Short Introduction to Pajek

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# Outline

1. Pajek

2. Data

3. Graph drawing

Pajek

Pajek (the Slovenian word for *spider*) is an excellent

computer program for the analysis and visualization of graphs.

It is made by Vladimir Batagelj and Andrej Mrvar

of the University of Ljubljana (Slovenia)

and can be freely downloaded (with manual) from

`http://vlado.fmf.uni-lj.si/pub/networks/pajek/`

It is continually being extended and updated.

Data formats

The basic data format is the `.net` file

for which an example is the following.

```
*Vertices 4
1 "A"
2 "B"
3 "C"
4 "D"
*Edges
1 2 1
1 3 1
2 3 1
1 4 1
```
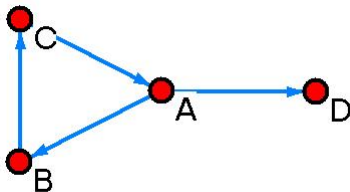
The file defining the graph
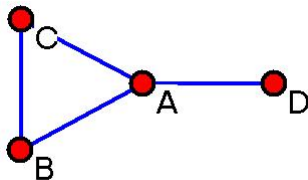
Data formats: directed graphs

```
*Vertices 4
1 "A"
2 "B"
3 "C"
4 "D"
*Arcs
1 2 1
2 3 1
3 1 1
1 4 1
```

The file defining the digraph

Other input data formats

For graphs and digraphs without values on the edges or arcs,
it is also possible to give in each line several edges/arcs
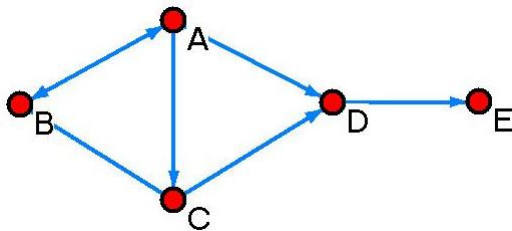emanating from one vertex:

```
*Vertices 5
1 "A"
2 "B"
3 "C"
4 "D"
5 "E"
*Arcslist
1 2 3 4
2 1
3 4 2
4 5
```
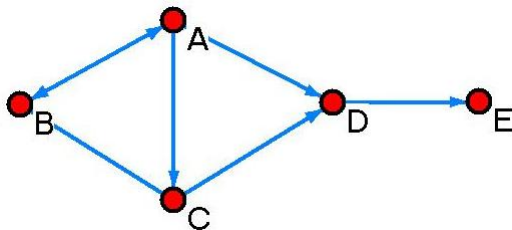
The file defining the digraph

Edgeslist has a similar meaning
for non-directed graphs.

The graph/digraph can also be given as an adjacency matrix:

```
*Vertices 5
1 "A"
2 "B"
3 "C"
4 "D"
5 "E"
*Matrix
0 1 1 1 0
1 0 0 0 0
0 1 0 1 0
0 0 0 0 1
0 0 0 0 0
```

Another file defining the digraph

Even if the matrix is symmetric,

it still defines a digraph.

Save as ...

When the command "Net – Save" is chosen,
the "Save as type" option gives the possibilities
to save the graph/digraph in any of these data types.

This feature allows the use of Pajek
as a very convenient tool
to transform one data format to another.

The input files can be created / modified by any text editor.

Leave no blank lines. Next to the .net files, there can be

.clu files with nominal data (*partitions*),

.vec file with numeric data,

.per files with permutations (orderings).

All have the same structure: e.g.,

Partition	Vector	Permutation
``` *Vertices 4 1 1 1 2 ```	``` *Vertices 4 0.5 1 1.5 40 ```	``` *Vertices 4 4 2 1 3 ```

Pajek project files

The different types of information can be combined

in a Pajek project file `.paj`.

The project file has parts with titles:

* `Network TitleA` (contents of `.net` file)

* `Partition TitleB` (contents of `.clu` file)

* `Permutation TitleC` (contents of `.per` file)

* `Vector TitleD` (contents of `.vec` file)

There can be several parts of the same type in one `.paj` file.

```
*Network Pan with handle
*Vertices 4
1 "A"
2 "B"
3 "C"
4 "D"
*Arcs
1 2 1
2 3 1
3 1 1
1 4 1

*Partition Pan versus handle
*Vertices 4
1
1
1
2
```

The file defining the
colored digraph
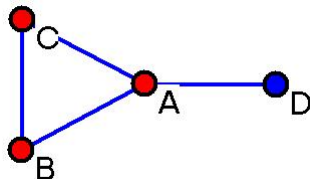
Graph drawing

To draw a graph (perhaps with additional properties),

choose the network / partition / vector

that you wish to work with, and use the *Draw* menu.

If you wish to use multiple colors for the vertices,

they must be defined in a partition,

and the command to be used is Draw-Partition (Ctrl-P).

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In the picture, under *Layout* you can choose 'Energy',

and usual one of Kamada-Kawai – Free and

Fruchterman-Rheingold – 2D gives good results.

In the 'Energy' algorithms, you can choose between the options

of using random or current positions as starting points.

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Export can be used to make a file of the picture.
An alternative to *Export* is to use the Alt-PrintScr key
to copy the contents of the graphical window,
and then past it with Ctrl-V to a graphical program
(e.g. *MS-Paint*) and then save it in a desired format.

Literature

- Wouter de Nooy, Andrej Mrvar, and Vladimir Batagelj, *Exploratory Social Network Analysis with Pajek*. Cambridge University Press, 2005.

- Vladimir Batagelj and Andrej Mrvar, *Pajek. Program for Analysis and Visualization of Large Networks*. Reference Manual, version 1.15. Ljubljana, 2006. Available from the Pajek website.