The tikzdotncross Package
Marking Coordinates and Crossing Paths
Version 1.2c

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Abstract

This package 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 instance, Electronics Circuits, e.g. *CircuiTikZ*.

1 Introduction

One recurring problem when drawing circuits in general is how to interpret a crossing line. There are many conventions, notably, for 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, mark a connection with dots and non touching lines with a jump, which is a bit overkill, but at least there is no margin for interpretation errors.

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 Package Options

`pinsize`	pin (circle) size (default: 1.2), in pt.
`pinang`	pin angle (default: 45).
`pincolor`	pin color (default: blue).
`pinlength`	pin length (default: 4), in pt.
`coordcolor`	coordinate color (default: red), used if `\showcoordstrue`.

Those can also be set, middle code, via:

`\setpindefaults`

`\setpindefaults` {⟨options as above⟩}

new: 2024/10/22

3 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. The initial state is `\showcoordsfalse`. It can be turned on/off as needed.

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

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` always draws a pin, besides declaring a coordinate and node as `\ncoord`. It expects one to 4 parameters, as listed. If omitted, the default length is 4 (unit: pt), the default angle is -45 (degrees), the default color is blue. Likewise, if `\showcoordstrue`, `\coord(name)` is just a short cut for `\pincoord (name,red,45)`.

> **Note:** Those defaults can be changed via package options, see 2, or `\setpindefaults`.

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

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

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

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

4 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 orientation.

> **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 will, in most cases, miss it (depends on how the node is draw and interacts with the soft path system).

> **Note:** When using the crossing coordinates, like (⟨cross-name⟩-i), be aware that in some ill-defined cases, `intersections` might detect a crossing either at the starting and/or ending points. `\pathcross` accounts for that, but you will be left with some extra reference coordinates, either the first one, last one or both.

5 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`).
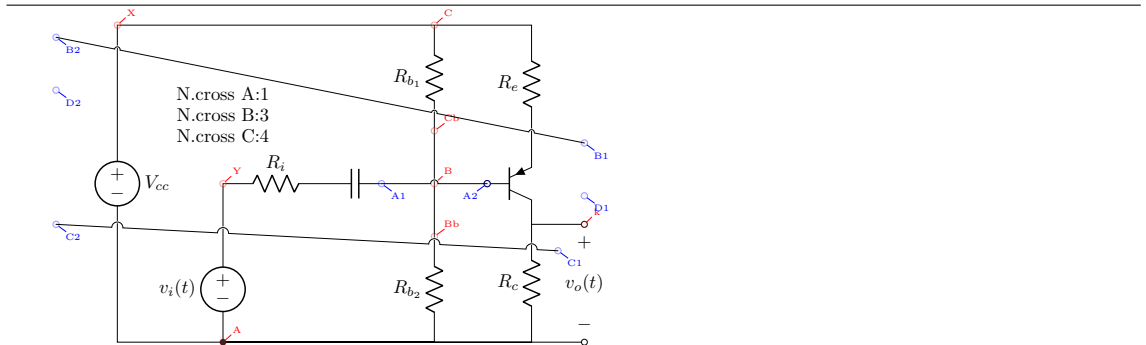
LaTeX Code:

```
\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(A1) ++(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(B1)    ++(-10,2)    \pincoord(B2)
        (B1) ++(0,-1)          \pincoord(D1) (B2) ++(0,-1)   \pincoord(D2)
        (T1.C)  ++(0.5,-0.5) \pincoord(C1) (T1.C) ++(-9,0) \pincoord(C2)
        (T1.B) \odotpincoord(A2,blue,225)
  ;
  %% And that's all, a few crossing lines
  %%
  \pathcross{A1}{A2}{base circ}[4pt] \draw (Y) +(0,1.7) node(){N.cross A:\crossT};
  \pathcross*{B1}{B2}{base circ}[3pt]  \draw (Y) +(0,1.3) node(){N.cross B:\crossT};
  \pathcross*[sec]{C1}{C2}{base circ}[6pt] \draw (Y) +(0,0.9) node(){N.cross C:\secT};

\end{tikzpicture}
}
```
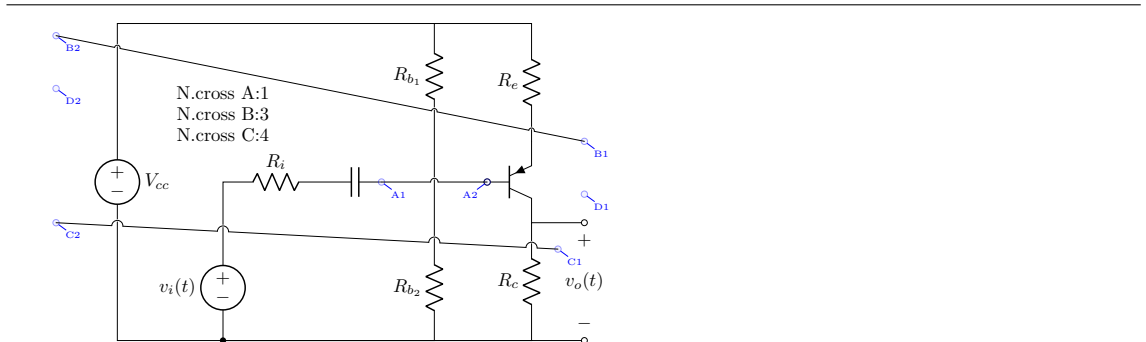
LaTeX Result:

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 might not be detected at all. For example, if someone tries to connect the nodes `D1` and `D2`, it will, unfortunately, fail detecting the node (pnp transistor) entirely:

LaTeX Code:

```
1  \resizebox{0.5\textwidth}{!}{
2  \begin{tikzpicture}
3      %% This is the reference, named path
4      %%
5      \draw[name path=base circ]
6      (0,0) \dotcoord(A) to[V,invert,l=$v_i(t)$] ++(0,2) -- ++(0,1) \ncoord(Y)
7         to[R=$R_i$] ++(2,0)
8         to[C] ++(1,0) \pincoord(A1) ++(1,0) \ncoord(B)
9          ++(1,0) node[pnp,anchor=B] (T1){}
10     (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
        )
11     (T1.C) to[R,l_=$R_c$] (T1.C |- A) -- (A)
12     (T1.E) to[R,l_=$R_e$] (T1.E |- C) -- (C -| A) -- ++(-2,0) \ncoord(X) to[V,l=$V_{cc}$] (X |- A) -- (A)
13     (T1.C) -- ++(1,0) node[ocirc]{} \ncoord(k) to[open,v=$v_o(t)$] (k |- A) node[ocirc]{} -- (A)
14     (Bb) -- (Cb)
15     ;
16     %% These are just a few, marked, coords (they could be part of the previous path
17     %%
18   \path (T1.E)  ++(1,0)        \pincoord(B1)     ++(-10,2)     \pincoord(B2)
19        (B1) ++(0,-1)           \pincoord(D1) (B2) ++(0,-1)    \pincoord(D2)
20        (T1.C)  ++(0.5,-0.5) \pincoord(C1) (T1.C) ++(-9,0) \pincoord(C2)
21        (T1.B) \pincoord(A2,blue,225)
22   ;
23   %% And that's all, a few crossing lines
24   %%
25   \pathcross{A1}{A2}{base circ}[4pt]           \draw (Y) +(0,2) node(){N.cross A:\crossT};
26   \pathcross[sec]{D2}{D1}{base circ}[6pt]       \draw (Y) +(0,1.6) node(){N.cross D:\secT};
27 \end{tikzpicture}
28 }
```

LaTeX Result: