The nef TikZ library*

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Abstract

The *nef* TikZ library provides predefined styles and shapes to create diagrams for neural networks constructed with the methods of the Neural Engineering Framework (NEF) [1].

Contents

1 Usage

To use the *nef* TikZ library load the *tikz* package and the library with:

```
\usepackage{tikz}
\usetikzlibrary{nef}
```

1.1 Global styles

nef This style provides basic general settings like minimum node sizes and arrow tips for the diagrams. It also sets some layout options on for graphs. The style can be applied to the `tikzpicture` environment or to more narrow scopes.

1.2 Node styles and shapes

ea Use this style for ensemble arrays.

*This document corresponds to tikz-nef v0.1, dated 2017/03/29.

Style/shape		Usage
`ea`		ensemble array
`ens`		ensemble
`ext`	ext	external inputs and outputs
`net`		network
`pnode`		pass-through node
`rect`		rectification ensemble

Figure 1: Node styles and shapes.

Style		Usage
`inhibit`		inhibitory connection
`modulatory`		modulatory connection
`recurrent`		recurrent connection

Figure 2: Edge styles.

ens Use this style for single ensembles.

ext Use this style for inputs and outputs external to the displayed network.

net Use this style for networks.

pnode Use this style for pass-through nodes.

rect Use this style for rectification ensembles (i.e., all encoders are 1).

1.3 Edge styles

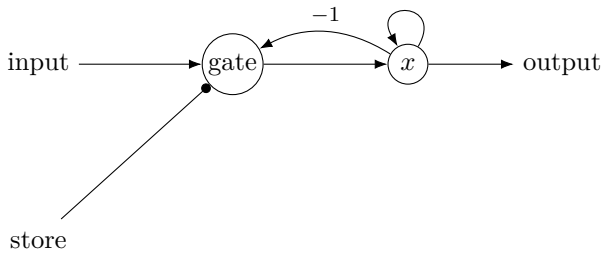
inhibit Use this style for inhibitory connections.

modulatory Use this style for modulatory connections.

recurrent Use this style for recurrent connections. It will add a loop above an ensemble or network.

2 Examples

2.1 Gated difference integrator (working memory)




```
\usepackage{tikz}
\usetikzlibrary{graphs}
\usetikzlibrary{nef}
\usetikzlibrary{quotes}

% ....

\begin{tikzpicture}[nef]
    \graph {
        input [ext] -> gate [ens] -> integrator/$x$ [ens] -> output [ext];
        integrator -> [bend right, "$-1$"] gate;
        integrator -> [recurrent] integrator;
        store -> [inhibit] gate;
    };
\end{tikzpicture}
```

References

[1] Chris Eliasmith and Charles H. Anderson. *Neural Engineering: Computation, Representation, and Dynamics in Neurobiological Systems*. Cambridge, MA: MIT Press, 2003. ISBN: 978-0-262-55060-4.