Including Graphics from JFLAP in a LaTeX Document

Suppose you are working on an assignment which involves the design of an automaton using JFLAP. After you have convinced yourself that the automaton has the desired behavior, you may want to include a diagram of your work in your LaTeX file. What steps are needed?

1. Within JFLAP, arrange the vertices to obtain a pleasing layout which avoids unnecessary edge crossings.

2. If appropriate, annotate the states of your automaton with labels to assist with understanding. To do this, right click with the arrow tool, then choose `Change Label` and add an appropriate label.

3. By convention, JFLAP files use the file extension `.jff`. Let's assume you are working on a finite-state machine which has been saved in a file named `sample.jff`. In order to include a diagram of your work in a LaTeX document, you need an image file. JFLAP can export in the `png` graphics format — one of the formats supported by the `graphicx` LaTeX package. To export a diagram of your automaton, use the `Save Image As...` menu item, found under `File`. From the choices offered, choose `Save Graph as PNG`. Supply an appropriate file name: `sample.png`, for example.

4. Unfortunately, the graphics file exported by JFLAP is not a tightly-cropped image, but has extra space. This isn't a big problem, since the `convert` utility of ImageMagick[1] can be used to trim this space. From a terminal window, move to the directory where your image file is stored and give this command:

   ```
   convert -trim sample.png sample.png
   ```

   This will overwrite your image file with a tightly cropped version of itself. This is the file needed for the LaTeX document.

5. Within the LaTeX document, we are going to use the `graphicx` package for graphics inclusion. In the preamble, we need the following:

   ```
   \usepackage{graphicx}
   ```

   If you are working on a homework assignment for MAT 4885, that statement has already been provided in the template file.

6. To include the graphics file `sample.png`, use one of the following model statements:

   ```
   \includegraphics{sample}
   \includegraphics[scale=0.7]{sample}
   \includegraphics[width=3in]{sample}
   ```

   In all cases, note that the `.png` extension does not need to be included — even though the file name is `sample.png`, the name `sample` is sufficient. In the first model statement, the graphics image is included at its full size. The next two examples show how to scale the image: either as a percentage (70 percent) or as a specified width (3 inches). There are many other options[2] available within the `graphicx` package, but these few examples are probably sufficient for what we need.

   In many cases, it will be desirable to place the graphics image within a `center` environment. Additionally, you might want to use a `figure` environment with a caption, but realize that figures can "float," which can sometimes be annoying.

[1] See `http://www.imagemagick.org/script/index.php` for full documentation.
[2] See `http://en.wikibooks.org/wiki/LaTeX/Importing_Graphics` for more details.

Example

Figure 1 shows a simple automaton which has been included within this document. Here is the relevant code which generated this example:

```
Figure~\ref{even} shows a simple automaton which has been included
within this document. Here is the relevant code which generated this
example:
\begin{figure}[hb!]
\begin{center}
\includegraphics[width=3in]{sample}
\end{center}
\caption{A DFA which recognizes
    $L = \{w \in \{a,b\}^*: \text{ $w$ has an even number of $a$'s}\}$.}
\label{even}
\end{figure}
```

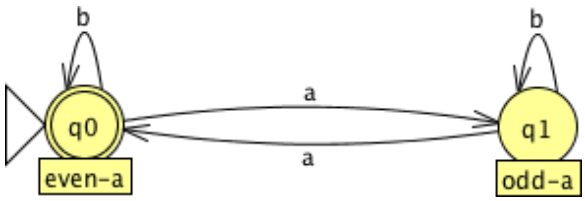

Figure 1: A DFA which recognizes $L = \{w \in \{a, b\}^* : \ w$ has an even number of a's$\}$.

Quick Summary

1. Generate the desired automaton in JFLAP.
2. Within JFLAP, export the diagram as a `.png` file.
3. Crop the graphic with the `convert` utility, using the `-trim` option.
4. Within the LaTeX file, use `\includegraphics` to place the graphic, scaling as needed.