZ", etc.

The **Select By Label Value** function, which allows users to perform selections based on label values, is available not only in the main menu but also in the **Element Data Toolbar**. This toolbar offers convenient access to a range of functions and options related to managing element data.

By locating the "Select By Label Value" function within the toolbar, users can efficiently perform selections based on labels without the need to navigate through the main menu.

▪ Select Polygons with Area Less / Larger

The **Select Polygons With Area Less Than (**  **)** and **Select Polygons With Area Larger Than (**  **)** functions are commonly used for selecting polygons based on their area. These functions allow the user to specify a threshold value and retrieve a list of selected elements along with their corresponding attributes.

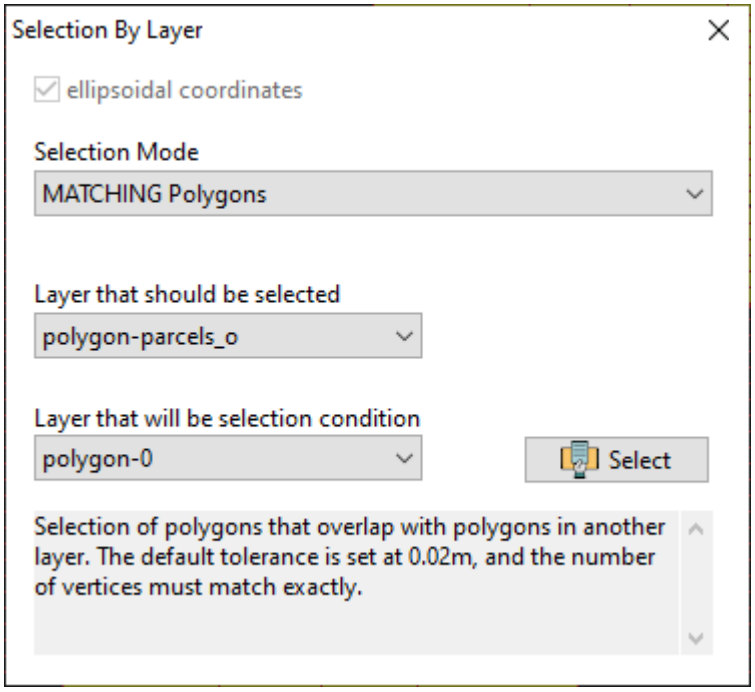
By using the Select Polygons With Area Less Than function, polygons with an area smaller than the specified limit will be selected. Similarly, the Select Polygons With Area Larger Than function selects polygons that have an area greater than the provided threshold

Upon executing these functions, the software will generate a list that displays the selected polygons and their associated attributes. Additionally, the selected polygons will be visually highlighted on the main Graphics Window panel, allowing for easy identification and analysis.

These select options are particularly useful when working with datasets that contain polygons of varying sizes. They enable users to filter and focus on specific polygons based on their area, aiding in various analytical and visualization tasks.

▪ Select By Layer 

When executing this action, a new dialog form will open. This type of selection involves two layers: the layer in which elements need to be selected and a condition layer.



The selection mode consists of several options:

- **Points In Polygons** - Points placed inside polygons
- **PolyLines INTERSECT Polygons** - Polylines that intersect polygons
- **Polygons INTERSECT Polygons** - Polygons that intersect polygons
- **Polygons IN Polygons** - Polygons contained in polygons
- **Points ON PolyLines** - Points along a polyline
- **PolyLines INTERSECT PolyLines** - Polylines that intersect polylines
- **DIFFERENCES Polygons with Polygons** - difference between polygons, create a difference polygons

Reserved

- **MATCHING Points** - Selection of points that overlap with points in another layer. Default tolerance 0.02m
- **MATCHING Polylines** - Selection of polylines that overlap with polylines in another layer. The default tolerance is set at 0.02m, and the number of vertices must match exactly
- **MATCHING Polygons** - Overlapping polygons
- **Polygons CONTAINING Points** - Selection of polygons containing points from the point layer.

To perform this selection, the user needs to follow a few steps.
Firstly, they must select the desired selection mode.
Next, they need to choose the layer where the selected elements will be stored, followed by selecting the condition layer.

Once these selections are made, the user can execute the procedure by clicking on the **Select** button. The selected elements will be displayed on the Graphics Window panel.

▪ Select By Text File Attribute Value 

When working with layers, it is essential to have the option to enable labels and select the desired label value field from a list.

This functionality is particularly useful when dealing with a text file that contains the label field values, where each value is present in a separate row.

Upon importing the text file, all the values will be automatically selected and highlighted in the main Graphics Window panel.

▪ Select By Text File with Element ID 

If you need to select the same elements multiple times for further processing, you can utilize this function.
It allows you to select a text file that contains the ID numbers of the elements, with each ID number on a separate line.

▪ Cover Polygons 

The purpose of this function is to select polygons that overlap with two or more other polygons. These overlapping polygons may create a single, unified polygon that matches the geometry of the first polygon. Usually these types of polygons retain the shape and boundaries of the first polygon.

By executing this function, the software identifies polygons within the active layer that have overlapping geometries.

▪ Geometric Identical Elements 

The Select Identical Elements function is a straightforward tool that operates on the active layer. It performs a geometry check and selects all the features within the layer that share the same geometry, indicating that they are identical.

By executing this function, the software compares the geometry of each element within the layer and identifies those that have an identical shape and spatial arrangement.
These identical elements are then selected and visually highlighted in the user interface.

The purpose of this function is to facilitate further processing of the selected elements based on the user's requirements. It allows for easy identification and manipulation of features that have identical geometries.

It's important to note that all elements, except for one (typically the first element), will be selected and highlighted.

▪ Neighboring Polygons 

The **Neighboring Polygons** function is designed to operate on selected polygon features within an active layer.
When this function is executed, it automatically selects all the polygons that are neighbors of the initially selected ones.

This feature allows users to quickly identify and work with polygons that share boundaries or are adjacent to the selected polygons. By conveniently selecting neighboring polygons, users can efficiently analyze spatial relationships and perform various tasks related to spatial data analysis and editing.

Note: When we refer to "Polygon Neighbors," we are specifically referring to polygons that are adjacent to each other or share a common border line. These neighboring polygons are directly connected and have a spatial relationship with each other, allowing for analysis and operations based on their adjacency.

▪ Restore Selection 

When multiple elements are selected, they will be visually highlighted in the Graphics Window panel. Additionally, the selected elements can be reviewed in the Selected Attributes section, where they are presented as an ID and attribute list in the form of a data tree.

It is possible to navigate through the selected elements by selecting one at a time from the Selected Attributes list. This allows for a sequential examination of the elements, facilitating a detailed review and analysis of their attributes.

The **Restore Selection** function refreshes the entire list of elements within the Selected Attributes section. This action updates the selection and ensures that the latest set of elements is accurately displayed, providing an up-to-date representation of the selected attributes.

▪ Select All 

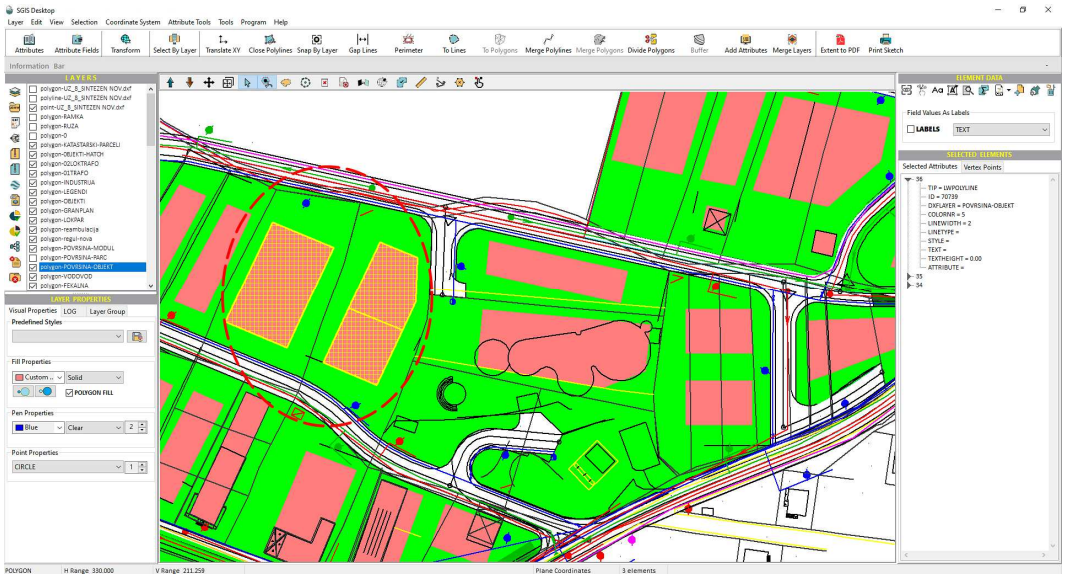
The **Select All** function allows you to select all elements from the active layer. You can find this function in the main toolbar, specifically in the Selection menu.

By selecting the "Select All" option, all elements in the active layer will be included in the selection.
This is a convenient way to quickly select all elements in order to perform certain operations or apply specific modifications to the entire layer.

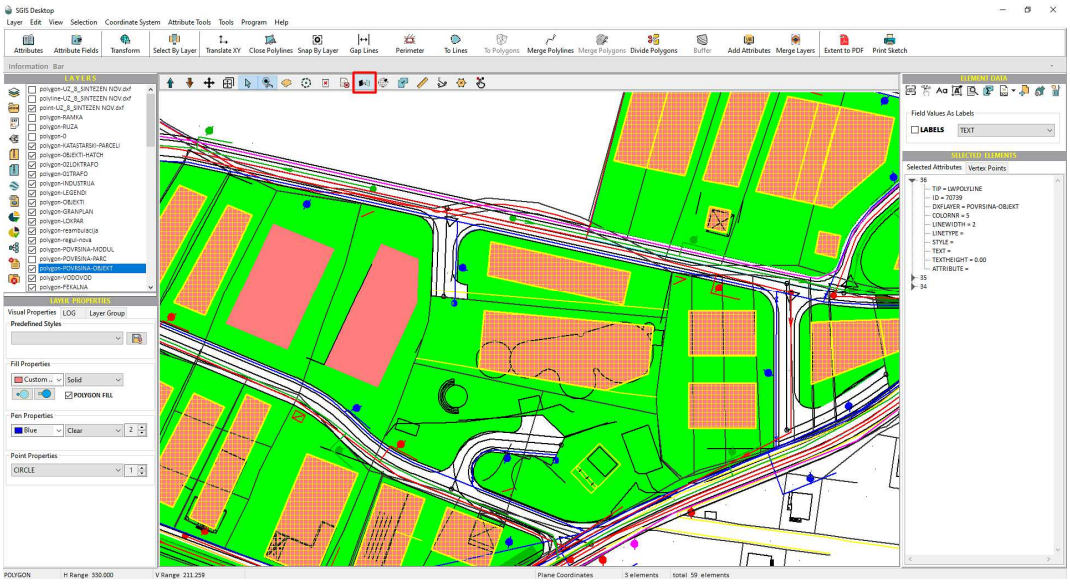
▪ Invert Selection

The **Invert Selection** function allows you to change the selection status of elements, converting unselected elements into selected ones, and vice versa. You can access this tool from two different locations:

- Menu Selection: You can find the "Invert Selection" function in the Selection menu located on the main toolbar of the software.
- Graphics Toolbar: Additionally, you can access the "Invert Selection" tool from the Graphics Toolbar, which provides quick access to various selection-related functions.
-



By selecting the "Invert Selection" option, the current selection status of elements will be reversed. Previously unselected elements will become selected, and previously selected elements will become unselected.



This tool is useful when you want to quickly switch the selection status of elements without manually selecting or deselecting individual elements.

▪ Clear Selection 

To clear the selection list and remove all selected elements, you can use the **Clear** function. This function is available in both the **Selection** menu and the **Graphics Toolbar**.

By selecting the "Clear" option, any elements that were previously selected will be deselected, and the selection list will be emptied.

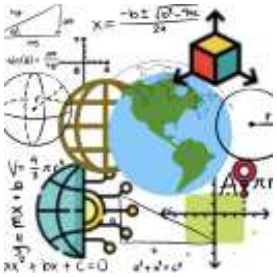
This is useful when you want to start a new selection or when you no longer need the current selection and want to work with unselected elements.

The "Clear" function helps in managing your selection by providing a quick and straightforward way to clear the selection list.

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Chapter 2.5

COORDINATE SYSTEMS



Coordinate systems are fundamental components in the geospatial world and GIS, providing a framework for defining and referencing locations on the Earth's surface. They establish a standardized system of coordinates, that enable accurate geospatial data representation, analysis, and integration across different datasets and applications.

By assigning a unique set of coordinates to each point on the Earth's surface, coordinate systems enable the precise positioning and measurement of features. This accuracy is crucial for various applications, such as surveying, mapping, navigation, and spatial analysis.

In the geospatial world, we incorporate projections and ellipsoidal coordinates, which are essential components for accurately representing the Earth's curved surface.

Projections are mathematical transformations that convert the three-dimensional shape of the Earth onto a two-dimensional plane. Since the Earth is a sphere or an ellipsoid, representing it on a flat surface requires distortion of certain properties, such as shape, distance, direction, or area. Different map projections serve specific purposes and are selected based on the needs of a particular application or region. Projection systems allow GIS users to choose an appropriate map projection that minimizes distortion for a specific area of interest. By selecting the right projection, users can preserve the desired spatial properties, such as preserving shape, maintaining accurate distance measurements, or conserving equal area representation.

Ellipsoidal coordinates, on the other hand, refer to the representation of locations on the Earth's surface using latitude, longitude, and elevation above the reference ellipsoid. The Earth's surface is best approximated by an ellipsoid due to its irregular shape. Ellipsoidal coordinates, often referred to as geographic coordinates, provide a means to precisely identify and locate points on the Earth's surface.Ellipsoidal coordinates are crucial for accurately georeferencing and geolocating features and observations in GIS. They provide a globally recognized system for describing positions, allowing for consistent referencing and integration of data across different spatial datasets. Additionally, ellipsoidal coordinates enable accurate measurement of distances, angles, and directions between points on the Earth's surface.

▪ Current Coordinate System 

Opening the **Current Coordinate System** function opens a new form that displays information about the Coordinate Reference System. This information corresponds to ESRI's .prj file format.

If the user loads a SHP file, the software will read the information from the .prj file, as well as the information about the Coordinate Reference System from GML, GMT, GeoJSON, or MIF/MID files.

If the files do not contain any information about the Coordinate System, the form will remain empty or undefined.

▪ Set Coordinate System 

When you want to define a coordinate system, you select this action which opens a new form. The definition itself consists of two parts:

- Ellipsoid Data and
- Projection Data.

Ellipsoid Data - Definition of an ellipsoid and its associated data. From a list, you can choose a pre-defined ellipsoid that is commonly used. The fields for the major and minor axes, as well as the inverse flattening, are automatically filled in based on the selected ellipsoid.

Projection Data - The projection is selected from a list. Currently, the following options are available: Transverse Mercator, Universal Transverse Mercator (UTM) projection, Lambert Conformal Conic, and Lambert Azimuthal Equal Area projections. You need to fill in the fields for initial latitude, central meridian, scale factor, false easting, and false northing. If you choose the UTM projection, the **UTM Zone** button becomes accessible. By clicking on it, you can enter either the zone or a specific longitude of any point of interest to calculate the central meridian of the corresponding UTM zone

After defining the ellipsoid and projection, you have the option to save them for future use. To do so, enter a name (alias) in the field and click the save button. This will immediately add the definition to the list of coordinate systems. The defined coordinate system is then saved in a file on the computer where the SGIS program is installed.

When defining the ellipsoid and projection using a pre-saved definition, selecting an entry from the list will automatically populate all the fields. Simply click the **Apply** button to adopt the defined ellipsoid and projection system, and then the form will be closed.

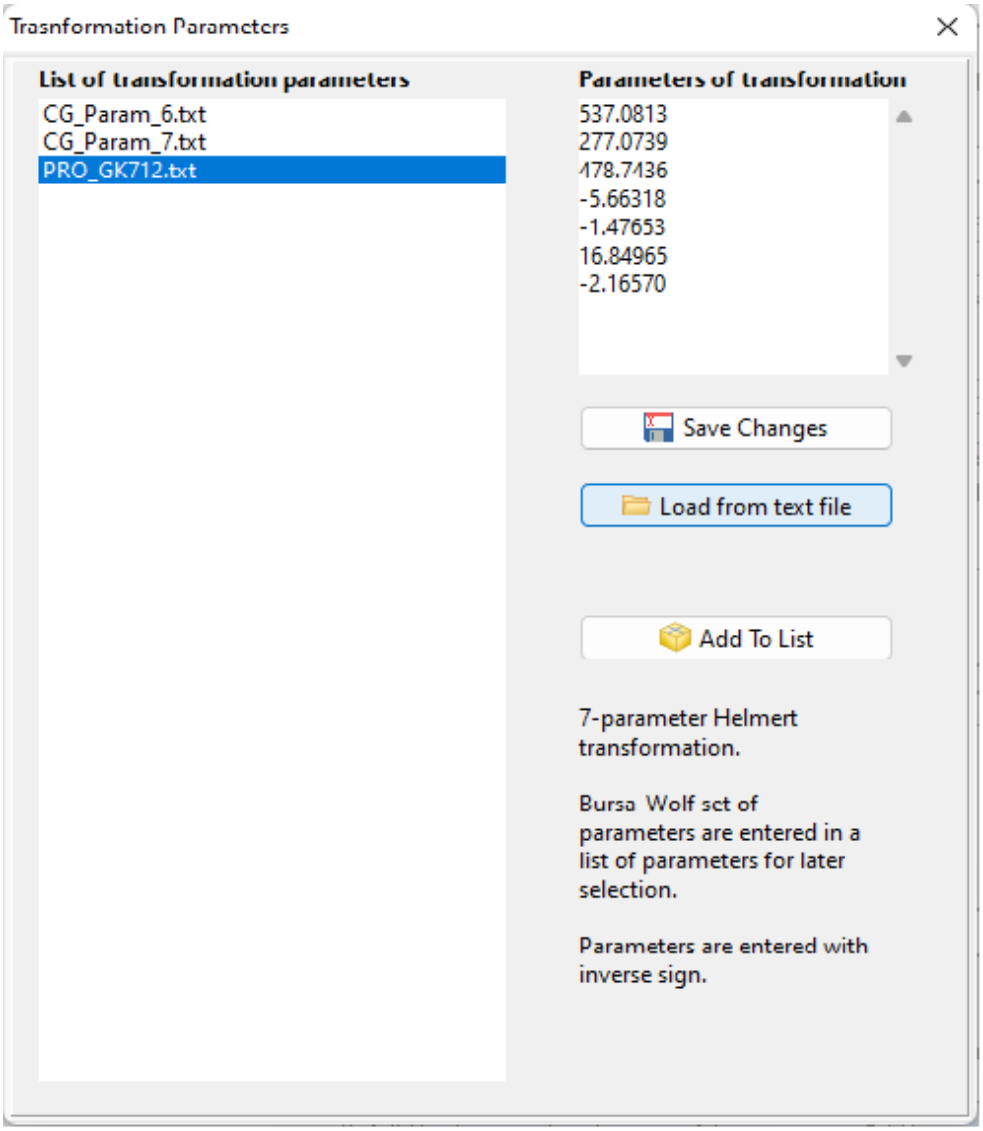
▪ Transformation Parameters

The **Transformation Parameters** function opens a new dialog form that is divided into three main parts.

This function deals with the parameters of a datum transformation, specifically using the 7-parameter Helmert transformation.

On the left side of the form, the list of already defined transformation parameters is displayed. This provides an overview of the existing parameter sets.

The upper right side of the form shows the actual parameter values, including translations, rotations, and scale. These values can be adjusted or modified according to the user's requirements.



The bottom right side of the form provides additional options such as loading parameters from a text file, adding new parameters to the list, or saving any changes made by the user. These options offer flexibility and convenience in managing the transformation parameters.

When the user opens this function, the previously defined parameters and the parameter list will be saved and displayed, allowing for easier future use.
The user has the ability to define names for the files in the list, providing a customizable way to identify and organize the transformation parameter sets.
This feature ensures that the user's settings and preferences are preserved, allowing for a seamless and efficient experience when working with transformation parameters.

To edit previously imported parameters from the list, you need to select the desired file and double-click on it.
This action will populate the **Parameters of Transformation** memo box with the selected parameters. Within the memo box, you can make the necessary changes to the parameters. Once you have finalized the modifications, you can save the changes by clicking on the **Save Changes** button. This allows you to update and customize the transformation parameters according to your specific requirements.

To import a new set of parameters, click on the **Load From Text File** button. Prior to that, ensure that you have selected the text file containing the desired parameters. The text files should follow the Bursa-Wolf set of parameters format, and the parameters should be entered with the inverse sign.

To save the newly imported parameters into the Transformation Parameters list, click on the **Add To List** button. This action will add the new set of parameters to the list displayed on the left side of the form. By doing so, you can conveniently manage and access multiple sets of transformation parameters for your tasks.

Note: It is recommended that you provide clear names for each set of parameters as they are added to the list. This will facilitate easy identification and selection of the desired parameters for future use.

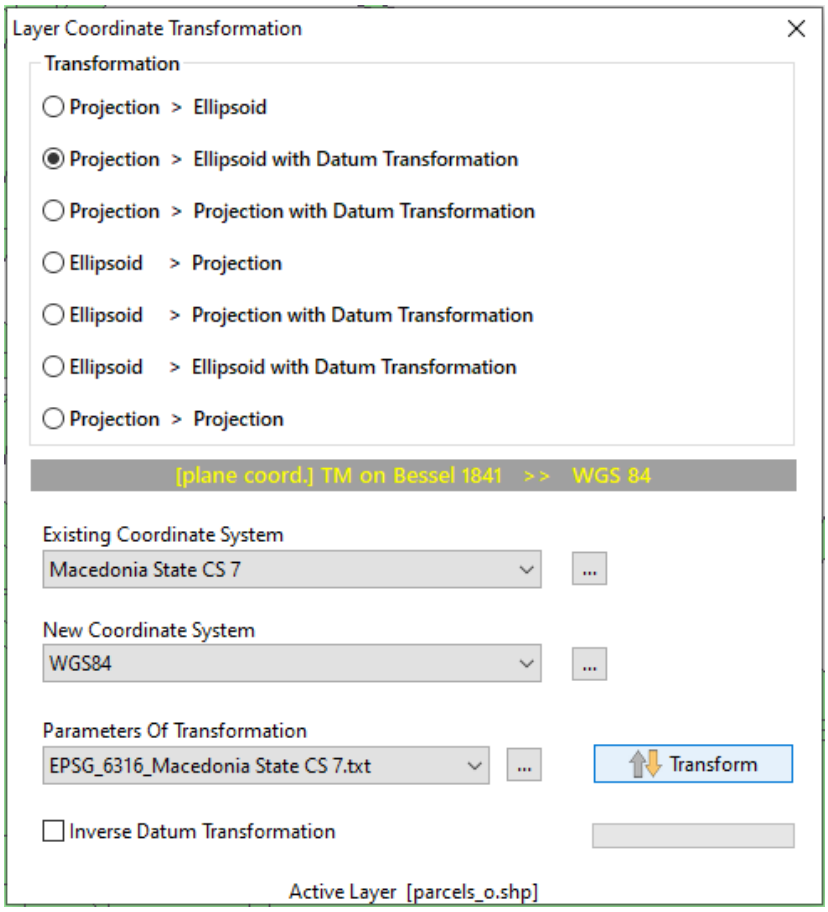
▪ Coordinate Transformation 

The **Coordinate Transformation** function allows for the conversion of coordinates between different coordinate systems. This transformation is applied to the active layer. Upon activating this function, a new form is displayed.

When performing coordinate system conversions, the typical question is: "I have my coordinates in one coordinate system, and I want to convert them to another coordinate system."

To address this, it is necessary to define both the existing coordinate system and the new coordinate system. The existing coordinate system can be selected from the dropdown list labeled **Existing Coordinate System**, while the new coordinate system can be chosen from the dropdown list labeled **New Coordinate System**. If the user is working with a datum transformation, which involves converting coordinates between different ellipsoids, a set of

transformational parameters needs to be selected. These parameters can be chosen from the dropdown list labeled **Parameters Of Transformation**.



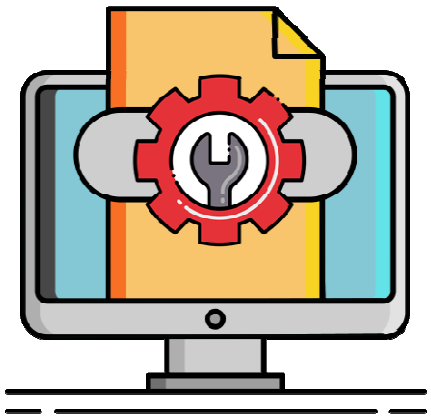
In the upper section of the form, the user can select or deselect the desired transformation type. This allows the user to specify the specific type of transformation required.

The actual transformation process is initiated by clicking on the **Transform** button. In the lower section of the form, a status bar is displayed, providing information about the progress of the transformation procedure. This feature is particularly helpful when working with layers that contain a large number of elements that need to be transformed.

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Chapter 2.6

ATTRIBUTE TOOLS



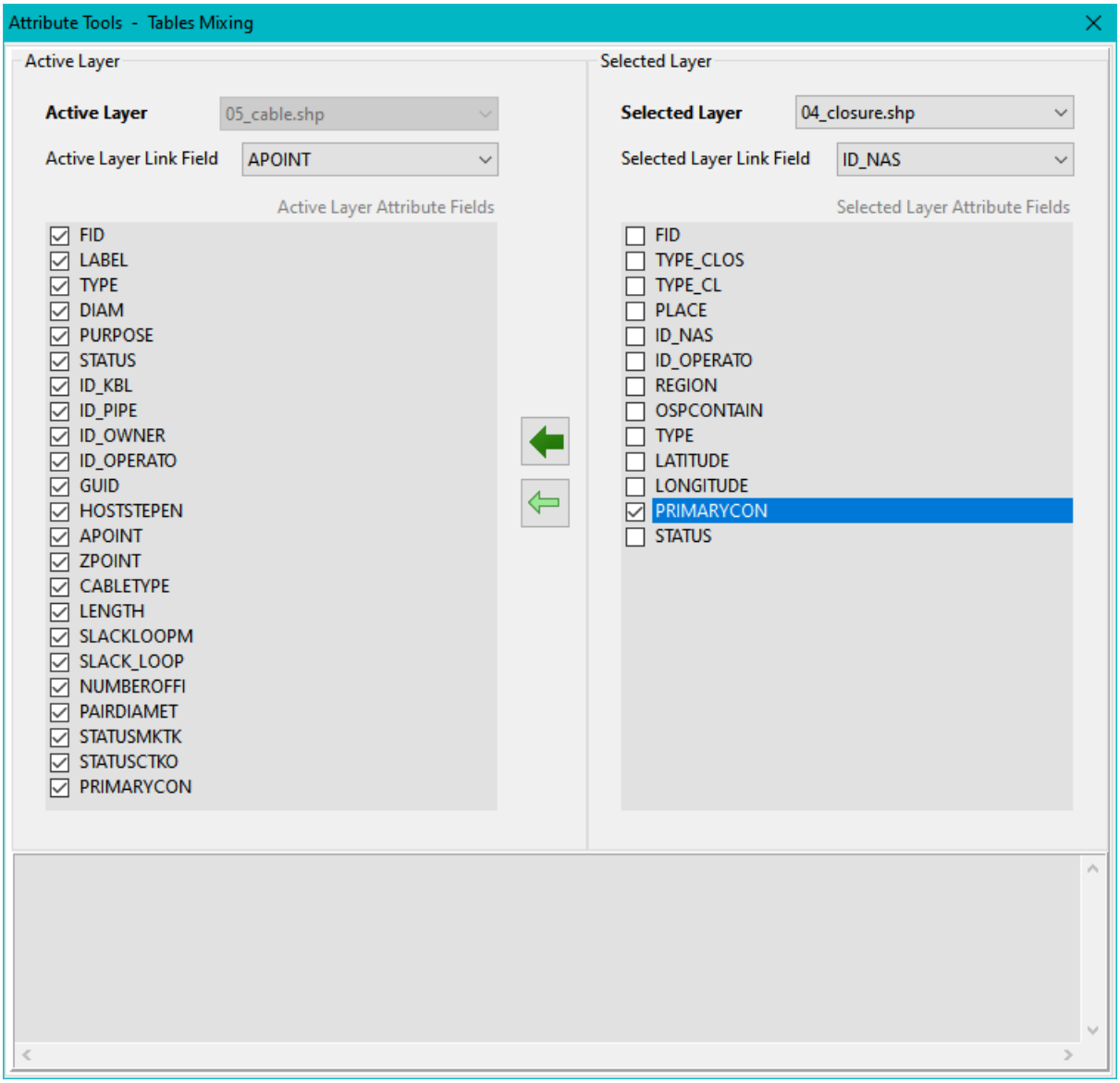
Attributes and attribute tables play a critical role in GIS by providing additional information and characteristics about geospatial features. They offer a structured way to organize and store non-spatial data associated with spatial data, enhancing the richness and depth of geospatial analysis and decision-making. Attributes are descriptive properties or characteristics assigned to individual features in a geospatial dataset. These properties can include information such as names, addresses, population counts, land use categories, or any other relevant data that helps define and differentiate features within a geographic context. Attributes provide context and additional details that complement the spatial representation of features. The attribute table is a tabular representation of the attributes associated with the features in a geospatial dataset. It organizes attribute data in rows and columns, with each row representing a specific feature and each column representing a specific attribute. The attribute table allows for the storage, management, and analysis of large volumes of attribute data, facilitating efficient data handling and exploration.

▪ Mix Tables 

The action triggers the opening of a new form. It pertains to the process of connecting fields from a different layer to the fields within the active layer. The matching of elements from the active layer with those from the selected layer is carried out based on the values of the respective fields.

Notably, this action represents a unique operation as it entails modifying the structure of the attribute table, apart from the designated **Attribute Fields** form which is specifically designed for structural changes to attributes.

Upon opening the form, all fields from the active layer are listed by default, with checkboxes indicating their selection status. The user can choose a field for linking from the active layer, referred to as the **Active layer Link Field**.



On the right side of the form, the user selects a layer called the **Selected Layer** and a linking field named the **Selected Layer Link Field**. In the "Active Layer Attribute Fields" section, the user can deselect fields that are not required for the join operation. In the "Selected Layer Attribute Fields" section, the user can select the fields they wish to link with the fields in the active layer.

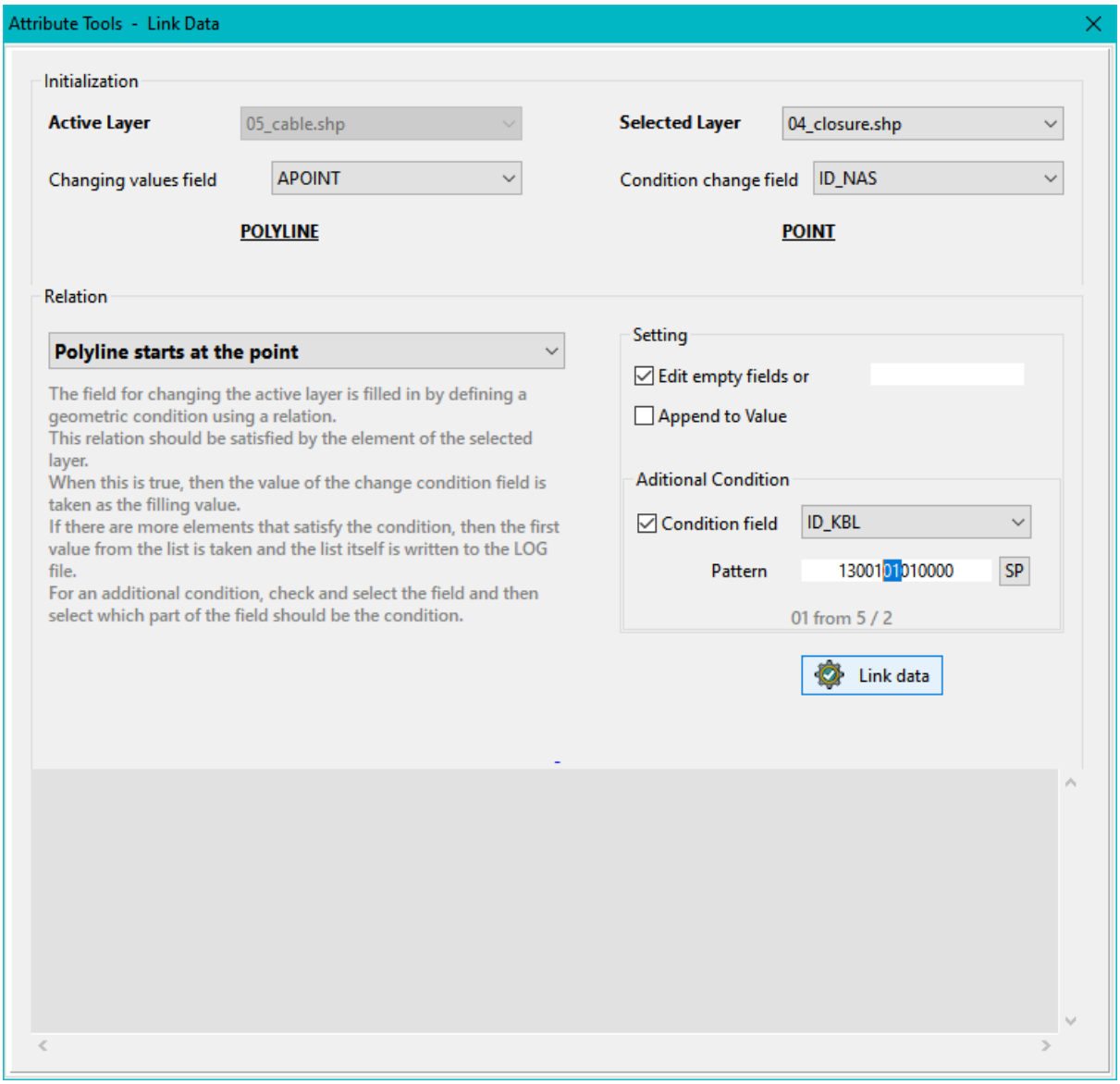
Clicking the button with the dark green left arrow performs the join action, where fields are matched based on their values.
Clicking the button with the light green left arrow performs the attribute field join from the selected layer to the active layer, assuming the elements are in the same order in both layers.

The bottom section of the form is dedicated to a LOG, which contains information regarding the ongoing process of the join operation.

▪ Link Data

The **Link Data** function opens a new form that allows for the modification of attribute tables.

Specifically, it enables changes to be made to the fields within the attribute table of the active layer. These changes occur when the values in those fields are either filled or supplemented with values from corresponding fields in a selected layer. This linkage between the two layers is established based on a geometrical relationship shared by the "take element" (the element to be modified) and the "give element" (the element providing the value).



The form is divided into three sections: Initialization, Relation, and LOG.

In the Initialization section, you will select the field (Changing Values Field) that you want to modify within the active layer. Additionally, you will choose the selected layer, which refers

to the layer from which the values will be retrieved. You can also specify the Condition Change Field, which represents the fields containing the values to be retrieved.

By selecting the Selected Layer, you will receive information about the type of layers involved in the process.

The Relation section involves selecting a geometrical relation between the Changing Value Field and the Condition Change Field.

The available relations depend on the types of elements present in the active and selected layers. In the Settings section, the option "Edit Empty Fields or _ _ _" is checked by default. This means that the Changing Values Field will be filled only in those fields that are empty or contain values provided by the user manually.

If you want to append values instead of filling them, you need to check the "Append to Value" option. In the Additional Condition part, you have the option to check the Conditional Field box. From the dropdown list, you can select a field from the active layer. This selected field will be populated with a value from the first element.

By selecting and clicking the SP button on the right, a portion of the condition field is separated. This indicates a case where the geometrical relation is filled by more than one element. It can also be used to narrow down the selection of values for the Changing Value Field.

The actual modification of field values in the Changing Value Field, based on the desired criteria, is performed by clicking the **Link Data** button.

The bottom part of the form is dedicated to displaying LOG information about the linking procedure.

▪ Grid Editor

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Chapter 2.7

TOOLS

Editing tools in GIS are essential components that allow users to modify and update geospatial data accurately and efficiently. These tools enable the creation, modification, and deletion of features, as well as the editing of attribute data, empowering users to maintain data integrity and incorporate real-world changes within their datasets. Advanced editing tools in GIS offer more sophisticated operations such as splitting, merging, buffering, or spatial overlays. These tools enable users to perform complex editing tasks, such as dividing features, combining multiple features, creating buffers around objects, or overlaying spatial layers. They enhance the overall editing capabilities and allow for more advanced spatial analysis and modeling.



▪ Export Layer Labels Coordinates 

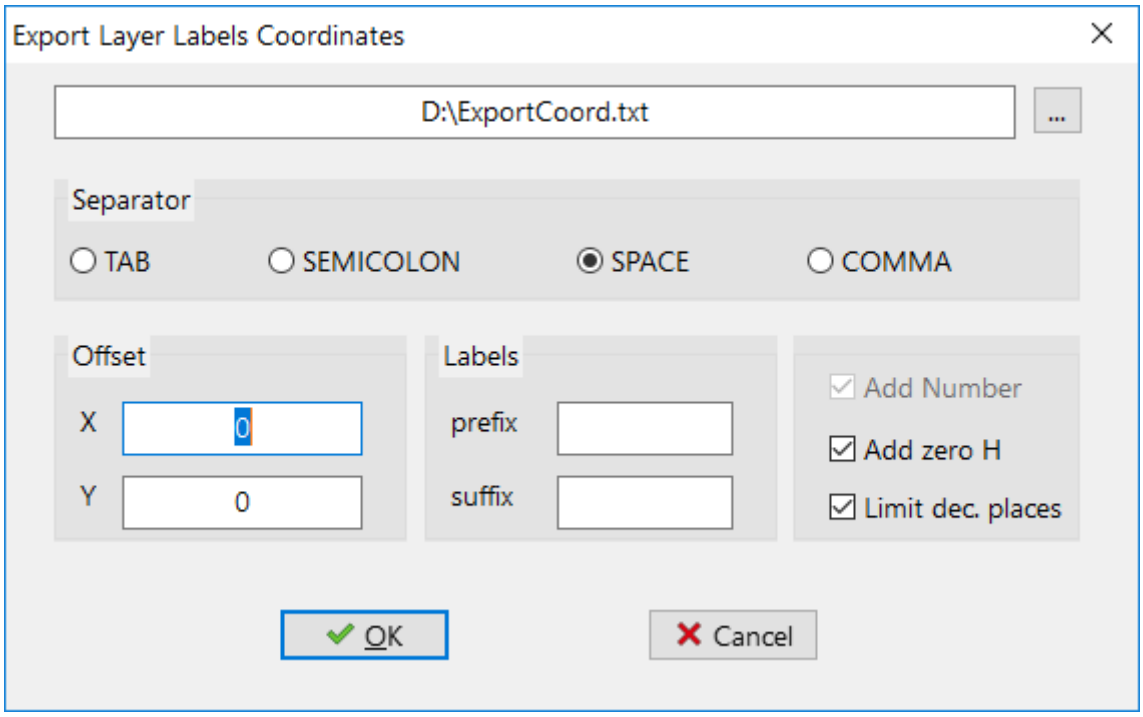
Labels are textual information that can be displayed on geometry features or maps. Each label represents a value from a selected field in the attribute table of a specific layer.

To enable the visibility of labels, you need to check the **LABELS** box. To choose which layer's labels you want to display on the main Graphics panel, click on the dropdown list of available layers and select the desired layer.

When working with a layer that contains point geometry, the label will display the coordinates of each individual point. For layers with polyline geometry, the label will display the coordinates of the starting point (zero element) of each polyline. For layers with polygon geometry, the label will display the coordinates of the centroid of each polygon.

However, in some cases, especially with irregularly shaped polygons or concave polygons, the centroid point may fall outside of the polygon. To address this issue, you can use the function **Place Centroid In Their Visual Center**. This function corrects the position of the centroid point by placing it inside the polygon frame. Once the centroid points have been adjusted, you can export the label coordinates accordingly.

The export of label coordinates can be performed using the **Export Layer Label Coordinates** function. This function opens a new form that allows you to configure the export settings. Within the form, you can specify the following options:



To define the saving path and file name for the coordinates, click on the "..." button next to the saving path and file name field. This will open a dialog box where you can browse your file system and choose the desired location and provide a name for the file.

Regarding the separator, you can specify the character or symbol to be used as a separator between the coordinates in the exported file. This separator helps to differentiate between different fields or values. You can choose from commonly used separators such as comma (,), semicolon (;), tab character (\t), or any other suitable character based on your requirements.

In addition to defining the saving path, file name, and separator, the export form also allows you to specify an offset along both the X and Y axes. This offset allows you to adjust the position of the exported label coordinates relative to their original location. By entering specific values for the X and Y offset, you can shift the coordinates horizontally or vertically.

Furthermore, you have the option to include a prefix and suffix for the exported label coordinates. The prefix is a string that will be added before each coordinate, and the suffix is a string that will be added after each coordinate. This feature enables you to add additional information or formatting to the exported coordinates.

By unchecking the option, you can disable the inclusion of a coordinate height value of 0.00 in the exported label coordinates. This means that if a label does not have a specific height value associated with it, it will not be included in the exported coordinates.

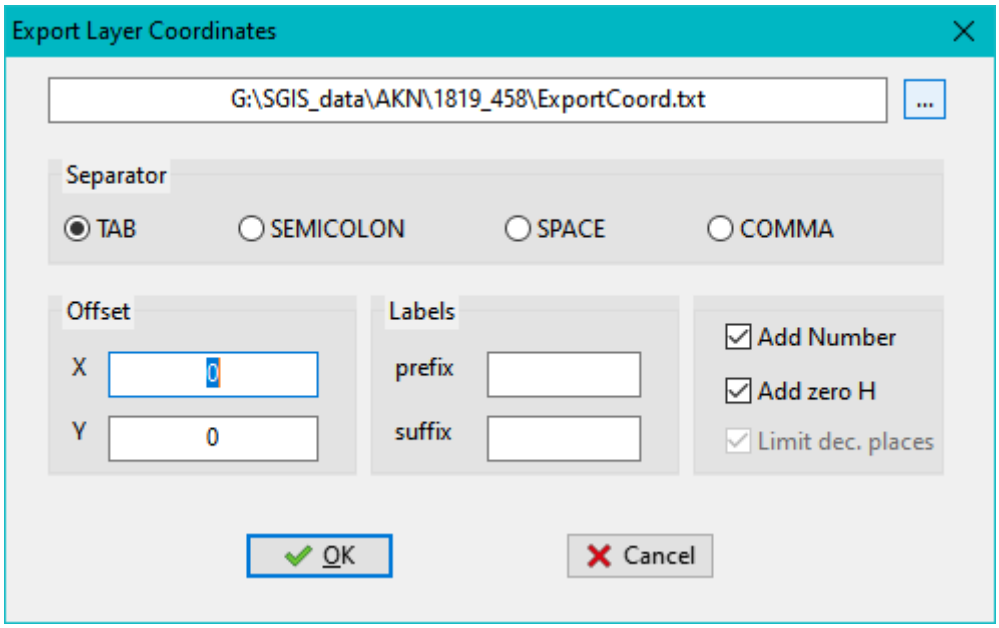
If you have the option "Limit Decimal Places" checked before exporting, the number of decimal places for the coordinates will be determined by the settings specified in

the **Options** form within the **General** folder. You can define the desired number of decimal places for the exported coordinates in this form.

▪ Save Layer Coordinates / Attributes

The function allows users to save data from the active layer as a text file. Depending on the user's requirements, they have the flexibility to choose what data to save: either the coordinates that define the geometry or the attributes that describe a specific layer.

When you select the function **Save Layer Coordinates to CSV (** **)**, a new form will open up, allowing you to define the settings for saving the layer coordinates. In this form, you have several options to customize the export process.



First, you can specify the path and name of the text file where the coordinates will be saved. This allows you to choose the location and file name that you prefer.

Next, you can define the separator that will be used to separate the coordinate values in the CSV file. Common choices for separators include commas (,), semicolons (;), or tabs.

Additionally, you have the option to apply an offset to the coordinates along the X and/or Y axis. This can be useful if you need to shift the coordinates by a certain amount.
You can also specify a suffix and/or prefix that will be added to each coordinate value in the CSV file. This can be helpful for adding additional context or formatting to the exported data.

When using the **Save Layer Attributes to CSV (** **)** function with the Open Dialog option, a new dialog form will appear where you can define the path and name of the file where the layer attributes will be saved.

▪ Export layer Coordinate [GML format]

The **Export Layer Coordinate [GML format]** function enables you to save and export the coordinates of the active layer as a TEXT file in GML format.

The export is performed in GML format, where the coordinates are listed for each element in the following format: Element Number (in order) ; X1 , Y1 space [X2 , Y2 space]...

Example:

0;590461.47,593650.58 590458.88,593626.87 590451.8,593627.76 590439.02,593628.93 590440.12,593639.15

▪ To Lines 

The function can be applied to layers containing polylines or polygons.

These elements are defined by an array of coordinates that precisely outline the shape of the polyline or polygon.

It is worth noting that a special scenario arises when dealing with a polyline that is defined by only two vertices, as it represents a straight line segment connecting those two points.

After executing the function, a new layer consisting of lines will be created.

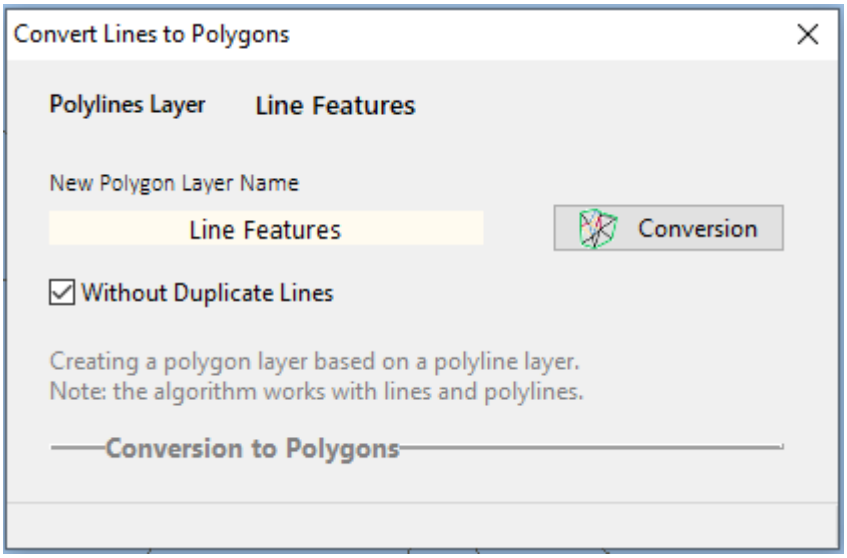
▪ To Polygons 

The **To Polygons** function allows for the conversion of a line or polyline layer into polygons. This function can be activated when working with an active layer containing lines and/or polylines.

By executing this function, the lines or polylines in the layer will be transformed into polygons, enabling further analysis or manipulation of the geometries as polygons.

When the "To Polygons" function is activated, a new pop-up window appears, providing various options.

The first line in the window displays the name of the active layer, which represents the layer from which the polygons will be created.



Below that, there is a blank input field where you need to enter the desired name for the new polygon layer that will be created. This allows you to specify a meaningful name for the newly generated polygons.

Additionally, there is a checkbox labeled "Without Duplicate Lines." This option is optional and can be selected if the input data contains duplicate geometries that need to be removed before creating the polygons.
By checking this box, the function will ensure that duplicate lines are excluded during the conversion process.

To initiate the conversion process, you need to click on the **Conversion** button in the pop-up window. Once clicked, the conversion process begins, and you can monitor its progress through the status bar located at the bottom of the form.
The status bar provides real-time updates on the ongoing conversion.

After the conversion is complete, you can close the form by clicking the appropriate button or closing the window. This signifies the end of the conversion procedure.

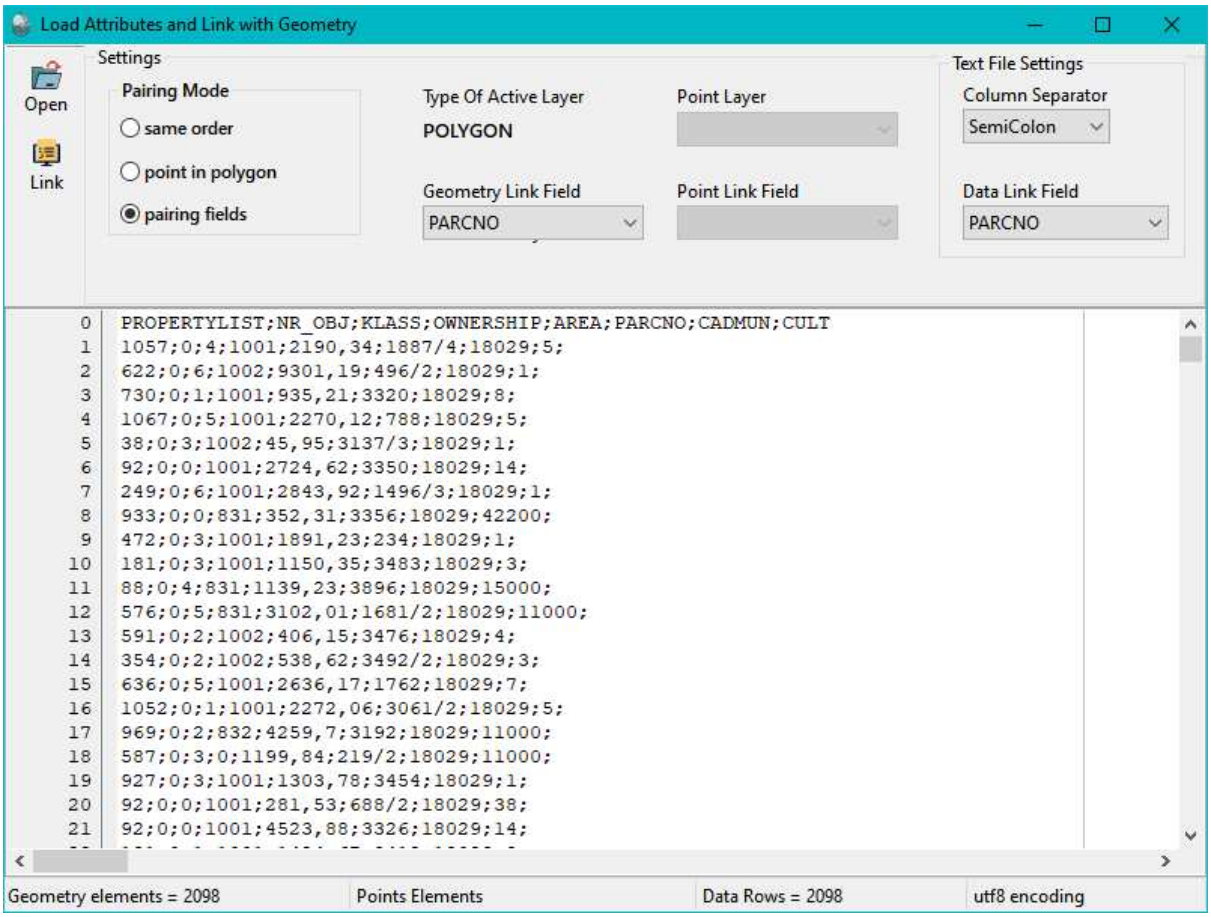
After the conversion procedure is completed and the polygons are generated, the resulting polygons will be displayed on the main Graphics Window panel. However, if you observe unfilled parts or gaps within the created polygons, it indicates the presence of errors in the input data.

These errors typically arise from lines or shapes that are not closed properly, meaning their endpoints do not coincide.
Additionally, other geometric errors may be responsible for the incomplete filling of polygons. To rectify this issue and generate accurate polygons, you need to identify and correct these errors in the input data.

Once you have addressed the errors, you can repeat the conversion procedure, and the corrected polygons will be created, devoid of any unfilled or incomplete areas. This ensures the creation of accurate and valid polygons based on the corrected input data.

▪ Add Attributes

The function opens a new form and is used for loading attributes from a text CSV format.



The text attribute file can be created in multiple ways, including:

- The text attribute file can be created by the user...
- SGIS Attributes - Exported to CSV format and then modified by the user...
- Exported from another software...

The first row must contain the field names separated by a delimiter.

The action does not modify the structure, i.e., the fields of the attribute table. If the loaded text file has a different number of fields or different field names, a warning will be issued. In that case, you should first use the Attribute Fields action to modify the structure of the attribute table.
The chosen separator for separating fields and their values in the text file is SEMICOLON. Additionally, you have the option to select other separators from a list, including SPACE, TAB, and COMMA.

To perform data linking, the method of linking between the graphic elements and the data from the text file with new attributes must first be defined. The following options are available:

- **Same Order:** This option means that the order of elements in the textual attribute table corresponds to the order of elements in the graphics. No additional adjustments are needed for linking.
- **Point in Polygon:** [Only in the case when the active layer, or the layer whose attributes are being modified, is of polygon type]; Define a point layer and a field within the same layer whose values correspond to the values of the defined field in the text file. This is most commonly the case when we have loaded a DXF file with vector data where one layer represents parcel boundaries and another layer contains parcel numbers.
- **Pairing Fields:** This option involves defining a field from the existing attributes and a field from the text file that will be paired based on their values.

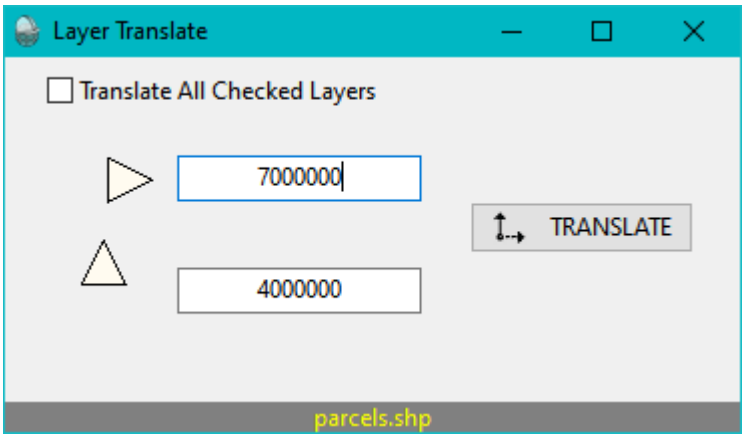
To link attributes with elements, click on the "Link" button. In case there is a specific issue, the "LOG" button will appear.

Note: When loading the text file using the "Open" function, the editor will read the text attributes in UTF-8 format. If you notice that the data appears to have a specific ANSI code page, you can right-click within the editor to access a menu for converting the text from the specific code page to UTF-8.

A successful linking process will display a message in the information line indicating the successful connection. If there are any issues, they will also be shown as information on the information line.
The status line provides details such as the number of geometric elements, the count of text attributes in the file, and in the case of point-to-polygon matching, the number of point elements.

▪ Translate XY

The **TranslateXY** function allows for the translation of coordinates along the X and/or Y axis of the active layer. If you wish to translate multiple layers simultaneously, you can enable the **Translate All Checked layers** option, which applies the translation to all selected layers.



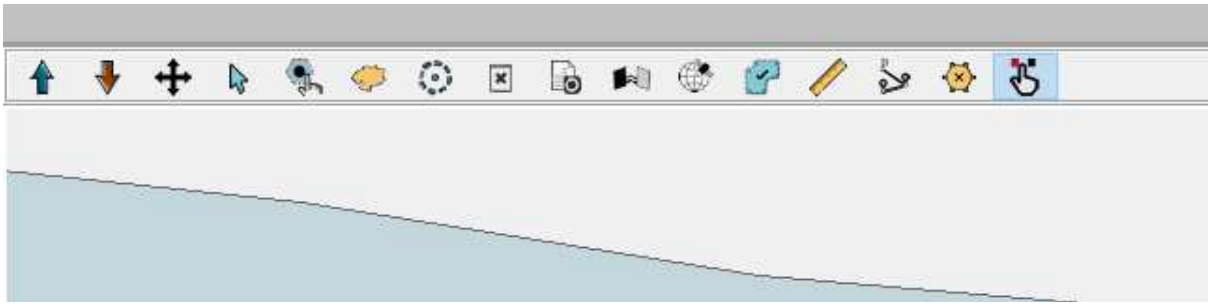
By specifying the translation distance along the X and/or Y axis, you can effectively move the coordinates of the selected layer(s) in the desired direction. This function is useful for

adjusting the position of elements within a design or spatial dataset, enabling precise spatial transformations without altering the geometric shape or attributes of the features.

The **Snap 2 Points to Translate Layer** function provides a convenient way to define translation points for the active layer. By selecting two points, you can specify the starting and ending vertices that determine the translation distance and direction.

Once you have chosen the two points, clicking on the TranslateXY button will display a new pop-up window. Inside this window, you will find the coordinate differences between the selected points, indicating the magnitude and direction of the translation.

This approach allows for a visual and intuitive method of defining the translation parameters. By graphically selecting the points of translation, you can precisely control the movement of the layer's coordinates, ensuring accurate and desired results.



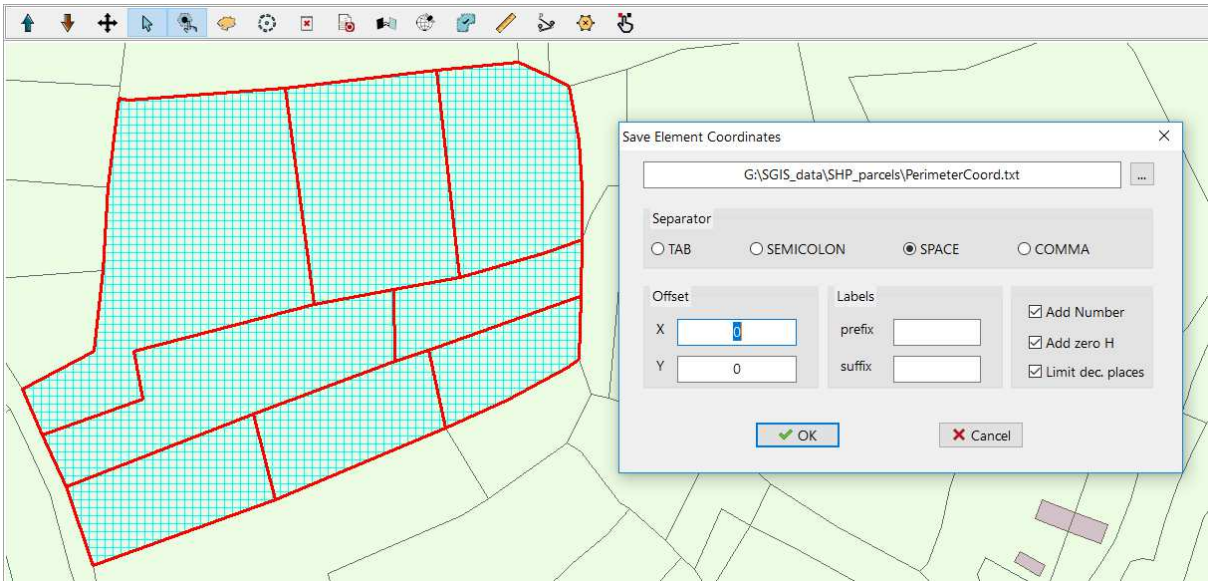
Additionally, the pop-up window provides transparency and visibility of the coordinate differences, allowing you to review and verify the translation before applying it to the layer.

▪ Perimeter Coordinates 

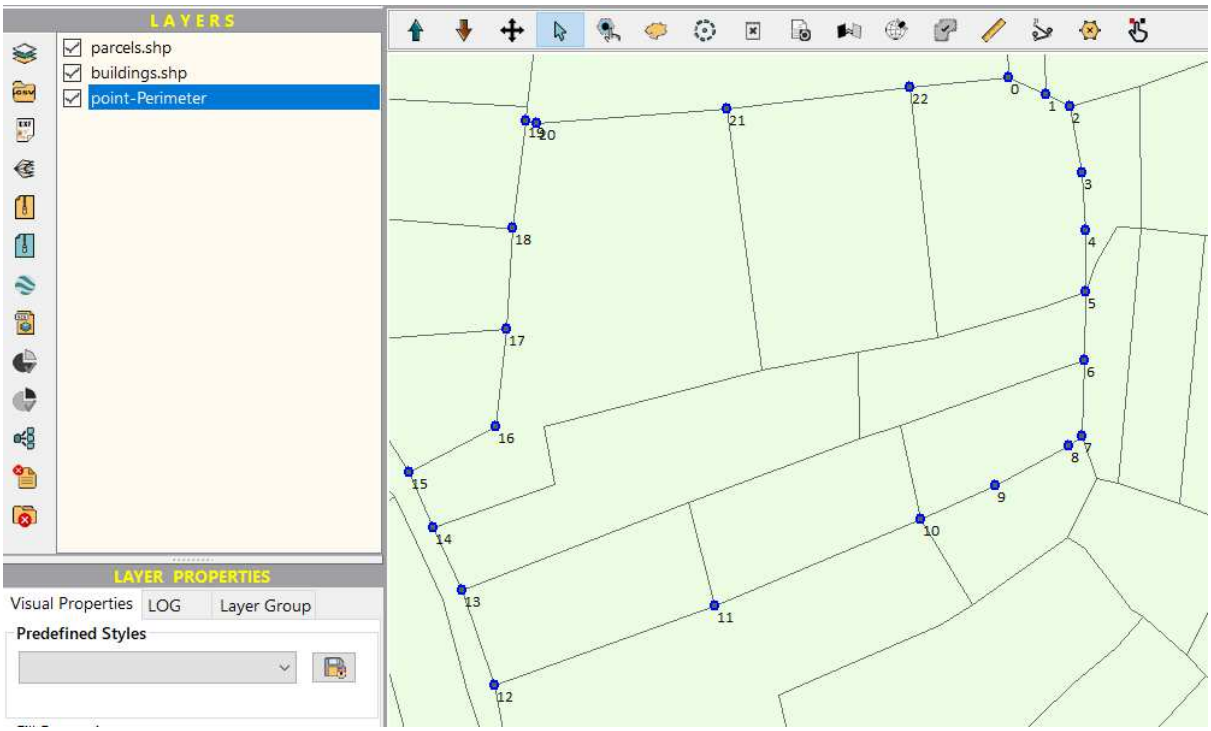
The **Perimeter Coordinates** function is designed to calculate the perimeter of multiple neighboring polygons. This function can be executed on elements of the polygon type.

To begin, the user needs to select the desired polygons. The selection can be made by applying a query filter operation in the Attributes section, by creating a polygon using the "Select Polygon" function on the main Graphics panel, or by activating the selection mode and adding elements using the "Select + Add" function.

Once the polygons are selected, the function calculates the coordinates along the desired perimeter. The result is a coordinate list, as well as a new layer of points that contains these coordinates. This allows for further analysis or visualization of the perimeter coordinates.



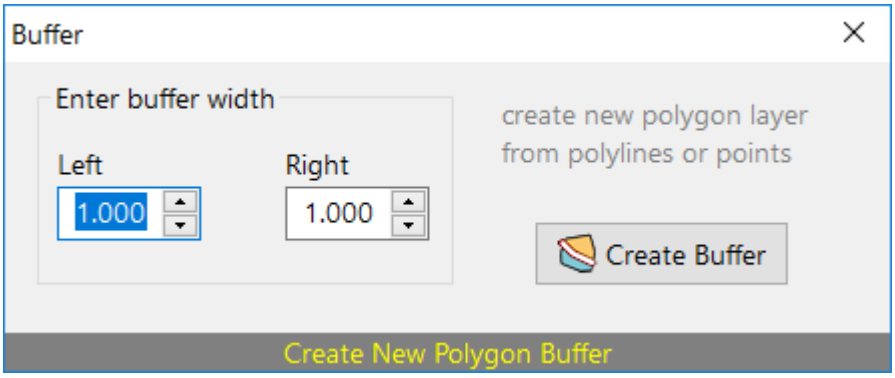
After executing the "Perimeter Coordinates" procedure, the following results are obtained:



▪ Buffer

The **Buffer** function generates buffer polygons based on layers consisting of polylines and points.

By default, the buffer function sets the width to 1.00 m on the left and 1.00 m on the right. However, the user has the option to adjust the input width for both sides. Upon clicking on **Create Buffer**, a new polygon layer will be generated.

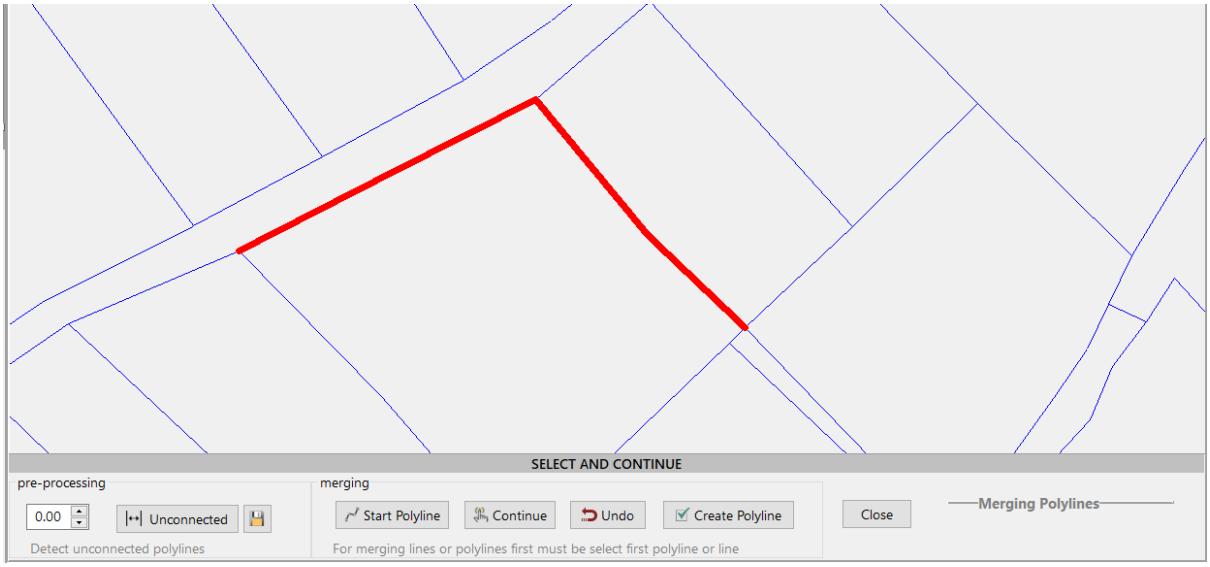


The number of buffer polygons created depends on the number of polylines or points within the active layer.

▪ Merge Polylines

The **Merge Polylines** function opens a new form that allows users to perform interactive merging of polylines. This function can be executed on the active or selected layer that contains polyline geometry (line elements).

The merging process involves both the new form and the main Graphics Window panel, providing an interactive and visual approach to the merging operation.



The "Merge Polylines" function consists of two main parts:

- Pre-processing and
- Merging.

These steps are designed to enhance the merging process and ensure accurate results.

In the **pre-processing** step, users have the option to detect unconnected polylines by specifying a tolerance gap distance. This feature helps identify any gaps or disconnections between polylines that may hinder the merging process. By clicking on

the **Unconnected** button, the function will analyze the polylines and provide the results in the form of point coordinates. These results can be saved as a LOG file for further reference or analysis. Additionally, the point coordinates can be imported later using the **Load CSV File** function, allowing users to work with the detected unconnected polylines more efficiently.

The second part of the function involves the actual **merging** of the polylines. This process is interactive, allowing users to visually and intuitively merge the polylines on the Graphics Window panel. By selecting the desired polylines and executing the merge operation, the function combines the selected polylines into a single, continuous polyline.
To use the "Merge Polylines" function from the main Graphics Toolbar, follow these steps:

- Activate the "Element Selection Mode" by selecting it from the toolbar. This mode allows you to select the starting polyline for the merging process.
- On the main Graphics panel, select the line or polyline that you want to serve as the beginning line for the merging process.
- In the new Form that appears, click on "Start Polyline" to indicate the starting point of the polyline.
- On the info tab of the form, you will see the message "SELECT AND CONTINUE," indicating that you should return to the main Graphics panel to select the next polyline.
- Select the next polyline or line segment that you want to merge with the previous one. The selected and connected polylines will be highlighted in red for better visual clarity and understanding.
- Click on "CONTINUE" in the form to confirm the selection of the polyline.
- You can repeat this process as many times as needed, selecting additional polylines to merge with the existing connected polyline. Each time you select a polyline and click on "CONTINUE," it will be added to the existing merged polyline.

By following these steps, you have control over where each line segment begins and ends, allowing you to create the desired merged polyline based on your specific requirements. The interactive nature of this function enables you to visually build the merged polyline by selecting and connecting individual polylines or line segments, providing flexibility and customization in the merging process.
The **Undo** button allows you to revert the selection of the last line, effectively going back one step. Once you have selected all the desired lines or polylines and wish to merge them into a single polyline, click on the **Create Polyline** button.

Clicking on the "Create Polyline" button will open a new pop-up dialog where you can enter the name for the new layer that will be created. The software may provide a default name suggestion. The newly merged polyline will be saved within this newly created layer.

If you choose to cancel the creation of the new layer, you will be presented with a list of existing layers from which you can select the desired destination to save the merged polyline.

Before clicking on the **Continue** button, when you select a line or polyline, it will be visually displayed on the Graphics panel. Alternatively, you can search for these elements through the "SELECTED ATTRIBUTES" feature. In some design files, there may be multiple lines or polylines that are drawn very close to each other or appear to be duplicates.

By clicking and selecting from the "SELECTED ATTRIBUTES" list, you can specifically choose the correct line from the table of attributes. This selected line will also be highlighted on the main Graphics panel, providing a clear visual indication.

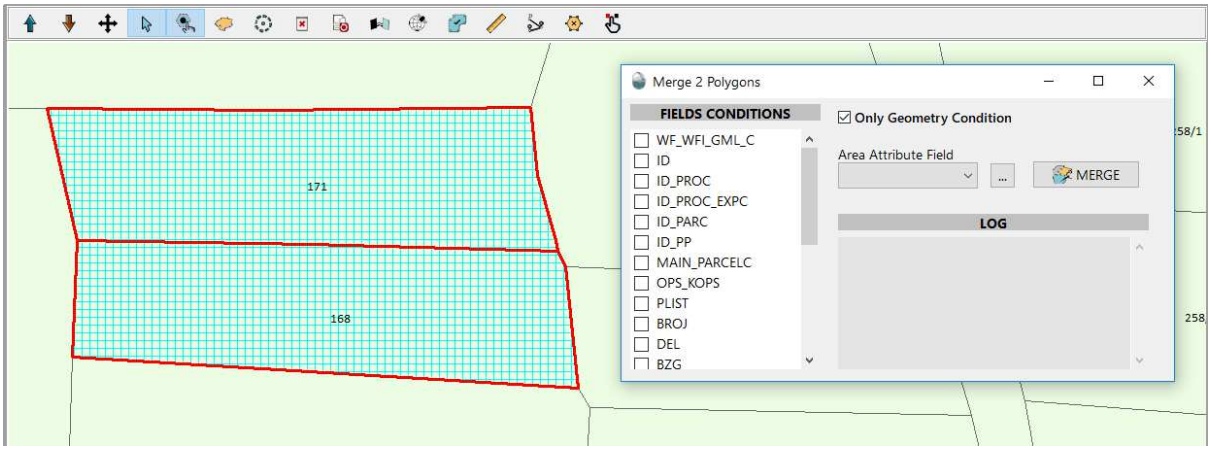
The newly created polylines on the Graphics panel are colored in green. The user can repeat this procedure as many times as needed, allowing for the creation of multiple merged polylines.

▪ Merge Polygons 

The function **Merge Polygons** allows you to combine two selected polygons into a single merged polygon. To utilize this function, you need to follow these steps:

1. Ensure that the layer you want to perform the merge operation on is selected.
2. Activate the "Element Selection Mode" by selecting the corresponding option.
3. Use the "Add To Selection List" function to select two polygons from the selected layer. This can be done by clicking on the polygons in the graphics window or using other selection methods provided by the software.
4. Once you have selected two polygons, open the "Merge Polygons" form by clicking on the corresponding option. The form will display the selected polygons and provide options for adjusting the merge settings.
5. Adjust the settings as desired, such as choosing the merge method or specifying attributes for the merged polygon. Execute the merge operation by clicking on the "Merge" button in the form.

The two selected polygons will be merged into a single polygon, combining their geometries and attributes. Please note that the "Merge Polygons" function can only be performed on a layer that contains polygon elements, and it requires selecting two polygons within that layer.



In the new form that appears for the **Merge Polygons** function, there is a column called "Fields Conditions". This column displays all the fields from the attribute list that describe the geometry of the active layer. Each attribute value has a checkbox in front of it, and by default, all checkboxes are unchecked.

The default setting implies that if the user does not have any specific requirements, only the geometry of the polygons will be merged. However, if the user wishes to merge polygons based on additional conditions, such as merging cadastral parcels, they need to uncheck the box labeled "Only Geometry Conditions" and check one or more fields from the column.

If the desired fields are not compatible for merging, the software will provide an informative message. For example, it might indicate that merging polygons with different owners is not allowed. This ensures that the user is aware of any limitations or inconsistencies when selecting the fields for merging.

The next step is to choose the field that will store the newly calculated area of the merged polygon. This field will be added to the attribute table of the resulting merged polygon.

The LOG section provides important information about the fields and conditions involved in the merging procedure. It displays details about the attributes and their values that are considered during the merging process. In case any issues arise during the merging procedure, such as incompatible field values or other constraints, a concise error message will be displayed in the LOG section. This message aims to provide an explanation of the problem encountered, helping the user understand why the merging could not be executed. By reviewing the LOG section, users can gain insights into the merging process, identify any potential issues, and troubleshoot any problems that may arise, ensuring a smooth and successful merging operation.

The merging process is initiated by clicking on the **MERGE** button. There are two types of merging operations that can be performed:

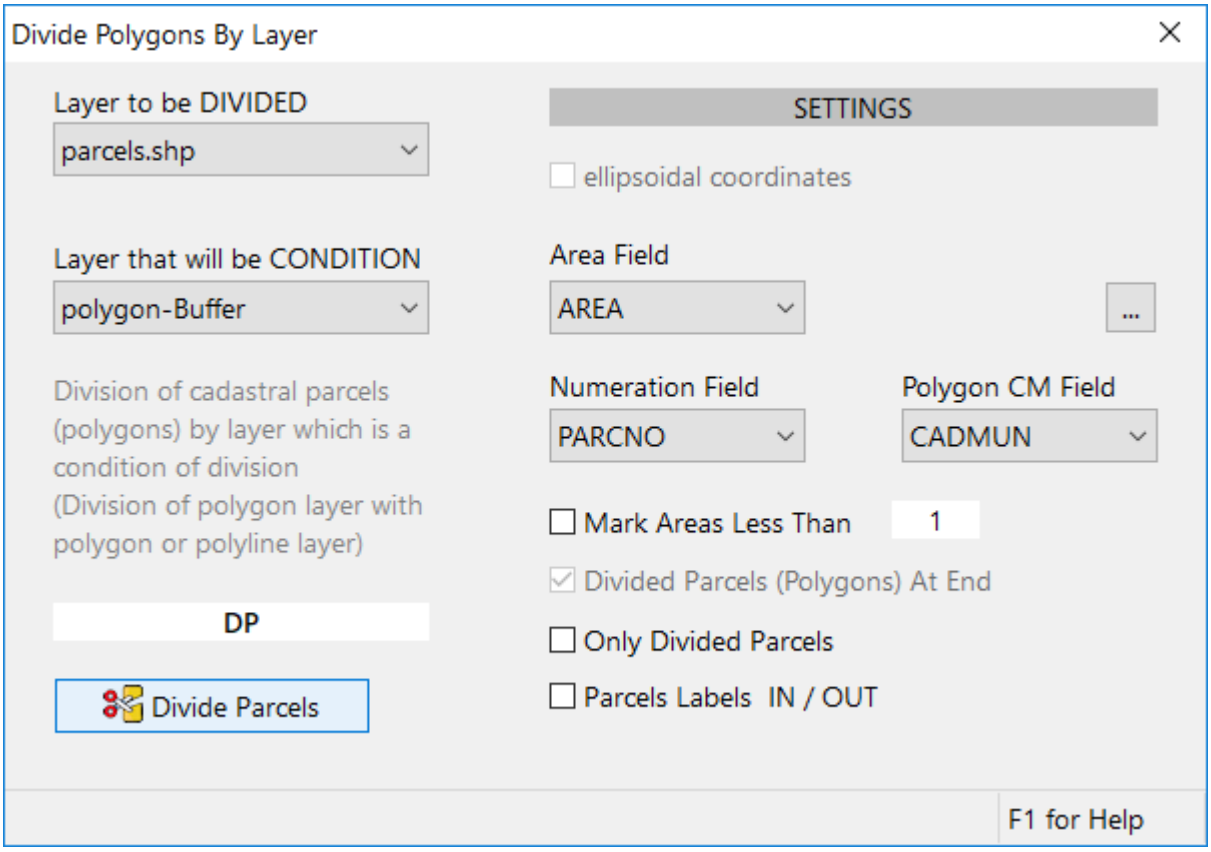
- Merging of polygons that share at least two points: This type of merging involves polygons that have at least one common line segment or edge. The merging action identifies such polygons and combines them into a single polygon.
- Merging of overlapping polygons: This type of merging involves polygons that overlap in some areas. The merging action identifies the overlapping regions and creates a new polygon that represents the combined shape of the overlapping polygons.

Both types of merging operations are supported, allowing users to merge polygons based on shared points or overlapping areas.

▪ Divide Parcels By Layer 

The **Divide Parcels By Layer** function allows the user to divide a polygon layer based on a condition layer of type polyline or polygon. The resulting polygons from the division are automatically separated into a new layer.

In order to execute the "Divide Parcels By Layer" procedure, the user needs to define a polygon layer that will be divided and a polyline or polygon layer that will serve as the condition for the division.



In the first layer, which is the layer to be divided, there can be one or more polygons that need to be divided. Similarly, in the condition layer, there may be multiple polyline or polygon features. It's important to note that during the division process, situations where a polygon is inside another polygon can also occur.

On the right part of the form, you will find the **Settings** section. In this section, the user can define the following settings:

- Area Field - This field allows you to specify the field inside the table of attributes that will store the areas of the newly created polygons.
- Numeration Field - This field allows you to specify the attribute field that will store the numeric title or number of the newly created polygons.
- Polygon CM Field - This field is used to specify the attribute field that contains metadata, which, together with the Numeration Field, unambiguously defines the polygons in relation to each other within the layer.

Also, in the Settings part, you can check the **Mark Areas Less Than** box and with it, add a limit value for areas. These areas, after the division is done, will be selected. If the **Only Divided Parcels** box is checked, then the newly created layer will consist of only the polygons (parcels) included in the division.

After the dividing procedure has finished, the **Parcel Labels IN/OUT** option allows all the parcels included in the division process to be labeled as IN, while all the parcels/polygons that did not participate in the division, to be labeled as OUT. This gives more visual clarity about which parcels were included and excluded from the process, as well as giving the oportunity for the user to separate them later, in a separate layer.

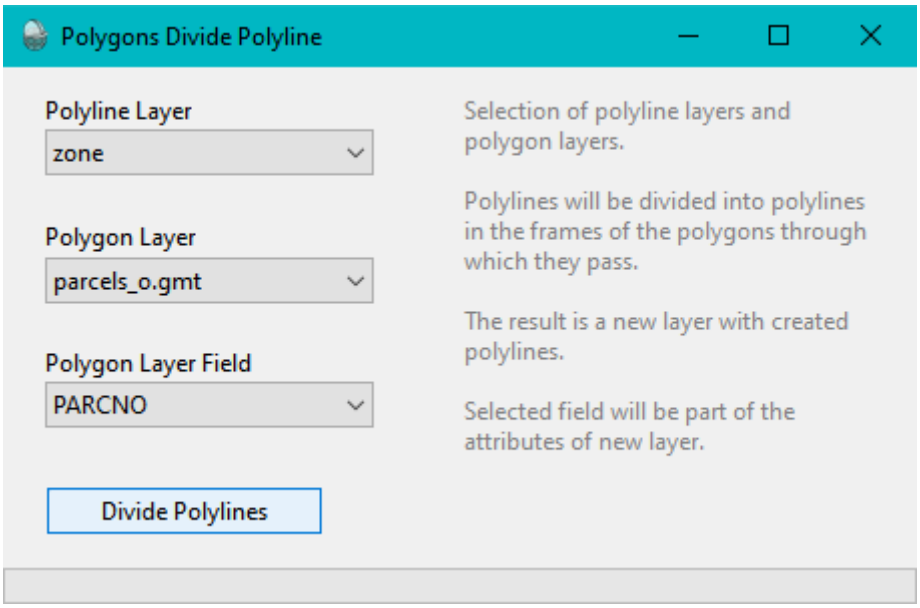
The actual division will be executed with clicking on the **Divide Parcels** button. While the procedure is ongoing, the user can monitor the progress on the Progress Bar. When the procedure is finished, the action form needs to be closed, and in the **Layers List** you will find a new layer that contains the output of the procedure, will be created.

If we select the layer and turn the Labels on, with Numeration Field we can preview all newly created parcels with their corresponding newly created Parcel Number.

This layer can be saved in one of the supported **SGIS** file formats through the Save As function.

▪ Polygons Divide Polylines 

The function **Polygons Divide Polyline** creates polylines that are divided by polygons. To initiate the procedure, the user needs to activate the corresponding pop-up form.



Inside the new form, the user needs to perform the following steps:

1. Define the layer of polylines: Select the desired polyline layer from the available options.
2. Define the layer of polygons: Choose the appropriate polygon layer from the available options.
3. Set an attribute field value: Select an attribute field value from the list of attributes of the polygon layer. This field serves as a link and is typically used to uniquely identify each polygon.

The result of the operation is multiple polyline elements, each described with the attribute value field "Length." Each polyline element represents a line segment that passes through a specific polygon.

The relationship between polygons and line segments is determined by the attribute value chosen by the user, such as "Parcel Number."

For example, if the user selects the attribute value "Parcel Number," the table of attributes will display the length of each line segment that passes through a parcel with the number 1455. In cases where multiple line segments pass through a single polygon, each segment will be displayed as a separate element with its corresponding length.

▪ Extent View to Raster File 

The **Extent View To Raster File** function allows you to export the current view extent as a JPG or PNG raster file.

When you activate this function, an open dialog form will appear where you can specify the desired path and filename for the exported raster file.

▪ Extent to PDF 

The function begins with a new dialog form where the user specifies the path and name of the desired view extent. Once entered, a new form appears for defining the settings of the PDF file.

Inside the form, the user has the option to choose the title of the extent outline, provide a description of the element or object, and specify the name of the worker.

Additionally, the format and orientation settings for the PDF file can be defined according to the user's preference.

▪ Sum Of Areas 

This function calculates the total area of polygons. It can only be activated when the active layer consists of polygon elements. Additionally, one or more polygons must be selected.

The sum of the area will be displayed in units of square meters, square ar, or hectares, depending on the coordinate units of the active layer (assuming the coordinates are in meters).

Important note: In order to execute this function, it is crucial to select polygons. You can make selections by activating the select mode and adding polygons to the selection list. Selections can be made through various methods, such as directly selecting polygons, applying query conditions, or selecting based on attributes.

▪ Removing Duplicates By Layer 

The Removing Duplicates by Layer function is designed to work with layers containing polylines and polygons. To use this function, follow these steps:

1. Select "Removing Duplicates by Layer" from the Tools menu. This will open a new form on the main screen.
2. Within the new form, select the appropriate layers for the "Searched Layer" and "Condition Layer". These layers will determine which elements will be considered for duplicate removal.
3. Once you have chosen the layers, the "Create" button will become active. Click on the "Create" button to initiate the procedure.

The status bar located at the bottom of the form will display the progress of the new layer creation. This will provide you with information about the process of removing duplicates and creating the new layer.

During the "Removing Duplicates by Layer" procedure, each element (polygon or polyline) from the first layer is compared to the elements from the second layer. The comparison is based on the geometry of the elements, specifically checking if the lines geometrically fully overlap.

Any lines that differ between the second and first layers are used to create a new polyline. This process continues until an overlapping section is encountered again, indicating a duplicate element.

As a result of the "Removing Duplicates by Layer" procedure, a new layer of polylines is created. These polylines represent the differences between the first and second layers.

Important Note: It is important to note that the "Removing Duplicates by Layer" function does not select the differences of polylines or polygons directly. Instead, it creates new elements and a new layer where these differences are displayed.

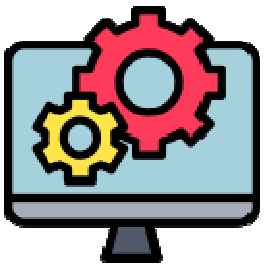
The function identifies the unique elements or variations between the two layers and generates new polylines to represent these differences. These newly created polylines are then saved in a separate layer, allowing users to visually analyze and work with the distinct elements present in the second layer compared to the first layer.

This approach ensures that the original layers remain unchanged while providing a clear representation of the differences between them in a separate layer for further analysis or editing purposes.

SGIS Desktop Release 1.3

Chapter 2.8

PROGRAM

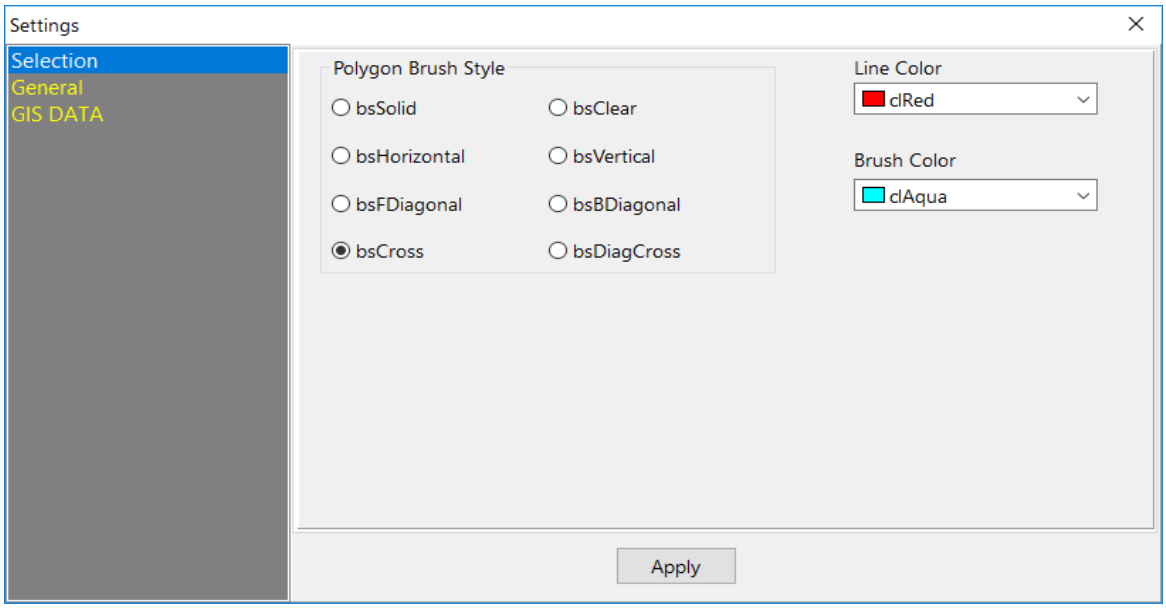


The Program or SGIS software configuration settings, refers to the process of customizing and setting up a GIS software environment according to specific user requirements and preferences. It involves adjusting various settings, options, and parameters within the software to optimize its functionality and align it with the user's needs.

▪ Options

In the **Options** form, users can access the fundamental settings of SGIS. These settings can be customized to meet the specific needs of the user. The form consists of three tabs: "Selection," "General," and "GIS Data."

In the **Selection** Tab, users can find options related to the appearance of selected polygons. They can customize the type of polygon fill, the default color for selected elements, as well as the color and style of the polygon fill for selected elements.



In the **General** Tab the following settings are available:

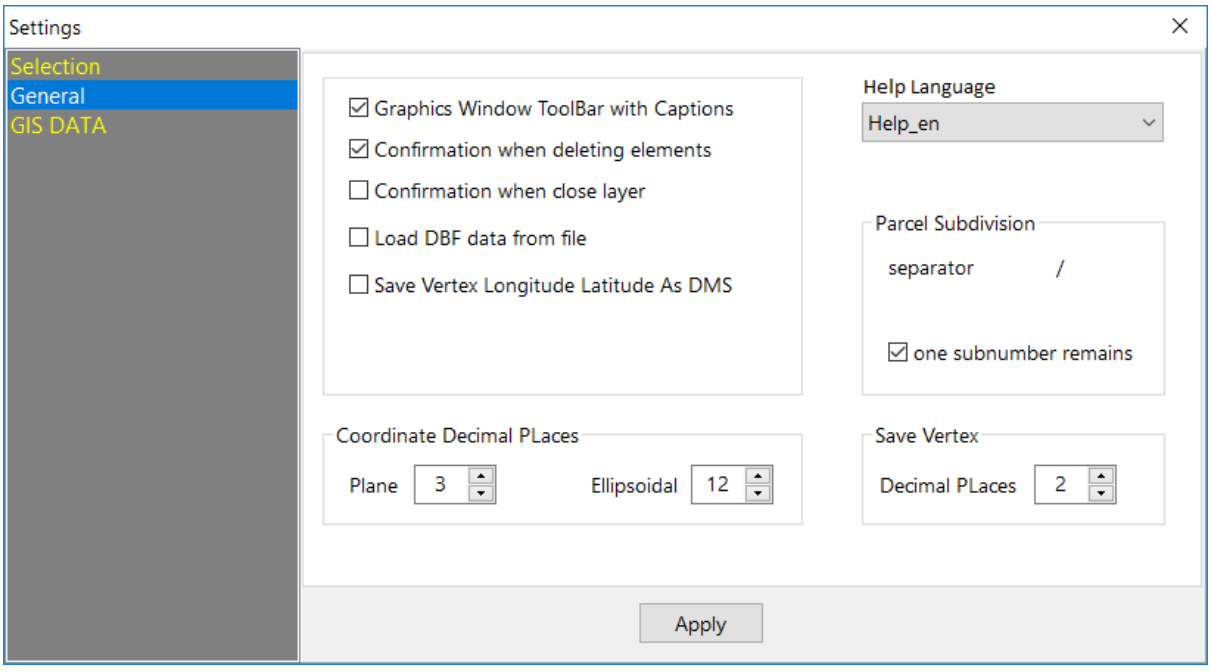
Graphics Window ToolBar with Captions - The "Graphics Window Toolbar with Captions" option allows users to toggle the display of captions on the ribbon toolbar. By enabling this option, captions will be shown alongside the icons on the toolbar, providing descriptive labels for each tool.
Confirmation when deleting elements - The "Confirmation when deleting elements" option enables a confirmation message to appear when deleting elements. When this option is enabled, the software will display a prompt or dialog box asking for confirmation before permanently deleting any selected elements. This helps prevent accidental deletion and provides an additional layer of precaution when making changes to the data.
Confirmation when close layer - The "Confirmation when close layer" option provides a user confirmation when closing layers. When this option is enabled, the software will display a prompt or dialog box asking for confirmation before closing any selected layers. This helps prevent accidental closure of layers and allows the user to confirm their action before proceeding. It serves as an additional precautionary measure to avoid unintended loss of data or changes to the layer structure.
Load DBF data from file - The "Load DBF data from file" option determines whether the table of attributes of a loaded SHP (Shapefile) file should open directly from the DBF (dBASE) table or not. When this option is enabled, the software will automatically open the attribute table directly from the DBF file associated with the SHP file. This allows for faster access to the attribute data without any additional steps. On the other hand, if this option is disabled, the software may load the attribute data from a different source or may require manual intervention to access the attribute table. Enabling or disabling this option depends on the user's preference and workflow. If quick access to the DBF table is desired, enabling this option would be beneficial. However, if there is a specific reason to load the attribute data differently, the option can be disabled.
Save Vertex longitude Latitude As DMS - The "Save Vertex Longitude Latitude As DMS" option allows the user to specify the format in which the vertex coordinates of ellipsoidal coordinates should be saved. When this option is enabled, the exported vertex coordinates will be saved in the format of Degrees Minutes Seconds (DMS). This means that the longitude and latitude values will be expressed as degrees, minutes, and seconds, providing a more detailed representation of the coordinates. On the other hand, if this option is disabled, the vertex coordinates will be saved in the format of Decimal Degrees. In this format, the longitude and latitude values are expressed as decimal numbers, representing the degrees in a decimal form. The choice between DMS and Decimal Degrees depends on the user's preference and the requirements of the application or analysis being performed. DMS format may be more suitable for certain applications that require a higher level of precision or when working with coordinates that are commonly represented in DMS format. Decimal Degrees format, on the other hand, may be preferred for simplicity and ease of calculations or when working with systems that primarily use decimal representations. Enabling or disabling this option allows the user to control the output format of the vertex coordinates based on their specific needs.

The **Coordinate Decimal Places** setting allows you to specify the number of decimal places to be used when exporting coordinates, whether they are in ellipsoidal coordinates or in a projected coordinate system. When exporting coordinates, it is common to specify the precision of the coordinates by limiting the number of decimal places. This helps to manage file sizes, improve readability, and ensure consistency in the exported data.
By adjusting the "Coordinate Decimal Places" setting, you can control the level of precision for the exported coordinates. For example, if you set it to 2 decimal places, the exported coordinates will be rounded to two decimal places. If you set it to 0 decimal places, the

coordinates will be rounded to the nearest whole number. The appropriate number of decimal places to use depends on the specific requirements of your application or analysis. In some cases, a higher number of decimal places may be needed to preserve the accuracy of the coordinates, especially when dealing with precise measurements or small-scale data. Conversely, a lower number of decimal places may be sufficient for general mapping purposes or when working with larger-scale data. It is important to consider the precision needed for your specific use case and strike a balance between data accuracy and file size or readability when setting the "Coordinate Decimal Places" option.

The **Help Language** option allows you to select the language in which the descriptions and help content for all the options and functions in SGIS are displayed. SGIS provides a comprehensive set of documentation and support materials, including HTML files, video tutorials, and PDF files. The HTML files are dynamic and vary depending on the selected language. During the installation process, SGIS offers a predefined list of languages that you can choose from. This ensures that the software interface and help content are presented in a language that you are comfortable with. If you need to add another language to SGIS, you have the option to do so. This allows you to access the documentation and help resources in your preferred language, making it easier for you to understand and navigate the software. By selecting the desired language from the "Help Language" option in the software's settings, you can ensure that all the help materials and descriptions are displayed in the chosen language, providing you with the necessary support and guidance to effectively use SGIS.

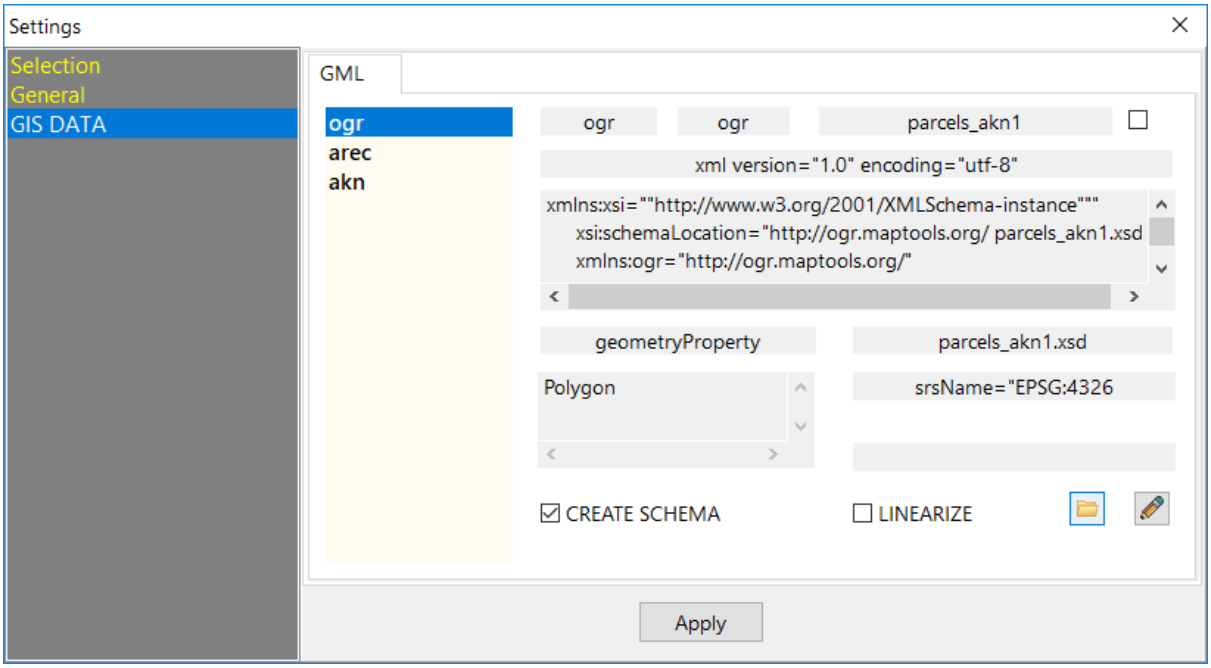
The **Cadastral Parcel Division** option is a significant feature that allows you to handle the division of cadastral parcels effectively. In most cases, when parcels are divided, the newly created parcels require a new number.



In our cadastral system, parcels are identified by a number and a subnumber. By accessing the "GENERAL" Tab in the software's options, you have the ability to configure the separator that will be used between the number and the subnumber of cadastral parcels. This allows you to customize the format of the parcel identifiers according to your specific requirements.

Additionally, you have control over how the subnumbers are distributed during the division process. You can choose whether the first subnumber should remain as it is or be adjusted based on the division. This flexibility ensures that the subdivided parcels are appropriately numbered and organized within the cadastral system.
By configuring the "Cadastral Parcel Division" option in the "GENERAL" Tab, you can tailor the parcel numbering and subdivision process to align with the standards and practices of your cadastral system, enhancing its accuracy and efficiency.

The **GIS DATA** Tab in the software's options is specifically designed to cater to the customization of GML (Geography Markup Language) data based on the user's requirements. It offers several features to facilitate the manipulation of GML files.



One of the key functionalities in this Tab is the ability to create a schema for the GML data. By enabling or disabling the corresponding checkbox, the user can determine whether a schema should be generated for the GML files.

This allows for better organization and structure of the data, ensuring compliance with specific standards or requirements.
Another option available in this Tab is the linearization of GML. By checking or unchecking the box, the user can control whether the GML files should be linearized. Linearization simplifies the structure of GML files, making them more compact and optimized for storage or transmission.

Furthermore, the user has the option to save their preferred settings as a template. This enables them to create a predefined configuration for future exports, streamlining the process and ensuring consistency in GML file generation. In summary, the "GIS DATA" Tab provides a range of options for manipulating GML data, including schema creation, linearization, and the ability to save customized settings as templates. These features empower users to tailor the generation and handling of GML files according to their specific needs and preferences.

▪ Add New Help Language 

The help options in **SGIS Desktop** are provided through HTML files located in a dedicated subfolder. The name of the subfolder follows a specific format, where "xx" represents a language shortcut. For example, if the installation is in English with a license key, the subfolder will be named "Help_EN" and will contain HTML files written in English.

If you wish to add support for another language after installation, you can use this function to create a new subfolder for that language. The subfolder should follow the naming convention, such as "Help_xx" where "xx" represents the language shortcut for the desired language. You can then place HTML files written in that language inside the subfolder. This allows users to access the help documentation in their preferred language, enhancing their understanding and usage of **SGIS Desktop**.

Let's consider an example scenario. You have received an order that includes a Help folder in German (Help_DE), and you have already extracted the folder to a location on your computer.

To integrate this Help folder into the software and make it available for future use, you can follow these steps: Click on the function related to adding a new Help folder. A dialog box will appear, prompting you to select the newly extracted Help folder (Help_DE). Choose the Help folder you extracted and click "OK" or "Select." The selected Help folder will be copied and integrated into the software. From the "Options" menu, navigate to "General" and locate the "Help Language" tool. In the "Help Language" tool, you will see a list of available help languages. Choose the desired language (in this case, German) from the list.

Once the setting is applied, the selected help language (German) will be displayed every time you start the software. By following these steps, you can incorporate the Help folder in the desired language and ensure that the software provides help documentation in that language during each use.

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Chapter 2.9

User Help



The 'Help' section serves as a crucial source of information about the software's purpose, features, and development. These pages provide users with a comprehensive understanding of the software and its capabilities. Here, users can find the official introduction to SGIS, offering insights into the software's origins, development process, and the underlying motivation behind its creation. This is of utmost importance, as it offers valuable background information and establishes a sense of trust and transparency between the software developers and users. Also, it enables users to assess whether the software aligns with their specific needs and requirements. This can be found through the Help pages, as comprehensive documentation that cover various aspects of the software, or through visual video tutorials, which further enhance the learning experience by providing a visual demonstration of different tasks and workflows.

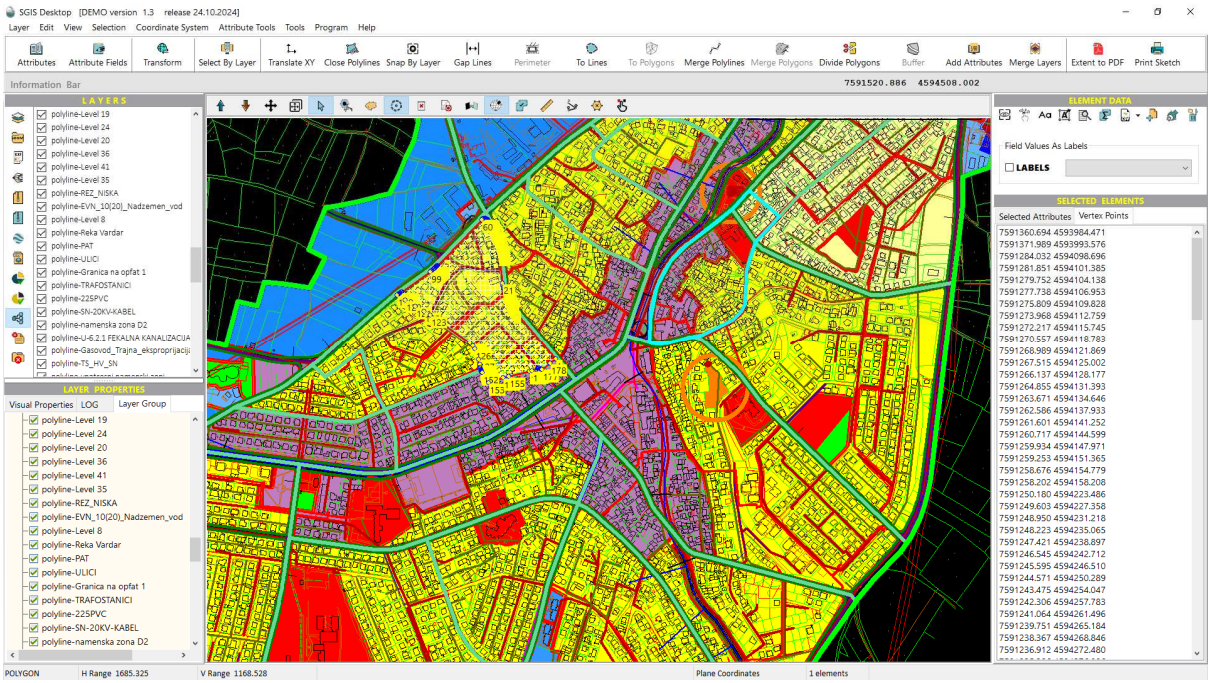
▪ SGIS (Description)

SGIS is designed as a user-friendly and fast software for working with 2D vector GIS data. The core focus in SGIS Desktop is on accuracy and precision, combining CAD functionalities with the expansive capabilities of GIS. Also, the software is speedy both in function and interface. Fast software signifies focus. The absence of delays or lags when activating or manipulating features in SGIS ensures a seamless and uninterrupted workflow.

SGIS enables users to seamlessly load, browse, search, select, visualize, edit, and save data in various supported formats.

The loaded data is organized into layers, with each layer typically containing a single type of element (point, polyline, or polygon).

With **SGIS**, you can import CAD data using the DXF format.



All operations performed on the data are related to the currently active layer (checked and selected in the layer list - LAYERS), which represents the internal structure where the loaded data is stored. Only one layer can be selected in the layer list.

The majority of SGIS operations on the data are performed on the selected or active layer.

The file from which the data is loaded remains unchanged throughout the execution of any function, except when saving the data from the selected layer in the same format using the **Save As** option. Saving the modified data to the same file from which it was loaded is an explicit operation that requires user confirmation. This ensures the preservation of the original data that was initially loaded into the program, avoiding any potential loss.

The rendering of graphics is limited to the checked layers only. This significantly affects the speed of zooming and panning operations when there is a substantial number of loaded files or a large volume of data overall.

Multiple instances of the program can be opened on the same computer.

When loading data into a layer, the coordinates that define the geometry of the elements in the file remain unchanged. To modify the coordinates, you can use the **Coordinate System > Transformation Selected Layer Coordinates** function.

Currently, the available transformations are: Transverse Mercator, Universal Transverse Mercator, Lambert Conformal Conic, and Lambert Azimuthal Equal Area projections. The ellipsoids for these transformations are selected from a predefined list, while the parameters for a 7-parameter Helmert transformation are manually entered by the user in the transformation parameter list. The entered parameters are saved for future use, dynamically expanding the parameter list as required. These transformations are highly precise and can be applied to meet diverse needs.

The coordinates that define the elements can be either Cartesian (in the projection) or geodetic (on the ellipsoid). In the Cartesian system, the horizontal axis is denoted as X

(using mathematical notation, equivalent to the Y-axis in geodetic notation), where coordinates increase towards the east.
The vertical axis is denoted as Y (using mathematical notation, equivalent to the X-axis in geodetic notation), and coordinates increase towards the north.
In the case of geodetic coordinates, the horizontal axis is represented as LON (longitude), while the vertical axis is represented as LAT (latitude).

The set of four values, consisting of the minimum X-coordinate, maximum X-coordinate, minimum Y-coordinate, and maximum Y-coordinate, is commonly known as the layer extent. It defines the spatial range or coverage of the layer, specifically along its X-axis and Y-axis coordinates.

Upon loading a file, its geometry is displayed in the **Graphics Window**. When multiple files are loaded simultaneously, the extent of the displayed content in the **Graphics Window** corresponds to the layer extent of the last loaded file.

The user has multiple options available for navigating the Graphics Window. They can use the **mouse wheel** by scrolling up to zoom in and scrolling down to zoom out. Additionally, they can perform **panning** operations by right-clicking and holding the mouse button. For more precise zooming and panning, the user can hold down the Control (Ctrl) key. To snap to a specific point, the Shift key should be held while interacting with the window.

The **Fit View** option is used to display the entire graphics from all the checked layers. It adjusts the view to ensure that the entire graph is visible within the window.

When drawing polygons as elements that have both boundaries and interior surfaces (color to represent the interior), the drawn graph is overlaid on the previously drawn graph. The order of drawing the elements follows the chronological order of loading each file into the corresponding layer. Therefore, the drawing order aligns with the layer list in the LAYERS section. To control the visibility of the elements, the **Up** and **Down** options allow for changing the order of layers in the layer list, consequently affecting the drawing order of the content within each layer.

Working with layers entails several tasks, including loading GIS files in the provided formats, importing DXF files, importing text data with coordinates and attributes, loading SHP or GML archives, importing KMZ archives, creating new layers from selected or unselected elements of the active layer, merging layers, and saving the active layer in one of the available GIS formats.

With SGIS, you have the ability to perform a variety of operations, including coordinate translation, limiting coordinates to a specified number of decimal places, altering the orientation of elements, closing unconnected polylines, identifying polyline gaps, snapping polylines, adding vertex points, redefining attribute fields, accessing and searching the attribute table of the active layer, applying filter operations, and making modifications. There are multiple methods for selecting elements. Additionally, you can carry out coordinate transformations, export layer coordinates and attributes, convert polygons or polylines to lines, transform vectorized CAD file lines into topology-based polygons, assign attributes, interactively connect lines to form polylines, merge polygons, and perform polygon division.

▪ Video Tutorials

If you are more of a visual learner and wish to access our tutorials, you can conveniently open the comprehensive list, with clicking on this option. This will allow for you to grasp concepts and instructions more effectively through visual demonstrations and examples.

To access the desired tutorial from the list of SGIS video tutorials, you can double-click on a specific video, which will open in the default web browser.

▪ PDF Guide

This function is accessible through the **SGIS Desktop** menu, allowing users to open PDF text files that provide explanations and examples related to various functions in SGIS Desktop. The selected PDF file is opened using the default search key configured in the system.