

## Project title

*Interface for Writing PSTRICKS Commands for Drawing Pictures in  $\LaTeX$*

## Supervisor

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## Brief description

The goal of this Project is *to implement a convenient, user friendly interface for writing PSTRICKS commands for pictures like labelled graphs in  $\LaTeX$ .*

This Project is analogous to another Project on writing formal tree-like proofs in  $\LaTeX$ .

For a student working on this project this would be a good and challenging opportunity to apply his/her programming skills and to learn  $\LaTeX$ .

## More detailed description

The standard  $\LaTeX$  is a tool of writing mathematical texts in a very good printing quality.  $\LaTeX$  is a kind of programming language to create a text with complicated formulas with many useful tools. However, many of them (some styles or packages) are extensions of  $\LaTeX$  which, unlike the standard  $\LaTeX$ , are used not so regularly and each time of their using requires an additional effort by the user to recall corresponding commands. PSTRICKS is a powerful package allowing to write in a  $\LaTeX$  file commands creating pictures, such as labelled graphs. Instead of recalling the commands each time when this package is used, to use, instead, user friendly interface to 'draw' pictures in a convenient, but suitably structured way. Creating such a visual interface which will automatically produce corresponding commands in the original  $\LaTeX$  file is the goal of this project.

Thus, the essence of the Project consists, in

1. understanding the minimum of the necessary concepts of  $\LaTeX$  and the package PSTRICKS;
2. implementing a user friendly interface allowing to create pictures (say, only labelled graphs) in a structured way (corresponding to the package PSTRICKS) which then will be translated into  $\LaTeX$  (actually into a text file) extended by the commands of this package;
3. creating non-trivial examples of pictures and demonstrating how this system works for them;

In fact, the way how to fulfil this Project should be invented by the student. As PSTRICKS is very rich of commands to create pictures, this project is actually open ended. Thus, a lot of things depends on the abilities and ambitions of the student.

## Background requirements

Familiarity with all  $\LaTeX$  and PSTRICKS features, however desirable, is formally unnecessary. Only the simplest fragments of them will be used and could be studied in a first stage of working on the Project. However, appropriate programming skills are necessary.

## Appendix (example)

Example of a  $\LaTeX$  file describing some picture by using the commands of PSTricks:

```
\documentclass[a4paper]{article}
\usepackage{latexsym}
\usepackage{amssymb} % whatever you need, e.g. amsmath, latexsym, etc.
\usepackage{pst-node} %pstricks package
\usepackage{pst-text} %pstricks package
\usepackage{pst-poly} %pstricks package
\usepackage{pstricks} %pstricks package

\begin{document}
\section*{Example of a bisimulation relation  $R$  between two graphs}
\begin{center}
\psset{unit=0.8 cm}
\begin{pspicture}(-7.0,0.0)(8.0,9.0)
%\psgrid[gridwidth=0.01,subgriddiv=10]
\cnode* (-5.0,7.0){3.0pt}{u}
\uput[dl](-5.0,7.0){ $u$ }

\cnode* (-5.0,1.0){3.0pt}{v}
\uput[dl](-5.0,1.0){ $v$ }

\cnode* (5.0,7.0){3.0pt}{u'}
\uput[dl](5.0,7.0){ $u'$ }

\cnode* (7.0,5.0){3.0pt}{u''}
\uput[dl](7.0,5.0){ $u''$ }

\cnode* (5.0,1.0){3.0pt}{v''}
\uput[dl](5.0,1.0){ $v''$ }

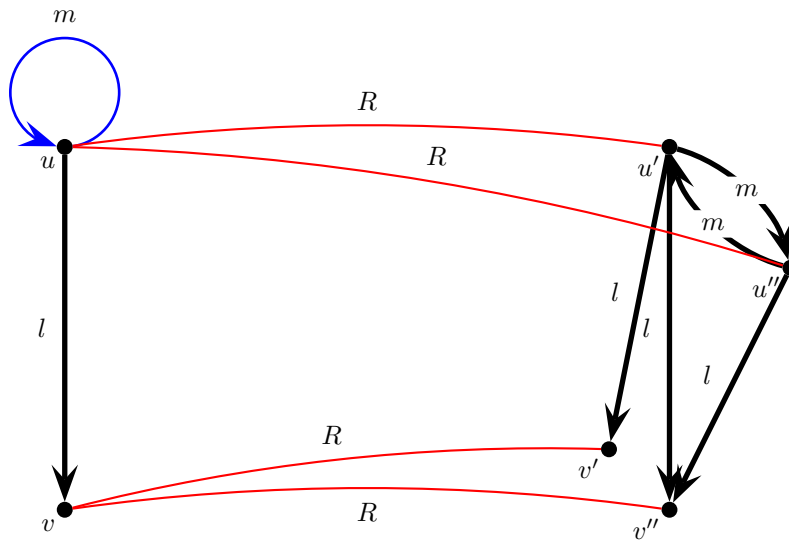
\cnode* (4.0,2.0){3.0pt}{v'}
\uput[dl](4.0,2.0){ $v'$ }

\ncarc[arcangle=0,linewidth=2pt,arrowsize=10pt]{->}{u}{v}
\Bput{ $1$ }
\ncarc[arcangle=0,linewidth=2pt,arrowsize=10pt]{->}{u'}{v'}
\Bput{ $1$ }
\ncarc[arcangle=0,linewidth=2pt,arrowsize=10pt]{->}{u''}{v''}
\Bput{ $1$ }
\ncarc[arcangle=0,linewidth=2pt,arrowsize=10pt]{->}{u''}{v''}
\Bput{ $1$ }
\ncarc[arcangle=30,linewidth=2pt,arrowsize=10pt]{->}{u'}{u''}
\mput*{ $m$ }
\ncarc[arcangle=-30,linewidth=2pt,arrowsize=10pt]{<-} {u'}{u''}
\mput*{ $m$ }
%% LOOP: %%%%%%%%%%%
\ncircle[angleB=180,nodesepA=0.0,linewidth=1pt,linecolor=blue,arrowsize=10pt]{->}{u}{0.9}
\Bput{ $m$ }

\ncarc[%arcangle=0,linestyle=dashed,
linecolor=red]{-}{u}{u'}
\Aput{ $R$ }
\ncarc[linecolor=red]{-}{u}{u''}
\Aput{ $R$ }
\ncarc[linecolor=red]{-}{v}{v'}
\Aput{ $R$ }
\ncarc[linecolor=red]{-}{v}{v''}
\Aput{ $R$ }
\end{pspicture}
\end{center}
\end{document}
```

And this is the resulting picture:

### Example of a bisimulation relation $R$ between two graphs

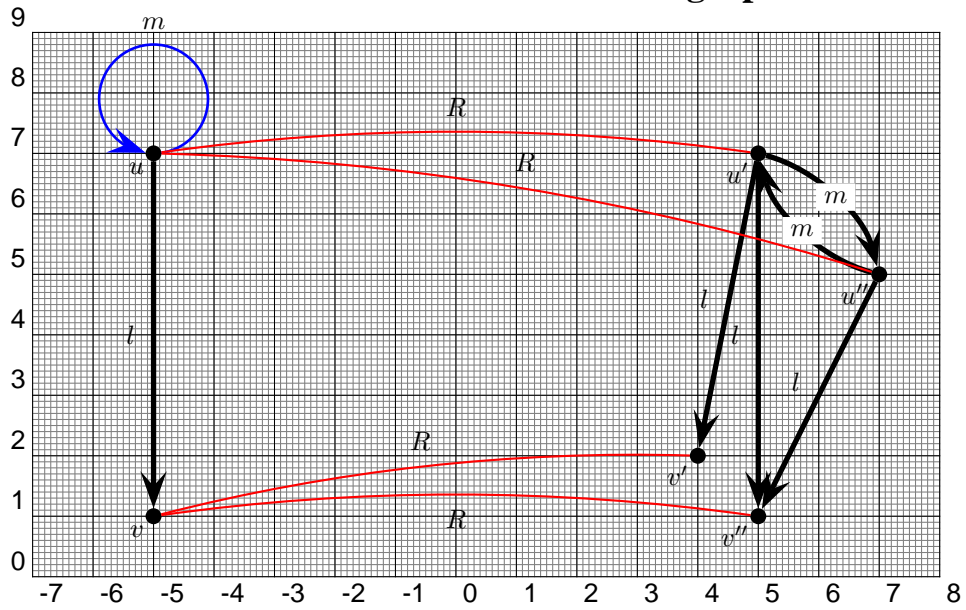


And the same with

```
\psgrid[gridwidth=0.01,subgriddiv=10]
```

uncommented (i.e., with % before this line omitted):

### Example of a bisimulation relation $R$ between two graphs



Evidently, the interface to be implemented should be based on a such grid.