# Adigraph, V1.2

Luca Cappelletti

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# Chapter 1

# Introduction

**Adigraph** is a latex library for drawing directed graphs and augmenting directed graphs, and to draw cuts over them.

It handles automatically the positioning of labels, with the exception of the horizontal position, and the inclinations of cuts.

## 1.1 Setup

### 1.1.1 Installing the dependencies

Clearly you need to have texlive installed. Then, make sure you have the following packages:

**fp** Used for floating point calculations.

**xparse** Used for elaborating parameters.

**xstring** Used for operations on strings.

**etoolbox** Used for operations on lists.

**tikz** Used for drawing the actual graphs.

**tikz calc library** Used for some internal calculations in tikz.

To be sure you can run the following, that will install the packages only if they are not already present:

```
1 sudo tlmgr install etoolbox xstring fp xparse tikz
```

### 1.1.2 Installing Adigraph

You can install Adigraph, if it isn't already present in your setup, by running the following on Unix systems:

```
sudo tlmgr install adigraph
```

On windows you should check on your package manager of choice (some latex distribution have a tlmgr implementation on windows too.)

# Chapter 2

# Usage

## 2.1 Creating a new graph

Here we create a new Adigraph object, called *myAdigraph*.

```
\NewAdigraph{myAdigraph}{
    <nodes here, separated by semicolon>
}{
    <edges here, separated by semicolon>
}{
    <cuts here, separated by semicolon>
}
```

## 2.2 Adding nodes

We set its nodes with the following syntax: *<node name: x coordinate, y coordinate, color: label>*.

```
\NewAdigraph{myAdigraph}{
     s:0,0;
     t:4,0;
}
\myAdigraph{}
```


### 2.2.1 Custom node colors

To color a node you can use the following syntax: *<node name: x coordinate, y coordinate, textual color>*. For example, to draw s in red and t in blue we would write:

```
\NewAdigraph{myAdigraph}{
      s:0,0,red;
      t:4,0,blue;
}
\myAdigraph{}
```


Tested available colors are: red, blue, black, green. You may extend the possible colors with LaTex libraries such as xcolor.

### 2.2.2 Custom node labels

To add a custom label you can use the following syntax: either *<node name: x coordinate, y coordinate: node label>* or *<node name: x coordinate, y coordinate, textual color: node label>* will work:

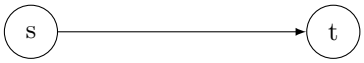
```
\NewAdigraph{myAdigraph}{
      s:0,0,red:start;
      t:4,0:end;
}
\myAdigraph{}
```


## 2.3 Adding edges

We set its nodes with the following syntax: *<node name: x coordinate, y coordinate, color : label>*.

### 2.3.1 A simple edge

```
\NewAdigraph{myAdigraph}{
      s:0,0;
      t:4,0;
}{
     s,t;
}
\myAdigraph{}
```

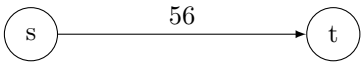


### 2.3.2 A colored simple edge

```
\NewAdigraph{myAdigraph}{
     s:0,0;
     t:4,0;
}{
    s,t,red;
}
\myAdigraph{}
```

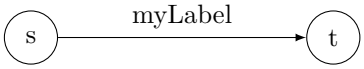

### 2.3.3 A weighted edge

```
\NewAdigraph{myAdigraph}{
     s:0,0;
     t:4,0;
}{
    s,t:56;
}
\myAdigraph{}
```



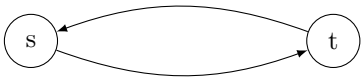

### 2.3.4 A weighted edge with label

```
\NewAdigraph{myAdigraph}{
     s:0,0;
     t:4,0;
}{
    s,t:56:myLabel;
}
\myAdigraph{}
```



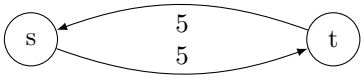
### 2.3.5 Edge in both directions

```
\NewAdigraph{myAdigraph}{
     s:0,0;
     t:4,0;
}{
    s,t;
    t,s;
}
\myAdigraph{}
```



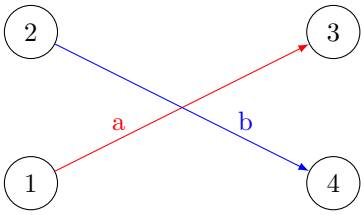

### 2.3.6 Edge with weights in both directions

```
\NewAdigraph{myAdigraph}{
     s:0,0;
     t:4,0;
}{
    s,t:5;
    t,s:5;
}
\myAdigraph{}
```



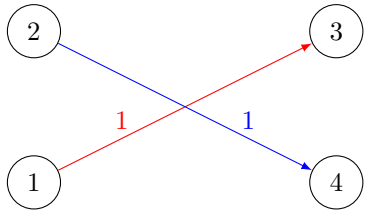

### 2.3.7 Positioning labels

```
\NewAdigraph{myAdigraph}{
    1:0,0;
    2:0,2;
    3:4,2;
    4:4,0;
}{
    1,3,red:1:a:near start;
    2,4,blue:1:b:near end;
}
\myAdigraph{}
```



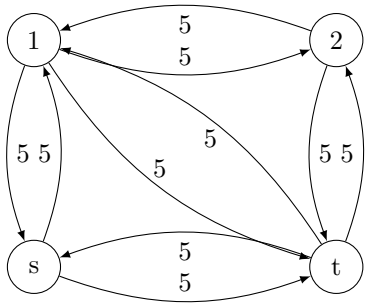
### 2.3.8 Positioning weights

```
\NewAdigraph{myAdigraph}{
    1:0,0;
    2:0,2;
    3:4,2;
    4:4,0;
}{
    1,3,red:1::near start;
    2,4,blue:1::near end;
}
\myAdigraph{}
```




### 2.3.9 Multiple edges with weights

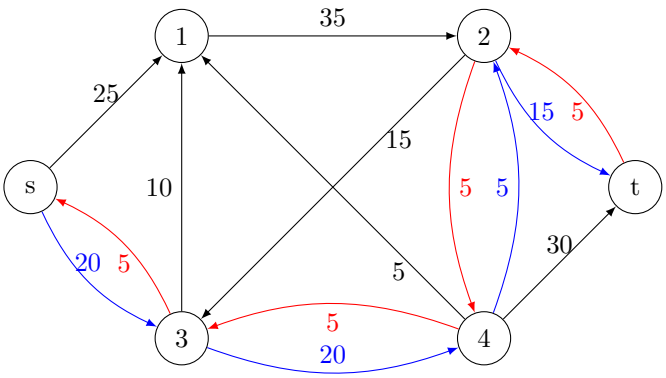
```
\NewAdigraph{myAdigraph}{
    s:0,0;
    t:4,0;
    1:0,3;
    2:4,3;
}{
    s,t:5;
    t,s:5;
    s,1:5;
    1,s:5;
    1,2:5;
    2,1:5;
    2,t:5;
    t,2:5;
    t,1:5;
    1,t:5;
}
\myAdigraph{}
```




## 2.4 Augmenting paths

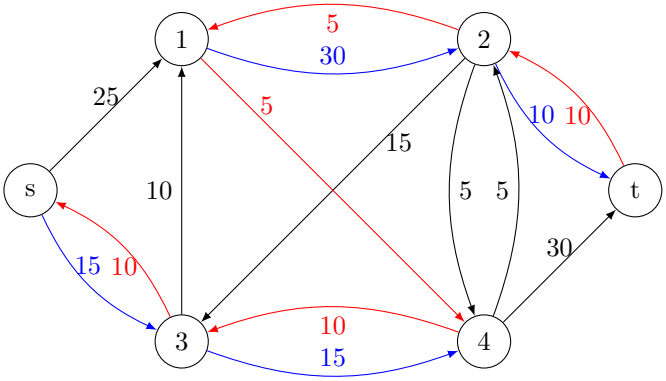
An augmenting path is specified by the following syntax: *<comma separated list of nodes:units>*. It is **very important** to note that incremental paths called upon the same object are memorized by default.

```
\NewAdigraph{myAdigraph}{
    s:0,0;
    1:2,2;
    3:2,-2;
    2:6,2;
    4:6,-2;
    t:8,0;
}{
    s,1:25;
    s,3:25;
    3,4:25;
    1,2:35;
    2,t:20;
    3,1:10;
    4,2:10;
    2,3:15::near start;
    4,1:5::near start;
}
\myAdigraph{
    s,3,4,2,t:5;
}
```

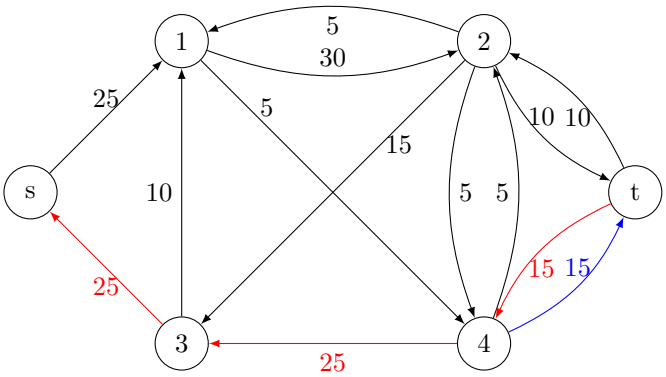



For example, suppose now we'd like to send another 5 units on the graph edited by the previous incremental path, we'll have just to write the following:

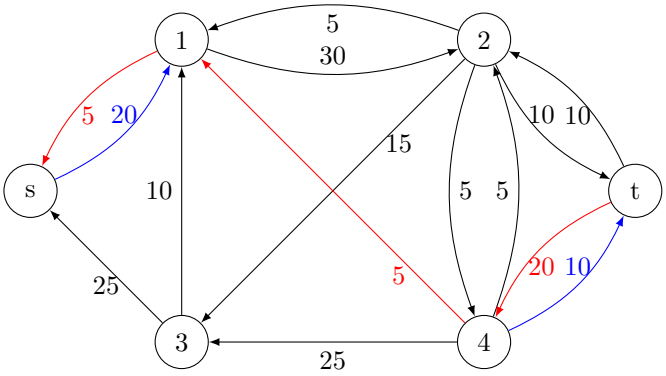
```
\myAdigraph{
    s,3,4,1,2,t:5;
}
```



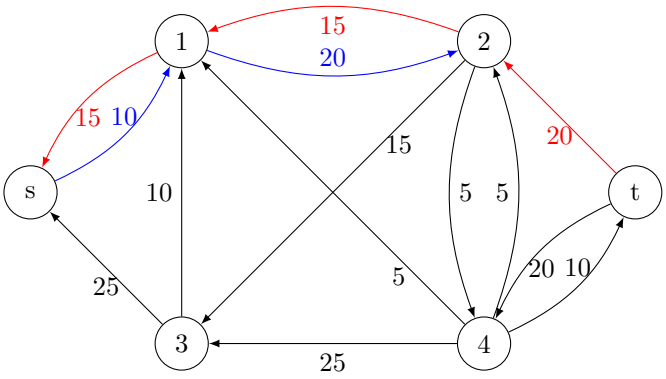
```
\myAdigraph{
    s,3,4,t:15;
}
```



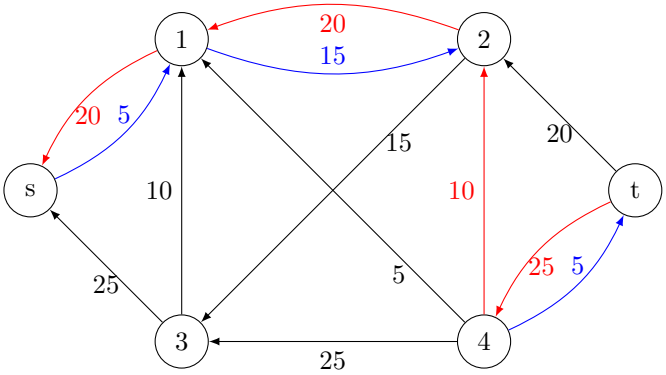

```
\myAdigraph{
    s,1,4,t:5;
}
```




```
\myAdigraph{
    s,1,2,t:10;
}
```



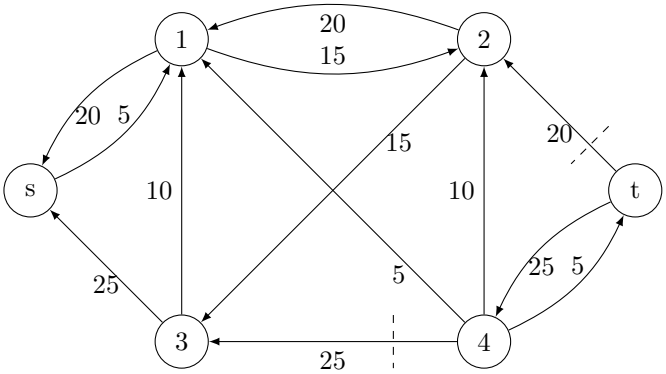
```
\myAdigraph{
    s,1,2,4,t:5;
}
```




## 2.5 Cuts

The following is to add cuts to show minimum cuts for example, the syntax is: *<first node, second node;>*

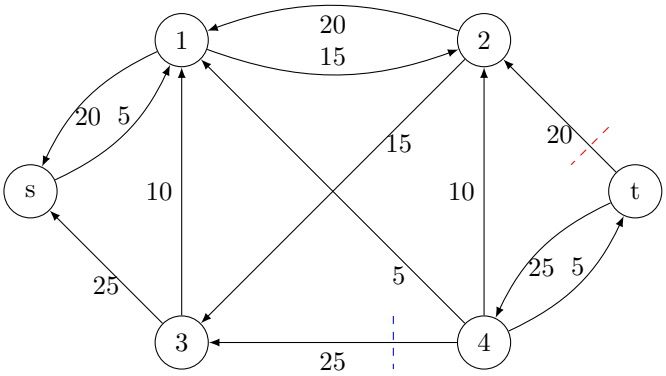
```
\myAdigraph{}{
    3,4;
    2,t;
}
```




### 2.5.1 Colored cuts

If you'd like to color the cuts you just have to add the color as follows: *<first node, second node, color;>*

```
\myAdigraph{}{
    3,4,red;
    2,t,blue;
}
```



# Chapter 3

# Warnings

## 3.1 Reserved words

I reserve to use for the package the following tokens:

1. Adigraph
2. AdigraphBuildEdge
3. AdigraphBuildEdgeWrapper
4. AdigraphBuildNode
5. AdigraphBuildPath
6. AdigraphCalculateOrientation
7. AdigraphCountPaths
8. AdigraphCurrentPathNumber
9. AdigraphCutBuilder
10. AdigraphDrawEdge
11. AdigraphDrawNode
12. AdigraphEdgeBuilder
13. AdigraphEdgeDrawer
14. AdigraphEdgeName
15. AdigraphElaboratePath
16. AdigraphElaboratePath
17. AdigraphExecuteCutBuilder
18. AdigraphFirstNode
19. AdigraphMemorizeEdge
20. AdigraphMemorizeNode
21. AdigraphNodeBuilder
22. AdigraphNodeName
23. AdigraphNumberOfPaths
24. AdigraphPathBuilder
25. AdigraphProcessCuts
26. AdigraphProcessEdges
27. AdigraphProcessNodes
28. AdigraphProcessPaths
29. AdigraphSecondNode
30. AdigraphSimpleSum
31. AdigraphTwinEdgeWeight
32. NewAdigraph