KaPPA-View 4

The Kazusa Plant Pathway Viewer, Version 4.0

Manual on User Map Creation

ver. 1.0

Kazusa DNA Research Institute

Contents

1. Introduction

KaPPA-View4 Classic (http://kpv.kazusa.or.jp/kpv4/) is a metabolic pathway database for representation and analysis of correlation networks of gene co-expression and metabolite co-accumulation and omics data (Sakurai et al., 2011 *Nucleic Acids Research* 39: D677-684). In addition to the pathway maps available as default, users can utilize their own map data for their analyses. This function extends the possibility of KaPPA-View4, for analyzing metabolic pathways not provided as default, for analyzing with carefully curated metabolic maps, for investigating about genes and metabolites not drawn on the default maps, and for making attractive data representations.

This manual describes procedures to create the map data that can be loaded onto KaPPA-View4. Refer to "Advanced Manual" or "Beginners' manual" for more details on KaPPA-View4 functions and operations.

1-1. Outline

The pathway maps of KaPPA-View4 were prepared as files in Scalable Vector Graphics (SVG) format. The SVG data are exchanged to Flash objects when they displayed on the Internet browsers. To realize the color painting of the gene, metabolite and reaction symbols according to the omics data analyzing, each symbol on the SVG maps has to be distinguished by the system, and therefore, each symbol must have an identifier that described in a defined rule.

Inkscape (http://www.inkscape.org/) is one of free software suitable for creating SVG data that enables editing of the IDs. It works on multiple platforms, has various drawing functions, and used by many users. In this manual, we describe the procedures for map data creation using Inkscape ver.0.46 for Windows. Please refer to the online manual of the Inkscape for the usage of the tool itself.

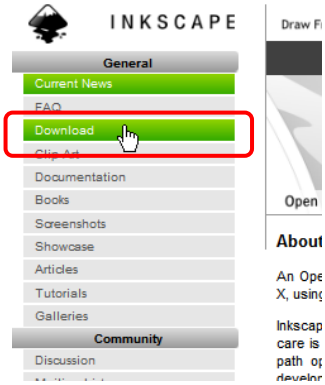
1-2. Installing Inkscape

Inkscape is a free open-source drawing software. This manual introduces Inkscape ver. 0.46.

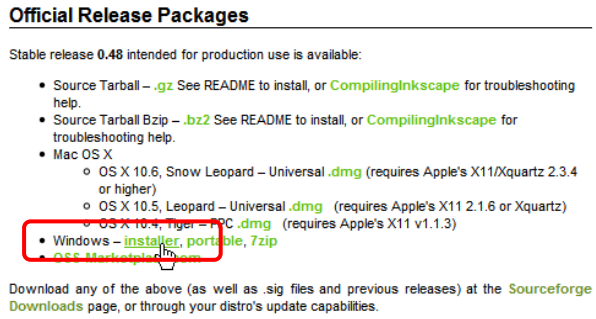
Go to the following URL.

http://www.inkscape.org/

Click “Download” in the menu on the left.

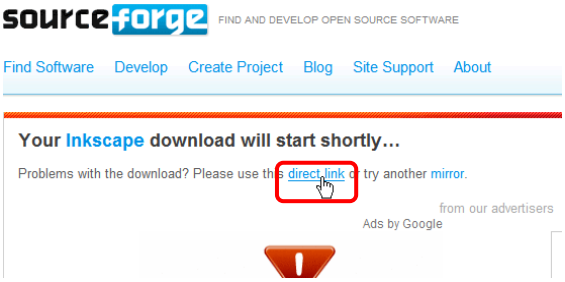


Select the installer for Windows.

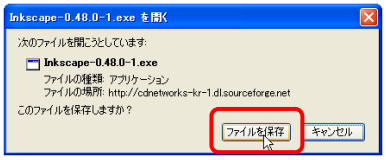


A page in Source forge opens, and then download automatically starts.

Click “direct link” if download doesn’t start.



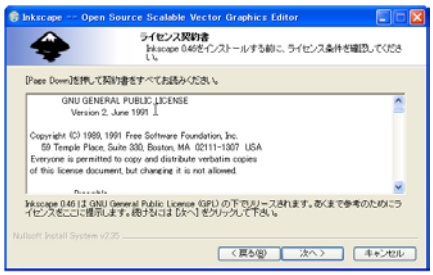
Save the installer (Inkscape-0.46.win32.exe) on your local disk.



Double click the installer to start installing.

Click on "Install".

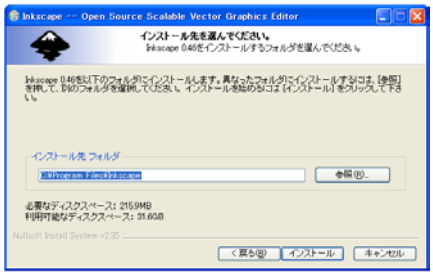
Click “Next” to accept the license agreement.



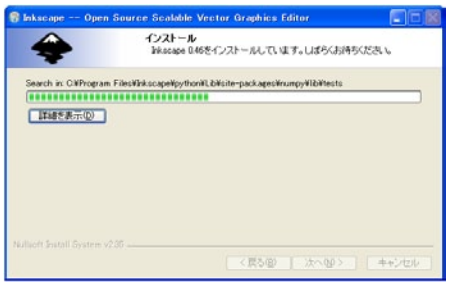
Click “Next.”

Users can customize the component of the program by altering the settings such as selecting languages in "translation".

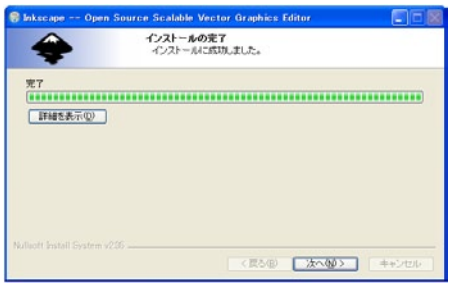
Choose install directory and click “Install.”



Installation proceeds.

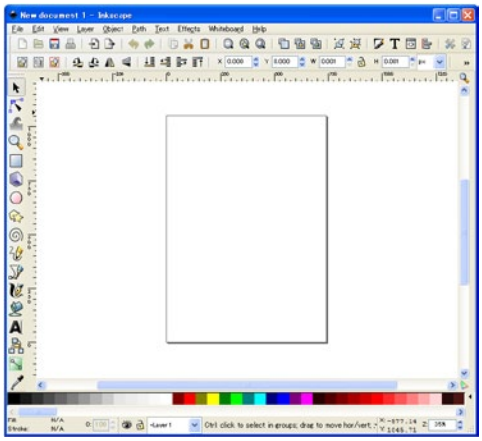


Click "Finish"



Click "Finish" again then Inkscape starts.

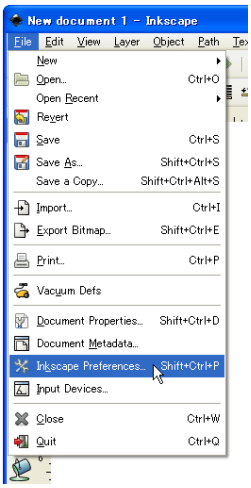
The initial page is shown below.



1-3. Recommended Settings

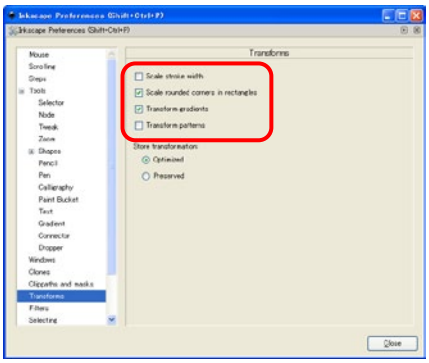
Following setting will allow users even more efficient map creation.

Click “File” and select "Inkscape Preferences..."



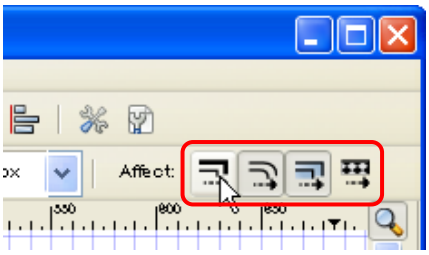
Click "Transform" and set the values as follows.

Item	Operation	Description
Scale stroke width	Uncheck	The line width stays constant while the object size is modified.
Scale rounded corners in rectangles	Check	The radius of the round angles proportionally resized with object size change.
Transform gradients	Check	The gradients (color gradations) are moved along with the objects, facilitates users to recognize the direction of the gene boxes when they are rotated.



Click “Close.”

This setting can be changed also from the menu on the main window.



2.Creating and Saving Files

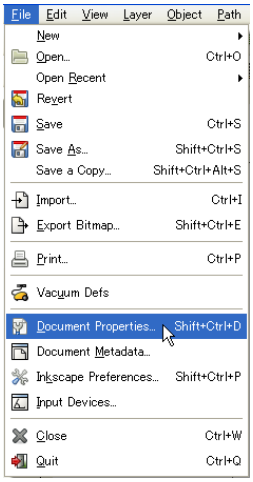
This section introduces basic conventions of the SVG files to be displayed properly on KaPPA-View4. Please refer to the following sections for creating individual objects.

2-1. Creating a File

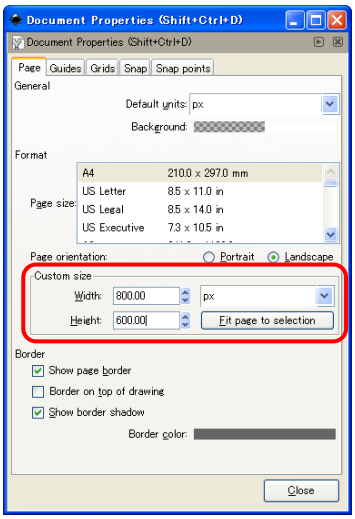
2-1-1. Set the image size to 800 x 600 pixels

KaPPA-View4 uses the image size of 800(width) by 600(height) pixels as default. We strongly recommend choosing this image size, because various functions such as Multiple Map View and printing maps are optimally processed with the image size.

Start Inkscape. Click “File” and select “Document Properties...”



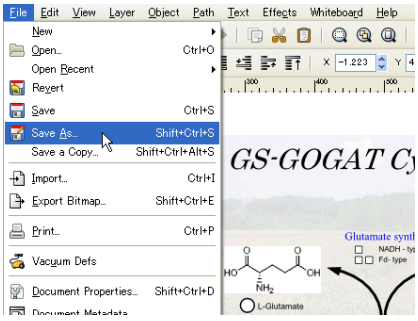
Type 800 into "Width", 600 into "Height", and select “px” for the unit. Then click “Close.”



2-2. Saving a File

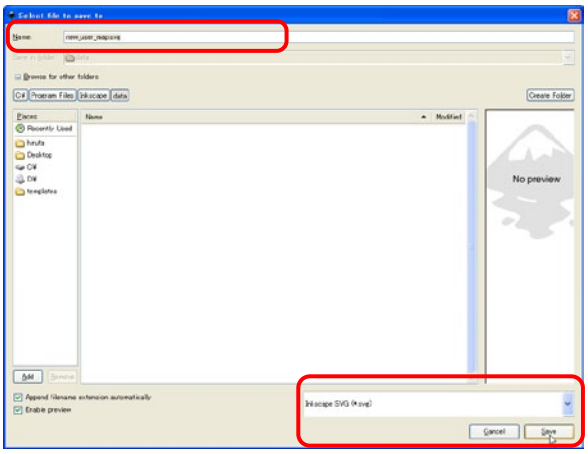
2-2-1. Save a file in the "Plain SVG" format

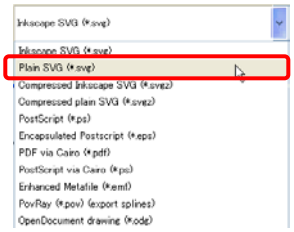
Click “File” and select “Save As...” to save the SVG map created.



Choose “Plain SVG” for the format of the file. Don't choose other formats.

Give a file name and click "Save" button.


No preview
Inkscape SVG (*.svg)
Cancel
Save

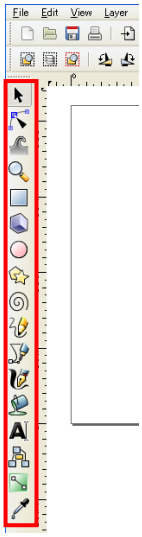

Inkscape SVG (*.svg)
Plain SVG (*.svg)
Compressed Inkscape SVG (*.svgz)
Compressed plain SVG (*.svgz)
PostScript (*.ps)
Encapsulated Postscript (*.eps)
PDF via Cairo (*.pdf)
PostScript via Cairo (*.ps)
Enhanced Metafile (*.emf)
PovRay (*.pov) (export splines)
OpenDocument drawing (*.odg)

3. Creating Objects and Assignment of IDs

By adding appropriate IDs to the figures drawn on Inkscape (objects), KaPPA-View4 system paints the objects in proper colors according to the experimental values such as changes of gene expressions and metabolite accumulations. In this section we introduce the basic operation of Inkscape to create objects and assignment of the IDs to them.

3-1. Creating an Object

An "object" is a drawing created on the Inkscape canvas. Create an object by clicking the toolbox on the left of the window and then doing appropriate mouse operations on the canvas.



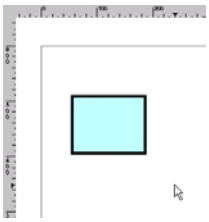
The tools commonly used for creation of User Maps of KaPPA-View4 are as follows.

 "Create rectangles and squares" tool

 "Draw Bezier curves and straight lines" tool

 "Create and edit text objects" tool

A square object created with "Create rectangles and squares" tool will look like below.



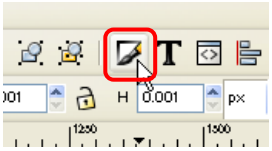
The color of the stroke and fill may vary depending on the environment of your PC.

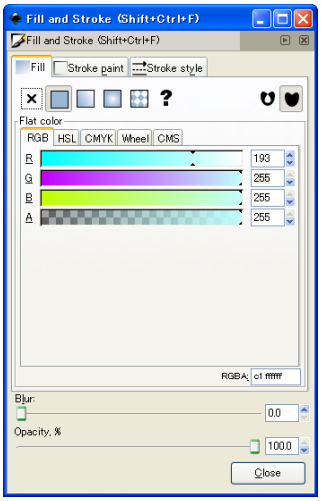
3-1-1. Setting of Stroke and Fill

An Inkscape object consists of a closed area and the line surrounding it. They are called fill and stroke respectively.

•*Color Setting*

Set the color of stroke and fill by clicking “Object” in the menu and selecting “Fill and Stroke...” Clicking the button shown below works as well.



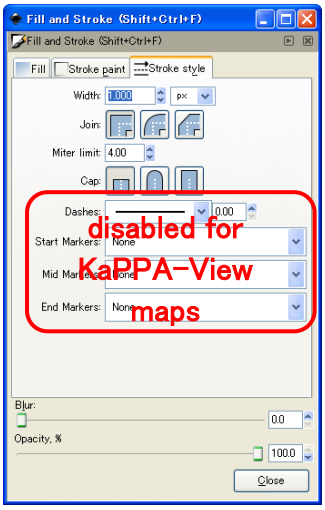


Color setting must be done in order to realize dynamic color painting by the KaPPA-View4 system according to the experiment data.

By selecting No paint button () of "Fill and Stroke" window users can choose not to color the object. Please note that the color won't be shown according to the data under this setting. For instance, select white or any other preferred color and avoid no paint for the fill when drawing a square that represents a gene. When drawing a curved arrow that shows enzymatic reaction, select no paint for the fill so that the color of inner area of the arc doesn't change.

•*Stroke Style and Stroke Tip Shape*

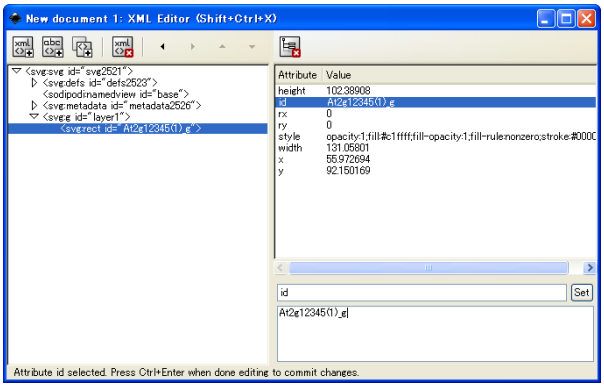
Inkscape provides functions to change the stroke style and tip shape, but the line style and, start, middle, and end point markers aren't shown appropriately in KaPPA-View4. When creating an arrow for such as enzymatic reactions create the arrowhead and the line of an arrow as two separate objects and group them together (see **4-4. Enzymatic Reaction** and **5-1. Grouped Objects**). Dotted lines can be created with a line drawn as a line object. (see **5-5. Creating Line and circle Objects with Inkscape**).



3-2. Setting ID

In order to allow the KaPPA-View4 system to color the objects according to the experiment data. ID acceptable to the system must be attached to each object. Assignment of IDs to the objects is done with XML Editor.

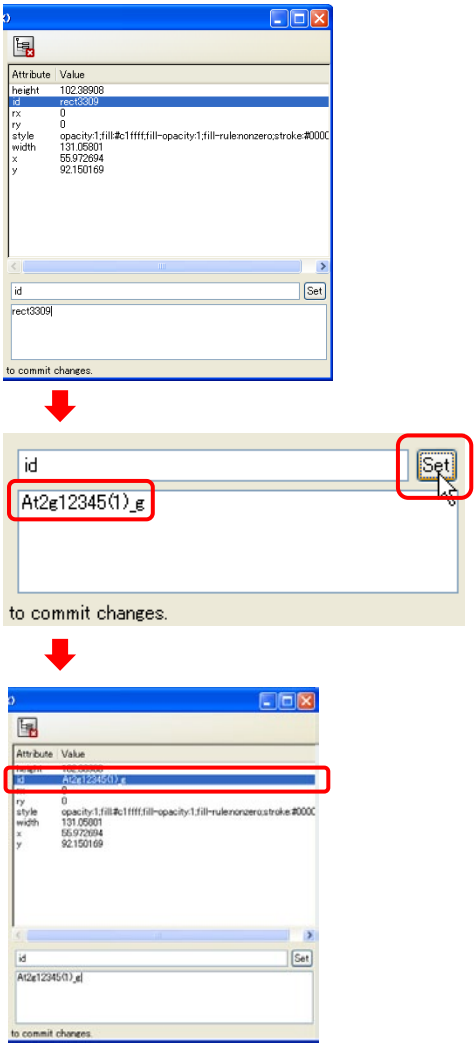
Click “Edit“ of the menu and select “XML Editor...” or simply click the button shown below to open an XML Editor window.



The XML editor and the canvas interlock with each other. Any item selected on the XML editor will be selected on the canvas as well and vice versa.

The selected item will be highlighted on the left side of the XML editor, and the attributes of the selected object will be line up on the right side of the editor.

When “id” from the Attribute list is selected, present value of the id will be displayed in the lower right window. Type a proper value into the area circled red in the figure below, and click "Set" to assign the value as the ID of the object.



3-2-1. Attention

The following care must be taken when attaching an ID to an object.

1) One SVG file cannot contain more than one objects of the same ID attribute. When identical ID is added to a different object, the ID of the object that originally had the now shared ID will be automatically changed to the default ID.

It is often the case that the users want to draw one compound on several places of a map. In such cases, group the objects together and assign an ID to the grouped objects. The procedure is covered in **5-1. Grouped Objects**.

2) The ID input area allows newline characters (returns), but KaPPA-View4 cannot properly process the inserted newline characters. Carefully set IDs not to insert any spaces or newline characters before or after the ID.

3) Please be sure to press "Set" to confirm the change after typing the ID. If the "Set" button isn't clicked the value won't be reflected. Check the upper-right area of the XML editor window to see if the ID value is properly changed.

4) Only use proper ID format KaPPA-View4 can recognize that will be covered the following chapters. Otherwise colors and other aspects won't be displayed properly.

4. Creating Map Objects

This chapter describes about the rules on drawing and attaching IDs for each type of object, in order to color the objects for genes, compounds, and enzymatic reactions on the created User Map properly in KaPPA-View4.

KaPPA-View4 converts parts of SVG data into Flash in the process of displaying. Since not all of the SVG expressions can be properly displayed on Flash, it is possible that Inkscape created map won't be displayed on KaPPA-View4 properly. Make sure the rules covered in this chapter are followed for proper displaying.

4-1. Gene

By assigning a gene ID used in KaPPA-View4 into rectangular objects, users can color each individual gene according to the gene expression. To display all the genes assigned to a particular enzymatic reaction, a gene box object can be used (see **4-2. Gene Box**).

4-1-1. Creating an Object

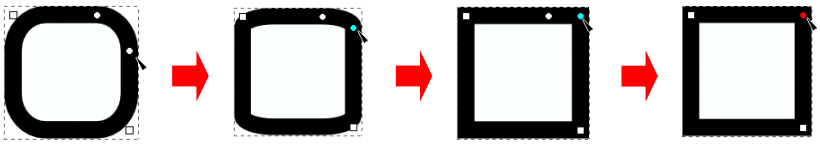
Use "Create rectangles and squares" tool () to create a square symbol to represent a gene. Make sure to set the color of the fill for data-according coloring. The color of the stroke won't be affected.

Typical attributes of KaPPA-View4 gene rectangular objects are as follows.

KaPPA-View element	A square representing each gene	
SVG Object	rect（required）	
Attribute	Description	Value
width	Width	10
height	Height	10

rx		Roundness toward X-axis	0
ry		Roundness toward Y-axis	0
style	fill	Color of the fill	#FFFFFF White（except for no paint）
	stroke	Color of the stroke	#000000 Black
	stroke-width	Stroke width	1.5 px

User can change the roundness of the corner of objects that are created with  tool. Click  tool and drag the white dots appeared on the selected rectangular objects, by which the values for "rx" and "ry" attributes would be altered.



4-1-2. Adding IDs

Use the following format to ID for rectangular objects that represent genes.

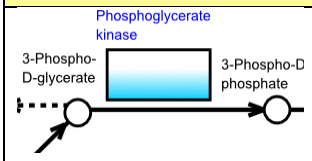
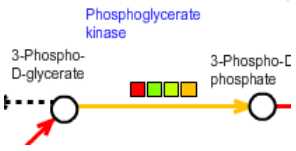
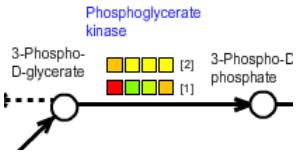
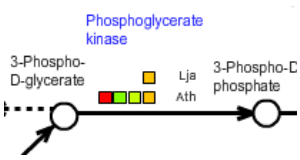
ID format of gene objects	text+(integer number)_g
text	Gene IDs used in KaPPA-View4 system or user-defined ID starting with "TMG" Gene objects with a user-defined ID will be colored when the ID and the corresponding experiment data are described in the uploaded or POST transferred data file.
Integer number	Use different integer numbers to draw one gene on more than one place of the same map.
example）	At1g12340(1)_g TMG001(1)_g

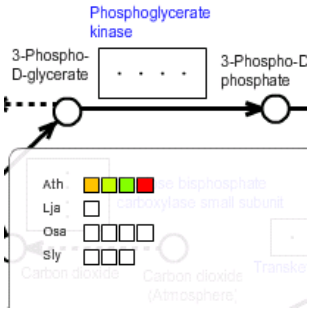
The gene IDs used in the system can be downloaded from the Download page of the KaPPA-View4 site. Please refer to “KaPPA-View4 Users’ Manual.”

4-2. Gene Box

A gene box is usually placed near enzymatic reaction arrow to represent several genes that correspond to the reaction. In KaPPA-View4 system, a gene box IDs and the corresponding gene IDs are interlocked, therefore all the genes are automatically displayed based on the gene box without creating rectangles for each gene.

A gene box is also utilized as an inset area for displaying various data on it according to the display mode of KaPPA-View4, such as the Universal Map Mode for data comparison between the species and a mode for data comparison between the experiments in a species. User Maps created by users cannot be utilized for these extra representations (see the table below), however, the displaying mechanism of gene box facilitates users to efficiently show all the genes assigned to the gene box on the User Maps.

A Gene Box drawn with Inkscape	
	A gene box is indicated with the pale blue gradation
KaPPA-View4 display	
	A representation in normal mode where genes for one of selected species are displayed in the area of the gene box.
	A data comparison mode where two experiment data obtained from a species are compared on the gene box. Not available for User Maps
	A representation in the Universal Map Mode where genes from multiple species are arrayed in the gene box with their selected experiment data. Not available for User Maps

	An example of a representation in the Universal Map Mode when the gene box didn't have enough space to display all the genes. By clicking [· · · ·] of the gene box, genes of each species can be viewed in a pop-up window. Not available for User Maps

Users cannot edit the enzymatic reaction to genes relationship that saved in the system. Administrator may update or curate the data without announcement.

To display certain genes individually on a map, draw them according to **4-1. Genes**.

4-2-1. Creating an Object

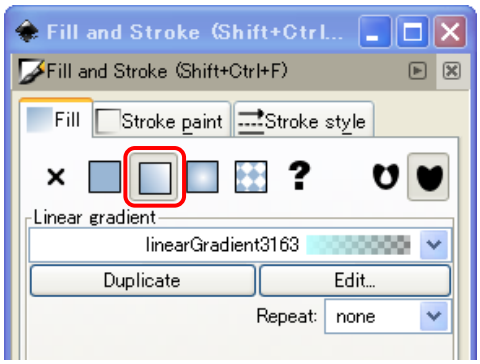
KaPPA-View4 processes gene boxes considering its direction (rotation) to properly order the genes along with the enzymatic reaction arrow. Follow the procedure below to create an object efficiently checking the direction of the gene box.

1) Create a rectangle object with "Create rectangles and squares" tool ( ).

Set the fill color any desirable color. If the corner is round, make it point referring **4-1. Genes**

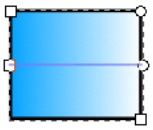
2) Set the gradation

Select the rectangle object and set the fill to "Linear gradient".

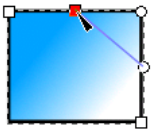


The square object will reflect the gradation.

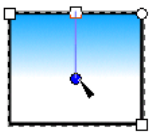
3) Select the object with  tool, and gradation controller will appear.



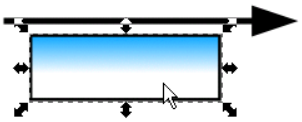
Move the controller so the color is the darkest on the upper line.
Move the left controller to the upper line.



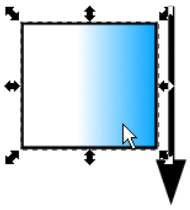
Place the right controller at the center of the square.



5) Edit the width and the height of the object and place it on a desired position using  tool.

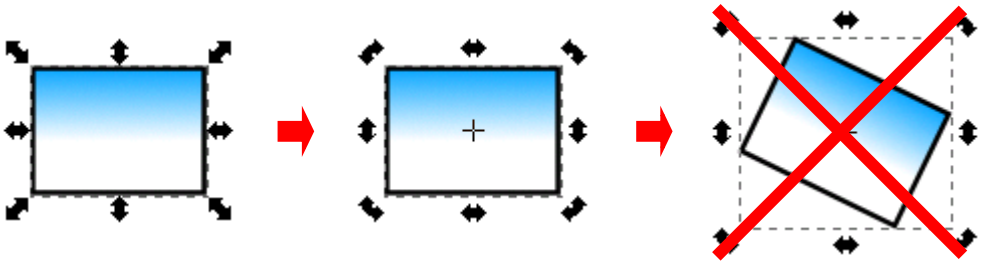


To rotate the rectangle object, use the "Rotate" or "Flip" tools on the tool bar ().



Caution:

In Inkscape, the resize controllers appear around an object by clicking the object with  tool. When the object is clicked again, the rotate and skew controllers appear, and users can arbitrarily rotate objects by dragging the rotate controllers. But never arbitrarily rotate the objects like that because KaPPA-View4 is only capable of processing the objects precisely rotated by 90 degrees.



First Click　　Second Click　　Rotate arbitrarily

Below is the value setting of the attributes required for a gene box object. Users can draw rectangles matching the requirements if they follow the orders mentioned above.

KaPPA-View element	A square representing a gene box	
SVGObject	rect（Required）	
Attribute	Description	Value

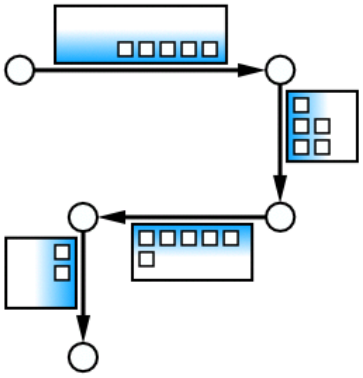
rx	Roundness toward X-axis	*not defined*（Required）
ry	Roundness toward Y-axis	*not defined*（Required）
transform	Rotating the object etc.	One of the below (Required) ・*not defined* (default) ・scale(-1,-1) ・scale(1,-1) ・scale(-1,1) ・matrix(0,1,1,0,0,0) ・matrix(0,-1,1,0,0,0) ・matrix(0,1,-1,0,0,0) ・matrix(0,-1,-1,0,0,0)

Gene boxes aren't visible on KaPPA-View4, so the fills and the strokes can be colored arbitrarily.

4-2-2. The Orientation of a Gene Box and the Order of a Gene Symbol

Genes in a gene box are drawn from left to right, top to bottom like shown below.

Place gene boxes using this property so that the genes are ordered along the enzymatic reaction arrow.



Caution:

The small squares of genes in the above picture are how they will be displayed on KaPPA-View4. They don't need to be actually drawn when users create a gene box.

4-2-3. Adding IDs

Add IDs to gene boxes following the format below.

ID format of a gene box object	B+number
number	Corresponding to the numeric part of enzymatic reaction ID starting with "R"
example)	B00001

The latest information on the gene box ID and the corresponding genes can be downloaded from Download page of the KaPPA-View4 web site.

4-3. Compound

Compounds are represented by circular symbol on KaPPA-View4 maps. By embedding a compound ID into an object, changes of the compound accumulations can be represented on the maps according to the experiment data.

4-3-1. Creating an Object

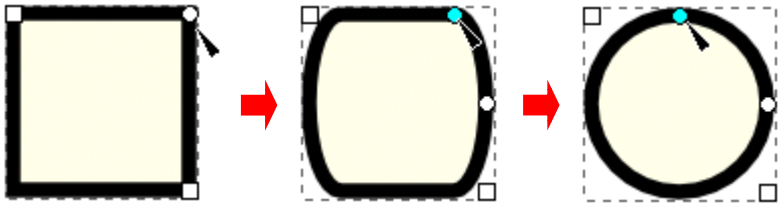
A circular symbol to represent a compound is created with "Create rectangles and squares" tool () as a "rectangle" object. Note that "Create circles, ellipses, and arcs" tool () that create "path" object isn't used.

The default maps installed in KaPPA-View4 may create a compound as a "circle" object. The proper color can be expressed, but with Inkscape a circle object cannot

be created with simple steps. If it is inevitable follow the procedure introduced in **5-5. Creating Line and circle Objects with Inkscape**.

1) Create a rectangular object with  tool. Press and hold Ctrl key and drag the canvas to draw a square.

2) Select the  tool and click the object to show the corner roundness controller. Drag the controller to make the rectangular circle.



Set the fill color so that the color will be expressed according to the data. The color of the stroke won't be affected.

Typical attributes of a circular symbol for compound of KaPPA-View4 are as follows

KaPPA-View element		A circle representing a compound	
SVG Object		rect（recommended）	
Attribute		Description	Value
width		Width	20
height		Height	20
rx		Roundness toward X-axis	10
ry		Roundness toward Y-axis	10
style	fill	Color of the fill	#FFFFFF White（except for no paint）
	stroke	Color of the stroke	#000000 Black

	stroke-width	Stroke width	2.0 px
SVG Object		circle（Not recommended. Only used in KaPPA-View default map）	
Attribute		Description	Value
r		Radius	9
style	fill	Color of the fill	#FFFFFF White（except for no paint）
	stroke	Color of the stroke	#000000 Black
	stroke-width	Stroke width	2.0 px

4-3-2. Adding IDs

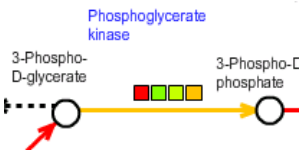
IDs for compound objects follow the format below.

ID format of a compound object	KPC+number, C+number, G+number, D+number, OR TMC+number
Description	KPC+number is compound ID format used in KaPPA-View4 Classic system. C, G or D+number are compound ID format used in KaPPA-View4 KEGG. TMC+number is a user-defined ID.　If the IDs and corresponding experiment values are described in the uploaded or POST transferred file, the color will be displayed according to the data.
example）	KPC00005 TMC00001

To look up the compound ID used in the system, download Compound Information File from the Download page or use the Search function of KaPPA-View4.

4-4. Enzymatic Reaction

Enzymatic reactions that connect compounds represented as arrows on KaPPA-View4. When expressing an experiment data, an arrow is colored based on the average value of genes assigned to the reaction.



4-4-1. Creating an Object

An enzymatic reaction object is created with "Create Bezier curves and straight lines" tool (). Arrowheads are also created with the tool (). Combine a stroke and an arrowhead to express an arrow.

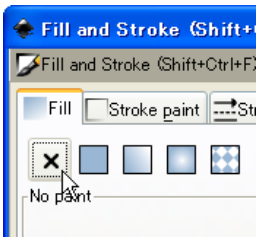
Users must take some cares when creating an enzymatic reaction object. Arrowheads and dashed lines, which can be stylized by Inkscape functions, cannot be properly viewed on KaPPA-View4. Dashed lines can only be chosen for straight lines created with a "line" object which cannot be created with the Bezier tool () (see **5-5. Creating Line and circle Objects with Inkscape**). A curved line should not be assigned fill color.

1) Draw a straight line with the Bezier tool ().

Define the start point by left clicking on the canvas. Move the cursor to the end point. By doing this action with pressing Ctrl key, slope of the line will be fixed to some defined degrees, facilitates to draw exactly horizontal and vertical lines.

Right click at the end point to finish drawing.

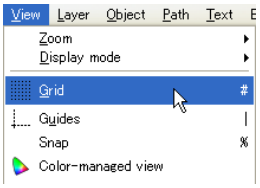
Line segments are created as a "path" object.　Select "No paint" for the fill color.



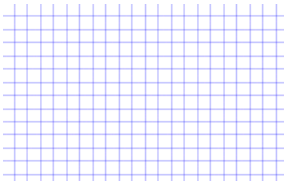
Make sure to select "No paint" for the fill color of a line because when drawing a curved line shown below with fill color, inner side of the curve will be colored on KaPPA-View4.

2) Create an arrowhead also using the Bezier tool ( ).

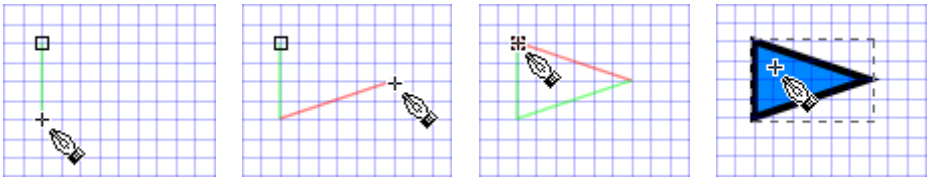
Grid line assists users to draw a symmetry arrowhead. Select "View" from the menu and click "Grid".



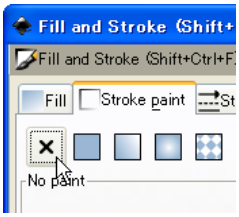
The canvas will be gridded.

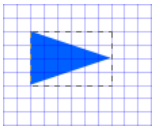


Draw a symmetrical arrowhead with the Bezier tool ( ).

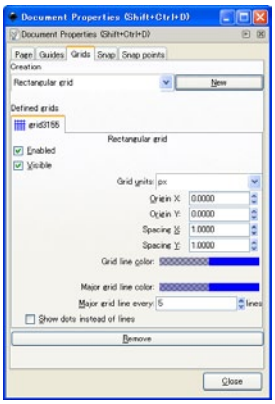


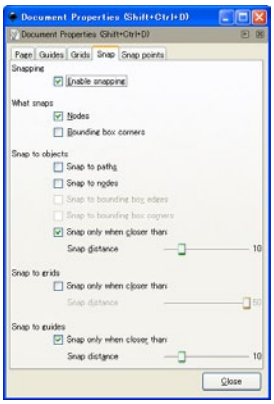
Left click at each point. When the end point meets the start point, the object completes.
Select "No paint" for the arrow head stroke.



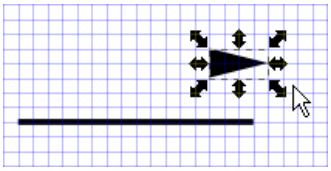


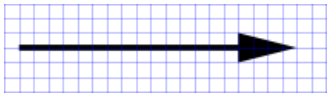
In the default setting, the clicked point snaps to a nearest intersection of the grid. For more detailed setting of grid spacing and snapping, open a window by clicking "File" from the menu and then "Document Properties...", and set conditions on "Grids" or "Snap" tab.





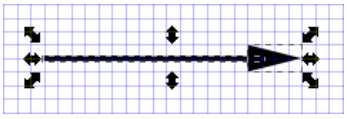
3) Place the line segment and the arrowhead suitably.



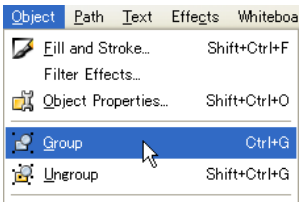


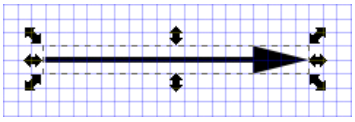
4) Group the two objects together.

Select the two objects simultaneously by dragging encircling the line and the arrowhead with  tool.

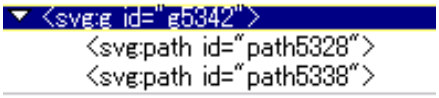


Group them together by clicking "Object" of the menu and select "Group".

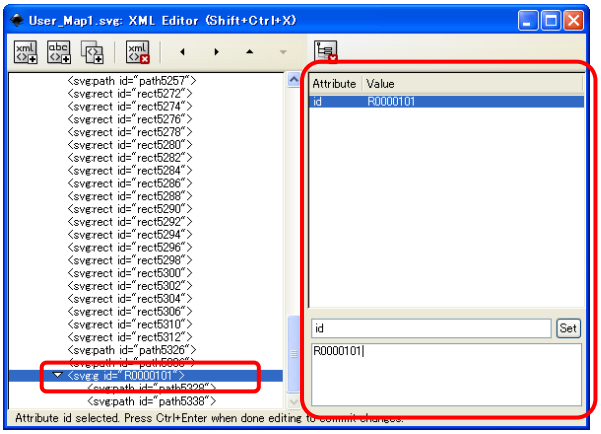




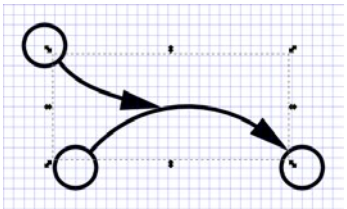
In the XML editor the grouped objects is expressed as <svg:g>. A line and an arrowhead objects are saved in it as child objects.



Add an ID to a grouped object to change the color of an enzymatic reaction arrow according to the data.

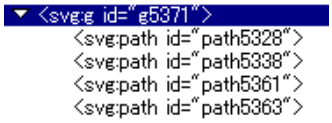


The Bezier tool () can be utilized to draw a complex curve. Grouping function enables users to draw various expressions such as branched enzymatic reactions.



Note:

Avoid creating multi-layered grouped objects when creating a complex enzymatic reaction objects with more than three objects grouped together. Grouping grouped objects together disturbs proper color expression.

	OK Each object is grouped only once.
	NG A grouped object includes other child groups. Proper color expression may be disturbed.

Typical attributes of KaPPA-View enzymatic reaction objects are as follows.

KaPPA-View element		An arrow representing each enzymatic reaction	
Line SVG Object		path（recommended）or line（only for dotted lines）	
Attribute		Description	Value
style	fill	Color of the fill	No color
	stroke	Color of the stroke	#000000 Black
	stroke-width	Stroke width	3.0 px
Arrowhead SVG Object		path（required）	
Attribute		Description	Value
style	fill	Color of the fill	#000000 Black
	stroke	Color of the stroke	No color

Refer to **5-5. Creating Line and circle Objects with Inkscape** for line objects creation.

4-4-2. Adding IDs

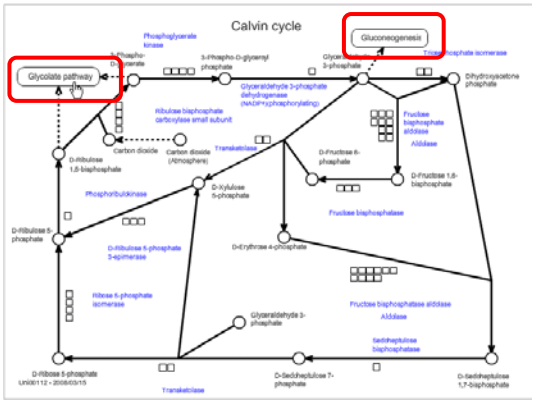
Add an enzymatic reaction object ID to a grouped object following the format shown below.

ID format of enzymatic reaction objects	R+number
Description	Enzymatic reaction IDs used in the system
example)	R0000101

To look up the enzymatic reaction IDs used in the system, download Enzyme information file from the Download function of KaPPA-View4 after logging-in. Genes assigned to enzymatic reactions are listed in Gene Box information file for each species.

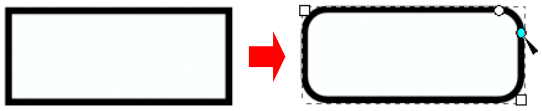
4-5. Link to Another Map

On a User Maps users can add links to other associated maps. The link is represented by a round-cornered rectangle with the name of the linked map in it. Users can jump to the other map by clicking the symbol. Efficient use of links will help understanding of the relationship of metabolic pathways.



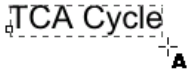
4-5-1. Creating Objects

1) Draw a square with "Create rectangles and squares" tool ( ) and use to control the roundness of the corners.



Select a color, typically white, for the fill color but not blank. No paint of fill will result in a KaPPA-View4 link symbol that can only be clicked on the line around.

1) Type in text with "Create and edit text objects" tool ( ).



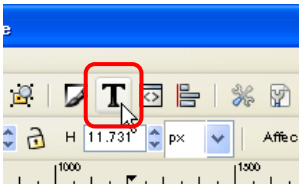
Note:

KaPPA-View4 cannot properly display a text object with newlines (returns) inserted. To display more than one line of text properly, either convert the text object to outlines or create one text object for each line.

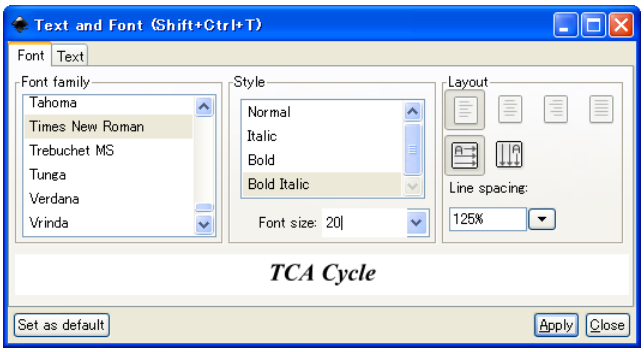
3) Change fonts following the steps shown below.

After finishing typing the text, re-select the text with tool.

Click the font setting button.



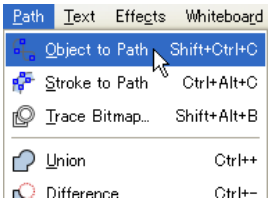
A Text and Font setting window will pop up. After setting font, style, size, etc. click Apply.



Now the text reflects the font setting.

4) Convert the text object to outlines.

To convert the text to outlines, select the text object and click "Path" of the menu and select "Object to Path".

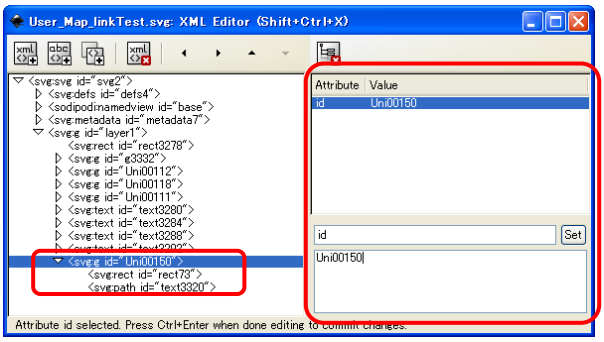


Visually the text is unchanged, but by selecting the object with  tool, it is recognized that the text is converted to outlines.

In fact, the outlined text is a "path" object. Users can recognize it with XML editor.

5) Pile the round-cornered rectangle and the text and group them together.

6) Add an ID to the grouped object. Assign the map ID of the linked map (see **4-5-3. Adding an ID**).



Typical attributes of a round-cornered rectangle representing a link to contiguous map in KaPPA-View4 are as follows.

KaPPA-View element		A round-cornered square representing a contiguous map	
SVG Object		A round-cornered rectangle part	rect (recommended) or path
Attribute		Description	Value
rx (for rect)		Roundness of the corner toward X-axis	10
ry (for rect)		Roundness of the corner toward Y-axis	10
style	fill	Color of the fill	#FFFFFF White (except for no paint)
	stroke	Color of the stroke	#000000 Black

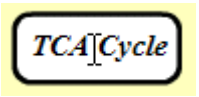
	stroke-width	Stroke width	1 px
SVG Object		A text part	path (outlined, recommended) or text
Attribute		Description	Value
style (before converting to outlines)	font-family	Font family	Arial
	-inkscape-font-specification	Inkscape font specification	Arial
	font-size	Font size	12.5 px
	font-weight	Bald font	normal（normal）
	font-style	Italicizing	normal (normal）

4-5-2. About conversion of a text to outlines

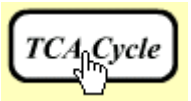
We've introduced a way for converting a text object to outlines in the previous section. There are two reasons for why we recommend this.

One is the limitation of the font. Since not all of the fonts described in SVG file can be converted into Flash properly with KaPPA-View4 (see **5-2. Font**), the design may corrupt. The text objects converted to outlines can prevent the design from collapsing.

The other is how the text is displayed on the map. When the cursor is placed on the not-outlined-text on map link object, the cursor will be I shaped, on the other hand, on the outlined-text object, the cursor will be finger shaped widely used to indicate a link. Functions are perfectly fine even for the not-outlined-text, but it is not intuitively user-friendly.



Before conversion to outlines



After conversion to outlines

One of the disadvantages of conversion to outlines is that text cannot be re-edited.

The link function on KaPPA-View4 is unaffected whether to do or not to do the text conversion to outlines. Therefore the conversion is up to the users.

4-5-3. Adding IDs

Attach an ID to an object that indicates the link to other map following the format below.

ID format of map link objects	3 letters+integer number(+1 letter)
Description	Map IDs used in the system
example)	Uni00001 Uni00034f Lja00017

Attach an ID to the grouped object that includes a round-curved rectangle and the text so that the link function is executed when the rectangle is clicked. To place several links to the same contiguous map, carefully group them all so that the resulted group object doesn't include any child group object.

There are several methods to look up map IDs used in the system.

- Get Map Information file of each species from Download page.

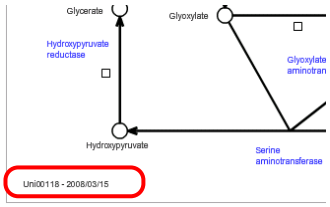
The figure below is an example of a Map Information file.

	A	B	C	D	E
1	map_level	map	map_parent	map_order	map_name
2	0	Uni00000		1	Plant metabolic pathways
3	1	Uni11000	Uni00000	1	Carbohydrate metabolism
4	2	Uni21100	Uni11000	1	CO2 fixation and central carbohydrate metabolism
5	3	Uni00112	Uni21100	1	Calvin cycle
6	3	Uni00118	Uni21100	2	Glycolate pathway
7	3	Uni00111	Uni21100	3	Glycolysis/gluconeogenesis
8	3	Uni00120	Uni21100	4	Phosphoenolpyruvate and pyruvate metabolism
9	3	Uni00150	Uni21100	5	TCA cycle
10	3	Uni00152	Uni21100	6	Glyoxylate cycle
11	3	Uni00090	Uni21100	7	Glycerol metabolism
12	2	Uni21200	Uni11000	2	Mono-, di- and oligosaccharide metabolism
13	3	Uni00020	Uni21200	1	Hexose phosphate pool
14	3	Uni00117	Uni21200	2	Pentose phosphate cycle
15	3	Uni00022	Uni21200	3	Sucrose metabolism
16	3	Uni00099	Uni21200	4	Trehalose metabolism
17	3	Uni00134	Uni21200	5	UDP-sugar metabolism
18	3	Uni00145	Uni21200	6	GDP-sugar and ascorbate metabolism
19	3	Uni00025	Uni21200	7	dTDP-sugar biosynthesis
20	3	Uni00443	Uni21200	8	Inositol phosphate metabolism

The map of map_level 3 in the first column (column A) is the lowermost layered metabolic pathway map. The map name is written in the fifth column (column E) and the corresponding map ID is on the second column (column B).

Example) In the figure above is Map Information file for a universal map. The map ID of Calvin cycle in universal mode is Uni00112.

- Check the ID on the lower left corner of the map in each map mode.



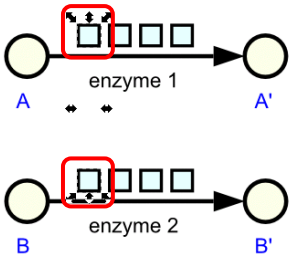
5. Other Objects

5-1. Grouped Object

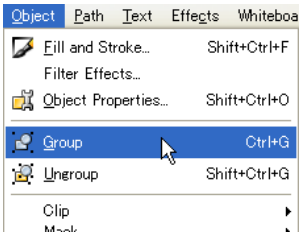
Inkscape can treat more than one object as one object. This function is called grouping. KaPPA-View4 colors objects according to experiment data by adding IDs to them, but when the objects are grouped together, coloring target may be limited. This section covers what to be careful about when grouping objects together.

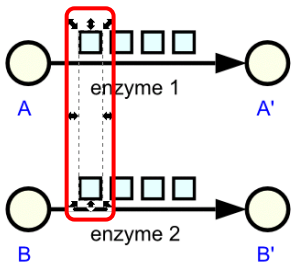
5-1-1. Grouping Objects Together

Using  tool, click objects while pressing Shift key to select several objects at the same time.

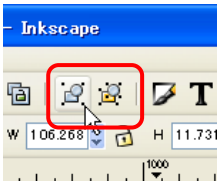


Click "Object" of the menu and select "Group" to group the selected objects together.

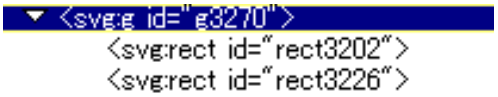




To ungroup the grouped objects, click "Object" and "Ungroup".
Grouping and ungrouping can also be done from the toolbar.



In XML editor, the objects that had been grouped together are now child objects that belong to the grouped object <svg:g>.



5-1-2. Coloring Rule of Grouped Objects

When a grouped object has been assigned KaPPA-View4 map element IDs, i.e., ID of gene, gene box, compound, enzymatic reaction, or link to contiguous map, the child objects that belong to the grouped object will be processed based on the rules shown below.

- When the child object has been assigned a valid ID, the child object will be colored according to the ID.

- When the child object hasn't been assigned any valid IDs, it will be colored according to the parent group ID. However if a parent grouped object (A) contained a child grouped object (B), the objects in group B will be excluded from the coloring according to the ID of A.

Therefore in other words, regarding coloring of the objects, the ID that added to the object that is out of the group is prioritized, and when an ID is added to a grouped object, only the objects that directly belong to the group will be affected.

5-2. Font

5-2-1. Standard Font: Arial

Arial is the standard font for KaPPA-View4 maps. Since a User Map created with Arial is properly displayed on KaPPA-View4 as it seen on the Inkscape, we strongly recommend using Arial.

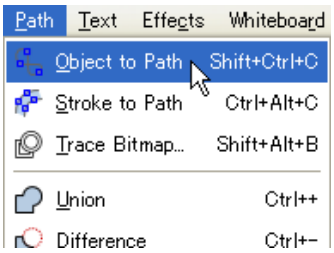
5-2-2. Using Other Fonts

Even if fonts other than Arial are used on a user map, the map is displayed on KaPPA-View4 with no error when the very computer is used because the computer must have the same font installed. However Flash cannot properly process some of special fonts such as Japanese font and may replace the font with similar one resulting in corrupted design or character. Special font may also cause some trouble when the SVG file is opened on a different computer. We strongly recommend using wide spread fonts such as Times New Roman other than Arial to prevent the corruption.

5-2-3. Conversion of a text to outlines

Even though text cannot be re-edited, by converting to outlines the text design and character corruption can be prevented, and it enables KaPPA-View4 to display in exactly the same way as on Inkscape. When the User Map is going to be sent to the KaPPA-View4 administrator, all the text on it must be converted to outlines.

Click "Path" of the menu and select "Object to Path" while selecting the text object.



The text doesn't change visually, but by selecting it with tool, users can see it is converted to outlines.

Users can see with the XML editor that the outlined text has been converted into a "path" object.

5-3. Text Object

In Inkscape text object, which is created with tool, users can insert a newlines (returns) within the text. However, KaPPA-View4 doesn't recognize the inserted newlines and display the text in one line. To avoid it, either convert the text to outlines or create each lines as a separate text object.

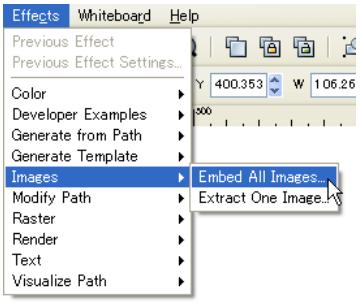
5-4. Image

Images can be added into User Maps and they are displayed on KaPPA-View4 too, facilitates to create attractive presentation maps. The image file must be embedded in the SVG file. The steps are shown below.

1) Add the image on the canvas.

Either copy and paste the image or click "File" of the menu and select "Import" to load the image.

2) Click "Effects" of the menu and select "Images" and then "Embed All Images..." to open a setting window.



To embed only the selected image, check "Embed only selected images" and click Apply button.

A console similar to the command prompt of Windows pops up briefly. When the console disappears, the embedding is completed.

3) Checking the image embedding.

The file size of the SVG file becomes larger after images embedding. Users can check if the image is properly displayed on the KaPPA-View4 according to a procedure described in **6-1. User Map Operation Confirmation**.

5-5. Creating Line and circle Objects with Inkscape

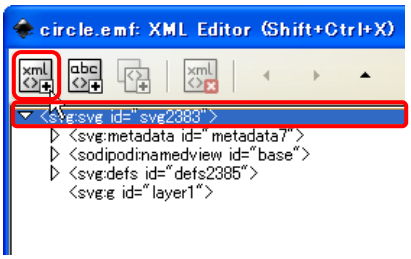
KaPPA-View4 default map contains dashed lines expressed with "line" objects and compounds circles created with "circle" objects, but in Inkscape they are not created easily with simple tools. This section covers the steps of creating those

objects. A dashed line created with a "path" objects cannot be properly expressed on KaPPA-View4. Use a line object to draw dashed lines.

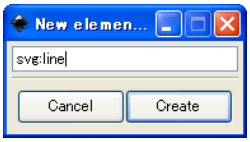
5-5-1. Creating Line Objects

Line object is the only way to create a dashed line on KaPPA-View4, although it cannot draw curves. Dashed lines can be used for links to contiguous maps and expressing multiple steps of the metabolic pathways,

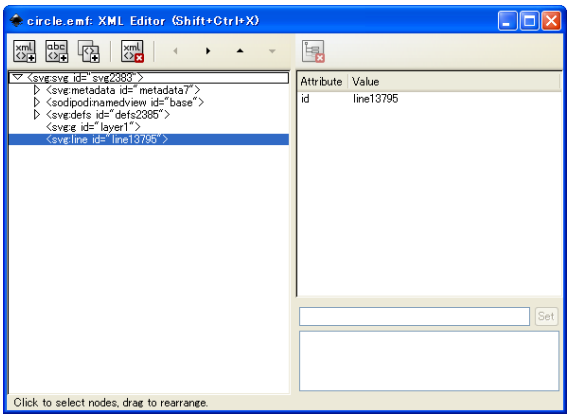
Open XML editor. Select <svg:svg id="*****"> on the highest rank and click "New element node" button.

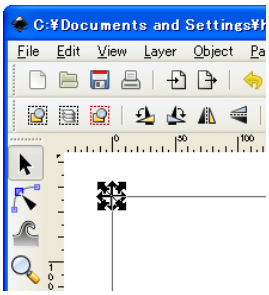


A dialogue pops up. Type "svg:line" and click "Create" button.

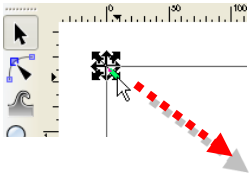


An item '<svg:line id="*****">' is added, and a marker appears on the upper left corner of the canvas.





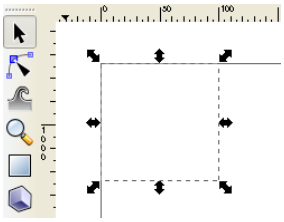
Try dragging one of the controller for object enlarging on the screen.



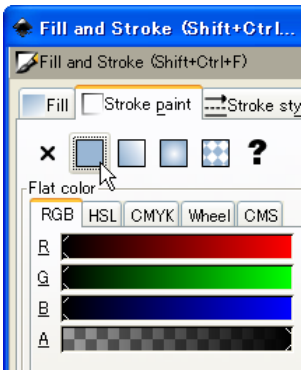
New attributes for position of the object are automatically added to the line object. Set each attribute value as below.

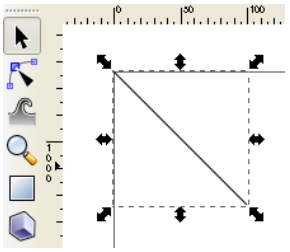
Attribute	Value	Description
x1	0	X coordinate of the start point
x2	100	X coordinate of the end point
y1	0	Y coordinate of the start point
y2	100	Y coordinate of the end point

They are displayed on the canvas as below.



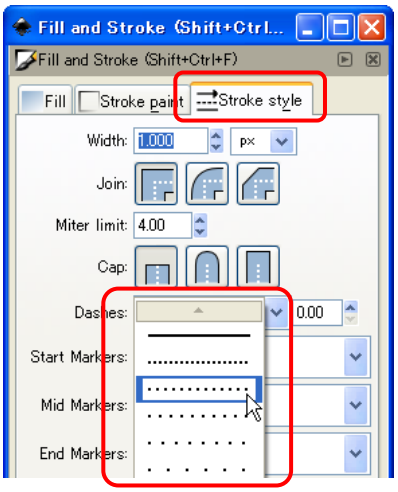
Line objects become visible by setting the stroke paint.

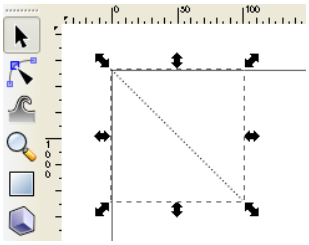




Adjust them by dragging and transforming.

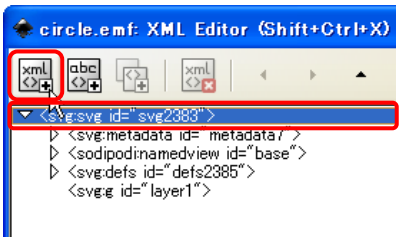
To make the line dashed, select "Stroke style" tab from "Fill and Stroke" setting window, and select an item from "Dashes:".



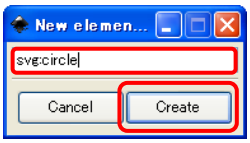


5-5-2. Creating Circle Objects

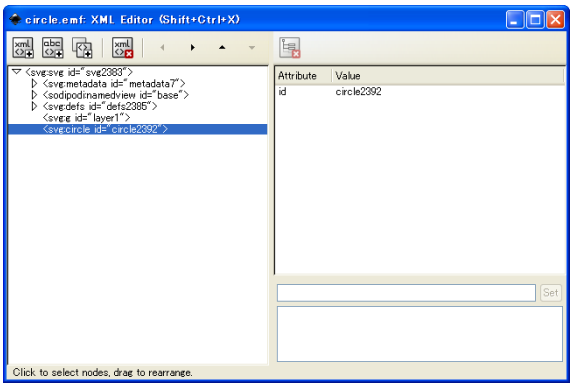
Open XML editor, select '<svg:svg id="*****">' on the top and click "New element node" button.



A dialogue pops up. Type "svg:circle" and click "Create" button.



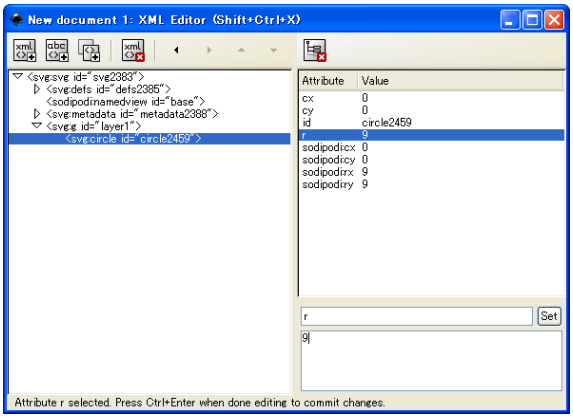
A new element will be added on XML editor, but the canvas still remains blank.



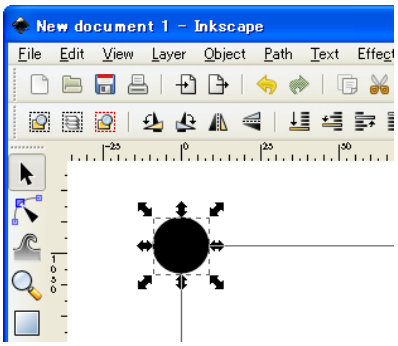
Select the element of '<svg:circle id="*****">' and set attributes and values as follows.

Attributes	Values	Description
cx	0	X coordinate of the center

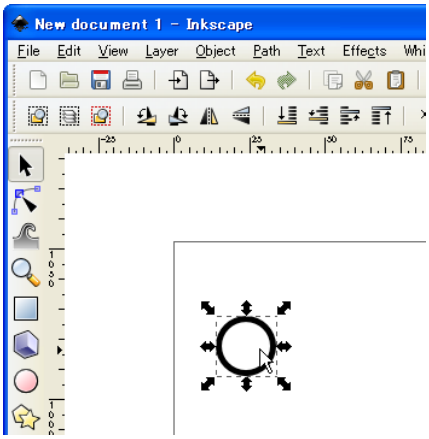
cy	0	Y coordinate of the center
r	9	radius



A black circle appears on the upper left corner of the canvas.

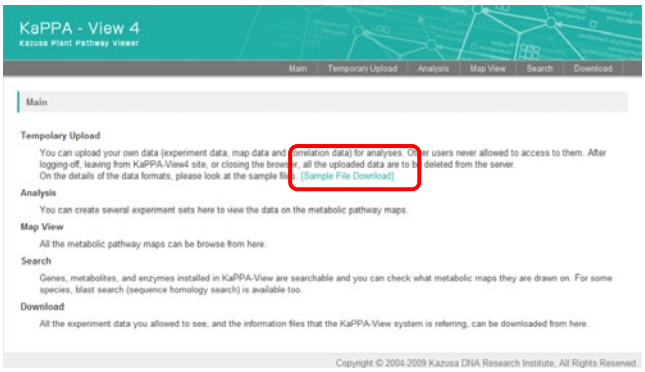


A circle object is now on the screen. Adjust the object just like other Inkscape objects.



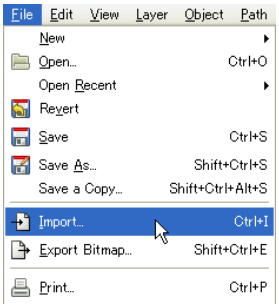
5-5-3. Loading Templates

Users can download sample data (sampleFiles.zip) from the KaPPA-View4 top page or from the main page that appears after logging in.

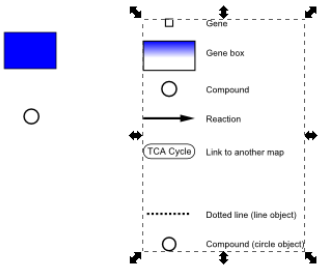


After unzipping the zip file, open "template_v***.svg" in "userMap" folder with Inkscape (v*** indicates the version of the data). Basic objects such as "line" and "circle" objects can be obtained from the file.

Users can load the template object onto the current canvas too. Click "File" of the menu and select "Import..."



Imported objects are grouped all together. Ungroup them before using.



6. Using User Maps on KaPPA-View4

You may want to test your first SVG if it actually works correctly on KaPPA-View4. When a good User Map is completed, it will be a great help for your efficient analysis. You may want to share your carefully curated map with many other people. You can send e-mail to the administrators by simple steps on KaPPA-View4. We welcome any criticisms on our default map.

This chapter covers the operation of KaPPA-View4 regarding the use of user maps. Refer to "Users' manual" for more detailed information of KaPPA-View4 operations.

6-1. Checking behavior of User Map

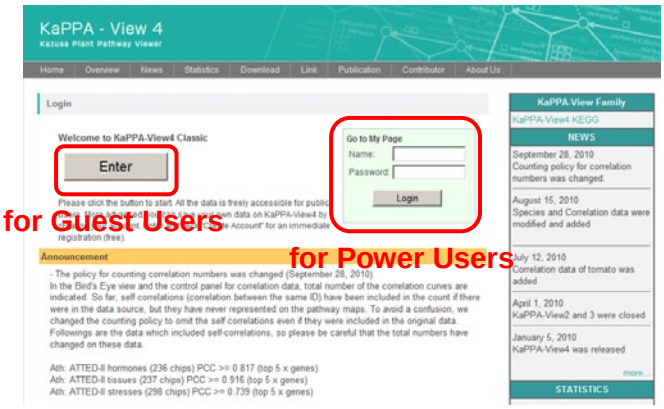
Uploading a user map to KaPPA-View4 is the best way to check the behavior of it.

6-1-1. Accessing to KaPPA-View4

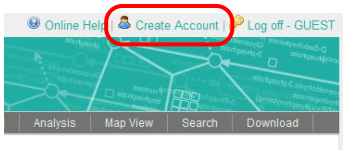
Go to KaPPA-View4 website.

http://kpv.kazusa.or.jp/kpv4/

Guests can log in simply by clicking "Enter". Power Users type "Name" and "Password" and click "Login" button to login.



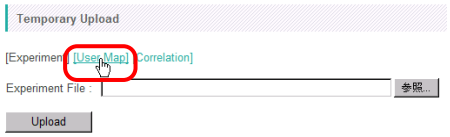
Power Users can save User Maps on KaPPA-View4 server and view them from Pathway Tree anytime. Guests have to upload User Maps for every analysis. A guest can easily become a Power User by clicking "Create Account" on the upper right corner of the window and following simple steps.



6-1-2. Uploading User Map for checking

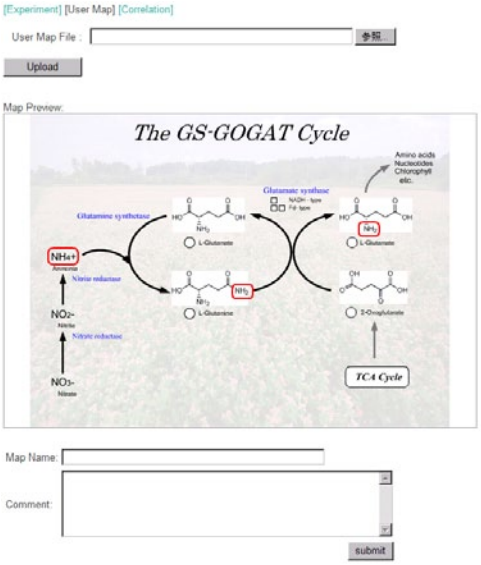
Click Temporary Upload in the main menu.

Select "User Map" for type of data.

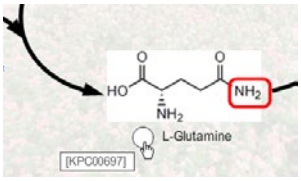


Click "Browse" and select the SVG file created with Inkscape, then click "Upload" button.

The loaded SVG file is converted into Flash and displayed as Map Preview.



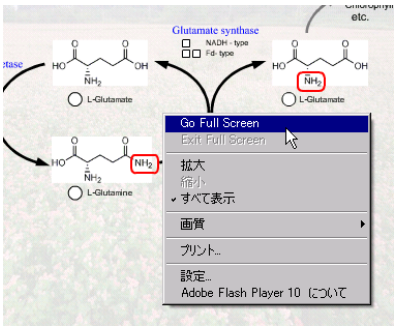
On the map preview, properly added valid IDs of objects such as genes, compounds, enzymatic reactions will be seen as tool tips when a mouse cursor is places on the objects.



Users can test if the user map functions properly in this way.
Information pop-ups and inter-map jumping don't function on preview. The coloring based on experiment data is neither visually expressed on preview.

Tip:

Right click to show Flash context menu. "Go Full Screen" expands the map to the full screen and will help users checking the details. "Zoom In" magnifies the map area around the mouser cursor.

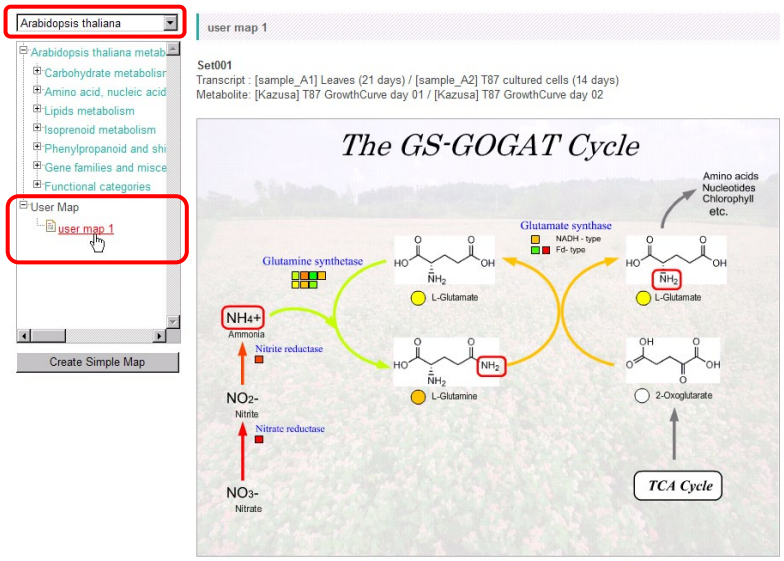


Once the user map is confirmed, upload the map to KaPPA-View4 server. Type a map name and click "Submit". The comment box can be left blank.

The map name will be displayed under the Pathway Tree that appears on Map View and Analysis screen.

6-1-3. Browsing User Maps on KaPPA-View4

The map name typed to upload will be displayed under the Pathway Tree that can be seen on Map View and Analysis screen. Select suitable species because user maps cannot be used under the Universal Map Mode.

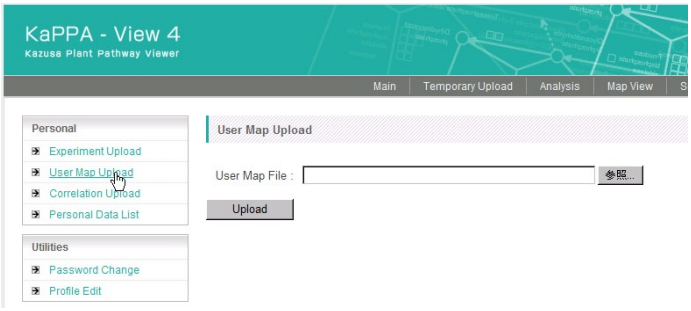


Confirm inter-map jumping and data-based coloring.

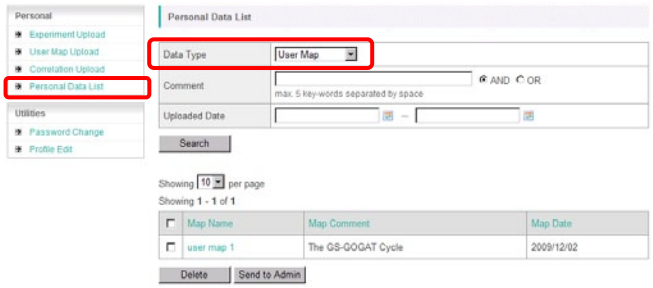
6-1-4. Registering User Maps on KaPPA-View4 (for Power Users)

Power Users can register their own user map into their account and use the maps right after logging in.

From the Power User menu on the left of the main window, select User Map Upload. Upload the maps from the form similar to Temporary Uploading. The registered user maps can be used from the Pathway Tree just like temporarily uploaded maps.



The registered maps are viewed in Personal Data List of Power User menu. Users can delete the map from Personal Data List as well.



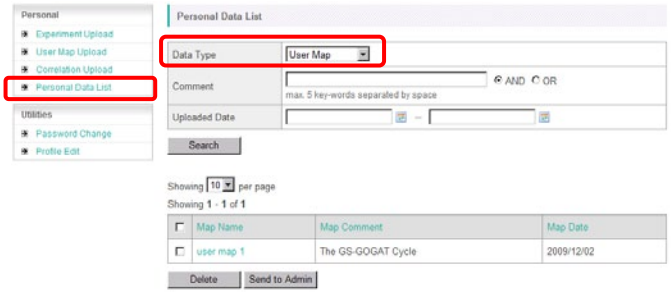
6-2. Sending User Maps to KaPPA-View4 Administrators (for Power Users)

Despite our best effort, there may be information error or deficiency in the default map. Once user maps with corrected errors or species specific pathways that default map didn't cover are completed, consideration them to the public is greatly appreciated.

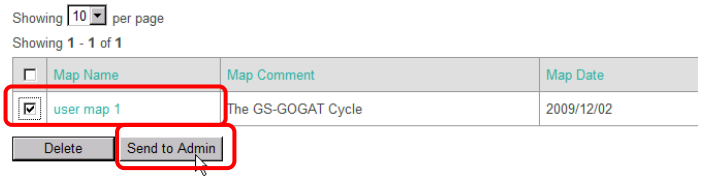
Power Users can send their user map to the KaPPA-View4 administrator with simple steps. The administrators will discuss on using the user map for improving the default map. We acknowledge the map donor with a great appreciation.

6-2-1. Sending a User Map

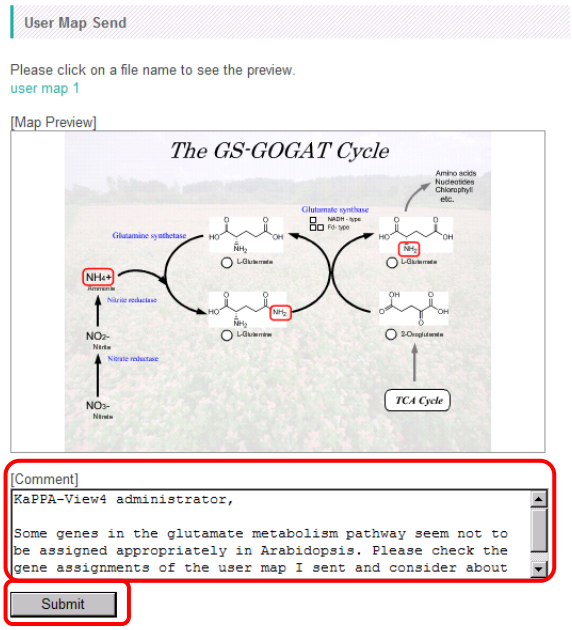
Register a user map as a Power User following **6-1-4. Registering User Maps on KaPPA-View4 (for Power Users)**. List the registered map from Personal Data List.



Check the User Maps to send and click "Send to Admin" button.



A new window pops up. Check the map and type message to the administrator. Click "Submit" to send the User Map file and the message.



The message can be either in English or Japanese. The administrator will e-mail the user to discuss the treatment of the user map.

6-2-2. Note

•*Notes on Creating a User Map*

Convert all characters to outlines when the user map to be sent uses any fonts other than Arial.

•*Comments to the Administrator*

Do not forget to send the following information.

- Name

Used for specifying the contribution.

- Affiliation

Used for specifying the contribution.

- Contact e-mail address

The administrator may contact regarding the user map information.

- Use of the user map

1) Information addition to the default map

2) Curation of the default map

3) Adding a new map

Please let us know the suitable species and position on the Pathway Tree.

7. Others

7-1. About Us

Team KaPPA-View

e-mail: kappa-view at kazusa.or.jp (replace at to @)
The Administrators and developing team of KaPPA-View in Kazusa DNA Research Institute (http://www.kazusa.or.jp/e/). Please send your all inquiries to this e-mail address.

7-2. Acknowledgements

We are grateful to Miss Sumy Sekine and Mr. Atsushi Hiruta for translation assistance of this manual into English. KaPPA-View was developed in Kazusa DNA Research Institute with a support from the New Energy and Industrial Technology Development Organization (NEDO), Japan under the research project named "Development of Fundamental Technologies for Controlling the Material Production Process of Plants" (P02001).

7-3. References

KaPPA-View4: a metabolic pathway database for representation and analysis of correlation networks of gene co-expression and metabolite co-accumulation and omics data. Sakurai et al., (2011) Nucleic Acids Research 39: D677-684

7-4. Manual Version

ver 1.0 (2010.12.30)
Initial English version released.

Appendices

Appendix A. List of Recommended Settings of Objects

KaPPA-View element		A square representing each gene	
SVG Object		rect（required）	
Attribute		Description	Value
width		Width	10
height		Height	10
rx		Roundness toward X-axis	0
ry		Roundness toward Y-axis	0
style	fill	Color of the fill	#FFFFFF White（except for no paint）
	stroke	Color of the stroke	#000000 Black
	stroke-width	Stroke width	1.5 px

KaPPA-View element	A square representing a gene box	
SVGObject	rect（Required）	
Attribute	Description	Value
rx	Roundness toward X-axis	*not defined*（Required）
ry	Roundness toward Y-axis	*not defined*（Required）
transform	Rotating the object etc.	One of the below (Required） ・*not defined* (default) ・scale(-1,-1) ・scale(1,-1) ・scale(-1,1) ・matrix(0,1,1,0,0,0)

		・matrix(0,-1,1,0,0,0) ・matrix(0,1,-1,0,0,0) ・matrix(0,-1,-1,0,0,0)

KaPPA-View element		A circle representing a compound	
SVG Object		rect（recommended）	
Attribute		Description	Value
width		Width	20
height		Height	20
rx		Roundness toward X-axis	10
ry		Roundness toward Y-axis	10
style	fill	Color of the fill	#FFFFFF White（except for no paint）
	stroke	Color of the stroke	#000000 Black
	stroke-width	Stroke width	2.0 px
SVG Object		circle（Not recommended. Only used in KaPPA-View default map）	
Attribute		Description	Value
r		Radius	9
style	fill	Color of the fill	#FFFFFF White（except for no paint）
	stroke	Color of the stroke	#000000 Black
	stroke-width	Stroke width	2.0 px

KaPPA-View element		An arrow representing each enzymatic reaction	
Line SVG Object		path（recommended）or line（only for dotted lines）	
Attribute		Description	Value
style	fill	Color of the fill	No color
	stroke	Color of the stroke	#000000 Black
	stroke-width	Stroke width	3.0 px

Arrowhead SVG Object		path（required）	
Attribute		Description	Value
style	fill	Color of the fill	#000000 Black
	stroke	Color of the stroke	No color

KaPPA-View element		A round-cornered square representing a contiguous map	
SVG Object		A round-cornered rectangle part	rect（recommended） or path
Attribute		Description	Value
rx（for rect）		Roundness of the corner toward X-axis	10
ry（for rect）		Roundness of the corner toward Y-axis	10
style	fill	Color of the fill	#FFFFFF White (except for no paint)
	stroke	Color of the stroke	#000000 Black
	stroke-width	Stroke width	1 px
SVG Object		A text part	path (outlined, recommended) or text
Attribute		Description	Value
style (before converting to outlines)	font-family	Font family	Arial
	-inkscape-font-specification	Inkscape font specification	Arial
	font-size	Font size	12.5 px
	font-weight	Bald font	normal（normal）
	font-style	Italicizing	normal (normal）

Appendix B. List of ID formats of Objects

ID format of gene objects	text+(integer number)_g
text	Gene IDs used in KaPPA-View4 system or user-defined ID starting with "TMG" Gene objects with a user-defined ID will be colored when the ID and the corresponding experiment data are described in the uploaded or POST transferred data file.
Integer number	Use different integer numbers to draw one gene on more than one place of the same map.
example）	At1g12340(1)_g TMG001(1)_g

ID format of a gene box object	B+number
number	Corresponding to the numeric part of enzymatic reaction ID starting with "R"
example）	B00001

ID format of a compound object	KPC+number, C+number, G+number, D+number, OR TMC+number
Description	KPC+number is compound ID format used in KaPPA-View4 Classic system. C, G or D+number are compound ID format used in KaPPA-View4 KEGG. TMC+number is a user-defined ID.　If the IDs and corresponding experiment values are described in the uploaded or POST transferred file, the color will be displayed according to the data.
example）	KPC00005 TMC00001

ID format of enzymatic reaction objects	R+number
Description	Enzymatic reaction IDs used in the system
example）	R0000101

ID format of map link objects	3 letters+integer number(+1 letter)
Description	Map IDs used in the system
example）	Uni00001 Uni00034f Lja00017