Miner3D

Release 5

User Manual

DIMENSION 5

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CHAPTER 1

Welcome to Miner3D software!

Miner3D Release 5 software from DIMENSION 5 is an innovative and advanced data visualization software. It was designed to help users to accelerate business decision making, doing sophisticated insights, enabling you to focus on generating ideas and results for business.

Whether it’s the standard and familiar Microsoft® Windows® navigation commands or the clean and uncluttered interface, you’ll find Miner3D software to be a tool that will be mastered in minutes. Beneath the unique and customizable interface, you’ll find a product that is both powerful and flexible.

Visual Data Mining

Today's world produces extremely high amounts of valuable data. The ability to get our hands on relevant, timely information is more important now than ever.

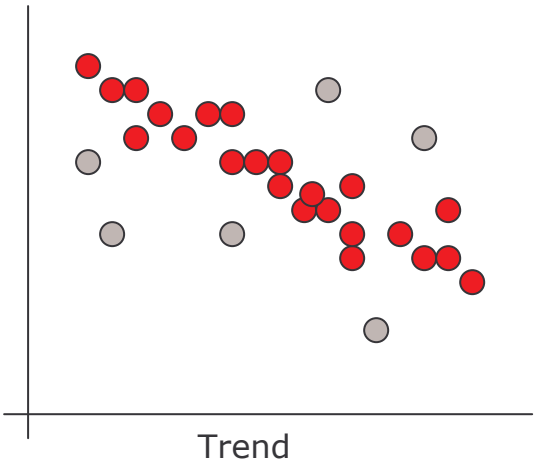
The traditional approach of data analysis is too scientific and too computationally oriented. However, our senses have been developing over thousands and millions years in a real physical world and every live human or animal explore and understand the reality in physical terms.

Size, shape, position, color, dimension, motion and other attributes of the physical world - these are the real signs of what is being to happen. These properties can carry the information with an ultimate efficiency.

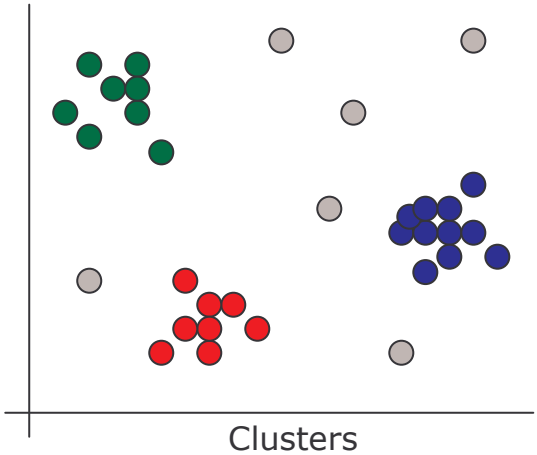
Guess what represents the reality the best way?
(Example of a simple data visualization technique)

Most people do not like statistics at all, but prefer to use eyes, hands or ears. In fact, our ability to perceive vast amounts of information in numerical or textual form is really weak and this is the reason why people find ways to analyze data visually.

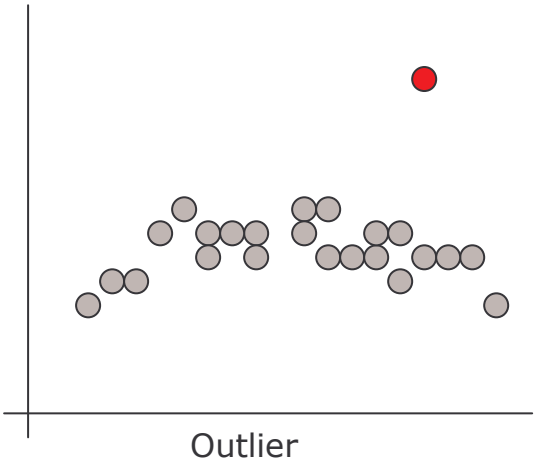
Whether a user realizes it or not, he or she usually tries to find something unusual, unknown, something what is believed to be of a value. One tries to identify a trend, a possible occurrence of patterns, clusters, or even outliers in data.



Trend



Clusters



Outlier

Analyst's hypotheses about data sets can be easily evaluated by simple look at the data model. If a hypothesis is not confirmed, Miner3D software allows a user to quickly modify data model and evaluate a next hypothesis. More, any of model's aspects can also generate series of new indices and a new useful information for creating next hypotheses.

Searching for key information, exploring and analyzing of information sets, and finally presenting, understanding and getting of a solution is a complex process. Data mining and data visualization break barrier and give people chance to see their data from different points of view.

Powerful data visualization is always the corner stone of every data mining process. Well-presented information is understood and accepted in seconds and may be easily turned into a new knowledge.

Miner3D Editions

The Miner3D family of products includes Miner3D Basic, Miner3D Professional and Miner3D Enterprise. All the editions boast a suite of powerful data visualization tools making them a true all-in-one visual data analysis solution.

Feature Availability	Miner3D Enterprise	Miner3D Professional	Miner3D Basic
Power User Interface Multiple-document fully customizable user interface with Auto Hide windows for screen space conservation.	Yes	Yes	Yes
Selector Visual querying through a variety of data selection methods.	Yes	Yes	--
Statistics Real-time Statistics calculated on selected data subsets.	Yes	Yes	--
Principal Component Analysis (PCA) PCA methods used for Data Dimensionality Reduction.	Yes	Yes	--
K-Means Clustering K-Means Clustering and other Data Set Reduction methods.	Yes	--	--
Database Connectivity SQL connectivity to Microsoft Access®, Microsoft SQL Server®, Oracle®, IBM DB2®, MySQL®, Sybase® and other database servers.	Yes	--	--
Microsoft Excel Instant Connectivity Fast direct data and workflow link with the favorite spreadsheet.	Yes	Yes	Yes
Data Picking User can manually pick up specific data points and copy to clipboard.	Yes	Yes	Yes
Movie Recorder Saves the process of refinement of data model, moves, rotations and also Selector visual querying.	Yes	Yes	Yes
Model Templates Available presets for Scatter plots, Bar charts, Lines chart, Tiles, Heat Map and other data models.	Yes	Yes	Yes
Synthesized Speech and Sounds Virtual voice and Sound mapping enables data sonification.	Yes	Yes	Yes

Most Miner3D products can be easily upgraded to a more advanced edition over the Internet. From the Help menu, choose “Miner3D on the Web” and follow the instructions on the Miner3D Store.

Note: *This manual covers features available in all Miner3D editions. Since different editions have different features, more advanced features are marked with special icon.*

What's New in Release 5?

We know you loved our previous software, but you'll be amazed by how much more you can do in this new version and how quickly your projects come together.

What's New in Release 5?

- Multiple-document interface allowing you to display several data models at the same time
- K-Means clustering and data reduction
- A neat, fully customizable User Interface designed for user's convenience
- Auto-Hide Windows that intelligently conserve a screen space
- Improved Principal Component Analysis (PCA)
- Selector with new controls enabling precise querying
- Real-time Statistics with new statistic functions
- Improved Data Reduction methods
- Support for calculated data columns
- Auto-Reload feature for monitoring real-time data feeds

Using Help

Please take a moment to familiarize yourself with the Miner3D online help conventions.

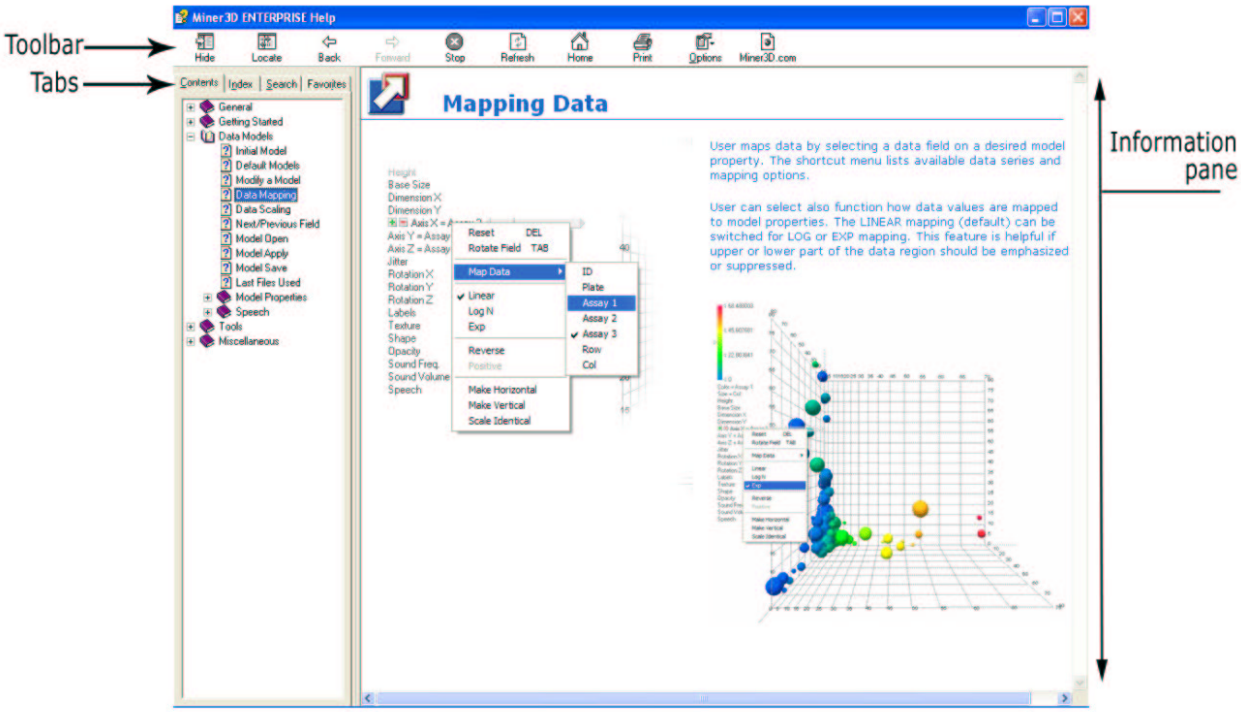
The Miner3D online help contains help for all of the features in the Miner3D software. Additional information can be found in the Miner3D PDF manual located on your installation CD. Information can also be found on the Miner3D Web site.

The Miner3D online help window functions the same as other Microsoft HTML help programs. For information on using the standard window commands, refer to the Microsoft online help.

To access online help, choose Contents and Index from the Help menu or press F1.

> Note: *To view online help, Internet Explorer 4.0 or later must be installed on your system. Internet Explorer is available for a free download from www.microsoft.com.*

The online help window has four tabs that you can use to find the information that you need.



The Contents tab provides a list of available help topics. Double-click a closed book ( ) to open the pages and then click a topic page ( ).

The Index tab provides a complete listing of the help topics available. Scroll through the list of available topics or type a word in the Type in the keyword to find box to quickly locate topics related to that word. Select the topic and click DISPLAY button.

The Search tab allows you to enter a keyword and display all of the topics in the online help that contain the keyword you have entered. Type a keyword in the Type in the word(s) to search for box and click LIST TOPICS button. Select the topic from the list and click DISPLAY button.

The Favorites tab allows you to keep topics that you revisit often in a separate folder. To add a topic to your favorites, click ADD button on the Favorites tab.

System Requirements

In order to use Miner3D software, your computer must satisfy the following minimum specifications:

Software:

- Microsoft® Windows® 2003, XP, 2000
- (Optional) ADO 2.6, 2.7, 2.8
- (Optional) Microsoft Excel 2003, XP, 2000
- (Optional) Microsoft Access 2003, XP, 2000

Recommended Hardware:

- 3 GHz Intel® Pentium 4
- 512MB RAM
- Display resolution 1280x1024 or higher
- OpenGL accelerated video card (NVidia, ATI, 3DLabs…)
- 17" monitor or better
- TrueColor (16.7M colors)
- 3-button mouse or a wheel mouse

Minimum Hardware:

- Intel® Pentium II or higher, or AMD Athlon™ processor
- 256MB RAM
- Display resolution 1024x768
- Hardware video card
- 15" monitor
- HiColor (65535 colors)

Technical Support

The Technical Support has technical skills, reference information, program updates, tips and tricks, and a knowledge base. You may contact support the following ways:

- On-Line Support http://miner3D.com/support/
- Email Support support@miner3D.com
- Telephone +421 33 7331101
- Fax +421 33 7331102
- Mail DIMENSION 5
Hurbanova 36
SK-920 01 Hlohovec
Slovakia
European Union

Installation

Installation from a CD-ROM:

1. Insert the CD-ROM. The setup screen appears (if CD-ROM AutoPlay is enabled). If CD-ROM AutoPlay is not enabled, click the START button and choose Run. In the Run window that appears, type the CD-ROM drive's letter and add :\setup.exe. Click OK to start the installation.
2. Click Install Miner3D. The installation process begins.
3. Follow the screen prompts and enter the necessary information when required.
4. At the last screen prompt, click FINISH to conclude the installation.

Installation from the Web:

1. Obtain the Web-access rights from Miner3D or from your distributor.
2. Download the setup file and save it to your hard disk.
3. Run the downloaded file. The installation process begins.
4. Follow the screen prompts and enter the necessary information when required.
5. At the last screen prompt, click FINISH to conclude the installation.

Uninstallation

To remove Miner3D from your computer perform the following steps:

1. In Windows open START→All Programs→Miner3D
2. Select Uninstall

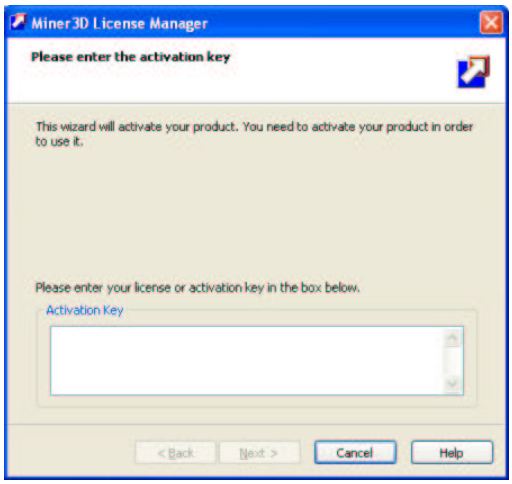
You also can uninstall Miner3D from the Window's Control panel:

1. In Windows open START→Control Panel
2. Open "Add or Remove Programs"
3. Select Miner3D
4. Press button REMOVE

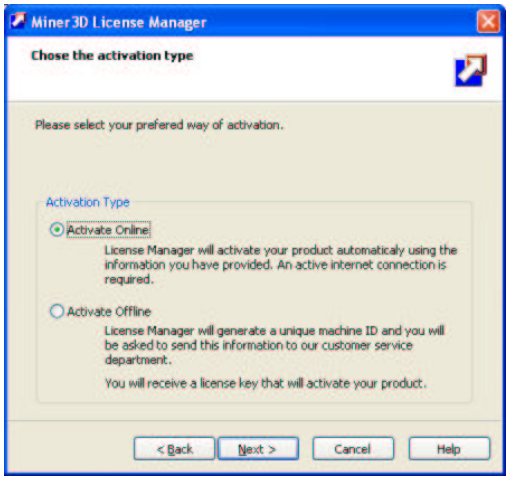
Activation

Upon commencing the installation of the Miner3D product, you will be immediately reverted to the Miner3D License Manager Wizard. The License Manager will activate your product. The activation process is required in order to make Miner3D software usable.

On the first screen you will see an Activation Key box. Enter your activation key in the provided box and press NEXT.

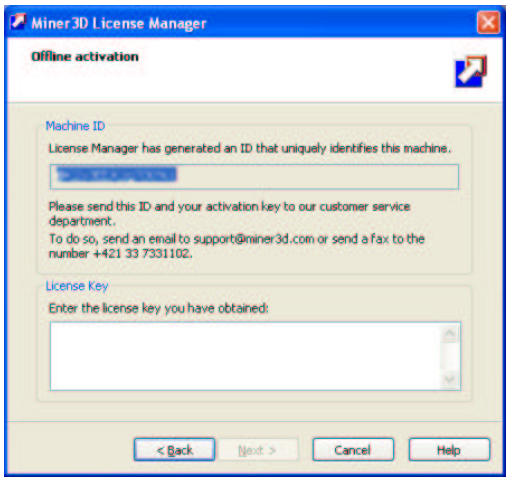


On the next screen, you will select a preferred way of the activation. The Online Activation requires a live Internet connection, but makes the activation process automated and we strongly recommend choosing this option.



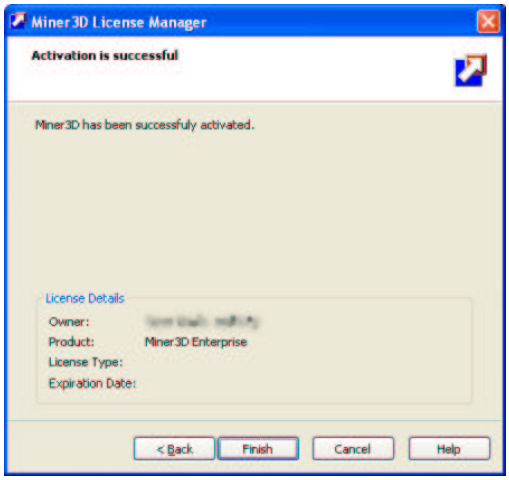
The Offline activation generates an ID code that uniquely identifies your machine. Fax this ID code along with the used Activation Key to +421 33 7331102, or email to support@miner3D.com.

We will send a corresponding License Key the same way (fax or email) back to you.



A final screen will appear informing you that your product has been successfully activated. Click the FINISH button to close the License Manager.

Now you are ready to use Miner3D.



If you experience errors while connecting to the activation server an error screen will be displayed. This usually indicates that you do not have a direct connection to the internet or there is a problem connecting to our server.

If you are already connected to the internet you can usually wait a few minutes which will correct the problem. If the problem persists, or if you believe you have received a message in error, please contact Miner3D support at +421 33 7331101, or support@miner3D.com.

CHAPTER 2

Getting Started

Miner3D software is a new way of doing sophisticated data analyses. Whether you are an experienced data analyst or a budding novice, the powerful features and capabilities of Miner3D software are organized to increase your creativity and productivity.

Inspired by the dashboards of the most advanced aircrafts or vehicles, Miner3D user interface puts all critical controls and information right in front of your eyes. Instead of all the boring technology related things Miner3D will put you right in the center of your data, allowing you to stay focused on doing sophisticated insights, generating ideas and results for your business.

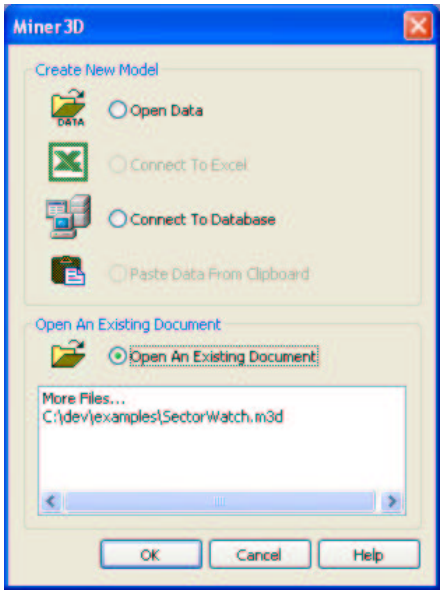
On the next few pages are outlined first basic steps describing the use of Miner3D. We strongly recommend to also look at the provided Examples and Tutorials. These files are a part of the standard Miner3D installation and are usually located in the "C:\ProgramFiles\Miner3D\Examples" subdirectory.

The following chapter summarizes the software's basic functions and operations.

Loading Data

Miner3D is a data-driven software and every single visualization or a picture you will ever create in it, depends on the source data. First you need to load data into Miner3D to be able to create a data model.

After the Miner3D is launched, a start dialog is displayed where a user can select either a Mine3D model (M3D) or a source from where data will be loaded. Miner3D can load data from several different data sources, either a very popular Microsoft® Excel®, common data files (CSV, TXT), common database files (DBF), from a system Clipboard, if it contains a valid data after a CTRL+C operation.



Miner3D Enterprise also includes the SQL database connectivity and can load data from servers like Microsoft® Access®, Microsoft® SQL Server®, Oracle®, IBM DB2®, MySQL®, Sybase® or any other ADO/ODBC compatible data sources.

There is a huge amount of people who use Microsoft Excel as their primary data application. For their convenience, Miner3D installs a new toolbar directly to the Excel's user interface. Pressing the Miner3D button causes Miner3D is launched and commanded to load data from the currently selected cell region.

Please keep in mind how important is to maintain a tabular organization of your data, or a database-like organization of your data. Often users get poor results because of poor quality of the source data. We always recommend to invest some time to the process of data preparation, extraction or re-formatting. The first row of the data table must always contain column names. This header enables you to easily identify data columns by its real names. After this header follow data rows itself.

> Note: *To learn more about a suitable data organization please see also section "Loading Data" in chapter "Using Miner3D Software".*

If you work with real-time data feed, either it is a financial data, or a process control data feed, you can turn on data Auto-Refresh and set a desired time interval, or you also can force the software to refresh data manually.

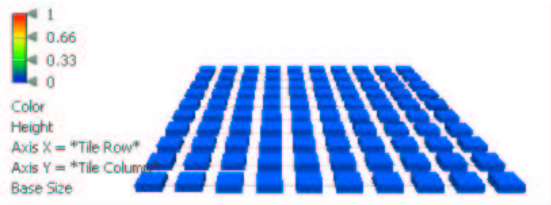
The process of data analysis can be a complicated undertaking, involving tens or even hundreds of data files, images, and special data sets. In the software, organization is handled by a small project file (M3D) that saves information about data source identification (file location or a database connection string) and about data model, which is basically a prescription of how data is visualized. This project file is neither a data file, nor an image file, but is instead used to edit, create or render the data scenes.

Because Miner3D software edits a data model file and not the original data sources, you can modify it without worrying about corrupting your source files. This not only gives you a strong sense of security, but it also gives you the freedom to experiment.

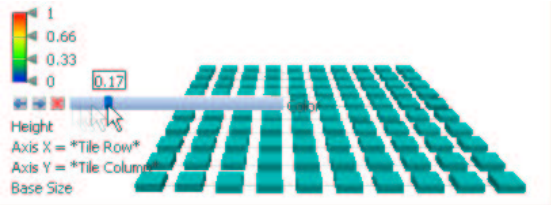
Creating a Model

Where your data is loaded in, Miner3D creates a default initial data model, where data rows are represented as graphic objects (usually balls, or boxes). The software then analyses the data set and identifies most selective columns. These columns are mapped on preferred properties of a data model.

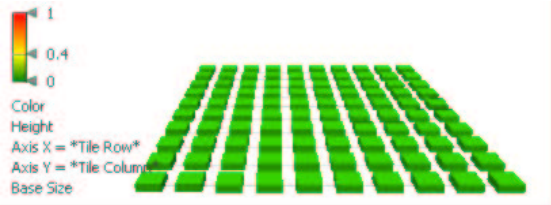
You can always modify the model property data mapping, either via the menu and controls within the visualization space, or using the controls in the Model window. Use click, right-click and drag mouse operations to change the property mapping.



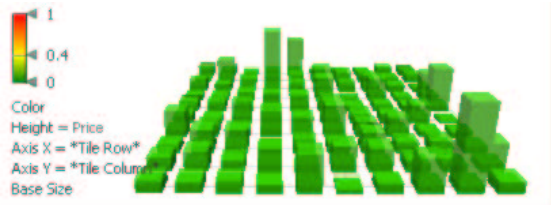
Let's say you want to change the default color from blue to green and also make the objects a bit bigger. You finds the "Color" label and drag it to the right until it reaches the desired color.



Supposed that the data set represents a real sales data, try to map "Price" on objects' Height property. Using a mouse click or right-click you will connect a specific data column to objects' heights.



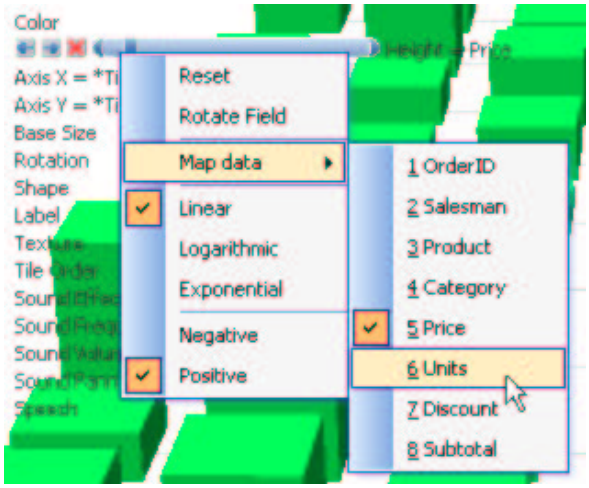
Repeat it until the label says "Height = Price". The model looks like this and you can easily see which records has which price.



Now make the model more interesting by adding another dimension to it. Map column "Discount" to "Color" property. The resulting image will be looking like this:

If click the small right arrow button of the “Height” property, the software will map onto the next available data column. Instead of “Price” the heights will represent “Units”.

You also can use right-click to see a context menu, the follow “Map Data” and choose the data column you desire to see as height. To remove data from the property, click the small red X button, or chose “Reset” from the context menu.



The mathematics behind data mapping allows you to change the linear mapping characteristics to logarithmic or exponential, or by fine-tuning specific mapping parameters.

> Note: *To learn more about all data-driven options of data model properties please see the section “Working with Models” in chapter “Using Miner3D Software”.*

Now try to move the model using your mouse. Drag it to the left, right, top or bottom and the model interactively responds. To rotate it, hold the right mouse button and mouse movements. Zoom the model with middle mouse button pressed (left+right buttons on 2-button mice), or turning a scroll wheel.

Until now we have been working with data driven properties of data objects, but you can also adjust the other properties of your data scenes. Its almost every aspect (color of background, planes, features of data grid, used fonts etc.) can be customized using the controls in the View window.

> Note: *To learn more about all non-data-driven options of data scenes please see the section “Working with Views” in chapter “Using Miner3D Software”.*

Using of Advanced Tools

Miner3D is not just a simple graph-maker. All the visuals the software generates are live and you always can change a position, view, data mappings. A mixture of powerful tools enables a complex data analysis.

Multiple Views

With the Release 5 the Miner3D software supports showing multiple data views at once. This feature allows you to create and see several different graphs built on the same data to see various contexts and explore more relationships hidden in data.

Selector

The query controls of the Selector tool allows you to perform interactive queries with instant feedback of all your data models. You can easily let Miner3D show you only the data that meets a specific selection criteria, e.g. show data where “Discount” is over 10%, or “Price” is between $10 and $100, or only data where a product category is “Beverages”.

This tool can be, especially in combination with Statistics, very helpful when you try to make some simple summary results or you want to explore complex relationships and clusters in data.

Statistics

Often there is a need for basic statistics results and a support for this is also included in Miner3D. More, it is interconnected with all data models and other tools, so you are able to combine the visual information, the information from Selector, with statistics. It is calculated in real-time and supports the other tools and features.

PCA and K-Means

Principal Component Analysis and K-Means clustering will give you more options to process large data sets, consisting either from many rows or many columns or both. These methods allow you to prepare data subsets that are more suitable for data visualization and increase the chance to see good results from your analysis.

Getting Results

Miner3D software is designed to be an interactive tool for doing visual data analyses. Many results, ideas or inspiring indices you can get by simple working with your models. Features of saving pictures, filtered data subsets, reports or movies are available too.

Miner3D software allows you to save your data model in a small M3D file. This file contains all of the information needed to recreate your models: data source file locations, database connection strings, list of all data mappings, setup of the view, etc. Next time you can revert back to your work by opening the M3D file.

You also may use Miner3D as a data filter and then you will need to save only the selected or picked data objects, or all objects with additional information about it selection status, and use it in a successor application. This can be delivered through data output files or Clipboard.

Often there is also a need to save a picture showing data models. You can do that by several ways, by copying an image to the Clipboard an pasting to your target document, or by saving an image file. For those who need to create a publishing-quality pictures there is an option to set the output image resolution and satisfy the requirements for hi-quality publication.

Miner3D can also prepare a video in AVI file format to show a live Miner3D shots during a presentation, or distributed via the Web or included in a 3rd party applications. The software has also a HTML report creation feature included and allows you to set what information is to be inserted to such a report.

> Note: *To learn more about how to save result information please see the section "Saving Results" in chapter "Using Miner3D Software".*

CHAPTER 3

The Miner3D Window

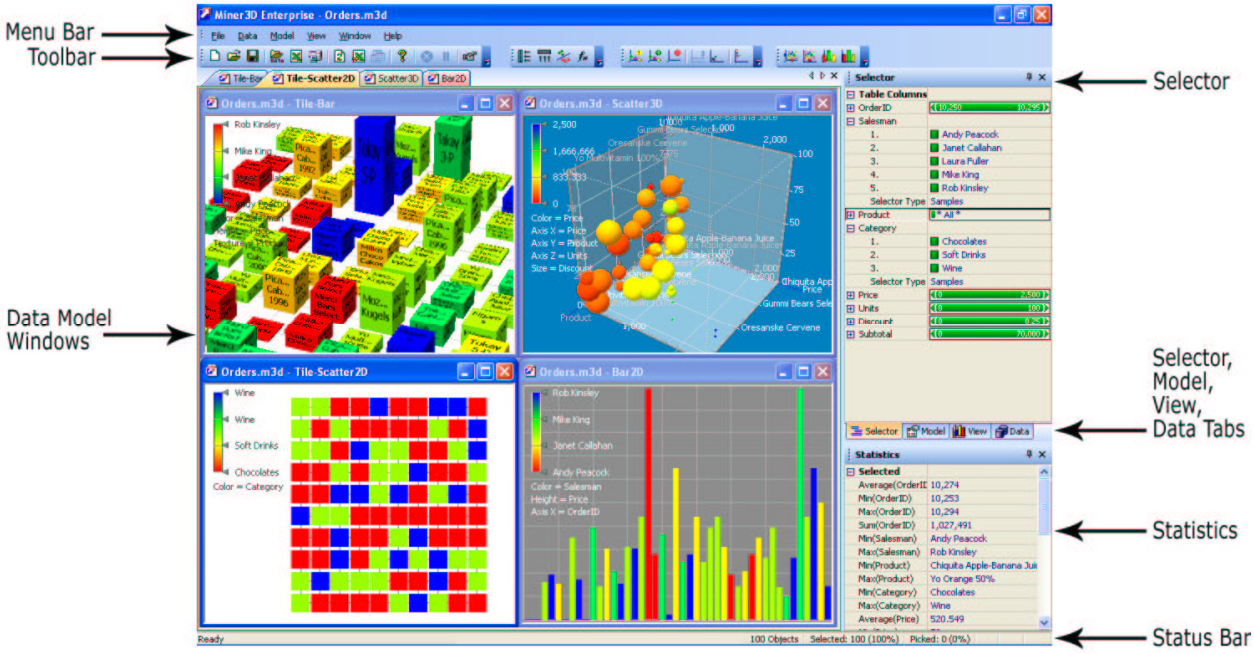
Miner3D software is designed to be an easy-to-use program with many tools that provide power and flexibility when doing data analysis tasks. Many operations, menu items, and shortcut keys are consistent with other popular Microsoft Windows software applications.

The following sections provide a graphical tour of the Miner3D workspace.

Main Window

This is the window that appears when the software opens a data model file. The work area is subdivided into two primary areas: data model windows and tools.

You can create new data models, resize them, switch between tools like Selector, Model, View or Data, you can customize the displacement of the components, change the docking by dragging the windows over a screen.



The user interface comes with built in theme support that will allow you to choose from three popular themes such as Classic, Windows XP and Office 2003.

Docking Areas

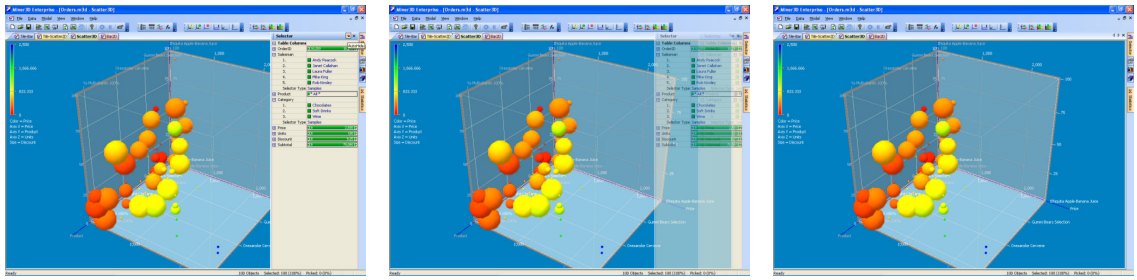
Miner3D software is featured with a sophisticated docking pane user interface. Users can easily “tear off” tabs and auto hide windows that allow for a more manageable application workspace.

The tabbed windows allow you to drag and tear off any of the individual tabs to create new windows that can either float or dock along the side of your application workspace. An outline is drawn to depict where your window will be located when you tear off or combine.

Miner3D provides visual clues as to which pane is currently active or has input focus. When a pane is active its caption area will highlight. The software gives you the flexibility of drag and drop positioning. You can easily drag and drop any docking pane or tab onto any dockable area such as your application workspace or another docking pane.

Auto Hide Windows

Miner3D user interface now also includes Auto Hide windows that provide a unique way for you to make the most of your application's desktop by hiding or showing windows with simple mouse movements.



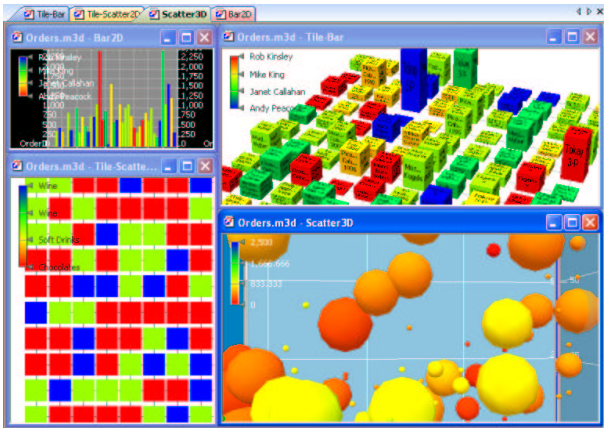
It is so simple: move your cursor over a window’s tab and the window will automatically restore to its original position. Then, when you don not need the window anymore, just click to another part of the user interface and the window will automatically hide.

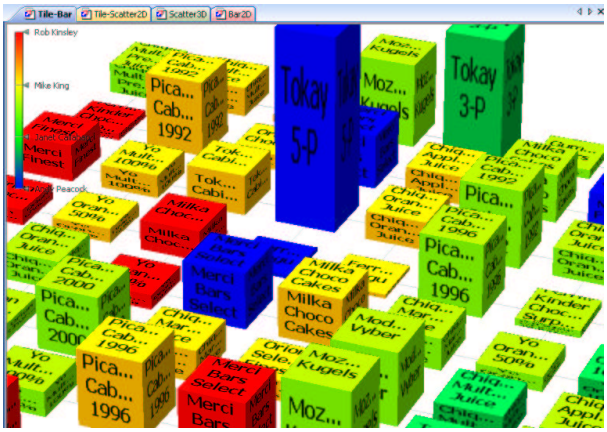
This feature conserves a screen space by virtually multiplying it. It makes the visualizations and tools are always quickly and easily accessible. Those parts of the user interface that are in use are maximized in size to be well and clearly readable.

The user interface components allow you to pin your hidden or floating panes allowing them to stay visible. You can also press the pin to easily hide panes to allow for more area available to your workspace.

Data Model Windows

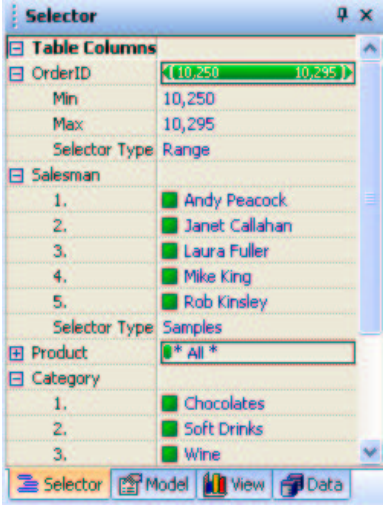
The software's user interface allows you to easily create, access and manage multiple data mode windows at once. Using the standard user interface conventions you can minimize, restore or delete the windows by clicking the buttons at the upper right side of the caption area.





You also can access or activate windows by clicking their tabs in top of the data window area. Under the menu Windows you can select Cascade, Tile, Arrange Icons or directly activate currently available model windows.

Selector Window



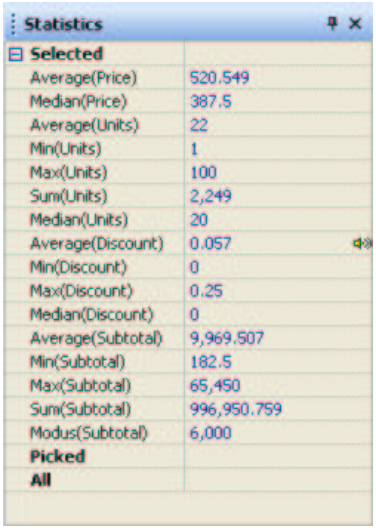
The Selector window is located in the top right area and displays selector controls for all of the data columns that are present in the current data.

You can expand or collapse specific data columns to access detail controls an information by clicking the +/- icons.

To turn on the Auto Hide feature click the Pin icon on top right. To close the Selector click the X button.

Right-click the Selector window area and choose a command from the submenu to change the selector control under the cursor.

Statistics Window



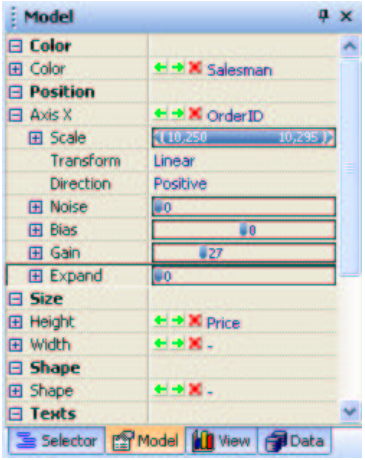
The Statistic window is by default at the right bottom area, but you always can move it to any other location or dock it to the area besides the Selector window.

You can expand or collapse specific data columns to access detail controls an information by clicking the +/- icons.

To turn on the Auto Hide feature click the Pin icon on top right. To close the Selector click the X button.

Right-click menu offers a variety of commands to customize the default content of the Statistics window.

Model Window



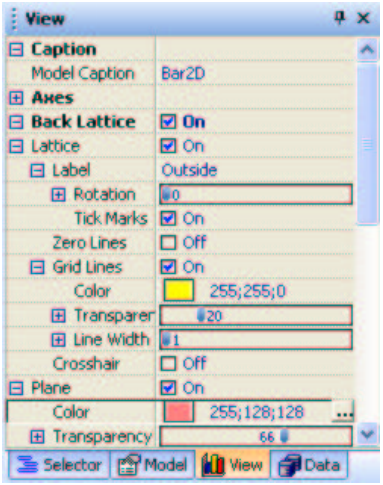
The Model window is located in the top right area and lists all data-driven properties available for the current data model.

You can expand or collapse specific model properties to access detail controls an information by clicking the +/- icons.

To turn on the Auto Hide feature click the Pin icon on top right. To close the Selector click the X button.

Right-click the Model window area and choose a command from the submenu to change the data mapping under the cursor.

View Window



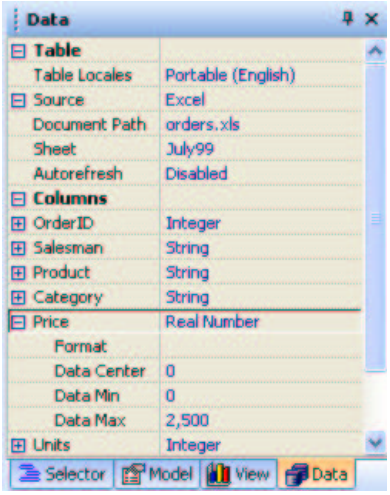
The View window is located in the top right area and lists View properties of the current data model.

You can expand or collapse specific model properties to access detail controls an information by clicking the +/- icons.

To turn on the Auto Hide feature click the Pin icon on top right. To close the Selector click the X button.

Right-click the View window area and choose a command from the submenu to change the selector control under the cursor.

Data Window



The Data window is located in the top right area and lists basic properties of the currently loaded data. You can load another table/view available in the currnt database, or a sheet in the current XLS file.

The list of columns allows you to set a specific format that will be used through the application.

You can expand or collapse specific model properties to access detail controls an information by clicking the +/- icons.

To turn on the Auto Hide feature click the Pin icon on top right. To close the Selector click
the X button.

Right-click the Data window area and choose a command from the submenu to change the selector control under the cursor.

Toolbar

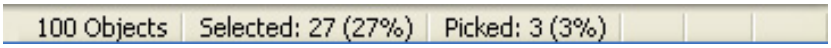
The toolbar allows you to quickly access the most commonly used functions and features. From the View menu, choose Toolbar and Customize to specify the buttons to be displayed.

Button	Description		Button	Description
	Open Miner3D Model file (M3D)			AutoBuild Model
	Save Miner3D Model			Reset Model
	Open Data file (XLS, CSV, TXT, DBF)			Waterlevel
	Connect to Microsoft Excel			Initial Position
	Connect to a Database			Legend
	Refresh data			Scatter 3D
	Activate Microsoft Excel			Scatter 2D
	Select a table, view or SQL query			Bars 3D
	Stop the current operation			Bars 2D
	Pause animation			Lines
	Create Movie			Heat Map
	Define a formula column			Tiles
	K-means clustering			
	Define PCA columns			
	Row reduction			

Status bar

The status bar is located at the bottom of the main program window and displays information about the current data:

- Number of data objects (rows count)
- Number of selected data objects, percentage
- Number of picked data objects, percentage



During any of time-demanding operations, like loading large data sets, texturing, clustering etc, the left side of the status bar also contains information about the progress of the operation.

CHAPTER 4

Using Miner3D

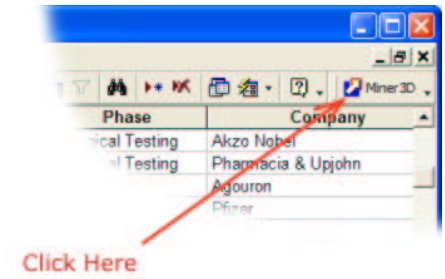
Regardless of your programming skills, statistical or mathematical expertise, Miner3D empowers you to understand trends and relationships in your data. The software makes it easy to create your data visualization masterpieces.

In a few steps, you'll be up and running.

Launching Miner3D

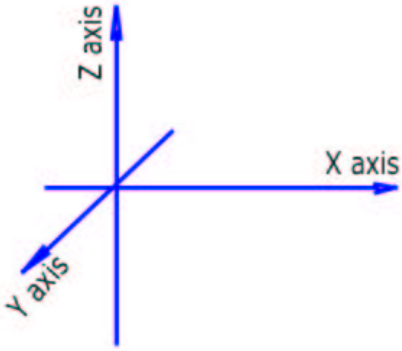
There is a several ways to launch Miner3D:

- Windows Start button, then follow All Programs→Miner3D
- Miner3D icon on the computer's desktop
- Double-Clicking Miner3D Model files (*.M3D)
- Start/Goto button within Microsoft Excel
- Dropping of M3D file over the Miner3D icon
- Dropping of a data file (XLS,CSV,TXT) over Miner3D icon

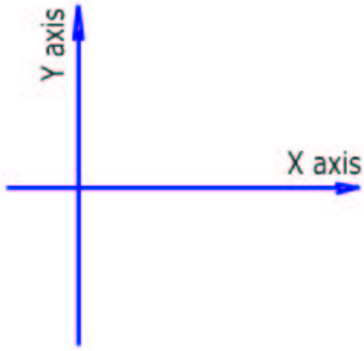


Navigation

This section discusses how to navigate through Miner3D screens in order to perform tasks quickly and easily. To determine the location of points, we first establish an arbitrary point in space as the origin. In data visualization, we say the data point is "left/right", model moves "up/down", or "higher/lower". In fact we move and rotate objects along the three dimensions, the X axis, the Z axis, and the Y axis.



Axes in 3D models.



Axes in 2D models.

> Note: Y-up and Z-up
>
> *In engineering or creative graphics industries, the tradition is to use Y as the "up" or elevation axis, with X and Z as the "ground" axes. However, we use Z as the up axis and X and Y as the ground axes.*

Your computer mouse provides an easy way to rotate, move, zoom data models as well as access all tools on the screen.

- Hold and drag move data model
- Hold and drag to rotate
- Hold (or +) and drag to zoom

You also can use the keyboard, if you like:

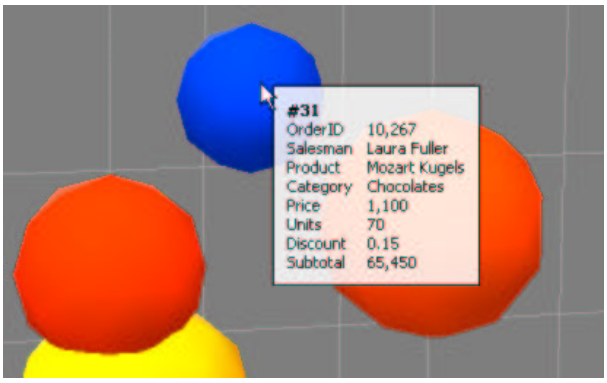
- Click Shift + ← → ↑ ↓ to move data model
- Click ← → ↑ ↓ to rotate data
- Click Ctrl + ← → ↑ ↓ to zoom

In many windows and tools, the function of the click of the right mouse button ( ) is to open a menu which displays a list of options that are relevant to the current screen/application. Selecting a menu option will either perform that command or take you to another part of the user interface where you can perform the command.

Details-on-Demand

To see a complete and exact information on a particular data object press the left mouse button on it. Data details are showed comfortably under the cursor.

This feature allows a user to understand data better and faster while keeping him in focused on a context. This is not disturbing as it is not necessary to running eyes over the whole screen.



If audio properties are deployed in the current data model, then after you click an object you also will hear a corresponding sound effect or synthetic voice speaking out the data details.

Picking Data Objects

At certain points in your work it might be helpful to manually pick out data points of your choice.

- To pick a data point simply press Ctrl + on an object.
- To pick all data points within a rectangle, hold Ctrl and drag to draw a rectangle.
- To protect the previous rectangle pick status, hold Shift while doing a single or rectangle picking.

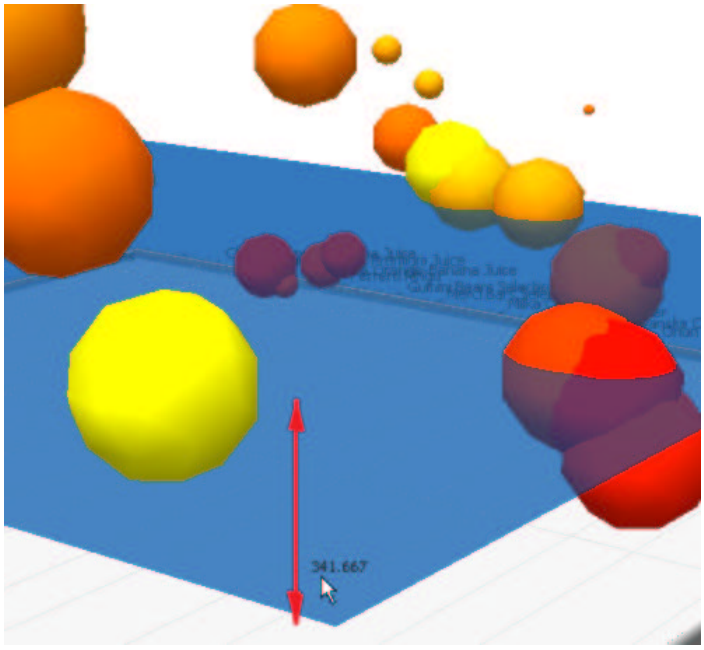
Use right-click over a data object to see a context menu, where you can change the pick status for the current object or for all data. The following options are provided:

- Pick Object
- Pick Invert
- Pick All
- Unpick All

> Note:
>
> *Pick and Selector status can be exported to another applications through Data Copy and used for further processing. This information is also available in generated HTML Reports.*

Waterlevel

Waterlevel is an additional semi-transparent horizontal layer. This level helps user to easier differentiate data objects visualized through graphic properties affecting the Z position in space.



Those properties are Axis Z, Height (Dimension Z), Size (Dimension XYZ). Data objects that are laid over the waterlevel are visible complete, while data objects laid under this waterlevel are invisible or visible only partially.

At the waterlevel is also displayed the actual value that represents waterlevel. Waterlevel supports all data types, numerical, text, date or time.

CHAPTER 5

Data

Miner3D is a data visualization software and every graphic it will create depends on input data. There are several ways of loading data from different data sources that can be accessed by Miner3D.

Data Organization

Because Miner3D presently requires a rowset data representation, it is necessary to pay serious attention to the logical organization of your data. For your success it is crucial to maintain a simple and consistent form of the data. Make sure that your data is in the form, where each column has a label in the first row and contains similar values or texts.

When connecting to databases, you will usually get data in proper tabular form, but many Excel users deploy fully all those exciting formatting capabilities of their favorite spreadsheet and then face serious problems processing data in other applications.

Please remember that, the simpler organization of your data, the better results you can get of it. It is always recommended to invest some time to data revision. Often, just a simple reformatting or reorganization has a tremendous influence on results. You can try to consult with a more experienced colleague or a friend. If necessary, you can contact Miner3D too at the following email address: support@miner3D.com

Below is an example of a data set in a correct tabular form:

Order	Salesman	Product	Category	Price	Units	Discount	Subtotal
10253	Laura Fuller	Chiquita Premium	Soft Drinks	400.00	40	0.00%	16000.00
10254	Rob Kinsley	Chocolate Surprise	Chocolates	90.00	15	15.00%	1147.50
10255	Rob Kinsley	Merci Finest	Chocolates	480.00	21	15.00%	8568.00
10256	Janet Callahan	Milka Chocolate	Chocolates	380.00	20	0.00%	7600.00
10257	Janet Callahan	Oresanske Cervene	Wine	760.00	2	0.00%	1520.00
...	...	...	...	...	...	...	...

Try to avoid organizing your data like this:

Laura Fuller
Chiquita Premium
Soft Drinks
$400.00
40
0.00%
$16,000.00

Rob Kinsley
Chocolate Surprise
Chocolates
$90.00
15
15.00%
$1,147.50

Rob Kinsley
Merci Finest
Chocolates
$480.00
21
15.00%
$8,568.00

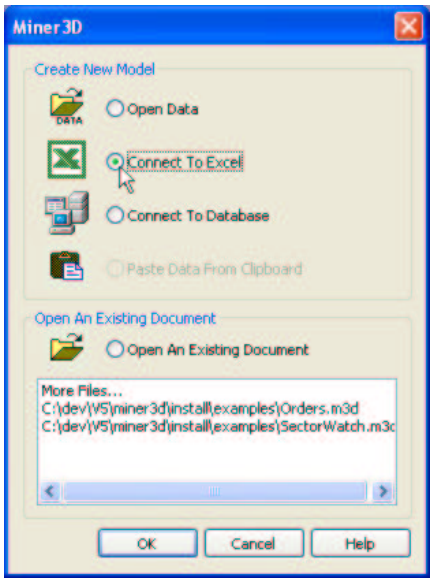
Janet Callahan
Milka Chocolate
Chocolates
$380.00
20
0.00%
$7,600.00

Janet Callahan
Oresanske Cervene
Wine
$760.00
2
0.00%
$1,520.00

Also avoid loading data organized like this:

	Salesman	Laura Fuller			Janet Callahan			Rob Kinsley		
	Price	$400.00	-	-	$380.00	$760.00	-	90	480	-
	Units	40	-	-	20	2	-	15	21	-
	Discount	0.00%	-	-	0.00%	0.00%	-	15.00%	15.00%	-
Product	**Subtotals**									
Chiquita Premium	Soft Drinks	$16,000.00	-	-	-	-	-	-	-	-
Oresanske Cervene	Wine	-	-	-	-	$1,520.00	-	-	-	-
Chocolate Surprise	Chocolates	-	-	-	-	-	-	$1,147.50	-	-
Merci Finest	Chocolates	-	-	-	-	-	-	-	$8,568.00	-
Milka Chocolate	Chocolates	-	-	-	$7,600.00	-	-	-	-	-

Loading Data from Microsoft Excel



Miner3D has included the feature of instant connectivity to Microsoft Excel. The direct data connection to Excel is fast and convenient and many users regularly use it.

This unique feature allows a user to avoid all the boring routine work related to management of data files. The extracting, formatting, copying, saving and loading is obsolete. Instead of this, only a single copy of data has to be maintained and user can fully concentrate on the work itself.

It's not necessary to manually copy and paste data, or to help the system to guess column data types or names. All that work is fully automatic and user has only to select the desired cell regions within Excel and starts Miner3D.

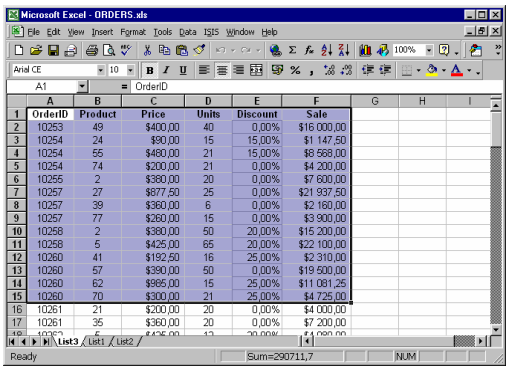
To launch Miner3D from within MS Excel:

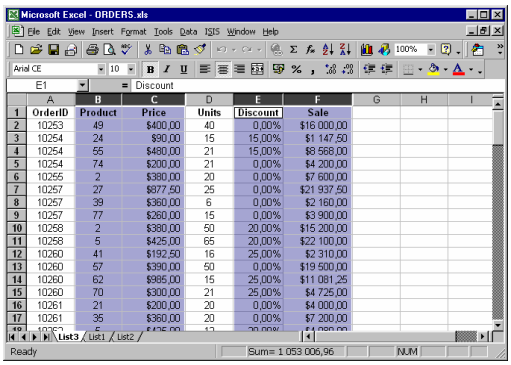
1. Start Excel and open the spreadsheet file you want to analyze.
2. Select cell region containing your data. Excel shows the selected range as highlighted area. Make sure there is a header included in the selection and the first row of the selection contains column names.

> Note:
>
> *Learn more about correct tabular data organization in section "Data Organization" in chapter "Loading Data".*

3. Start Miner3D by clicking the icon on the toolbar.
4. Miner3D automatically loads, analyzes and shows data.

Examples of valid cell selections:



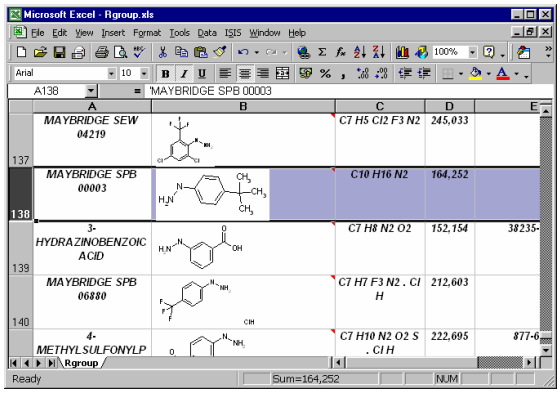


If there is an active data sheet that does not contain a special formatting and starts at the first row with column names, it is not necessary to indicate the selection. Miner3D will automatically find the start and end cells of a data region and load the contents.

If your XLS file contains more than one data sheets, Miner3D connects the active data sheet. To connect to another data sheet, which is not active, activate them for first.

You also can use the Table→Source→Sheet control in Data window to force Miner3D load data from a specific data sheet.

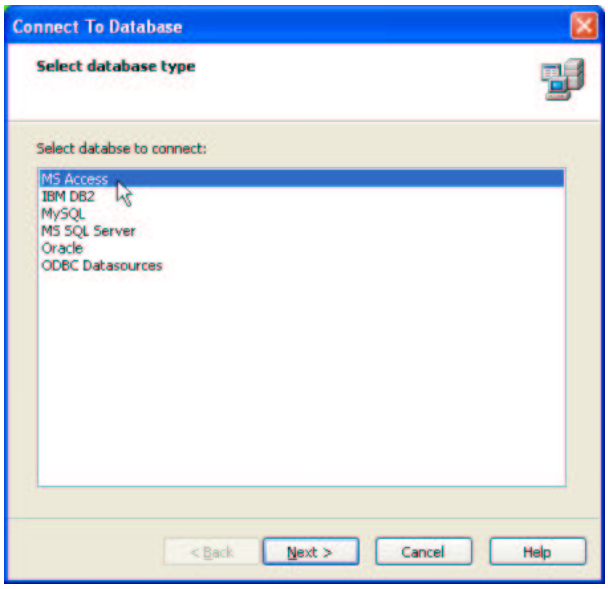
Live Excel connection allows user to deploy also other advanced features: Double-click on a data object and user will be navigated back to Excel to the corresponding data row. This feature allows user to look easily also at objects embedded in the database. The objects could be pictures, photos, document links, chemical structures, Internet links etc.



Loading data from Databases

Miner3D can also load data from database servers available on your corporate network. The software has a direct ADO support for Microsoft SQL Server®, Oracle®, IBM DB2®, MySQL®, Microsoft Access®.

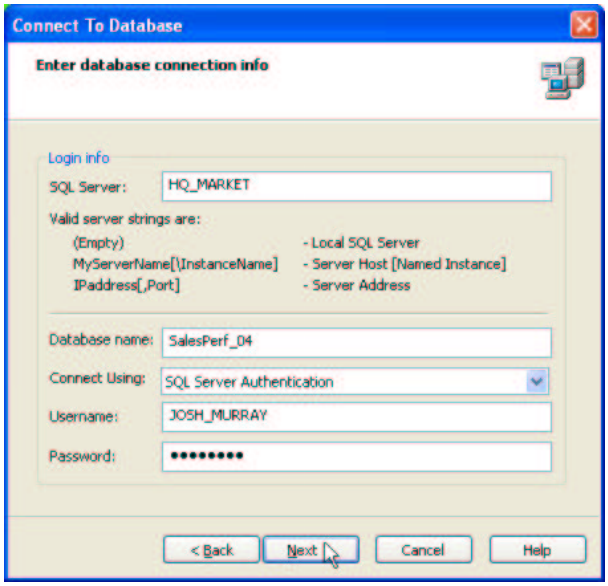
Miner3D can create a data connection also through ODBC, so then virtually unlimited amounts of data sources are reachable and connectable.



First, please make sure to have a valid database access information. Ask your database or network administrator for instructions on how to connect.

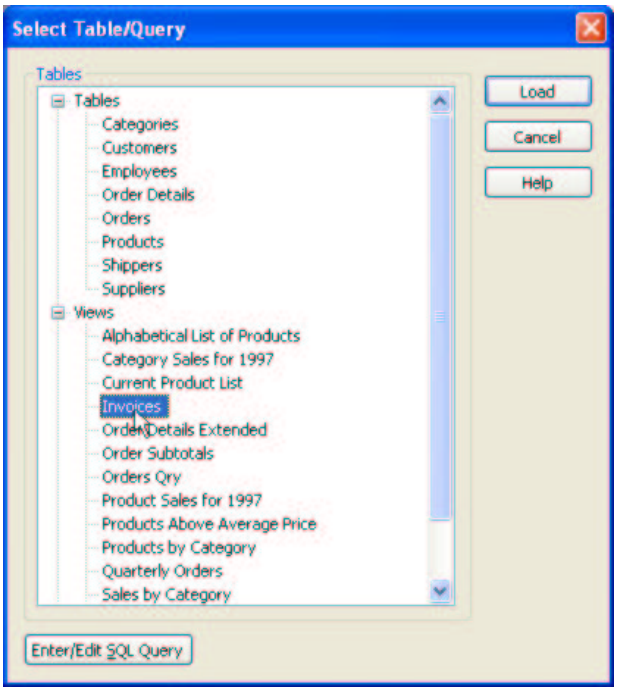
In general, the information consists of a valid host name, or server name, or IP address.

If your server does require additional identification, then a user name and password is required too.



If you will be using ODBC connectivity, then first make sure to have ready that data sources. To prepare an ODBC data source, open START→Control Panels→Administrative Tools→ODBC Data Sources and create or modify a User DSN or System DSN. Then you will find the data source listed in the Miner3D Database connection dialog.

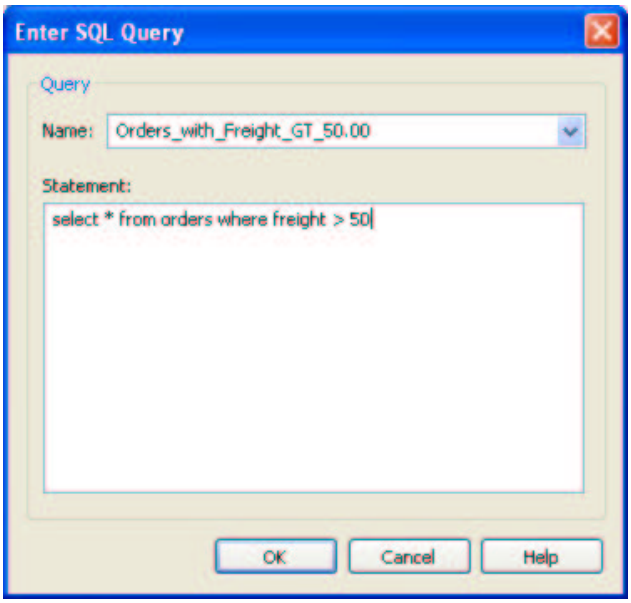
After a successful database connect a list of accessible tables and views is displayed in a Select Table/Query dialog.



Choose the data table or view of your choice to continue loading the data from the desired source.

Click the Enter/Edit SQL Query if you want to run your own query.

In the Enter SQL Query dialog you can create new SQL queries and edit queries that are stored. When you have finished designing your query, you can run it.



When designing a query, be careful about using the real names of tables or views of the currently connected database.

It is also important to use exactly the same SQL syntax as required by your database engine. Watch the documentation of your data source to find that SQL syntax standard and see also examples of its use.

Different technologies use different syntaxes. ANSI SQL-92 is considered a standard widely, but older software can use ANSI SQL-89, or even its own proprietary syntaxes. Contact your database administrator for this information.

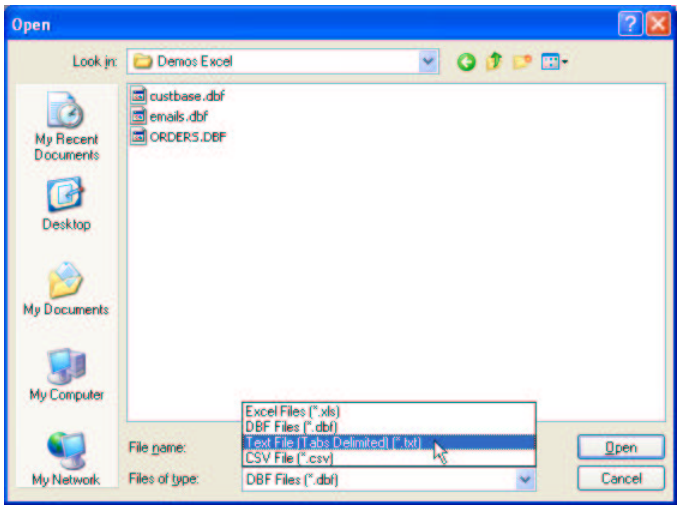
Loading data from Data Files (CSV, TXT, DBF)

Miner3D allows you to work with data files, originated from other applications and other data sources. For that purpose you can use text files and DBF files. The DBF format is also widely supported by many data applications and can be successfully used for data exchange.

There are two commonly used text file formats:

- Delimited text files (TXT), in which the Tab character usually separates each field of text
- Comma separated values (CSV) text files, in which the comma character (,) usually separates each field of text

On the File menu, select Open Data File to open a dialog. In the Files of type box, click the file type of your choice.



Because this dialog is used also for loading Excel data, it lists XLS files as well.

In the Look in list, locate and double-click the text file you want to import.

Miner3D also supports a multi-byte character data exchange and you can load Unicode data files.

Loading data from Clipboard

Miner3D can load data also from Clipboard. Many applications support Clipboard and you can exchange data with them over this channel.

1. In the data source application, select data of your interest. Make sure the data is organized in a tabular data form described earlier.

   > Note:
   >
   > *Learn more about correct tabular data organization in the section "Data Organization" in chapter "Loading Data".*

2. Copy data into Clipboard. In most cases you can use key combination CTRL+C or CTRL+INSERT, or there is a menu item Edit→Copy.

3. Switch yourself to Miner3D.

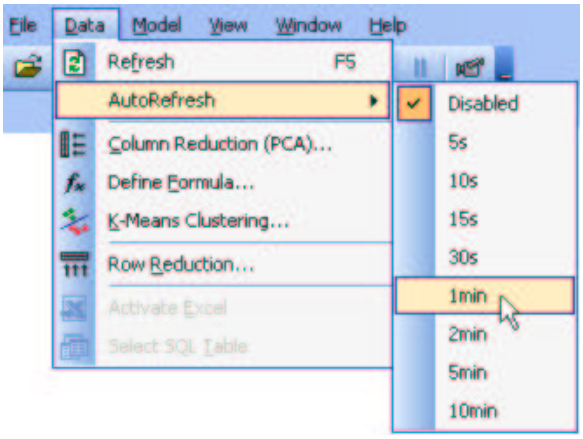
4. Select menu item File→Paste Data, or press keys CTRL+V or SHIFT+INSERT. Data are pasted into Miner3D, then processed and visualized.

Data Auto-Refresh

Anytime you can refresh your data by pressing F5 or choosing menu Data→Refresh.

If you are connected to a continuously refreshing data source, such as a real-time data feed from a stock exchange, or a feed representing a physical process, you can have Miner3D refresh at stated intervals.

Allowable intervals are by 5, 10, 15, 30 seconds and 1, 2, 5 and 10 minutes.



As you know, data often changes. Your data source can be changed in its dimensions or in number of records. Therefore, the data model may show a varying number of rows or columns. You should be careful if you refresh data extensively.

CHAPTER 6

Models

The most critical part of data visualization is a proper development of data model. No software can know which of available graphic properties could reasonably represent the nature of your data.

There are data series that may be perfectly visualized as size of object, but not as a color. Another data series is well displayed as position of objects in the space along X,Y,Z axes.

If a data model can be created very clear and meaningful, it is also very easy to create a very unclear model that makes no sense. This is why a proper selection of attributes of data model is so important. It is highly recommended to pay serious attention to careful model creation.

On the following pages you will learn how data is mapped and visualized in data models using various mapping techniques and various graphic and audio attributes. Ways of detailed setting will provided too.

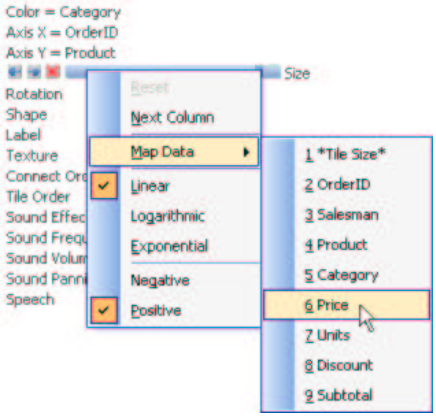
Mapping Data

Data visualization is actually a process of transforming text information into a physical-like scene, where information can be captured through differences in size, color or position of data objects. Human's brain deploy analogies like the following: big cube=big number, small cube=small number.

The process of attaching real data onto series of graphical objects, that were originally identical, causes the objects differ in how they physically look like or where they are located. If there is no data mapped, then the objects are of the same size, same color and same position. The Miner3D visualization engine includes many graphic, and also audio (!) properties, and your data can be mapped to any of large set of data model attributes.

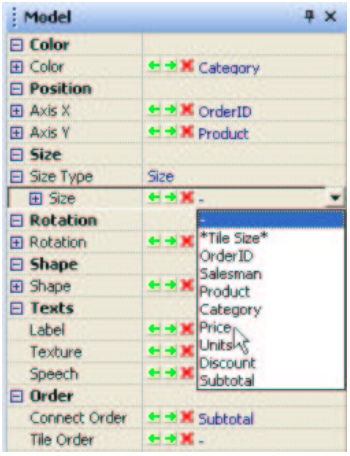
When working with data from "Orders" example, to map "Price" data on "Size" property of data objects do the following:

1. Hold the mouse over the "Size" label
2. Right-click to see the context menu
3. Open Map Data submenu to see the available data columns
4. Choose "Price"

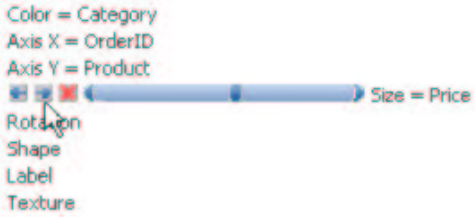


You can do the same within the Model window, that is usually located at top right screen.

1. Left-click the space rightward from "Size"
2. Choose "Price" from the listed data columns



You also can do that if you click the small blue right "Next Column" arrow button. Clicking repeatedly, or holding the button, causes the next data column in your data table is mapped to the corresponding property.



Similarly, clicking the left "Previous Column" arrow button cause the previous data column is mapped to the property.

To remove any data from a model property, click the red X button, or select "Reset" item from the right-click context menu.

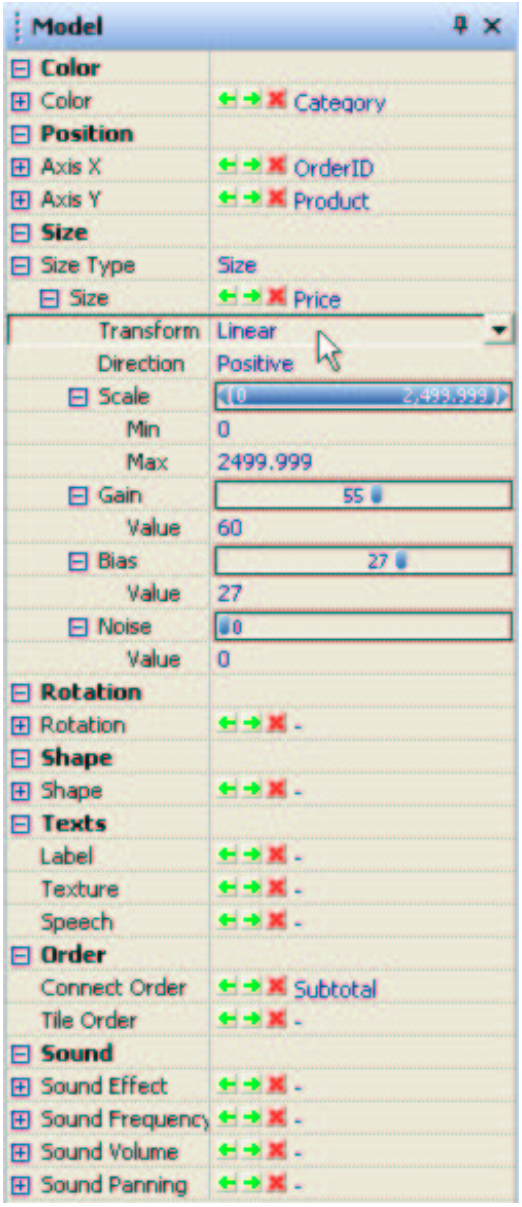
Please remember, that you can map the same data column to more than one model property. For example, "Price" data can be mapped both to "Size" as well as to "Color" property. This helps user to emphasize specific data in the data model.

Mapping Options

Mathematically, there is several ways how to transform data into the graphics. Default mapping transformations can not always fit perfectly to your visualization needs.

Through the Model window you can access several mapping options that are included in the software:

- Transformation:
  - Linear
  - Exponential
  - Logarithmic
- Scale allows you to set the minimum and maximum boundaries
- Gain increases or decreases the amount of how data is transformed
- Bias controls the difference between the lowest and the highest data points
- Noise adds a random artificial distribution to transformed data.



To adjust the mapping options user can access it either by dragging the controls, or by direct entering the numerical value.

Graphic Properties

Data can be mapped to any of a large set of data model properties, or model attributes.

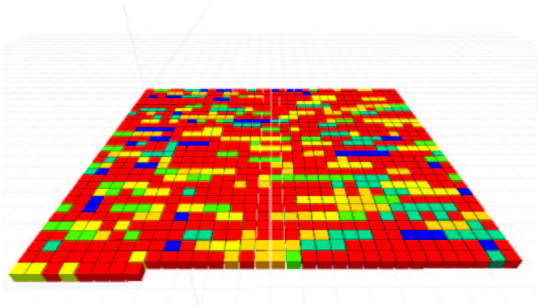
Model properties can be adjusted also if there are no data mapped onto. A user can anytime adjust size, color, shape of data objects to any value, to achieve his or her best idea on how the model should look like.

Available data model properties:

- Color
- Size (Dimension X, Y, Z)
- Height (Dimension Z)
- Base Size (Dimension X, Y)
- Dimension X, Y
- Axis X, Y, Z
- Rotation X, Y, Z
- Shape
- Label
- Texture

Color

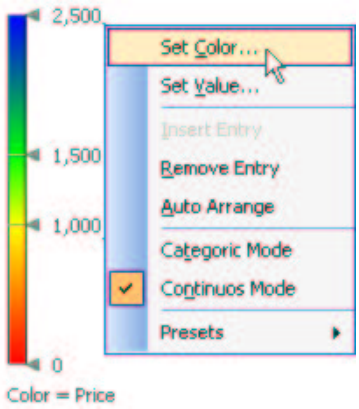
Powerful coloring allows user to create fully customizable color ramp, which is used as a rule how data objects are brushed.

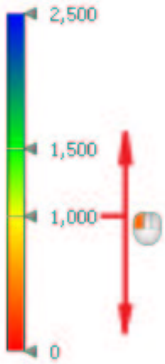


Color successfully communicates data series like “Price”, “Discount”, “Temperature” or “Performance”. It might be well combined with Size, Position or Shape attributes.

Right-click any color entry point or any part of the color ramp to see a color ramp menu.

Using this menu you can modify color ramps, set colors or exact values for color entries, insert or remove color entry, change the mode from Continuous to Categorical and vice versa, or apply any of pre-defined color presets. Every change in the color ramp is immediately updated also on the model.



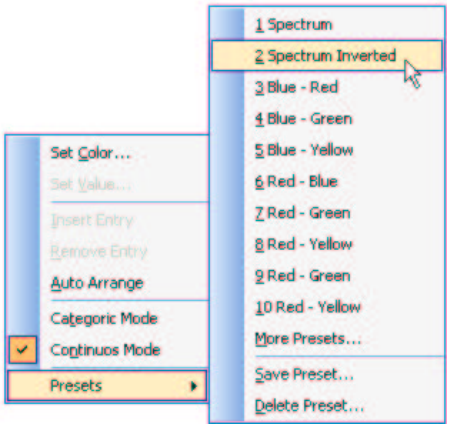


When you drag a color entry up or down with your mouse, the color ramp is continuously changing by setting anew value for a color entry.

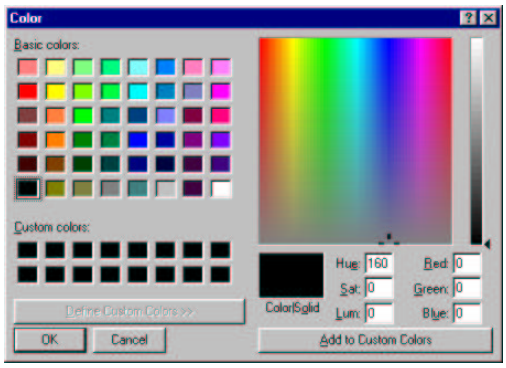
The data model is also being updated in real-time and you can see how data values are displaced over your data set.

As any of other model properties, color supports all available data types (integer, real, text, date, time) and most of available mapping methods.

There is a set of templates with predefined color ramps included in the standard features. User can further customize templates by changing of border colors, inserting color entries, setting of exact colors or values.

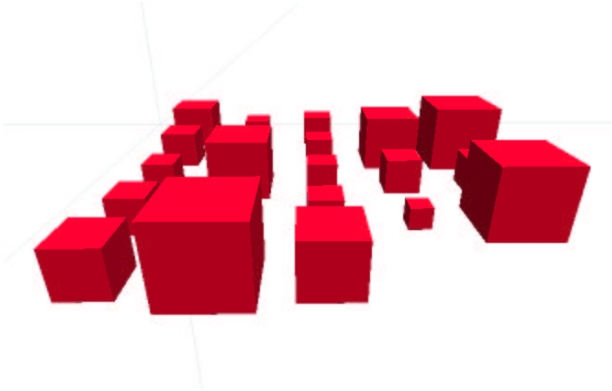


Upon selecting the “Set Color” item a color chooser dialog is opened, where you can select any of more than 16 millions colors.



Size

Size of data objects is affected by data mapped onto, using the common analogy: bigger object=bigger value, smaller object=smaller value.

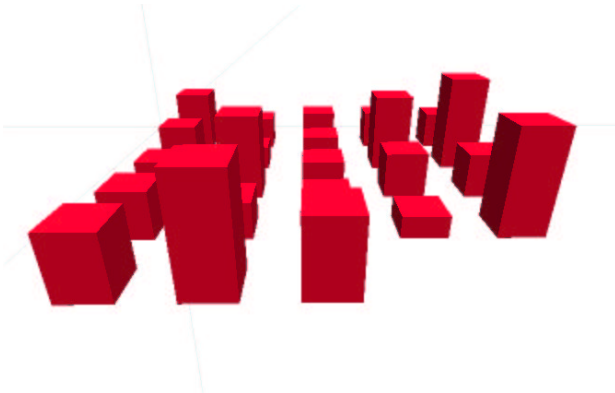


This property easily communicates data fields as "Subtotal", "Investment", "Molecular Weight", or "Project Phase".

It might be well combined with Color or Axes.

Height

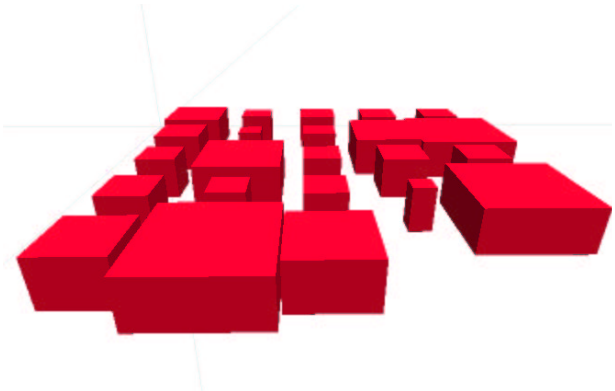
The Height property is similar to Size property. It is identical to Dimension Z, just more meaningful name is used here.



Only the Z-dimension of objects is affected by data values.

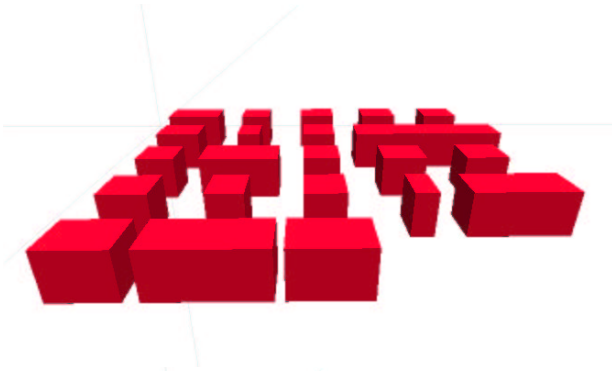
Base

Both X- and Y-dimensions of data objects are affected by mapped data values.

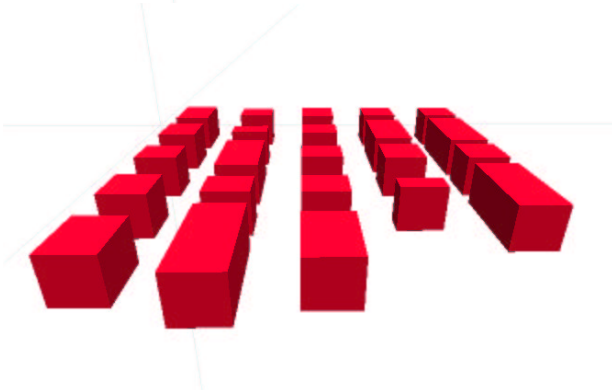


Dimension XYZ

X-, Y- or Z-dimension of data objects is affected by mapped data values.



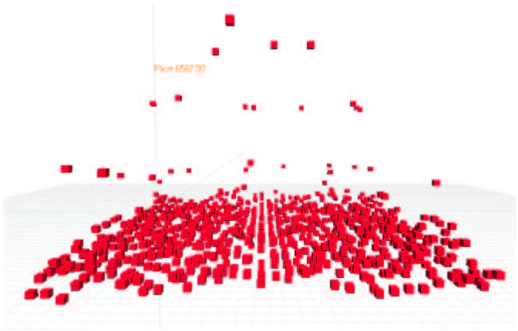
This dimension is widely used for smaller data sets, where data can be successfully mapped directly to objects' dimensions.



On large data sets it is however difficult to perceive rather minor differences in dimensions of data objects. Using of this property is not recommended on large data sets.

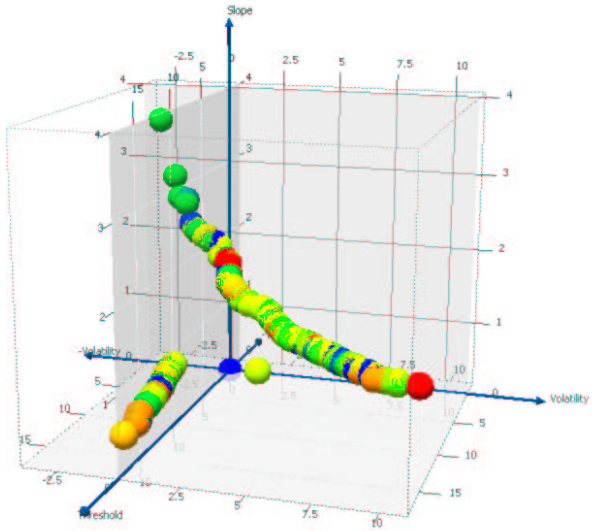
Axis XYZ

Mapping data on axes affects the position o data objects along mapped axes. It allows user to distinguish data by distance from the origin.



X-, Y- and Z-axis mapping is suitable for larger data sets as it is easy to understand the difference in data.

These attributes may be well combined with size and color.

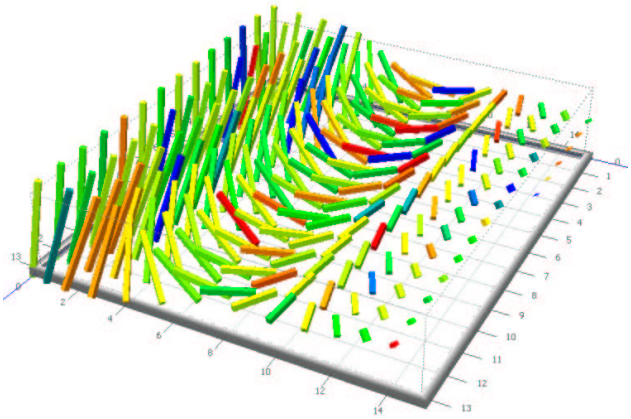


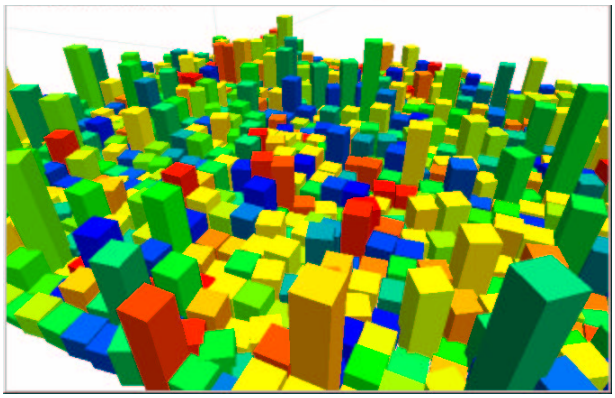
Rotation XYZ

Rotation property allow you to distinguish data by rotation around local axes of data objects.

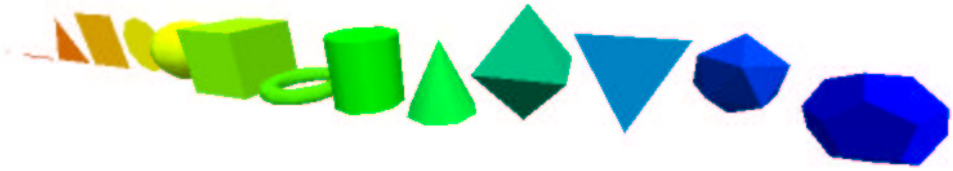
To achieve the best possible model, try to increase related object's dimensions.

Try to combine rotation property with others carefully. Extensive use of rotation mapping in single model might result into an unclear data model, especially if there is a large amount of data points.

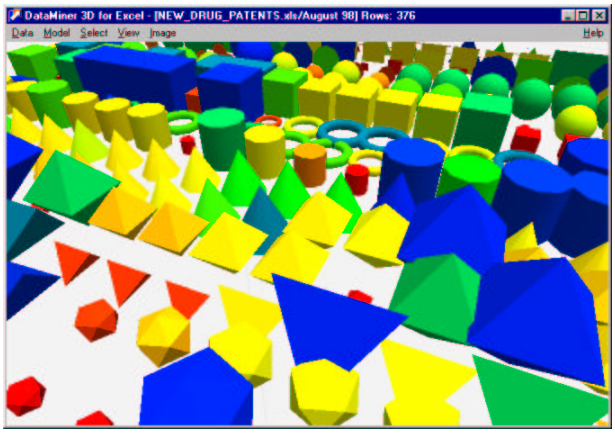




Shape



The system can display data objects as points, lines, triangles, squares, circles, balls, cubes, rings, cylinders, cones, octahedrons, tetrahedrons, icosahedrons, dodecahedrons, shapes of animals, plants, buildings, cars, jets, even humans.



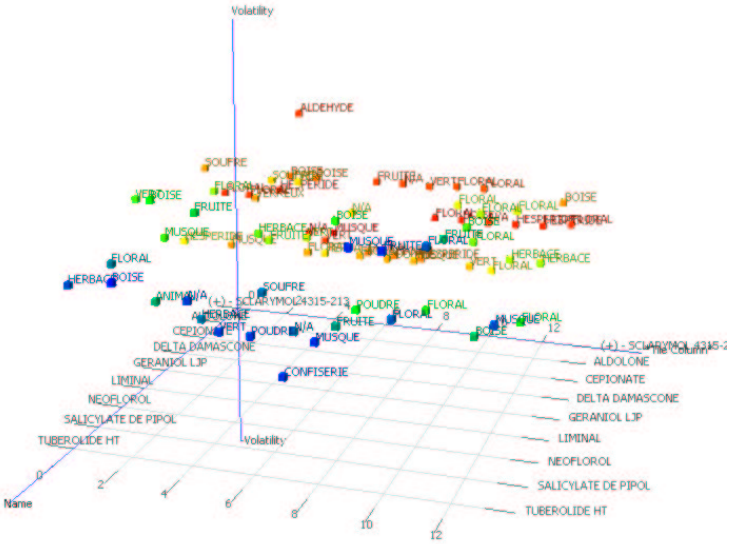
The object shape can successfully visualize data like “Category”, “Product Type” or “Age Group”.

! Please, keep in mind, that extensive use of more complicated object shapes (balls, animals, humans, machines...) eats your computer’s performance and may result into a low interactivity, especially on older computers. It’s highly recommended to install an OpenGL 3D graphics accelerator video card if you plan to use that property regularly.

For very large data sets, try to consider using simpler object shapes (box, square, triangle) in your model. The data model will be faster and will enable more interactive experience.

Label

You can add texts representing any of available data series and annotate data objects by text labels. This feature improves orientation and puts an attractive touch on the model.



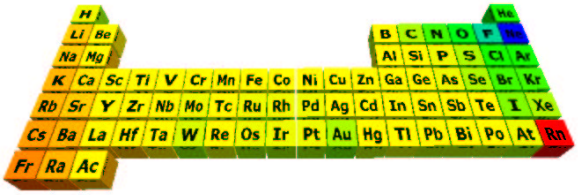
There are two basic types of data labels: 2D and 3D.

Upon right-click over the label property you can set the desired font family, font weight and size.

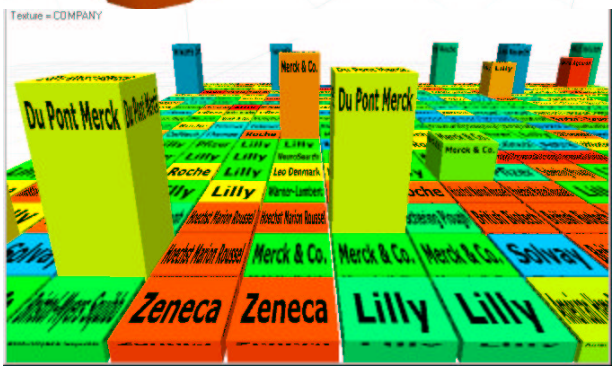
You also can set the labels a specific uniform color or let them be colored by its original data object.

Texture

The system also allows a user to paint original data texts and stick them on object surfaces.



This unique feature will help you create a better-looking data models that facilitate faster and better orientation. It is possible to create texture labels for every supported data type – numeric, text and data and time data.



! This feature requires a powerful computer and may significantly slow-down overall performance on older machines. It's highly recommended to use modern computers with powerful graphics.

Audio Properties

Miner3D also supports data sonification and provides you with an acoustic way of communicating information.

Data values are mapped to audio characteristics of data objects. Clicking on data objects those sounds can be triggered and a user can listen to tones representing the original data values.

Available audio properties:

- Sound Effect
- Frequency
- Volume
- Panning
- Speech

Sound Effect

Miner3D is capable of producing several basic sound effects. Using this audio property you can set the default sound effect. You also can use it similarly as e.g. object shape, to communicate data values through spectra of sound effects.

Frequency

Data values mapped on Sound Frequency are sonified as sounds played at different tone heights.

The higher the value, the higher tone you hears.

The lower the value, the lower the tone you hears.

Volume

Data values mapped on Sound Volume are sonified as sounds played at different volume heights.

The higher the value, the louder the sound you hears.

The lower the value, the subtle the sound you hears.

Panning

Data values mapped on Sound Panning are sonified through stereo speakers.

The higher the value, the more rightward the sound you hears.

The lower the value, the more leftward the sound you hears.

Speech

The Speech Synthesizer enables you to hear detailed information in the most natural form - by listening to a computer voice speaking-out data values upon mouse click.

You can select your favorite voice in the Control Panel, or by installing Text-To-Speech engine of your choice.

Note: *To learn more on how to enable a Speech Synthesis on your computer please look at "System Requirements" and "Troubleshooting".*

Model Templates

Miner3D can save developed data model in a template file and reuse it repeatedly in future.

Model templates keep the information on:

- Data Type Information
- Model Setup
- View Setup
- Color Ramp

It is possible to use data model also for other data sets. Even if the model template was not originated on current data, the software will be able to create a data model.

To save Miner3D model template select menu Model→Save Template. A dialog "Save Model Template" is provided to select a model template name.

Default Models

Currently available default models included in the standard Miner3D installation:

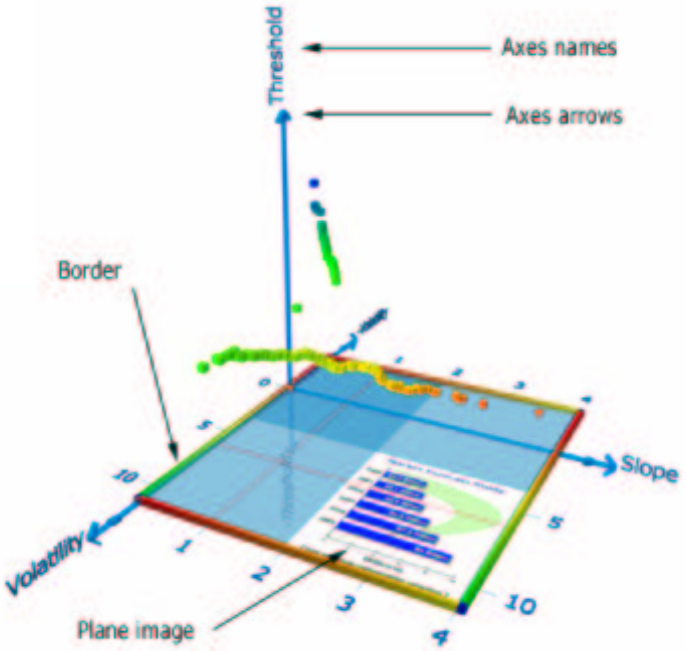
- Scatter 3D
- Scatter 2D
- Bars 3D
- Bars 2D
- Lines
- Tiles
- Heat Map

CHAPTER 7

View

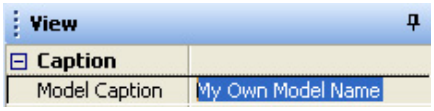
The View window gives a user a complete control over those parts of the data visualization space that is not directly data-driven.

Controls in that window sets axes, labels, lattices, planes, images, borders, fonts etc.

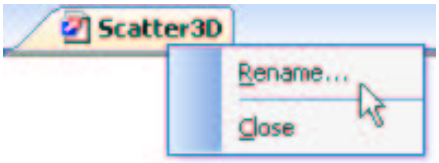


Caption

The Caption section allows you to give your own names to data views. By default, it has a name of the model template that was used at its creation.



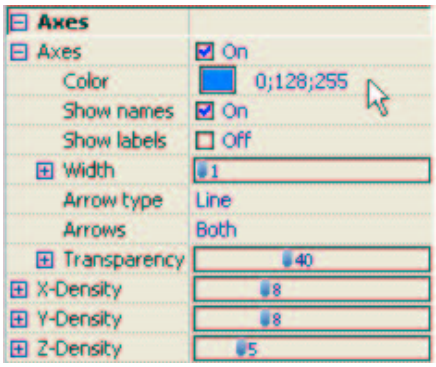
You can change it anytime either by direct editing the Model caption field in the View window, or if you right-click the model's window tab and choose Rename.



Axes

The Axes section controls the axes-related setup.

You can turn Axes On/Off, set its color, line width, transparency, set the ending arrows, turn On/Off names on the ends of axes, labels.

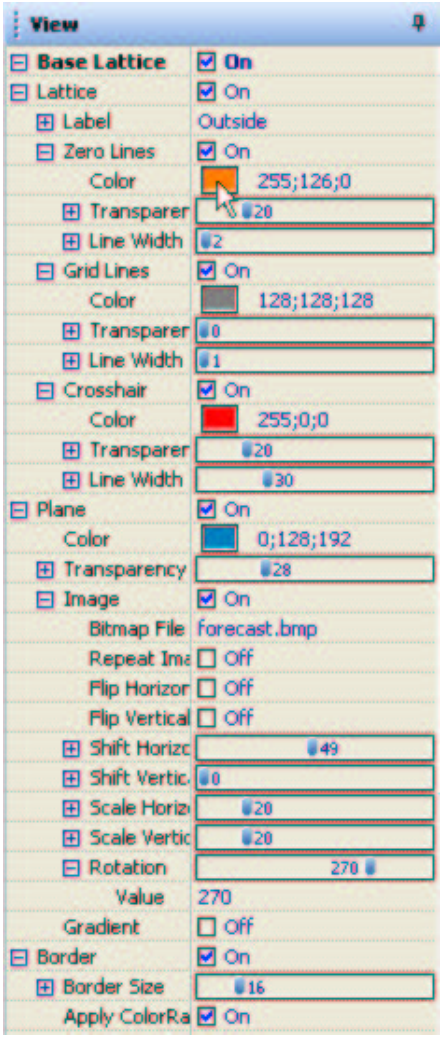


Density controls set the value stepping at the axes, which is basically a number of subdivisions. The density setting controls also the stepping on lattices and other parts of view where applicable.

Lattices

Lattice settings controls the visibility status (On/Off) of all three lattices:

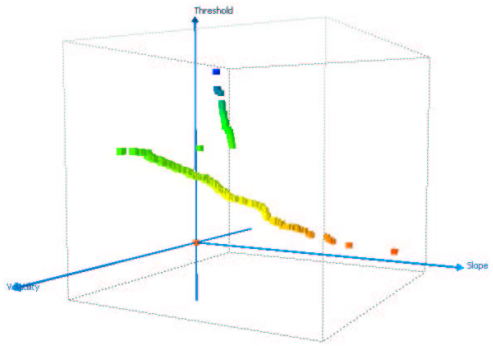
1. Base Lattice is defined by X, Y axes
2. Side Lattice is defined by Y, Z axes.
3. Back Lattice is defined by X, Z axes



Using the View controls you can set a large variety of lattice items:

- Labels: placement options
- Zero lines (lines always in zero position): color, transparency, line width
- Grid lines: color, transparency, line width
- Crosshair (manually aimed lines showing a projected position of a data object on planes): color, transparency, line width
- Plane: color, transparency, image texture, texturing options (repeat, flip, shift, scale, rotation), gradient, gradient options (lead color, fade direction, fade progress, fade speed, transparency)
- Border: border size, color options

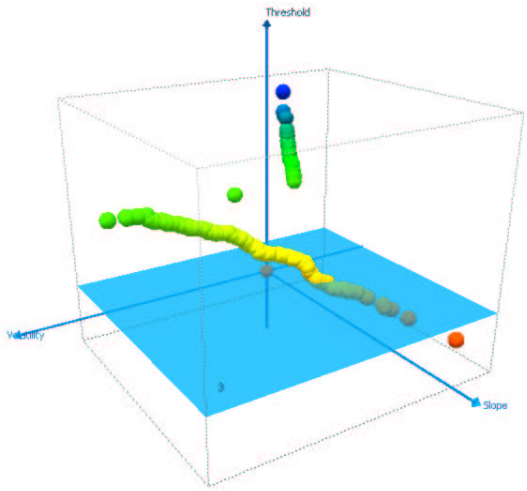
Frame



You can turn On/Off a boundary frame, which helps one to perceive the spatial displacement of data objects.

Control for setting its color is provided.

Water

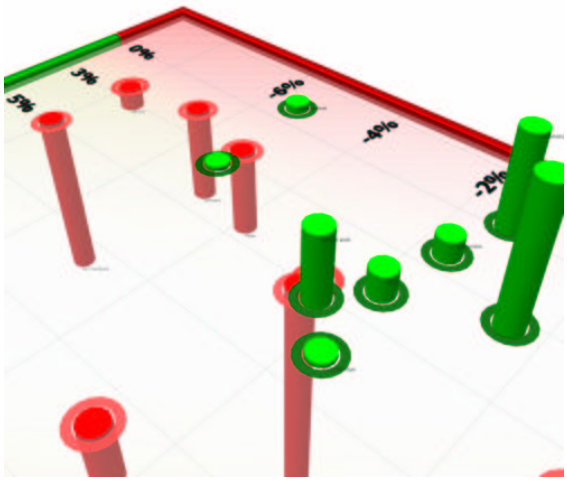


You can turn On/Off a water level plane.

This feature helps one to perceive the vertical displacement of data objects.

Controls for setting color, transparency and exact position are provided.

Collars



In the View window user turns On/Off object collars.

This is a small circular, or rectangle object at the base of data objects. It is used mainly for emphasizing the zero level of 3D bar charts, but can be used also with other types of graphs.

Controls for setting the size and transparency are provided.

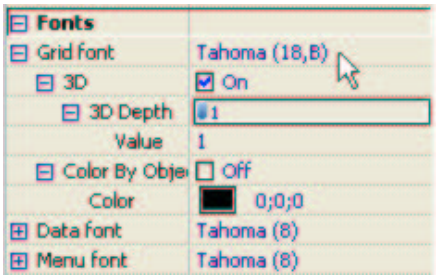
Legend

The control allows user to turn On/Off the property mapping menu displayed at the left top corner of data model windows. It basically consists of a color ramp and a list of properties.

You also can access this feature via the Legend button in the toolbar.

Fonts

The software uses several different text types and you can customize its look by setting a specific font for every of them.

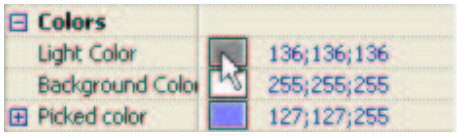


Controls for setting the font family, size, weight, style are provided. User can also choose between flat 2D and 3D fonts, where it is possible to set the 3D depth.

Color can be explicitly defined or Color By Object is chosen to allow texts take its color from a mother object, either it is a lattice, axes or data points.

Colors

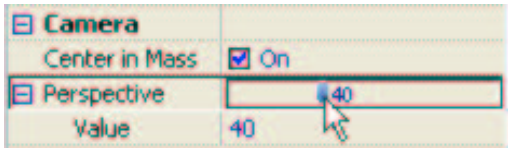
A background color, light and picked objects color can be set using a color chooser dialog.



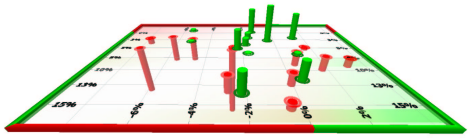
Click on the color boxes to open the color chooser where user can pick the desired color. Click OK button to use the newly selected color or choose CANCEL to close the color chooser without applying the color.

Camera

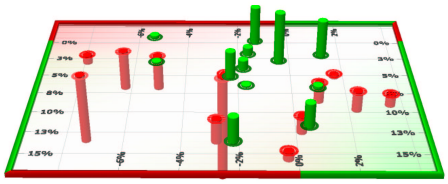
Camera section of the View window allows you to set the origin of the data model and control the perspective.



Perspective slider controls the level of perspective distortion of the camera used in the software.



Various effects can be achieved, from a very distorted image, a "Fish Eye" effect, to almost an axonometric projection with a very low level of perspective.



CHAPTER 8

Selector

Selector is a powerful data selection tool that enables a user to easily "Slice and Dice" your data and display it in a variety of interactive views. It provides a visual and interactive query making and helps to reveal patterns and clusters in data and their layouts and decompositions in data models. This tool, in combination with the Statistics calculator, plays a central role in Miner3D software enabling thorough data analysis with a high level of interactivity and context visualization.

The Miner3D Selector changes the way people are used to perform business intelligence by creating a fast and convenient access to building your own interactive OLAP Cubes. In many types of tasks it perfectly eliminates the need for a traditional query & reporting tools, complicated online analytical processing or for any other separate "heavy-analytics" technology.

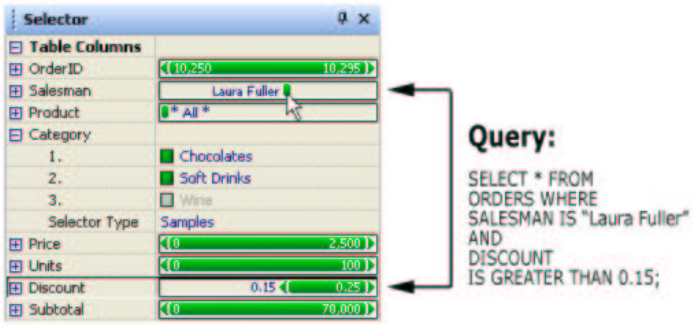
A proper use of Selector and Statistics gives you an easy access to see series, get its summaries, averages and other results that are always provided within the context. After getting known how to use Selector efficiently, you will be able to perform all your business intelligence, build your own OLAP Cubes, multidimensional, statistical and spatial information analyses, as well as customer relationship management (CRM), supply chain and operations, financial and business performance management.

Using Selector

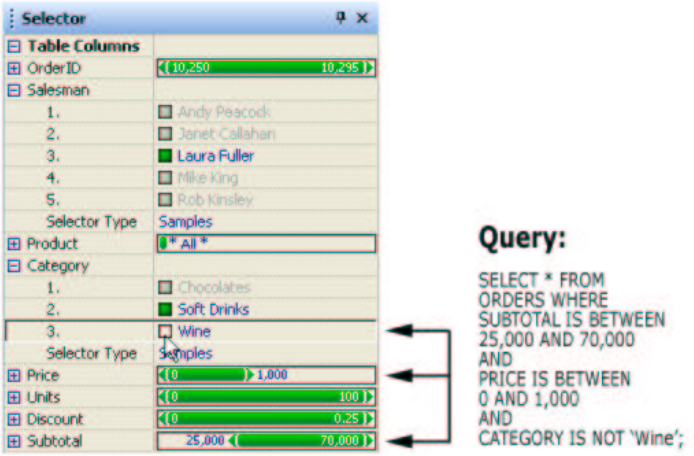
Selector is a visual tool that lists all data dimensions (columns, or fields) present in the loaded data set. From top to bottom, you can find column names and a data selection control right from it. The design of the controls allow you to easily modify the selection criteria, by simple dragging sliders using a mouse, or clicking a button, representing a data sample.

Every action you perform in the Selector is instantly reflected in the rest of Miner3D software: visual data models are immediately redrawn so then only those data points that fits the criteria et in Selector are shown, and Statistics calculator (see the next chapter) is refreshed. This feature allows a user to visually monitor the response of data models.

To enable you create a complex queries it is possible to use a combination of several selector controls at once. In the example right from here is used a combination of an Item slider (Salesman=Laura Fuller) and a Range slider (Discount > 0.15).



Another example shows use of two Range sliders (Price < 1,000 AND Subtotal > 25,000) and a Sample control (Category <> 'Wine').

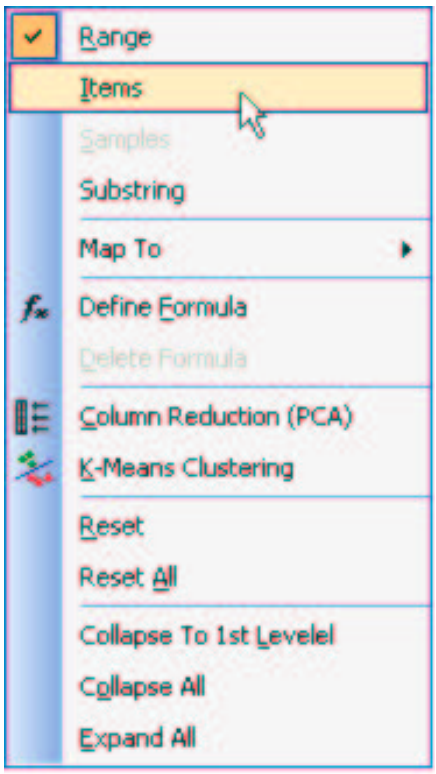


Because all this happens in real-time, it is easy to perform whatever number of queries, do a number trials and fails and continue analyzing data as long as necessary for finding the answers you are looking for.

Selector Controls

Miner3D supports all main data types and the Selector has included these basic selection controls that makes visual query making possible:

- Range
- Items
- Samples
- Substring

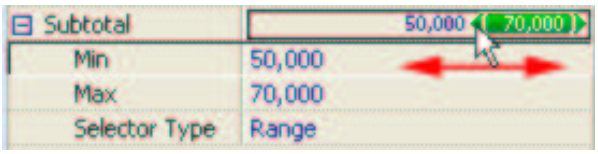


All the controls can handle data types supported by Miner3D (integer numbers, real numbers, texts, date and time), but every of these basic controls works differently and performs various data selection operations.

Right-clicking a selector control gives you a context menu, where you can change the current control to any other selection control that is available, to reset the current or all controls, map data column to a model property, define a formula or open PCA or K-Means dialogs.

Range

The Range selector controls the data set by setting a minimum and maximum range values. Data points lying outside a given range are not visible.



The control deploys a good ergonomics and naturally shows the information about range selection. This gives a sense of power and also makes some fun to the user, who was challenged to try other database querying tools.

- To move the minimum range value higher, drag the left triangle to a desired position.
- To move the maximum range value lower, drag the right triangle to a desired position.
- To slide the range selection lower or upper, drag the middle bar of the control to a desired position. The distance between the min and max values is preserved.
- Alternatively you also can use cursor keys to adjust selection control from the keyboard.
- Use edit text fields in the expanded control to enter range values manually.

Right-click on the control to reset its range values to the entire data column's values range or to change the current control type to another one.

Items

The Items selector controls the data set by setting a specific data sample as a selection criteria. Data points that do no equals to that sample are not visible.

Data samples are assorted in an ascending order, either by alphabet, from smallest to biggest or from the oldest to newest.

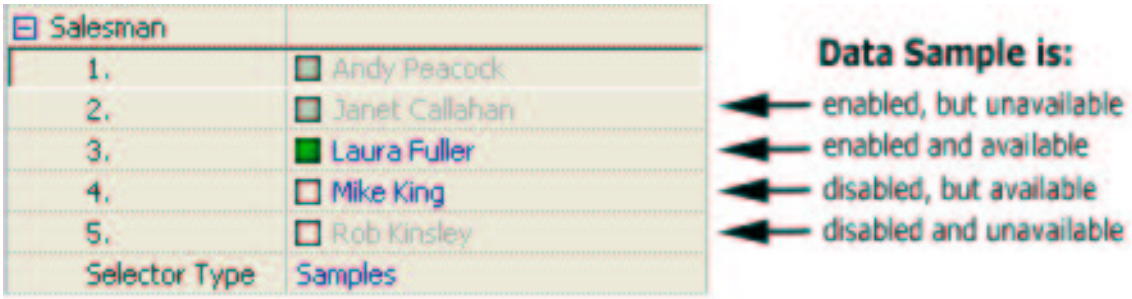
- To change the item sample, drag the slider to a desired position.
- Alternatively you also can use cursor keys to adjust the item slider from the keyboard.

Right-click on the control to reset its range values to the entire data column's values range or to change the current control type to another one.

Samples

The Sample controls lists all samples for the specific data column. The list is assorted in descendent order, from A to Z, or from smallest to biggest number.

The sample control is actually a button with 4 different states. The states are displayed below:



The status of the samples depends on the settings of the other Selector controls. If there are no such data points that meet the other selection criteria, then that sample is unavailable.

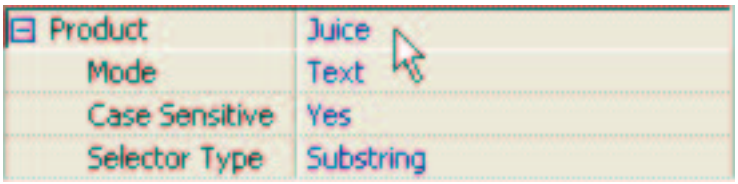
The Sample controls react in real-time and you can see an immediate response on the availability of specific samples. Controls are ergonomically designed and naturally shows the information about selection state.

- To enable or disable a sample, left-click over the sample button
- Alternatively you also can use cursor keys to navigate within samples. Click [space] to enable or disable a current samples.

Right-click on the control to reset its range values to the entire data column's values range or to change the current control type to another one.

Substring

The Substring selection control is used for doing substring searches over data.



The example above searches data objects containing “Juice” substring within data of “Product” column.

By entering a text fragment, a substring, you will immediately receive data objects that contain the specified fragment within the data column. Substring control can also work numeric, date or time information.

Substring control has a support for Case Sensitive queries, so you can set case sensitivity On/Off.

Substring control uses REGEX, so if you are familiar with it, then feel free to use that kind of complex expressions syntax.

Right-click on the control to reset its range values to the entire data column’s values range or to change the current control type to another one.

CHAPTER 9

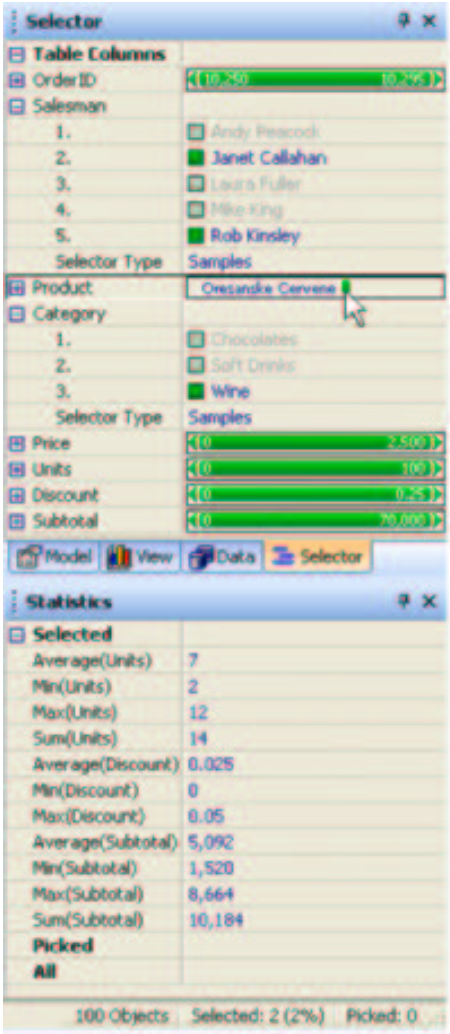
Statistics

Statistics calculator computes selected results and summaries on data subset, which is currently selected by Selector. This tool automatically performs user-defined calculations and helps a user to quickly measure and analyze data. It provides additional information that may be easily combined with information discovered through pure visualization.

Statistics with the support from Selector provides a user the same functionality as running CUBE, ROLLUP, COMPUTE commands on complicated and hard-to-use SQL technologies. For most of users, the use of Miner3D's interactive and visual approach is a perfect replacement for complicated OLAP, Cubes and SQL queries.

Interactivity, ease-of-use and the presence of query and visualization context, combined with statistic data, allow a user to quickly and easily find data subsets that produce requested results.

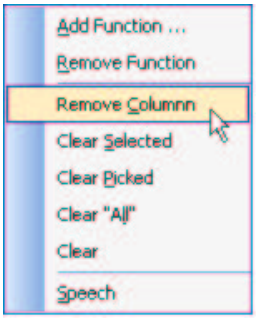
Using Statistics



The Statistics window by default contains a list of statistic functions in the form Function(Data Column) = result. Results are calculated only for data points that are currently visible through the Selector. If you change the Selector setup, the statistics immediately responses by recalculating all listed functions.

You can continue dragging Selector sliders and you always be receiving the statistics for the current data. More, you always have a clear information about the context of the result, because the Selector and visual data models are still visible and up to date. That way you can thoroughly analyze your data and receive only those results that are of a real value and not tons of useless figures without any context. Using couple of mouse movements you can see summaries of your data, averages, min or max values or other invaluable information.

The default contents of the Statistics window can be changed by a user to reflect her or his needs for specific statistics data. A set of most common statistic functions is available to satisfy your needs for getting exact numbers.



Upon you right-clicks on the Statistics window a context menu is provided where you can add new functions, remove current contents by lines or by whole data columns (series).

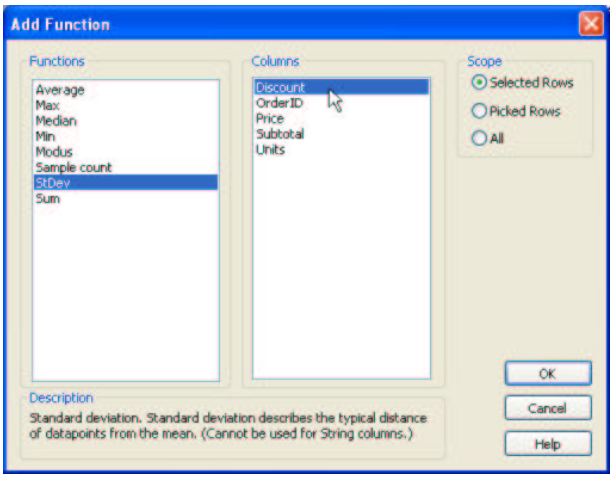
If you have Speech Synthesis enabled, then you can select one of the stat functions to be automatically spoken by Miner3D upon it changes.

To do that, right-click over the stat function and select Speech from the context menu. That way you can stay focused on visuals or Selector and still receiving statistic results, now delivered to your ears.

The setup of Miner3D Statistics is kept in M3D files, so you can save your customized contents for future use.

Statistic Functions

Statistics can calculate basic statistic functions. It is designed both for a user without any statistics background as well as for advanced users.



Methods available in Miner3D Statistics can deliver the most informative results and can be understand easily by common users.

Miner3D Statistics supports the following statistic methods:

- Average - average (mean) of the selected values in the column
- Maximum - the biggest selected value in the column
- Median - the value greater than exactly one half of the selected values in the column
- Minimum - the smallest selected value in the column
- Modus - the value with the most occurrences of selected values in the column
- Sample count - sample count of the selected values in the column
- Standard Deviation – describes the typical distance of data points from the mean.
- Sum - summary of selected values in column

> Note:
>
> *Some of the statistic functions cannot be used for text or string information because of its mathematical nature.*

CHAPTER 10

Data Reduction

When the data set you want to load is too large, either in the mean of rows or columns, it may be necessary to reduce the data by extracting just a subset of the original data. This can be achieved in the following ways.

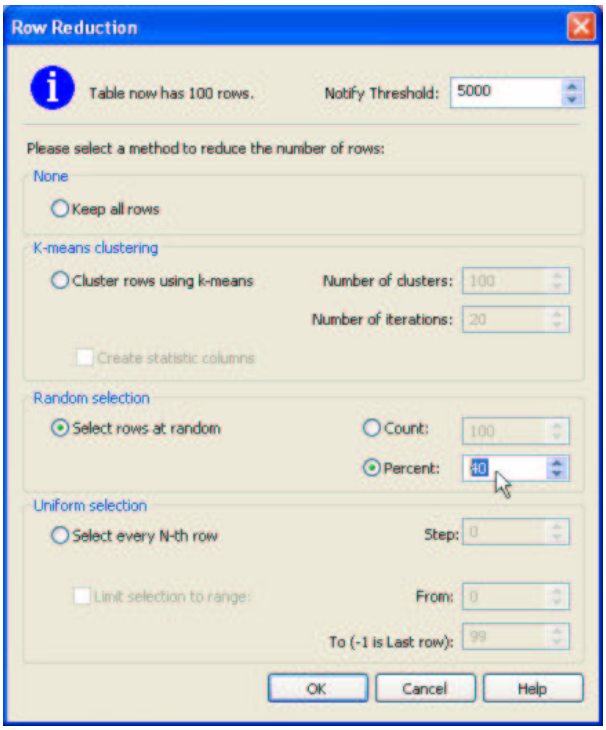
Miner3D includes several methods for:

- Row Reduction by data sampling
- Principal Component Analysis (PCA)
- K-means Clustering

Row Reduction

If you have so many data points that they are cluttering the display if all displayed, or if the performance suffers, one may reduce their number in a variety of ways.

If Miner3D detects a data set that exceeds a specified limit of rows to be loaded without any user prompt (notification threshold), then a Row Reduction dialog is displayed.



A user has several options to handle that situation:

- Keep all rows – forces Miner3D to load a complete data set
- K-means Clustering: rows clustering using K-means (see the next section)
- Random selection: select a percentage or an exact number of rows to be loaded
- Uniform selection: select a step value (every N-th row), and/or range to load (from-to-step)

One can select some random representatives and ignore the rest. However, a small and outlying group of data points could be entirely ignored, although its very existence may be the most important discovery to be made from the data.

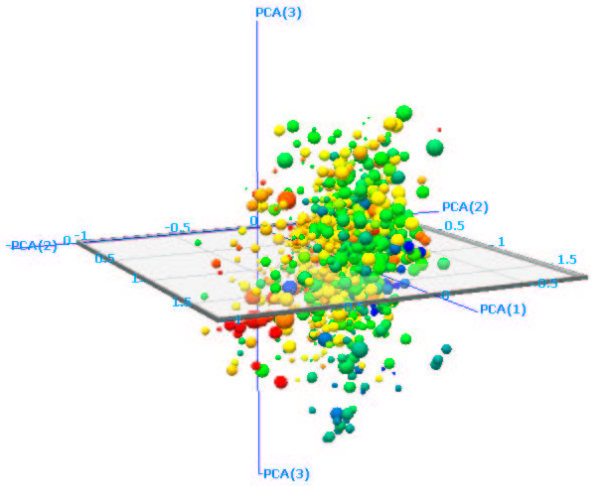
To reduce the danger of this happening and to improve coverage of the data with the representatives, we can group the data points into clusters and use these (or more precisely, centers of these) as our new dataset.

Row reduction via clustering is accessible in Miner3D by selecting Data→Row Reduction and choosing the "Cluster rows using K-means" option in the dialog offered. One should select a number of clusters that best matches the desired number of data points in the dataset. The total number of resulting data points may be slightly smaller than the value specified, as some candidate clusters will cover no data points and be dropped.

Row Reduction helps to manage the number of data points and keeps the interactivity and the overall feedback of a data model at an acceptable level.

Principal Component Analysis

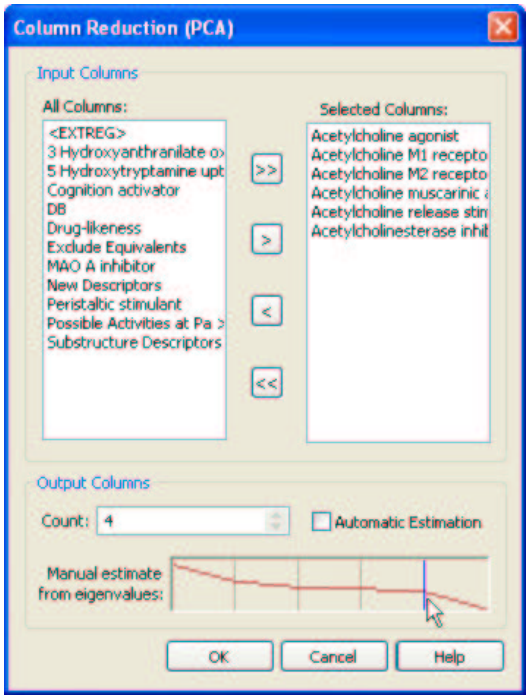
Often, we need to process datasets of high dimensionality, while the information is borne by a few important dimensions, or their combinations, while the rest contains measurement 'noise' or other uninteresting data. To identify these important dimensions, we perform PCA.



PCA selects a 'subspace' in the data that contains the most information, throwing away the remaining dimensions.

Using PCA

PCA is invoked by selecting Data→Column Reduction (PCA). In the dialog displayed, one can pre-select which columns are considered in PCA, thus filtering out clearly irrelevant ones.



For instance, for discovering the proteins whose content varies in a disease, the date of sample taken should be irrelevant.

Furthermore, one should select the number of dimensions of the projection surface, or in other words, the suspected dimensionality of the data.

Miner3D offers two methods for doing this, automatic estimation and user estimation:

- Manual estimation: The PCA dialog assists you in selecting the correct dimensionality by displaying the eigenvalue graph at the bottom. Typically, the first couple of eigenvalues are larger, then they drop off sharply. The "best" dimensionality corresponds to the point of the dropoff. The graph is clickable to allow you to select the correct dimension, according to your perception.

- Automatic estimation: The PCA uses a similar heuristic as for the manual estimation, but can be fooled by extreme values. User-assisted estimation tends to be more on target.

> Note: *PCA in Miner3D is implemented via eigen decomposition of the covariance matrix. Therefore it is computationally unsuitable for datasets of extremely high dimensionality, such as some tasks in microarray data processing.*

PCA Literature

A selection of PCA-related literature:

- Legendre P. and L. Legendre (1998) Numerical Ecology. Second English Edition. Elsevier, Amsterdam.

- Dillon W.R. & M. Goldstein (1984) Multivariate analysis. Methods and applications. John Wiley & Sons, New York.

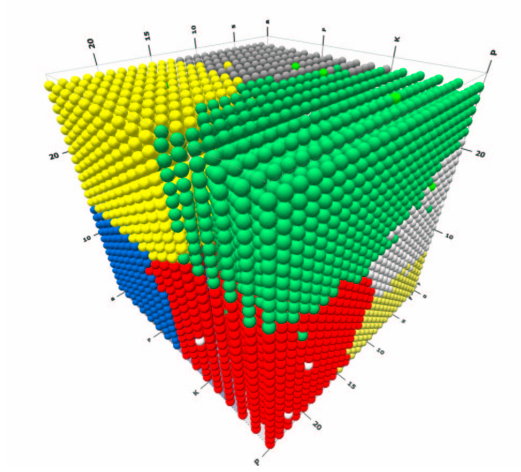
- Jobson J.D. (1992) Applied multivariate data analysis. Volume II: categorical and multivariate methods. Springer-Verlag, New York.

- Johnson R.A. & D.W. Wichern (1992) Applied multivariate statistical analysis. Prentice-Hall, Englewood Cliffs.

- Legendre P. and L. Legendre (1998) Numerical Ecology. Second English Edition. Elsevier, Amsterdam.

- Sharma S. (1996) Applied multivariate techniques. John Wiley & Sons, New York.

K-means Clustering



The process of extracting knowledge from data is more an art than a science at present. The human intuition remain irreplaceable and often some preconception about the nature of information to be discovered in the data exists before the data is analyzed, even before it is collected.

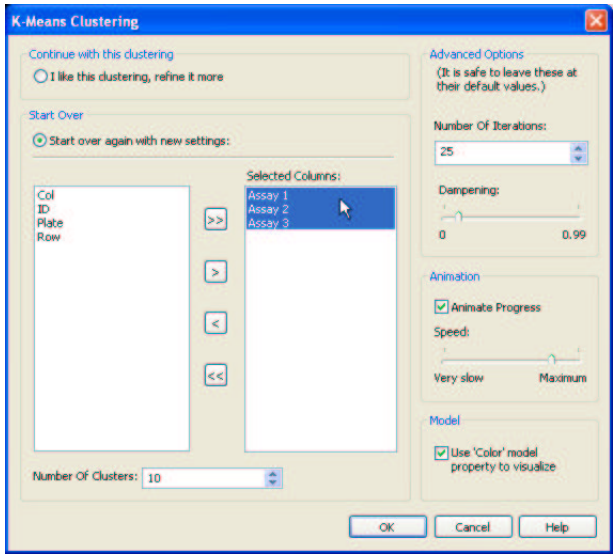
Numerous techniques were developed that extract information from data, each of them tailored to a specific type of information. Suppose the following scenario: A food store chain opens a new store. The management is well aware that different groups of customers frequent the stores and the task of fine-tuning the new store's product portfolio with respect to the population that the new store will serve stands before them. To this end, they want to analyze what groups constitute their customer base, from the wealth of records of cash register transactions.

The identification of such subgroups in data is commonly termed clustering. Sometimes these groups are clearly defined and rather obvious. Gaping differences between the shopping habits of married and single people, or men and women have become notorious. Sometimes the borders may be more subtle ("Tea drinkers will more likely buy chicken than beef, while beer drinkers will have the opposite preference"), or nonexistent. It is up to human judgment to determine how many groups -- clusters the data should be divided into, and to decide the validity of the outcome.

Using K-means

Miner3D brings a popular method of clustering, named K-means, to your hands. To perform clustering, choose Data→K-means clustering from the menu.

A dialog will appear that allows you to select columns of data that you consider relevant, and exclude the obviously irrelevant ones. You should specify the number of clusters that Miner3D will attempt to identify.



After clicking OK, a new column "Cluster no" becomes available, in a category of its own.

If a clustering was already performed, the option 'I like this clustering, refine it more' becomes available. This allows you to proceed with more iterations of K-means, using the same basic settings. You cannot change the basic settings (columns and number of clusters) if you wish to refine a clustering result.

Interpretation

Try mapping the new "Cluster no" column onto the Color or Shape property of the graphical representation. Assuming you chose to map Cluster no on Color, structure in the data should reveal itself by presence of areas of (nearly) homogeneous color. If you find the result unsatisfactory, do not hesitate to repeat the process, Miner3D will suggest a different clustering.

Advanced options

Advanced options give the expert user a finer level of control over the process of clustering.

There are two advanced options. You can choose to iterate until the clustering stabilizes (no points change their cluster membership in an iteration). If you choose this option, the clustering will stop on stabilization and the 'Stop' toolbar icon will go gray again. Alternatively, you can perform a fixed number of iterations.

'Dampening' denotes the amount of 'inertia' that the clusters have, when moving towards the centroid of their cloud. Setting a higher dampening value may slow down the clustering, which will require more iterations, but sometimes improves the quality of the result.

Animation

To see the progress of the clustering algorithm, use the 'Animate progress' checkbox. Miner3D suggests using color to visualize cluster membership. However, you may have mapped the 'Cluster no.' column to a model property different from 'Color'. In this case, uncheck the checkbox and your model mapping will remain untouched. You will see the 'Stop' and 'Pause' toolbar buttons light up when animation is running.

The provided slider allows you to specify the speed with which the animation will proceed.

K-means Literature

A selection of K-means related literature:

- T. Kanungo (2002) An Efficient K-Means Clustering Algorithm Analysis and Implementation. IEEE Communications

- T. Kanungo, (2000) The Analysis of a Simple K-means Clustering Algorithm, Univ. of Maryland

- K. Alsabti (1998) An Efficient K-means Clustering Algorithm, Proc. 1st Workshop High Performance Data Mining

- P.S. Bradley and U. Fayyad (1998) Scaling Clustering Algorithms to Large Databases, Proc. 4th Int'l Conf. Knowledge Discovery and Data Mining

- V. Faber (1994) Clustering and the Continuous K-means Algorithm, Los Alamos Science

- A.K. Jain and R.C. Dubes (1988) Algorithms for Clustering Data. Englewood Cliffs, N.J.: Prentice Hall

- T. Kohonen (1989) Self-Organization and Associative Memory, third ed., New York: Springer-Verlag

CHAPTER 11

Saving Results

Miner3D is a visual data analysis software and by its design it generates results in a variety of forms. One will use it mainly for making charts, while other one benefits on data selection and filtering capabilities, or having just the visual data analysis session. For all of them, the software provides a reasonable set of features to save the results.

Model Save

Developed data models can be saved by user for future use.

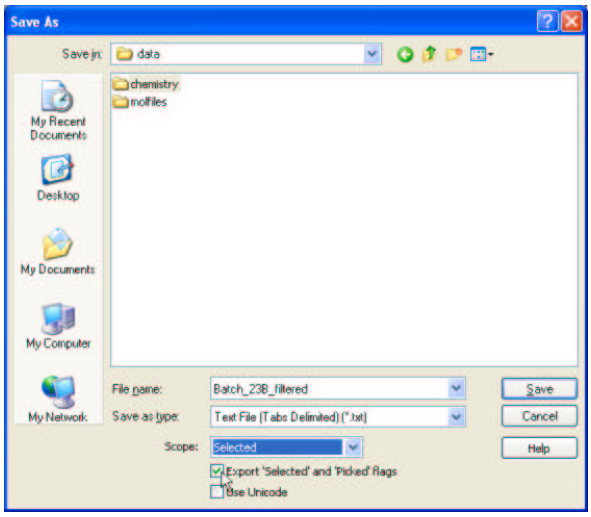
The model record keeps information on:

- Data Reference (does not store data directly, just a reference to data source)
- Names and data types of Columns used in visualization
- Used data mapping, model properties, scaling, options
- Color Ramp
- View settings (colors, axes, lattices...)
- Current model and camera position
- Selector setup
- Statistics setup

To save Miner3D Model, press button Save on toolbar. A dialog "Save” or “Save Model As" is provided to give the model name.

The Miner3D Model file is written in XML, which is basically a hierarchical model structure in text format. Be however cautious to edit the file manually and always create backup copies.

Data Save



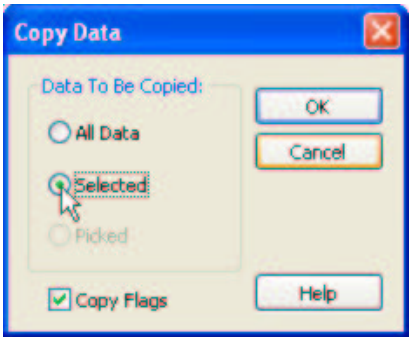
For future use in another applications Miner3D allows you to save data in data files.

Select menu File→ExportData→DataSave and use the dialog privided to set the target file name and location.

Options are provided to set the following:

- Data format (Comma separted CSV file, Tab seprated TXT file)
- Data subset to be saved (All, Selected, Picked)
- Include the Selected and Picked status information
- ASCII, or Unicode encoding

Data Copy



Miner3D allows you to copy data to Clipboard and paste it to other applications.

Select menu File→ExportData→DataCopy and use the provided dialog to further specify data to be copied. You can also use key combination CTRL+C or CTRL+INSERT.

Options are provided to set the following:

- Data subset to be saved (All, Selected, Picked)
- Include the Selected and Picked status information

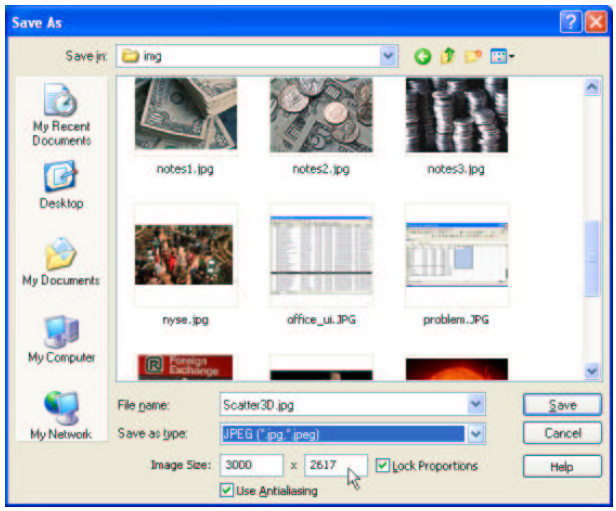
Image Save

This feature allows you to create hi-resolution publishing quality pictures of you data visualizations.

To save an image of the current data model, select menu option Model→Image→Save.

In the provided Image Save dialog you can set the following options:

- Image file format
- Image Size (resolution)
- Antialiasing



The software can save images in the following image formats: Windows Bitmap (BMP), JPEG (JPG), TIFF (TIF), Targa (TGA) and PNG.

Miner3D can save images even of higher size than those of your computer screen! You can set the desired image size in the edit boxes at the bottom of the Image Save dialog. On fast computers you can save even pictures of 6000 x 6000 pixels or even more. You can also turn on Antialiasing to make your images smoother and finer.

Image Copy

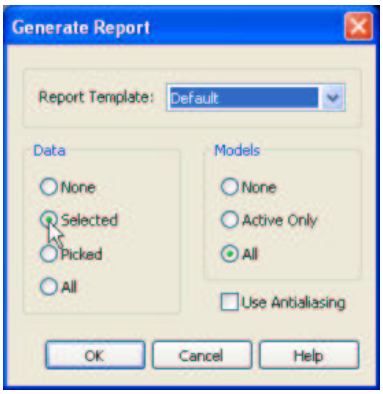
Selecting of Model→Image→Copy menu item you will copy an exact 1:1 copy of your current data model into Clipboard. The image can be then pasted into the target application, Word, PowerPoint, Excel, HTML Editor, Photoshop or any other compatible application.

Image Print

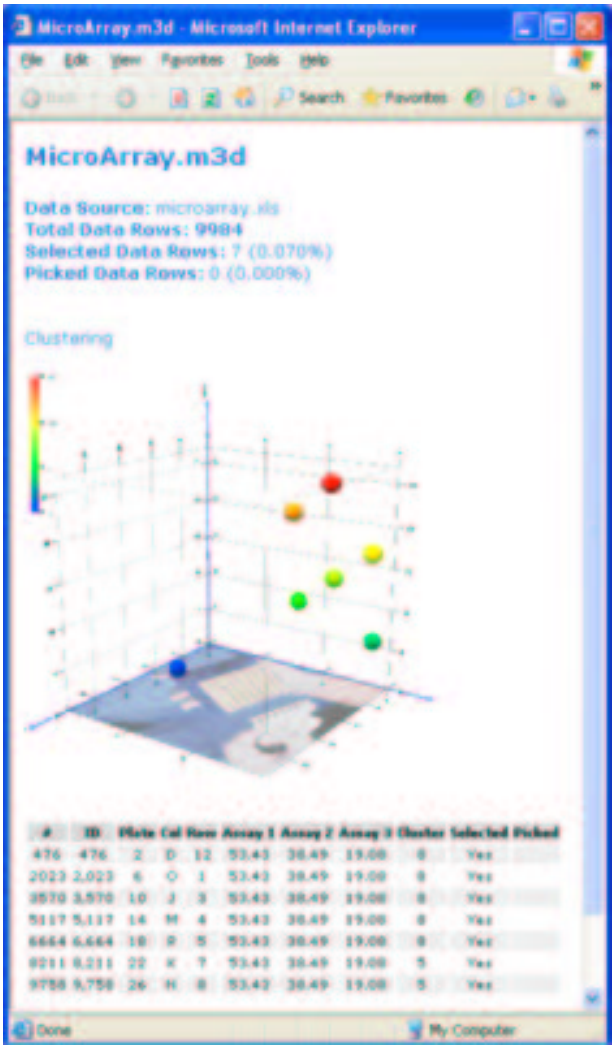
Selecting of File→Print menu item you will print out an exact 1:1 copy of your current data model on a selected printer device.

Create Report

Miner3D allows a user to create HTML formatted reports, including images of data models, statistics and tables of selected data.



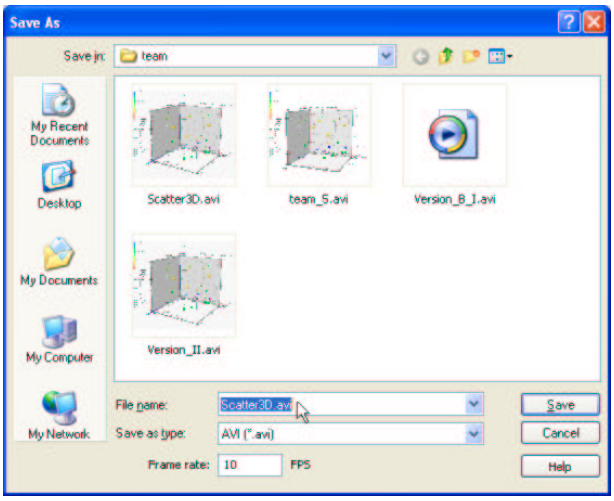
Select File→Create Report to see a dialog where you can select components of the report. Options for selecting a report template, data subsets and images of models are provided.



The report templates are basically HTML files and are located in "\Program Files\Miner3D\Reports" directory. You can create your own report templates by modifying the Default.html file.

Create Movie

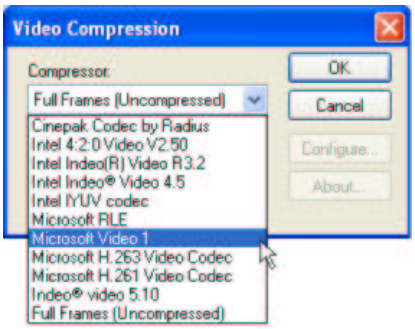
Miner3D allows you also to create video files where your data analyses are recorded step by step. You can have saved in live video shots a process of refining data model, movements, zooming, rotations and also visual querying in Selector.



That files are saved in AVI compatible video files. These files can be played in Windows Media Player® or other video player software. You also can insert video files to multimedia presentations, or emailed to your colleagues or team members.

Select File→Create Movie to see a dialog where you can set the name of the video being created. Option to set the video frame rate per second is provided. This setting has an influence on how the final video is played in video player software. Frame rate "10" means that 10 frames is played per second. We recommend to use rather a lower number: 4 or 6 FPS is a good choice.

After that file save dialog another dialog is displayed where you select a video codec. Usually a variety of video compression algorithms is available, but the list of available codecs depend on what software you have installed on your system. In the case of problems with initializing video compression engine, try to experiment with video codecs, prefer either FullFrames (Uncompressed) engine, or Microsoft or Intel video compressors.



CHAPTER 12

Miscellaneous

Quick Card

How to map data to a model property:

- Pick a model property label of your choice (left top corners of data models, or Model window)
- Click the right blue “Next Column” button to map the first available column, or
- Right-click with mouse over a property and select a desired column

How to scale data mapped property:

- Select a model property label (left top corners)
- Drag the slider, or min/max control to a desired position

How to edit data mapping options:

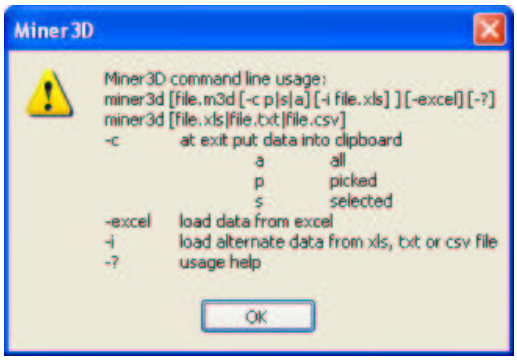
- Right-click with mouse over a model property and select menu item of your choice (left top corners), or
- Use controls in Model window

How to delete/remove data mapping:

- Click the red button over a model property, or
- Press DEL key

Command Line

You can customize how Miner3D starts.



In Windows Explorer, go to \Program Files\Miner3D, right-click Miner3D.exe, and click Create Shortcut. Right-click the shortcut you created, click Properties, and then modify the path in the Target box with switches from the following table.

In some scenarios, you can use more than one switch at a time. If you use more than one switch at a single command, you should separate the switches with spaces. For example: -i data.txt -c

To start Miner3D and...	Type
...load Miner3D Model from a specific M3D file	model.m3D
...load alternate data from XLS, CSV or TXT file	-i data.xls
...after exit copy data points to Clipboard (This feature be used to feed Miner3D processed data to successor applications.)	-c [p|s|a]
...force Miner3D to load data from Excel	-excel

Switches are not case sensitive: -I is the same as -i.

If a Miner3D re-installation replaces your custom shortcut, you must re-create your custom shortcuts.

Mouse Shortcuts

Move Model	
Rotate Model	
Zoom Model	or (+) or a use Wheel Mouse
Map, Scale	left click and/or drag of a property controls
Details-on-Demand	left click over a data object
Pick Object	Ctrl + over a data object
Rectangle Pick	Ctrl + + DRAG to draw a rectangle

Keyboard Shortcuts

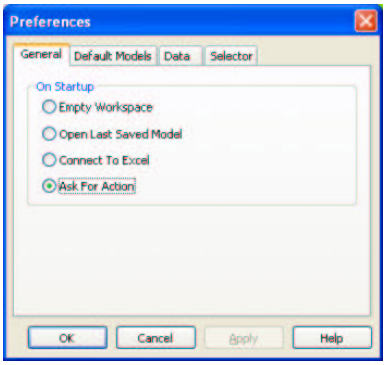
CTRL+O	Open Miner3D Model
CTRL+S	Save Miner3D Model
CTRL+V SHIFT+INSERT	Paste data from Clipboard to Miner3D
CTRL+C CTRL+INSERT	Export Picked Data
CTRL+SHIFT+C CTRL+SHIFT+INSERT	Export Selected Data
DELETE	Reset current property mapping
TAB PAGE DOWN	Next Column
SHIFT+TAB PAGE UP	Previous Column
CTRL+A	AutoBuild Model
CTRL+R	Reset Model
F5	Data Refresh
F1	Help

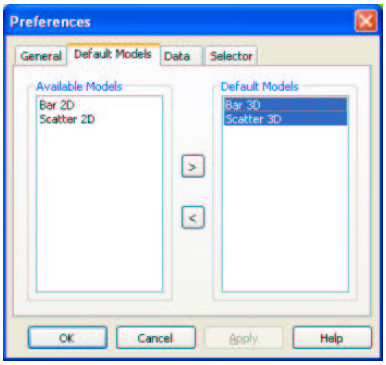
Preferences

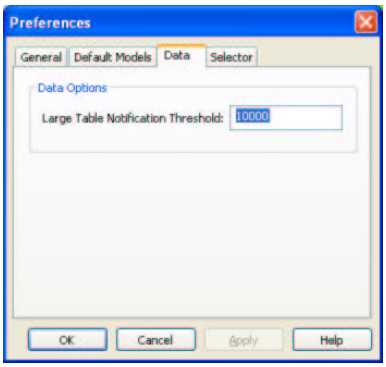
You can specify settings for a variety of Miner3D features by selecting options in the Preferences dialog box. The availability of some options depends on the release version.

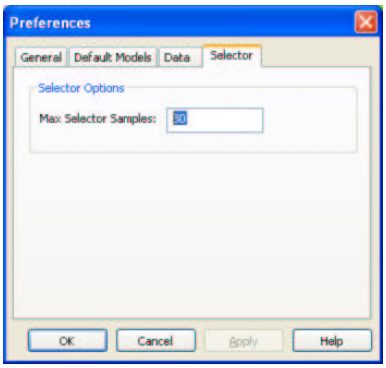
From File menu choose Preferences. There are tabbed windows with submenus for:

- Set the behavior after Miner3D starts
- Select Default Model templates to be used upon data load
- Large Table Notification threshold
- Selector Samples Maximum number to be listed









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APPENDIX A

Troubleshooting

Why Miner3D always hangs when I launch it?

The OpenGL was originally developed by Silicon Graphics®. It is now a computer industry standard API utilized for the purpose of 3D video display rendering and 3D hardware acceleration a required software resource. It is strongly recommended to download and install the very latest video drivers to ensure that your computer system complies with these requirements.

OpenGL Compatibility

OpenGL 1.1 or higher must be installed within your system prior to running Miner3D. If this is not installed you may experience severe performance problems or the software may not run at all. Your video card and drivers must be 100% compatible with OpenGL 1.1.

If your video card is not hardware accelerated the software will run in software mode and exhibit severe slowdown during your work. If you are unsure regarding the specifications or compatibility of your video card and drivers with OpenGL 1.1 please contact your hardware manufacturer directly for further information and possible software updates.

Whilst your hardware may not be OpenGL 1.1 compliant you may still be able to run the software with the very latest drivers, but you may experience an omission of graphic details or corruption abnormalities with the video display.

OpenGL Errors

On attempting to run Miner3D if the software stops running correctly you will require a specific video driver update. Native video drivers that are supplied as standard with your Windows operating system do not have fully included support for OpenGL. Compliant drivers for OpenGL 1.1 are produced and provided directly through the video chipset and card manufacturers respectively. An installation of these updated compliant drivers will automatically supply OpenGL support to your system.

Note: Motherboard integrated video chipsets may exhibit performance problems. This may be hardware limited as system memory could be shared for use as video memory.

Video Hardware Acceleration

If the software graphics seem to run at a very slow rate this may be a result of incorrectly set Windows video hardware acceleration.

Select Windows Desktop with right mouse button, then follow Properties→ Settings→Advanced→Troubleshoot→Hardware acceleration and alter level stepping accordingly.

Video Chipset Compatibility

During its development Miner3D has been tested on the more popular desktop hardware configurations available today.

Name Type
ATI® Radeon™ 7200, 7500, 8500, 9000, 9200, 9500, 9600, 9700, 9800
Matrox® Parhelia™
NVIDIA® GeForce® 256, DDR
GeForce2® MX, MX100, MX200, MX400, GTS, Pro, Ti, Ultra, 2GO, MX
Integrated graphics (nForce®)
GeForce3® Ti200, Ti500
GeForce4® MX420, MX440, MX460, Ti4200, Ti4400, Ti4600, Ti4800, MX
Integrated graphics (nForce 2)
GeForce FX® 5200, 5600, 5800, 5900

Whilst it will be possible to run Miner3D utilizing other available manufacturer video chipsets and drivers we cannot guarantee stability or performance of the software.

Note: Because of limitations within some notebook mobile chipsets and the 3D hardware requirements of Miner3D, we therefore cannot guarantee 100% compatibility.

My data does not seem to fit in Miner3D?

Miner3D data model partly depends on how source data are organized. Since Miner3D prefers a tabular form of source data you can achieve the best possible results only when you maintain your data correctly.

Please see the chapter “Data Organization” in section “Using Miner3D – Data” to learn more about what is recommended to prepare your data to make it suitable for use in Miner3D.

Why the database return indexes instead of real text data?

Sometimes, when you load your data from databases, one suffers on receiving rowsets that contain indexes instead of real texts that those indexes represent. This happens quite often, but can be solved relatively easily.

This behavior is actually correct. It is done by a design of a database, where indexes help to improve performance and generally enable data searching and sorting. For our purposes, however, indexes in results actually hide data, make them difficult to understand and analyze.

You can avoid this if you, or your database admin, develops a set of views (queries) that return real texts that are behind those indexes. Once such views are prepared you should prefer loading data from there.

Example of a database table returning indexes:

Order	Salesman	Product	Category	Price	Units	Discount	Subtotal
10253	**22**	**534**	**3**	400.00	40	0.00%	16000.00
10254	**43**	**234**	**2**	90.00	15	15.00%	1147.50
10255	**43**	**64**	**2**	480.00	21	15.00%	8568.00
10256	**16**	**73**	**2**	380.00	20	0.00%	7600.00
10257	**16**	**6**	**1**	760.00	2	0.00%	1520.00
...	**...**	**...**	**...**	...	...	...	...

Example of a database view returning text data results:

Order	Salesman	Product	Category	Price	Units	Discount	Subtotal
10253	**Laura Fuller**	**Chiquita Premium**	**Soft Drinks**	400.00	40	0.00%	16000.00
10254	**Rob Kinsley**	**Chocolate Surprise**	**Chocolates**	90.00	15	15.00%	1147.50
10255	**Rob Kinsley**	**Merci Finest**	**Chocolates**	480.00	21	15.00%	8568.00
10256	**Janet Callahan**	**Milka Chocolate**	**Chocolates**	380.00	20	0.00%	7600.00
10257	**Janet Callahan**	**Oresanske Cervene**	**Wine**	760.00	2	0.00%	1520.00
...	**...**	**...**	**...**	...	...	...	...

Why is Miner3D so slow on my computer?

Miner3D is a new type of application where an interactive data modeling approach plays a central role.

On older machines, you may experience slow performance, especially when a large data set is loaded, or you extensively use complex data objects like 3D labels, or complex shapes like figures, balls, etc. or you applied textures on surface of objects.

We recommend to use Miner3D on modern computers delivering high computing and graphics power, or use rather a simple graphic objects like triangles or squares and avoid using texturing.

Please see the “System Requirements” and “Why Miner3D always hangs when I launch it?” to learn more about how to tune-up your system.

How can I enable the Speech Synthesis?

To use the Speech Synthesizing capabilities of Miner3D software, please make sure your operating system is properly configured.

Open the control panel by selecting START→Control Panel. You should see a Speech icon among others.

If you are using the newest Microsoft operating systems (Windows XP, 2003 or higher), then your system already includes the necessary speech engine software and usually is also configured properly.

<u>For Windows 2000 users:</u>
It might be necessary to download and install Microsoft Speech software (Microsoft SAPI). Perform the following steps:

1. Download Microsoft SAPI 5.1 (68 MB) from http://www.microsoft.com/speech/
2. Run the installation of the SAPI 5.1 software. Follow the instructions of the installation script. To make the changes active, please Reboot your operating system.