

# 835 L<sup>A</sup>T<sub>E</sub>X for Game Theory Overview

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## 1 sgame and egameps

Martin Osborne (University of Toronto) has developed two key style files/packages that you can call in L<sup>A</sup>T<sub>E</sub>X in order to represent normal form and extensive form games. Personally, I prefer these packages to the alternatives (writing your own tables and/or using the TikZ package to draw games). That said, they can be a bit buggy and do require you to use a particular set of macros for compiling. That is, using a L<sup>A</sup>T<sub>E</sub>X editor, you have to be able to use XeLaTeX or another format that contains the L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> macros by default. Some editors contain these just as a matter of course, others do not. Most of the internal bugs in the packages have been resolved, but in particular be careful about the order in which you call packages when initiating a L<sup>A</sup>T<sub>E</sub>X document that contains these styles. In my experience, they are very sensitive to their placement in the order especially when you are also calling xcolor and/or TikZ.

One point in favor of the sgame and egameps styles is that Prof. Osborne has set up documentation with useful walk-throughs and examples. You can learn more about the packages and view his example pdf files here:

<http://www.economics.utoronto.ca/osborne/latex/index.html>

## 2 TikZ

Your other main option for representing extensive form games will be to use the TikZ package. TikZ is a multi-purpose and very flexible set of commands that let you draw almost any set of shapes you can think of within the L<sup>A</sup>T<sub>E</sub>X environment. There are many tutorials and examples online that you can reference if you would like to draw circles or represent organizational relationships (e.g., flowcharts). You might also want to use TikZ in PS835, PS836, or ECON711 in order to plot best responses/best response correspondences or visually represent the equilibrium condition as parameter values change. Here I will just provide some useful example code for a few of the common games for which you might want to use TikZ. You can find a slightly more extensive overview and set of notes on TikZ in the Github repository for the Political Science Department's annual intro L<sup>A</sup>T<sub>E</sub>X workshop here:

<https://github.com/bouchat/LatexWorkshop/tree/master/Tikz>

### 2.1 Examples

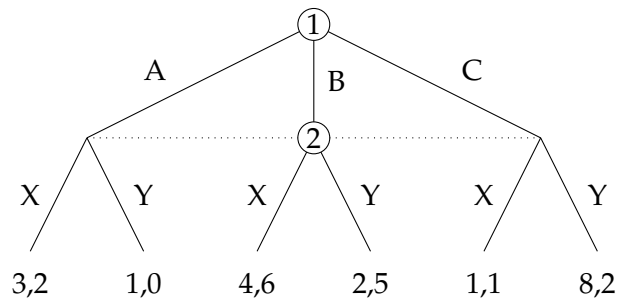
For both of these examples, you will need to define a new gray color prior to the `\begin{document}` line using this command: `\definecolor{mrgray}{gray}{0.85}`.

### 2.1.1 Extensive Form Game with Information Set Example

```

\begin{figure}[h!]
\begin{center}
\begin{tikzpicture}[scale=1.5]
\draw(0,2) -- (-2,1);
\draw(0,2) -- (0,1);
\draw(0,2) -- (2,1);
\draw (-1.4,1.6) node{A};
\draw (.2,1.5) node{B};
\draw (1.4,1.6) node{C};
\draw(-2,1) -- (-2.5,0);
\draw(-2,1) -- (-1.5,0);
\draw (-2.5,.5) node{X};
\draw (-1.5,.5) node{Y};
\draw(0,1) -- (-0.5,0);
\draw(0,1) -- (0.5,0);
\draw (-0.5,.5) node{X};
\draw (0.5,.5) node{Y};
\draw(2,1) -- (1.5,0);
\draw(2,1) -- (2.5,0);
\draw (1.5,.5) node{X};
\draw (2.5,.5) node{Y};
\draw[dotted] (-2,1) -- (2,1);
\filldraw[fill=white](0,2) circle (4pt) node{1};
\filldraw[fill=white](0,1) circle (4pt) node{2};
\draw(-2.5,-.3) node {3,2};
\draw(-1.5,-.3) node {1,0};
\draw(-0.5,-.3) node {4,6};
\draw(0.5,-.3) node {2,5};
\draw(1.5,-.3) node {1,1};
\draw(2.5,-.3) node {8,2};
\end{tikzpicture}
\end{center}
\end{figure}

```



### 2.1.2 Signaling Game Example

```
\begin{figure}[h!]  
  \begin{center}  
    \begin{tikzpicture}[scale=2]  
      \draw (0,-1) -- (0,1);  
      \filldraw[fill=white] (0,0) circle (4pt) node {N};  
      \draw (0.1,0.5) node[anchor=west]{Good};  
      \draw (0.1,-0.5) node[anchor=west]{Bad};  
      \draw (-0.1,0.5) node[anchor=east]{$p=.5$};  
      \draw (-0.1,-0.5) node[anchor=east]{$p=.5$};  
      \draw (-2,1) -- (2,1);  
      \draw (-2,-1) -- (2,-1);  
      \draw (-1,1.1) node {H};  
      \draw (1,1.1) node {F};  
      \draw (-1,-1.2) node {H};  
      \draw (1,-1.2) node {F};  
      \filldraw[fill=mrgray] (0,1) circle (4pt) node {1};  
      \filldraw[fill=mrgray] (0,-1) circle (4pt) node {1};  
      \draw[dotted] (-2,-1) -- (-2,1);  
      \draw[dotted] (2,-1) -- (2,1);  
      \filldraw[fill=mrgray] (-2,0) circle (4pt) node {2};  
      \filldraw[fill=mrgray] (2,0) circle (4pt) node {2};  
      \draw (-2,1) -- (-3,1.5);  
      \draw (-2,1) -- (-3,0.5);  
      \draw (-2.5,1.5) node{R};  
      \draw (-2.5,0.5) node{S};  
      \draw (-2,-1) -- (-3,-1.5);  
      \draw (-2,-1) -- (-3,-0.5);  
      \draw (-2.5,-0.5) node{R};  
      \draw (-2.5,-1.5) node{S};  
      \draw (2,1) -- (3,1.5);  
      \draw (2,1) -- (3,0.5);  
      \draw (2.5,1.5) node{R};  
      \draw (2.5,0.5) node{S};  
      \draw (2,-1) -- (3,-1.5);  
      \draw (2,-1) -- (3,-0.5);  
      \draw (2.5,-0.5) node{R};  
      \draw (2.5,-1.5) node{Y};  
      \draw (3.1,1.5) node[anchor=west]{4,3};  
      \draw (3.1,0.5) node[anchor=west]{6,5};  
      \draw (3.1,-0.5) node[anchor=west]{0,2};  
      \draw (3.1,-1.5) node[anchor=west]{1,1};  
      \draw (-3.1,1.5) node[anchor=east]{2,3};  
      \draw (-3.1,0.5) node[anchor=east]{5,5};  
      \draw (-3.1,-0.5) node[anchor=east]{3,4};  
      \draw (-3.1,-1.5) node[anchor=east]{4,3};  
    \end{tikzpicture}  
  \end{center}  
\end{figure}
```

