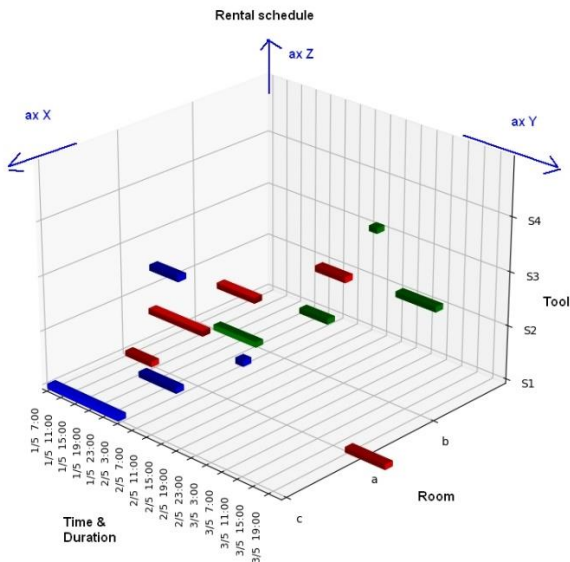


Application for drawing 3d charts – characteristic

General purpose

The program draws 3D graphs based on 4 data for: X, Y-start point, Y-duration, Z
The attached .jpg contains an full view of the chart.



The program is capable of drawing graphs based on numerical data (real numbers) and on time type data.

Environment

Windows (8, 10), 32 and 64-bit processor

Menu 'File' - File manipulation functions :

Open *.xlsx and *.csv file with data

Saving to disk the data in *.csv format

When opened: Displays the file's data in tabular form. Get the first record as column titles.

Sample files and an example table layout are attached to the documentation.

Menu 'Edit' - Table editing functions:

Insert, Delete, Clear column

If the user inserts a column - he must give it a title.

The program asks for the title and enters it into the table

Copy column contents to clipboard, Paste clipboard to column

Insert, delete, clear a row

Copy row contents to clipboard, Paste clipboard contents to row.

Editing cell contents: Clear, Copy, Paste

Example of table (for full view see attached file):

	Event	CAR	Time Start (yyyy-mm-dd hh:mm:ss)	Duration (min)	Time End
1	A	S1	2021-05-01 08:00:00	50	2021-05-01 08:50:00
2	A	S1	2021-05-01 09:00:00	50	2021-05-01 09:50:00
3	A	S1	2021-05-01 10:00:00	110	2021-05-01 11:50:00
4	A	S1	2021-05-01 12:00:00	50	2021-05-01 12:50:00
5	A	S1	2021-05-01 13:00:00	110	2021-05-01 14:50:00
6	B	S1	2021-05-01 15:00:00	50	2021-05-01 15:50:00
7	B	S1	2021-05-01 16:00:00	50	2021-05-01 16:50:00
8	B	S2	2021-05-01 08:00:00	110	2021-05-01 09:50:00
9	B	S2	2021-05-01 10:00:00	50	2021-05-01 10:50:00
10	B	S2	2021-05-01 11:00:00	110	2021-05-01 12:50:00
11	B	S2	2021-05-01 13:00:00	50	2021-05-01 13:50:00
12	C	S2	2021-05-01 14:00:00	50	2021-05-01 14:50:00
13	C	S2	2021-05-01 15:00:00	110	2021-05-01 16:50:00
14	C	S2	2021-05-01 17:00:00	50	2021-05-01 17:50:00
15	C	S1	2021-05-02 08:00:00	110	2021-05-02 09:50:00
16	C	S1	2021-05-02 10:00:00	110	2021-05-02 11:50:00.000000

Procedure of 3D chart data preparation

After loading the data from the file into the table, the program asks the user which 4 columns of data are to be selected for the chart for X,Y-start, Y-duration, Z-axis.

The program opens a dialog box - example in the appendix. In the dialog box the user chooses:

- what columns will be used for the chart - dropboxes with column titles);
- what is the data type for the Y column (choice of 1 from 3 : number, time in the format yyyy-mm-dd hh:mm:ss, time in the format dd/mm/yyyyy hh:mm:ss)
- what is the data type for Y-duration (dropdown, choose 1 of 4: number, week, day, hour, minute, second)
- what data range to draw on the chart (minimum and maximum for each axis)

User confirms the selection and the program memorizes it.

NOTE: The program must remember the column titles, not their number in the table. If the user adds / inserts a column to the table between, for example, the first and the second column taken into the chart - the number of the second column will change. The column title will remain the same.

Setting columns dialog (example):

Choice of columns for 3D chart

Choice of columns

Axe X

Event

Axe Z

CAR

Axe Y Start Point

Time Start

Axe Y Duration

Duration

Type of numbers

Time (yyyy-mm-dd hh:mm:ss)

Time (d)

Show Min

A

S1

2021-05-01

Show Max

C

S4

2021-05-04

Set the of columns for 3D chart

'3D Chart' menu:

'Draw Chart' submenu:

The program draws a chart from cuboids, based on selected columns and range.

Submenu 'Select Columns':

The program runs an analogous procedure as described above. The user can change the source columns of the chart and the range of data

Submenu 'Refresh':

When the chart is displayed, changes to the data in the table (editing cells) do not cause the chart to refresh. Only selecting the 'Refresh chart' command causes the chart to be redrawn.

Chart:

User can :

- rotate, zoom in, zoom out the drawn graph, set zoom,
- can export the image to a file;

When you hover the cursor over a plot cuboid, the status bar displays the X,Y-Start,Z data for that cuboid

It is possible to modify the table data while the chart is enabled. The modified data is not displayed on the chart until the Refresh command is selected.

The program should draw auxiliary lines on the chart. The distance between auxiliary lines (their density) depends on the displayed data range, so that the chart remains legible.

The distance can also be set by the user in the chart options.

The colours of the graph sections are determined by the oX axis data. For the same given oX all segments have the same colour. The program is to have about 50 specific chart colours defined.

It should be assumed that the number of different oX data will be large. If the number of data exceeds the number of defined colours, then after drawing the graph with the last colour from the defined list, the program takes the first colour from the list again for the next data.

Example: 50 colours are defined; the table on the X axis has 90 different data x1, x2, x3 ... x89, x90.

Chart x1 is drawn with colour 1, chart x49 with colour 49, chart x50 with colour 50 and chart x51 from the beginning: with colour 1, x52 with colour 2 etc.

The axes are labeled according to the column titles.

Pitch on the Y-axis is calculated and shown proportional to the scale and extent of the drawing. For example, at high magnification, the pitch is drawn every 1, at medium magnification every 10, at low magnification every 40.

The oX and oZ axes show the labels of all variables in the drawing range.

Application parameters and options

After opening a table file, the top bar of the program window displays the file name along with its extension.

Idem for chart window

The program saves the selected attributes in a separate file. When the program is opened, the program reads the attributes stored there from the file and applies them for use.

The program has a simple Options menu:

When the Options menu is opened, the user sees a table with columns:

- attribute name
- current value (editable field for the user)
- Column with a hint Minimum value
- Column with hint Maximum value.

Example 1:

The attribute table contains the line Chart background colour.

In the first column is the name: Chart background colour

In the second - the current value, editable : #FFFFFF or white

In the third - as a suggested "minimum" is the colour #000000 or black

In the fourth one as a prompted maximum is the colour #FFFFFF or white

Colour format - to be agreed.

Example2:

Attribute table contains the line Font size Data table.

In the first column there is the name of the attribute (option): Font size Data table.

In the second - the current value to be edited : 11

In the third - as a suggested "minimum" is 8,

In the fourth - as suggested "maximum" is 36 (example)

At the bottom of the table there are 3 buttons :

- Apply and Close : the program applies the attribute options in the current session and closes the dialog box;
- Save and Close : the program saves the new attribute values to a file, applies them to the current session and closes the dialog box;
- Abandon : the program closes the dialog without making any changes.

Examples of parameters/attributes stored in the file

(some may not have min and max values):

a. colors of table window and column selection window:

. color of table background

. color of the table font

b. colors of the graph

. the color of the background of the graph

. color of the secondary lines .

. color #1 of the data graph

. color #2 of the data graph

...

. color #49 of the data graph

. color #50 of the data graph

. font color of axis labels and chart title

c. fonts

. font size of tables

. font size of chart labels

d. oZ/oZ chart cubic size / parameters

e. path to the folder with the last opened or saved file.

On first startup, this may be "C:/"

Tools

The program has a menu with tools :

1. collision detection command.

When the user activates the Collision Detection command.

the program analyzes:

a. if for the same value oY any given oX has 2 or more assigned values oZ

b. and vice versa: if for the same value oY any given oZ has 2 or more assigned values oY

Let's take an example from the file table1_short.csv:

This is the schedule of people a,b,c taught in rooms S1,S2,S3,S4.

For Room S1 there is a collision because 1/05/2021 between 8:00 and 9:30 is used by persons C and A.

The program performs an analysis and then displays a report window showing which table records are in conflict.

2. The "cut" chart view tool.

After choosing the "cut" command, the program draws a plane perpendicular to the oY axis, in the point of the maximum range of the oY axis set by the user. Then it marks with diamonds the data that are intersected by the cutting plane.

Finally, it applies auxiliary lines identifying the X and Z coordinates of the cut data. The attached image

"Cut_the_chart_tool.jpg" shows the effect of using the tool when the user set the Max range of the chart view to 1/05/2021 15:10.

Example (for the full view see attached file)

