The memorygraphs package

Camil Staps*

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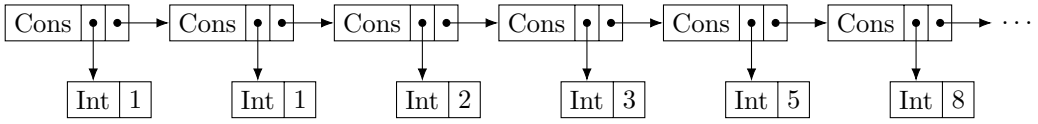


Contents

1 Introduction

This is the documentation of the LaTeX package memorygraphs. It defines some Ti*k*Z styles and adds anchors to existing styles that ease the declaration of "memory graphs". It is intended for graphs that represent the memory of a computer program during its execution.

2 Functionality

/tikz/memory graph

The `memory graph` style is to be used on `tikzpicture`. It sets a different node distance that the author finds suitable for this kind of graphs.

37 42

```
\begin{tikzpicture}[memory graph]
  \node[draw] (x) {37};
  \node[draw,right=of x] {42};
\end{tikzpicture}
```

*info@camilstaps.nl

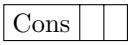
2.1 Nodes

The following styles can be used to typeset memory blocks:

/tikz/block
: This is the most basic style to define a memory block. By default, this shape is a rectangle with borders:

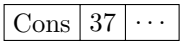

```
\begin{tikzpicture}[memory graph]
  \node[block] {37};
\end{tikzpicture}
```

/tikz/arity = ⟨*n*⟩
: The `arity` style can be used to create a node with arguments. This implies `block`:




```
\begin{tikzpicture}[memory graph]
  \node[arity=2] {Cons};
\end{tikzpicture}
```

\arg {*i*}
: Because blocks with `arity` are multipart rectangles, one can use Ti*k*Z's `\nodepart` to put contents in the arguments. However, it can be confusing that `\nodepart{two}` refers to the *first* argument, so we redefine `\arg` in `block`s to identify arguments of the memory block:




```
\begin{tikzpicture}[memory graph]
       \node[arity=2] {Cons \arg{1} 37 \arg{2} \dots};
\end{tikzpicture}
```

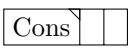
Should one want to use math mode's `\arg` in a memory block, they can first rename it:


```
\let\matharg\arg
\begin{tikzpicture}[memory graph]
  \node[block] {$\matharg(1)$};
\end{tikzpicture}
```

2.2 Markings

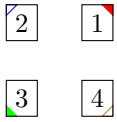
It is possible to mark the head of memory blocks using triangles in the north east and south east corners.

/tikz/block mark north east = ⟨*style*⟩
/tikz/block mark north west = ⟨*style*⟩
/tikz/block mark south east = ⟨*style*⟩
/tikz/block mark south west = ⟨*style*⟩
: With this key, triangular marks can be added to the corners of the head of a node:



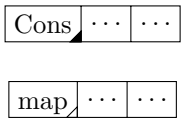

```
\begin{tikzpicture}[memory graph]
  \node[arity=2,block mark north east] {Cons};
\end{tikzpicture}
```

It is optional to add a style:



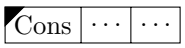

```
\begin{tikzpicture}
    [memory graph,every node/.style={block}]
  \node[block mark north east={fill,red}] at (1,1) {1};
  \node[block mark north west={blue}] at (0,1) {2};
  \node[block mark south west={fill,green}] at (0,0) {3};
  \node[block mark south east={brown}] at (1,0) {4};
\end{tikzpicture}
```

The key is long to avoid clashes with other packages, and because it depends on the context what nodes should be marked for. It is of course possible to define a shorthand in your own document. One application is to mark nodes that are in head normal form (HNF), for which one may define the key `hnf`:




```
\tikzset{every block/.style={block mark south east}}
\tikzset{hnf/.style={block mark south east=fill}}
\begin{tikzpicture}[memory graph]
  \node[arity=2,hnf]
    {Cons \arg{1}$\dots$ \arg{2}$\dots$};
  \node[arity=2] at (0,-1)
    {map \arg{1}$\dots$ \arg{2}$\dots$};
\end{tikzpicture}
```

The size of the rectangles is defined by `\memorygraphs@marklength`, which can of course be changed. The default is 4.0pt.



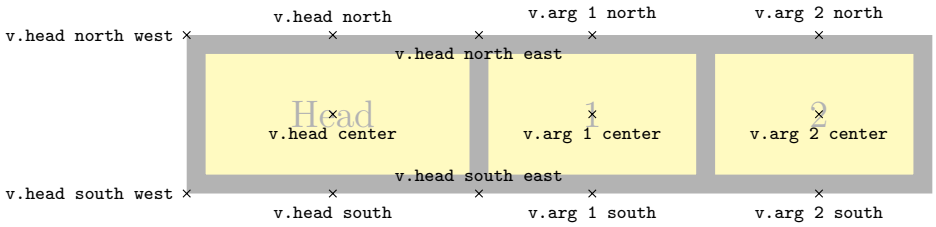

```
\makeatletter
\memorygraphs@marklength=7pt
\makeatother
\begin{tikzpicture}[memory graph]
  \node[arity=2,block mark north west=fill]
    {Cons \arg{1}$\dots$ \arg{2}$\dots$};
\end{tikzpicture}
```

2.3 Anchors

Because blocks with `arity` are multipart rectangles, one can use anchors like `two south` to refer to the south of the second part of a node. These are aliased as `arg` *i* `south` (and similar for other anchors on multipart nodes), where `arg 1` stands for `two`. The first block of a node is aliased as `head` instead of `arg 0`, so one can use `head south`. For `head`, anchors for the corners (`head north east`, etc.) are defined as well.

The parts of multipart rectangles do not normally have a `center` anchor, but memorygraphs defines these. One can use both `two center` and `arg 1 center` to refer to the center of the first argument of a node.

The additional anchors are shown below. See the Ti*k*Z manual for the predefined anchors.

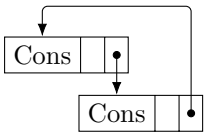


```
\Large
\begin{tikzpicture}
  \node
    [arity=2,
     line width=.25cm,inner xsep=1.25cm,inner ysep=.75cm,
     color=black!30,fill=yellow!30]
    (v) {Head \arg{1} 1 \arg{2} 2};
  \foreach \anchor/\placement in
    {head north/above,head south/below,head center/below,
     head north east/below,head south east/above,head north west/left,head south west/left,
     arg 1 north/above,arg 1 south/below,arg 1 center/below,
     arg 2 north/above,arg 2 south/below,arg 2 center/below}
    \draw[shift=(v.\anchor)] plot[mark=x] coordinates{(0,0)}
      node[\placement] {\scriptsize\texttt{v.\anchor}};
\end{tikzpicture}
```

2.4 References

/tikz/ref

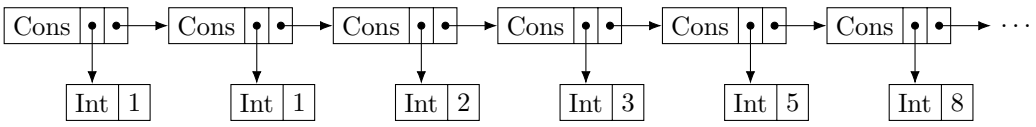
This is a simple style for arrows with a circle at the start and slightly rounded corners:




```
\begin{tikzpicture}[memory graph]
  \node[arity=2] (hd) {Cons};
  \node
    [arity=2,below=of hd.arg 2 center,anchor=head north]
    (tl) {Cons};
  \draw[ref] (hd.arg 2 center)
    -- (tl.head north);
  \draw[ref] (tl.arg 2 center)
    |- ($(hd.head north)+(0,.4)$)
    -- (hd.head north);
\end{tikzpicture}
```

3 Examples

- The linked list of Fibonacci numbers on the title page was generated with:

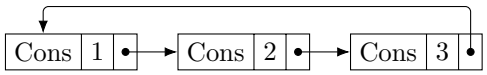


```
\begin{tikzpicture}[memory graph]
  \node[block,arity=2] (xsa) {Cons};
  \node[block,arity=1,below=of xsa.arg 1 south,anchor=head north] (xa) {Int \arg{1} 1};
  \draw[ref] (xsa.arg 1 center) -- (xa.head north);

  \def\prevname{a}
  \foreach \name/\val in {b/1,c/2,d/3,e/5,f/8}{
    \node[block,arity=2,right=of xs\prevname.arg 2 east] (xs\name) {Cons};
    \node[block,arity=1,below=of xs\name.arg 1 south,anchor=head north]
      (x\name) {Int \arg{1} \val};
    \draw[ref] (xs\prevname.arg 2 center) -- (xs\name);
    \draw[ref] (xs\name.arg 1 center) -- (x\name.head north);
    \xdef\prevname{\name}
  };

  \node[right=of xsf.arg 2 east] (rest) {$\dots$};
  \draw[ref] (xsf.arg 2 center) -- (rest);
\end{tikzpicture}
```

- A cyclical linked list, with unboxed integers:




```
\begin{tikzpicture}[memory graph]
  \node[block,arity=2] (xs) {Cons \arg{1} 1};

  \node[block,arity=2,right=of xs.arg 2 east] (xsb) {Cons \arg{1} 2};
  \draw[ref] (xs.arg 2 center) -- (xsb);

  \node[block,arity=2,right=of xsb.arg 2 east] (xsc) {Cons \arg{1} 3};
  \draw[ref] (xsb.arg 2 center) -- (xsc);

  \draw[ref] (xsc.arg 2 center) -- +(0,.6) -| (xs.head north);
\end{tikzpicture}
```

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