

TropicalInsect and TropicalInsectX: A User's Manual

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1 Installation

1.1 External software

The software TropicalInsect is based on the programs *polymake* and *gfan*. It is necessary, that you have installed both programs successfully. To install, visit the homepages and follow the installation instructions. Please download at least *polymake 2.9.9* at <http://www.polymake.org/doku.php/download/start>. If you want to use transparency, you have to use a patched version of *polymake*. The patch itself and instructions on how to apply it can be found on <http://forum.polymake.org/viewtopic.php?f=8&t=13>. At <http://www.polymake.org/doku.php/download/start> you can find a list of the required external software for *polymake*.

gfan can be downloaded at <http://www.math.tu-berlin.de/~jensen/software/gfan/gfan.html>, where you can also find instructions on how to install *gfan* in the manual. There is a third software named *JReality*, which you can download at http://www3.math.tu-berlin.de/jreality/index.php?article_id=4.

In the case, that you want to use the graphical user interface TropicalInsectX, you have to make sure, that you have installed the library *libqt-perl*. If it is not available in the package manager of your system, please search and download the according package from <http://perlqt.sourceforge.net/>.

1.2 TropicalInsect

Please ensure that the following files are located in the same directory: *tropicalinsect.pl*, *tropicalinsectX.pl* and *manual-tropicalinsect.pdf*. Make the GUI executable with the command `chmod u+x tropicalinsectX.pl`.

2 Using the software

2.1 TropicalInsect- using the shell

TropicalInsect is a software to draw the intersection of some tropical surfaces, using the software *gfan* and *polymake*. To start the program move to the directory containing the file *tropicalinsect.pl* and type the command

```
polymake --script tropicalinsect.pl or  
polymake --script tropicalinsect.pl <arguments>,  
where <arguments> could be:
```

`--surfaces=..` to define the surfaces. This option is required.

`--colors=[0,255,255][255,255,255]...` to choose some colors for the surfaces. You can also separate them by comma, e.g. `[0,255,255],[255,255,255]` If not specified, the first color will be red and the second green. Everything else, except the intersection, will have a randomly chosen color.

`--intersectioncolor=..` to specify the color for the intersection in RGB-format. Standard is blue.

`--intersectiontransp=..` to specify the transparency of the intersection. 1 is clear, a value near 0 is opaque. Standard is 0.01

`--transparencies=[0.3][0.7]..` to specify different transparency values for different surfaces. Like with `--colors`, you can also separate the values by comma, i.e. `[0.3],[0.7]`.

`--show=none` or `--show=0,2,..` if you do not want all surfaces to be shown. The first surface has the number 0 and "none" means just the intersection will be drawn

`--stable` to draw the stable intersection

`--help` to see this help

`--forcejavaview` to force the use of javaview

`--verbose` if you would like to have debug information

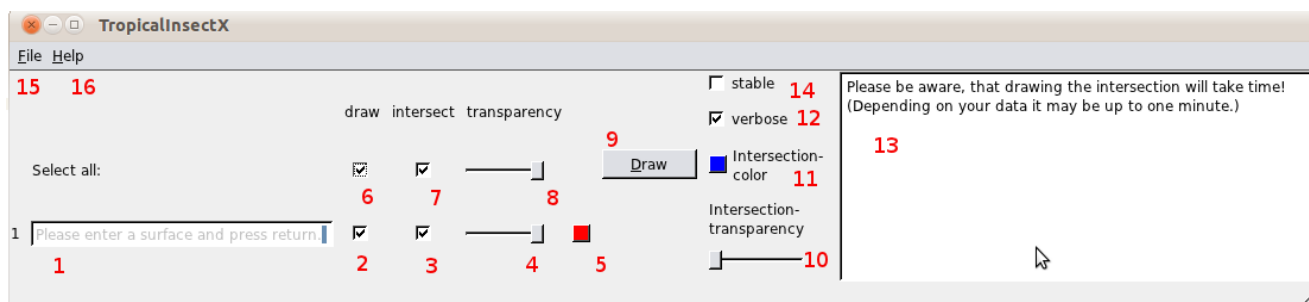
Please be aware, that drawing the intersection of several surfaces WILL TAKE TIME!

2.2 TropicalInsectX- using the GUI

TropicalInsectX is a graphical user interface for the program *TropicalInsect*. There are two possibilities to start the gui. Either doubleclick on the file *XTropicalInsect* or go into the directory where the file *tropicalinsectX.pl* is located and type the command

```
perl tropicalinsectX.pl or ./tropicalinsectX.pl.
```

After starting *TropicalInsectX*, a window with several objects opens.



1. edit line to type in the first surface. To get another edit line press enter after your input. Please use only the variables x, y, z, t, digits from 0 to 9 and the operations +, -, * and ^.
2. checkbox to select the surface to be drawn. If you select a surface, it automatically will get intersected, thus the checkbox with number 3 will get checked.
3. checkbox to select if the surface should be in the intersection. If a surface is not selected to be in the intersection, it is also not selected to be drawn.
4. slider to change the transparency of the surface, the values increase from left to right.
5. button to change the color of the surface.
6. checkboxes to select all or none (i.e. only the intersection will be drawn) surfaces to be drawn.
7. checkboxes to select all or none (i.e. there isn't anything to be drawn) surfaces to be in the intersection.
8. slider to set the same transparency for all surfaces.
9. draw button to draw all surfaces with the specified settings. Please be aware, that drawing the intersection of several surfaces WILL TAKE TIME!
10. slider to change the transparency of the intersection
11. button to change the color of the intersection
12. checkbox to select the verbose option. If it is checked the shell output appears in the white window number 13. If the verbose checkbox is not enabled the window number 13 will disappear.
13. white window for the shell output. Only visible if verbose is checked.
14. checkbox to select the stable option. If it is checked, the picture shows the stable intersection of the surfaces.

15. menu with the items **Exit**, which exits the program and **Clear** which resets everything.
16. menu with the items **Manual**, which opens this file, and **About**, which gives you some information about the license.

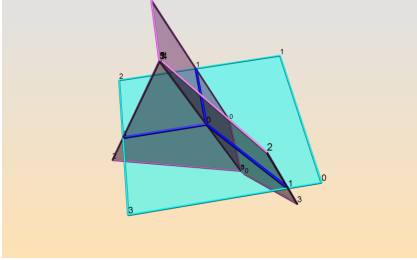
TropicalInsectX can not change the picture. If you want to change some settings, you have to draw a new picture by clicking the *Draw*-button again.

3 Examples

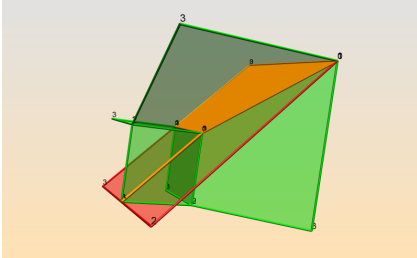
3.1 Examples using the shell

The following three examples are chosen mainly to show how to use *tropicalinsect* and to show the syntax of different options.

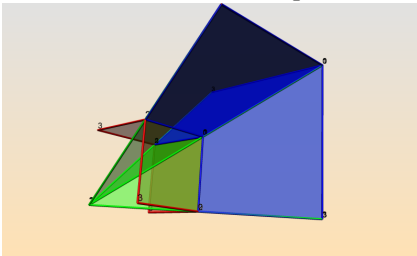
```
polymake --script tropicalinsect.pl --surfaces=x+ty^2,xy+z+t
--stable --colors=[0,255,255] [255,120,255]
```



```
polymake --script tropicalinsect.pl --surfaces=x+y,x+y+z+t
--intersectioncolor=255,150,0 --verbose
```



```
polymake --script tropicalinsect.pl --surfaces=x+y+z+t,x+y+z
--intersectiontransp=0.3
```



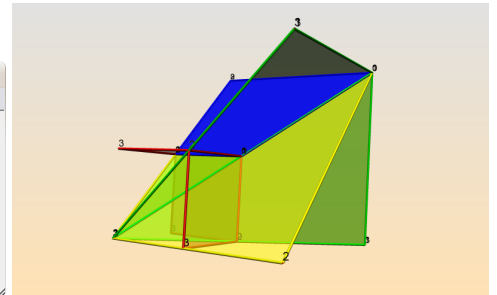
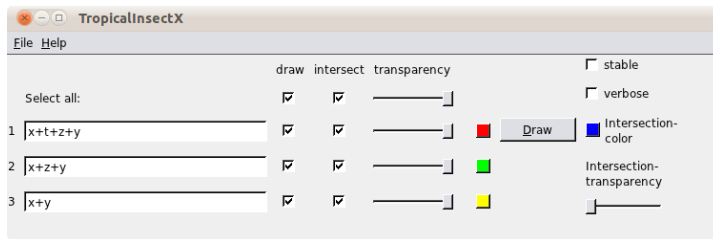
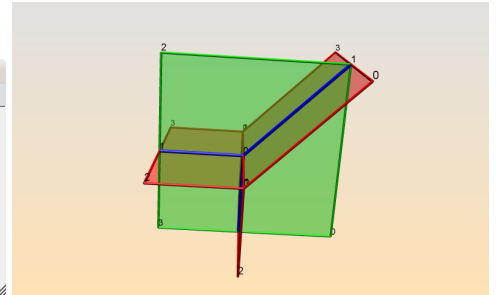
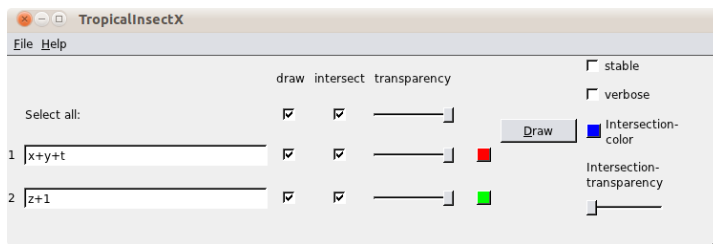
3.2 Examples using the GUI

In this section four different examples were chosen to show different applications of TropicalInsect. There won't be an example for every attribute you can change. The user is expected to experiment himself, for example with different transparencies.

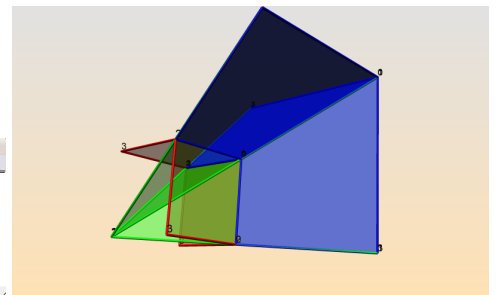
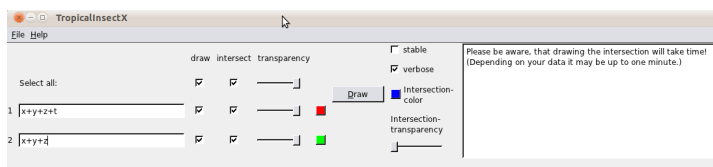
There will be a picture of the gui and of the drawn intersection. Because of consistency the intersectioncolor will always be blue and the colors of the surfaces are red, green, and yellow.

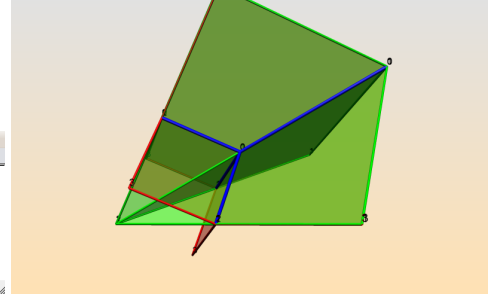
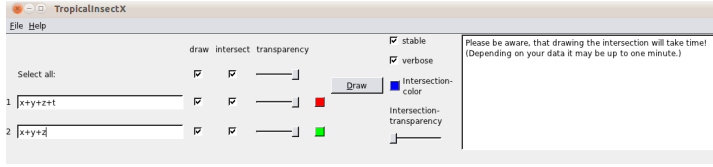
1. *TropicalInsect* is able to draw hypersurfaces or curves as the intersection of other hypersurfaces.

In the first example you can see the intersection forming a blue curve, in the second example creating a blue hypersurface.

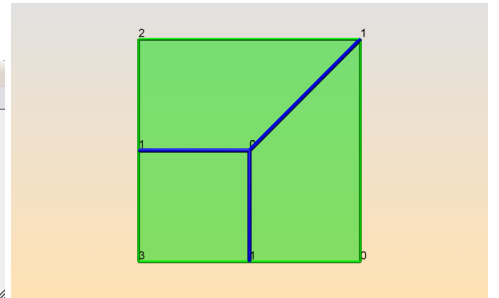
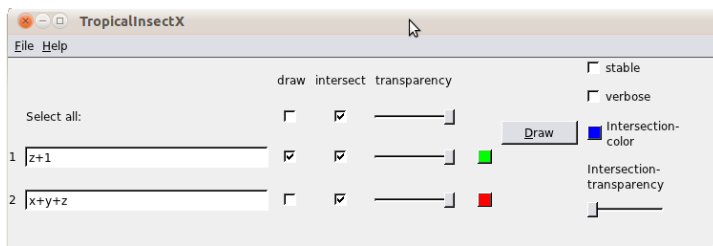


2. In this example the option stable is presented. There are two pictures of the intersection of the surfaces $x + y + z + t$ and $x + y + z$ from which the second one shows the stable intersection.

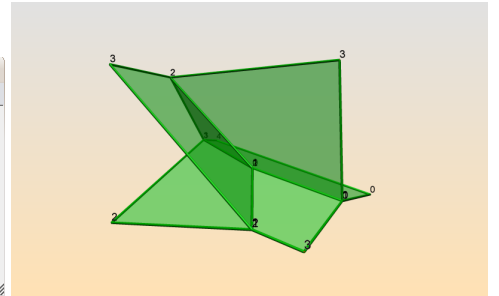
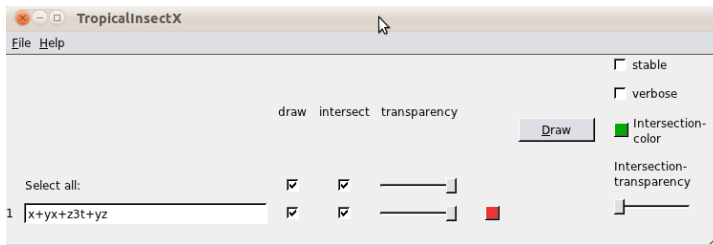




3. *TropicalInsect* is also able to draw tropical curves. To get a tropical curve, you have to intersect the curves, with e.g. the x-y-plane. That means one of the curves has to be $z + 1$, additionally you have to unselect the drawing checkbox of the other surface.



4. You can also draw single hypersurfaces with *TropicalInsect*. To do so you have to select only one hypersurface to be in the intersection. Be aware, that you have to change the intersection color, if you want the color of the hypersurface to differ from blue.



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