Marking Coordinates and Crossing Paths
Version 1.0

Alceu Frigeri*

January 2024

Abstract

This is a small package that offers a few alternative ways for declaring and marking coordinates and drawing a line with "jumps" over an already given path, which is a quite common issue when drawing, for instace, Electronics Circuits (like with *CircuiTikZ*).

1 Introduction

One recurring problem when drawing in general is how to interpret a crossing line. There are many conventions, notably, the old school (like the author of this) a jump denotes "non touching lines" while a simple cross is a connection, more recently (like the past 25 years), the winning convention has been that a dot marks a connection, whilst a simple cross denotes "non touching lines". Many, for the sake of staying in the safe side of the wall are now marking a connection with dots and non touching lines with a jump, which is a bit overkill, but at least there is no margin for error.

And that's it, this package defines some commands to mark/pin a connection, declaring a coordinate and node at the same spot, for later reference, and a command to draw a line jumping over crossing lines of a pre-existent path.

2 Declaring and Marking Coordinates/Nodes

Those are based on some ideas from Redaelli et al. (*CircuiTikZ*). Main differences: a variable number of parameters (see below) and it always also adds an empty node n⟨coord⟩.

\showcoordstrue
\shoocoordsfalse

```
\showcoordstrue
\showcoordsfalse
```

These will affect how `\ncoord`, `\dotcoord` and `\odotcoord` will behave, with `\showcoordstrue` a red pin will also be added to the newly defined coordinate/node.

\ncoord
\pincoord

```
\ncoord(⟨coord⟩)
\pincoord(⟨coord⟩)
\pincoord(⟨coord⟩ , ⟨color⟩)
\pincoord(⟨coord⟩, ⟨color⟩ , ⟨angle⟩)
\pincoord(⟨coord⟩, ⟨color⟩, ⟨angle⟩ , ⟨distance⟩)
```

The `\ncoord` always expects a single parameter ⟨coord⟩. A coordinate named ⟨coord⟩ and node named n⟨coord⟩ (a "n" is added as a prefix) will be created for later use/reference. If `\showcoordstrue` is en force, it will also add a pin.
The `\pincoord` expects one to 4 parameters, as listed. If omitted, the default value for distance is 4 (unit: pt), the default value for the angle is -45 (degrees), the default value for color is blue. In fact, the `\coord(name)` is just a short cut for `\pincoord (name,red,45)`, if `\showcoordstrue`.

\dotcoord
\dotpincoord

```
\dotcoord(⟨coord⟩)
\dotpincoord(⟨coord⟩)
\dotpincoord(⟨coord⟩ , ⟨color⟩)
\dotpincoord(⟨coord⟩, ⟨color⟩ , ⟨angle⟩)
\dotpincoord(⟨coord⟩, ⟨color⟩, ⟨angle⟩ , ⟨distance⟩)
```

These are the same as `\ncoord` and friends, just adding a dot (a filled in, small circle) at the coordinate.

*https://github.com/alceu-frigeri/tikzdotncross

\odotcoord `\odotcoord(⟨coord⟩)`
\odotpincoord `\odotpincoord(⟨coord⟩)`
`\odotpincoord(⟨coord⟩ , ⟨color⟩)`
`\odotpincoord(⟨coord⟩, ⟨color⟩ , ⟨angle⟩)`
`\odotpincoord(⟨coord⟩, ⟨color⟩, ⟨angle⟩ , ⟨distance⟩)`

These are the same as `\ncoord` and friends, just adding an open dot (a small circle filled with white) at the coordinate.

3 Crossing Paths

\pathcross `\pathcross*` `[⟨cross-name⟩]` `{⟨coordA⟩}` `{⟨coordB⟩}` `{⟨path-name⟩}` `[⟨width⟩]`

This will draw a line from ⟨coordA⟩ to ⟨coordB⟩ "jumping over" any pre-existent (soft) path named ⟨path-name⟩. First of, the reference path ⟨path-name⟩ has to be defined using the *name path* key (*name path*=⟨path-name⟩).
Then this will "calculate" the intersections between the line (defined by the coordinates (⟨coordA⟩) and (⟨coordB⟩)) and the path named ⟨path-name⟩. At each intersection a coordinate named (⟨cross-name⟩-i) and a node (n⟨cross-name⟩-i) will be defined (i goes from 1 up to the number of crossings detected.) A macro named ⟨cross-name⟩T will have the number of crossings found.
At each intersection a semi-circle will be drawn, and finally a line will be draw connecting ⟨coordA⟩ to ⟨coordB⟩ over all intermediate nodes.
The star version flips the semi-circles.

> ***Note:*** The default ⟨cross-name⟩ is "cross". It may contain only characters, as any valid TEX macro name. The default ⟨width⟩ of the semi-circle is 7pt.
>
> ***Note:*** This is based on the *tikz* library *intersetions*, inheriting it's limitations. The main one: It only detects crossings over "soft paths", this means, if the line defined by ⟨coordA⟩ and ⟨coordB⟩ crosses over a node, it won't detect it.

4 Some Examples

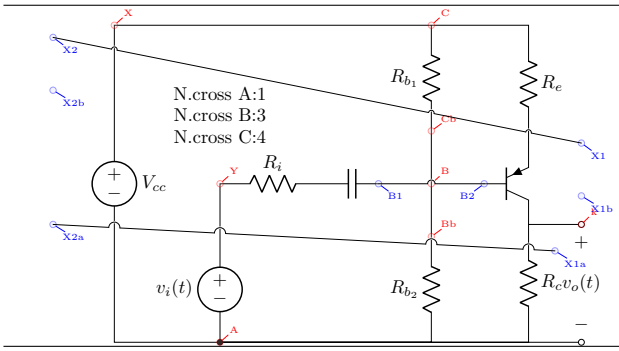
Note: In the examples below, the circuit doesn't make much/any sense, it is just a way to show the commands possibilities.

A first example with `\showcoordstrue` (showing all coordinates defined with `\ncoord`).

LaTeX Code:

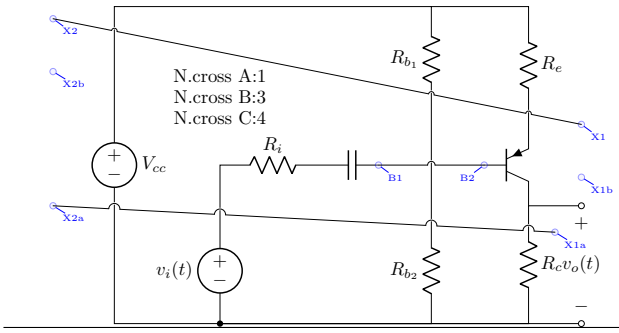
```
\resizebox{0.5\textwidth}{!}{
\begin{tikzpicture}
      %% This is the reference, named path
      %%
      \draw[name path=base circ]
    (0,0) \dotcoord(A) to[V,invert,l=$v_i(t)$] ++(0,2) -- ++(0,1) \ncoord(Y)
      to[R=$R_i$] ++(2,0)
      to[C] ++(1,0) \pincoord(B1) ++(1,0) \ncoord(B)
       ++(1,0) node[pnp,anchor=B] (T1){}
    (A) -- (A -| B)  to[R=$R_{b_2}$] ++(0,2) \ncoord(Bb) (B) ++(0,1) \ncoord(Cb) to[R=$R_{b_1}$] ++(0,2) \ncoord(C
      )
    (T1.C) to[R,l=$R_c$] (T1.C |- A) -- (A)
    (T1.E) to[R,l_=$R_e$] (T1.E |- C) -- (C -| A) -- ++(-2,0) \ncoord(X) to[V,l=$V_{cc}$] (X |- A) -- (A)
    (T1.C) -- ++(1,0) node[ocirc]{} \ncoord(k) to[open,v=$v_o(t)$] (k |- A) node[ocirc]{} -- (A)
    (Bb) -- (Cb);
    ;
    %% These are just a few, marked, coords (they could be part of the previous path
    %%
  \path (T1.E)  ++(1,0)      \pincoord(X1)    ++(-10,2)     \pincoord(X2)
        (X1) ++(0,-1)        \pincoord(X1b) (X2) ++(0,-1)   \pincoord(X2b)
        (T1.C)  ++(0.5,-0.5) \pincoord(X1a) (T1.C) ++(-9,0) \pincoord(X2a)
        (T1.B) \pincoord(B2,blue,225)
  ;
  %% And that's all, a few crossing lines
  %%
  \pathcross{B1}{T1.B}{base circ}[4pt] \draw (Y) +(0,1.7) node(){N.cross A:\crossT};
  \pathcross*{X1}{X2}{base circ}[3pt]  \draw (Y) +(0,1.3) node(){N.cross B:\crossT};
  \pathcross[sec]{X2a}{X1a}{base circ}[6pt] \draw (Y) +(0,0.9) node(){N.cross C:\secT};

\end{tikzpicture}
}
```

LaTeX Result:



And the same with `\showcoordsfalse`

LaTeX Result:



As said, the main limitation (derived from how *intersections* works) is that crossings between the line and nodes aren't detected at all. So if someone tries to connect the nodes *X1b* and *X2b*, it will result:

LaTeX Code:

```
\resizebox{0.5\textwidth}{!}{
\begin{tikzpicture}
      %% This is the reference, named path
      %%
      \draw[name path=base circ]
    (0,0) \ncoord(A) to[V,invert,l=$v_i(t)$] ++(0,2) -- ++(0,1) \ncoord(Y)
      to[R=$R_i$] ++(2,0)
      to[C] ++(1,0) \pincoord(B1) ++(1,0) \ncoord(B)
       ++(1,0) node[pnp,anchor=B] (T1){}
    (A) -- (A -| B)  to[R=$R_{b_2}$] ++(0,2) \ncoord(Bb) (B) ++(0,1) \ncoord(Cb) to[R=$R_{b_1}$] ++(0,2) \ncoord(C
      )
    (T1.C) to[R,l=$R_c$] (T1.C |- A) -- (A)
    (T1.E) to[R,l_=$R_e$] (T1.E |- C) -- (C -| A) -- ++(-2,0) \ncoord(X) to[V,l=$V_{cc}$] (X |- A) -- (A)
    (T1.C) -- ++(1,0) node[ocirc]{} \ncoord(k) to[open,v=$v_o(t)$] (k |- A) node[ocirc]{} -- (A)
    (Bb) -- (B) -- (Cb);
    ;
    %% These are just a few, marked, coords (they could be part of the previous path
    %%
  \path (T1.E)  ++(1,0)      \pincoord(X1)    ++(-10,2)     \pincoord(X2)
        (X1) ++(0,-1)        \pincoord(X1b) (X2) ++(0,-1)   \pincoord(X2b)
        (T1.C)  ++(0.5,-0.5) \pincoord(X1a) (T1.C) ++(-9,0) \pincoord(X2a)
        (T1.B) \pincoord(B2,blue,225)
  ;
  %% And that's all, a few crossing lines
  %%
  \pathcross{B1}{T1.B}{base circ}[4pt]          \draw (Y) +(0,2) node(){N.cross A:\crossT};
  \pathcross[sec]{X2b}{X1b}{base circ}[6pt]     \draw (Y) +(0,1.6) node(){N.cross B:\secT};
\end{tikzpicture}
}
```

LaTeX Result: