

The style file `cgc-latex.sty` neither loads nor requires packages or fonts. Kerning control for typesetting CCG slashes, LF's colon, and for rule decorations in CCG derivations is in the pt unit, without the `\!` command. This is because the eye-pleasing slash distance seems to be independent of font size, at least to my eyes.

If you feel like changing it, just look for the `\kern` command.

All math is introduced by `\ensuremath` in `cgc-latex.sty`; there is no `$. . $` unless you introduce it manually. I don't recommend using math without `\ensuremath` in `cgc-latex.sty`. The short form `\bm{. .}`, for 'bare math', is for that.

To use this CCG style, please include the following line somewhere in the  $\LaTeX$  preamble:

```
\usepackage{cgc-latex}
```

I demonstrate examples with increasingly high-level `cgc-latex` code, from lowest level `\cgex` to `\begin{cgc}` and `\begin{cgg}`.

An Example with the `\cgex{n}{derivations}` command. The `\lf{}` is already in math mode. Lexical assumption lines are drawn by one command.

$$\begin{array}{c}
 \text{John} \qquad \text{likes} \qquad \text{Mary} \\
 \hline
 \text{S}/(\text{S}\backslash\text{NP}) \quad (\text{S}\backslash\text{NP}_{3s})/\text{NP} \quad (\text{S}\backslash\text{NP})\backslash((\text{S}\backslash\text{NP})/\text{NP}) \\
 :\lambda p.p.\text{john}' \quad :\lambda x\lambda y.\text{like}'xy \quad :\lambda p.p.\text{mary}' \\
 \hline
 \text{S}\backslash\text{NP} :\lambda y.\text{like}'\text{mary}'y \\
 \hline
 \text{S} :\text{like}'\text{mary}'\text{john}'
 \end{array}$$

The `cgc-latex` code is:

```

\cgex{3}{John & likes & Mary\\
\cglines{3}\\
\cgf{S\fs(S\bs NP)} & \cgf{(S\bs\cgs{NP}{3s})\fs NP}
& \cgf{(S\bs NP)\bs((S\bs NP)\fs NP)}\\
\lf{\lambda p.p\,\,\so{john}}
& \lf{\lambda x\lambda y.\so{like}xy} & \lf{\lambda p.p\,\,\so{mary}}\\
& \cglines{2}{\cgba}\\
& \cgres{2}{S\bs NP \lf{\lambda y.\so{like}\so{mary}y}}\\
\cglines{3}{\cgfa}\\
\cgres{3}{S \lf{\so{like}\so{mary}\so{john}}}
}

```

You will notice that the result of ‘likes Mary’ was typeset in a different font. That’s because `\cgres` command typesets its input in default font. Use the `\cat` command inside it to avoid that (or `\cgf`):

$$\begin{array}{c}
 \text{John} \qquad \text{likes} \qquad \text{Mary} \\
 \hline
 S/(S\backslash NP) \quad (S\backslash NP_{3s})/NP \quad (S\backslash NP)\backslash((S\backslash NP)/NP) \\
 : \lambda p.p\text{john}' : \lambda x\lambda y.\text{like}'xy \quad : \lambda p.p\text{mary}' \\
 \hline
 S\backslash NP:\lambda y.\text{like}'mary'y \quad \leftarrow \\
 \hline
 S:\text{like}'mary'\text{john}' \quad \rightarrow
 \end{array}$$

The `cgg-latex` code is:

```

\cgex{3}{John & likes & Mary\\
\cglines{3}\\
\cgf{S\fs(S\bs NP)} & \cgf{(S\bs\cgs{NP}{3s})\fs NP}
& \cgf{(S\bs NP)\bs((S\bs NP)\fs NP)}\\
\lf{\lambda p.p\,\,\so{john}}
& \lf{\lambda x\lambda y.\so{like}xy} & \lf{\lambda p.p\,\,\so{mary}}\\
& \cglines{2}{\cgba}\\
& \cgres{2}{\cat{S\bs NP}\lf{\lambda y.\so{like}\so{mary}y}}\\
% note that \cgres is by default in \cgf font
\cglines{3}{\cgfa}\\
\cgres{3}{\cat{S}\lf{\so{like}\so{mary}\so{john}}}
}

```

Same example with lower-level ccg-latex commands for lexical assumption lines, and with shorthanded type-raising notation using subscript and superscript. NB. they are typeset in math mode without needing  $\$$ .  $\$$ .

$$\begin{array}{ccc}
 \text{John} & \text{likes} & \text{Mary} \\
 \hline
 \text{NP}_{3s}^{\uparrow} & (\text{S} \backslash \text{NP}_{3s}) / \text{NP} & \text{S} \backslash (\text{S} / \text{NP}) \\
 :\lambda p.p\text{john}' & :\lambda x\lambda y.\text{like}'xy & :\lambda p.p\text{mary}' \\
 \hline
 & \text{S} / \text{NP} : \lambda x.\text{like}'x\text{john}' & \xrightarrow{\text{B}} \\
 \hline
 & \text{S} : \text{like}'\text{mary}'\text{john}' & \longrightarrow
 \end{array}$$

The ccg-latex code is:

```

\cgex{3}{John & likes & Mary\\
% uses the alias \cat rather than \cgf above--same result
\cgul & \cgul & \cgul\\
% manually repeats the columns for comparison with \cglines above
\cat{\cgss{NP}{3s}{\uparrow}}
& \cat{(S\bs\cgs{NP}{3s})\fs NP} & \cat{S\bs(S\fs NP)}\\
\lf{\lambda p.p\,\,\so{john}}
& \lf{\lambda x\lambda y.\so{like}xy} & \lf{\lambda p.p\,\,\so{mary}}\\
\cgline{2}{\cgfc}\\
\cgres{2}{\cat{S\fs NP}\lf{\lambda x.\so{like}x\so{john}}}\
% note that \cgres is by default in \cgf font
\cgline{3}{\cgfa}\\
\cgres{3}{\cat{S} \lf{\so{like}\so{mary}\so{john}}}\
% using \cat inside \cgres is nae problem
}

```

An example with double slashes (for morphology, etc.)

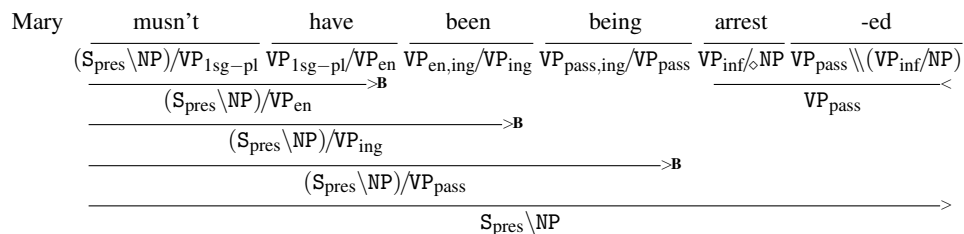
$$\frac{\text{dismiss} \quad \text{-ed}}{\frac{\text{VP}_{\text{inf}}/\text{NP} : \lambda x \lambda y. \text{dismiss}' xy \ ((S \backslash \text{NP}_{\text{agr}})/\text{NP}) \backslash \backslash (\text{VP}_{\text{inf}}/\text{NP}) : \lambda p \lambda x \lambda y. \text{past}'(Pxy)}{(S \backslash \text{NP}_{\text{agr}})/\text{NP} : \lambda x \lambda y. \text{past}'(\text{dismiss}' xy)}} <$$

The ccc-latex code is below (using \cgg instead of \cat, which do the same, and native latex math for LF, which does the same as \lf{. .}). NB. empty subscripts with no effect, if you keep changing the categories as I do).

The last \cgres is a painful reminder that if you put inline math in it using \$..\$, you will get a warning from L<sup>A</sup>T<sub>E</sub>X. Use \lf{. .} or \bm{. .} instead.

```
\cgex{3}{dismiss& -ed\\
\cglines{2}\\
\cgf{\cgs{VP}{inf}\fs\cgs{NP}{}}
$: \lambda x \lambda y. \so{dismiss}\,x\,y$&
\cgf{((\cgs{S}{})\bs\cgs{NP}{agr})\fs NP)\bss(\cgs{VP}{inf}\fs NP)}
$: \lambda p \lambda x \lambda y. \so{past}(P\,xy)$\\
\cgline{2}{\cgba}\\
\cgres{2}{\cgf{(\cgs{S}{})\bs\cgs{NP}{agr})\fs\cgs{NP}{}}
\lf{\lambda x \lambda y. \so{past}(\so{dismiss}\,x\,y)}}
}
```

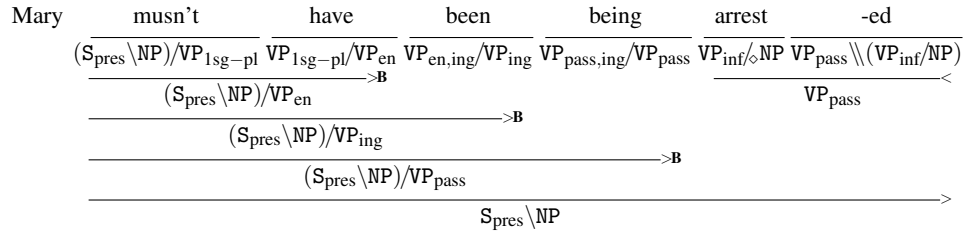
Here is one example with features galore, from Emmon Bach:



Here is the ccg-latex code:

```
{\footnotesize
Mary \cgex{6}{musn't & have & been & being & arrest & -ed\\
  \cglines{6}\\
  \cgf{(\cgs{S}{pres}\bs NP)\fs\cgs{VP}{1sg-pl}}
  & \cgf{\cgs{VP}{1sg-pl}\fs\cgs{VP}{en}}
  & \cgf{\cgs{VP}{en,ing}\fs\cgs{VP}{ing}}
  & \cgf{\cgs{VP}{pass,ing}\fs\cgs{VP}{pass}}
  & \cgf{\cgs{VP}{inf}\fds NP}
  & \cgf{\cgs{VP}{pass}\lds(\cgs{VP}{inf}\fs NP)}\\
  \cglines{2}{\cgfc} &&& \cglines{2}{\cgba}\\
  \cgres{2}{\cat{(\cgs{S}{pres}\bs NP)\fs\cgs{VP}{en}}}}
  &&& \cgres{2}{\cgs{VP}{pass}}\\
  \cglines{3}{\cgfc}\\
  \cgres{3}{\cat{(\cgs{S}{pres}\bs NP)\fs\cgs{VP}{ing}}}}\\
  \cglines{4}{\cgfc}\\
  \cgres{4}{\cat{(\cgs{S}{pres}\bs NP)\fs\cgs{VP}{pass}}}}\\
  \cglines{6}{\cgfa}\\
  \cgres{6}{\cat{\cgs{S}{pres}\bs NP}}}
}}
```

Same example with `\begin{ccg}{n}{data}{derivations}\end{ccg}`.  
No gloss line, and lexical assumption lines are drawn by default.



Here is the ccg-latex code:

```
{\footnotesize
Mary
\begin{ccg}{6}{musn't & have & been & being & arrest & -ed}
  {\cgf{(\cgs{S}{pres}\bs NP)\fs\cgs{VP}{1sg-pl}}
    & \cgf{\cgs{VP}{1sg-pl}\fs\cgs{VP}{en}}
    & \cgf{\cgs{VP}{en,ing}\fs\cgs{VP}{ing}}
    & \cgf{\cgs{VP}{pass,ing}\fs\cgs{VP}{pass}}
    & \cgf{\cgs{VP}{inf}\fds NP}
    & \cgf{\cgs{VP}{pass}\lds(\cgs{VP}{inf}\fs NP)}\backslash\backslash
    \cglines{2}{\cgfc} &&& \cglines{2}{\cgba}\backslash\backslash
  \cgres{2}{\cat{(\cgs{S}{pres}\bs NP)\fs\cgs{VP}{en}}}
  &&& \cgres{2}{\cgs{VP}{pass}}\backslash\backslash
    \cglines{3}{\cgfc}\backslash\backslash
  \cgres{3}{\cat{(\cgs{S}{pres}\bs NP)\fs\cgs{VP}{ing}}}\backslash\backslash
  \cglines{4}{\cgfc}\backslash\backslash
  \cgres{4}{\cat{(\cgs{S}{pres}\bs NP)\fs\cgs{VP}{pass}}}\backslash\backslash
  \cglines{6}{\cgfa}\backslash\backslash
  \cgres{6}{\cat{\cgs{S}{pres}\bs NP}}
}
\end{ccg}
}
```

Another example, to show glossing in the beginning. The end gloss is typeset by `\mc`, for multi-column, centered.

It uses `\begin{ccgg}{n}{data}{gloss}{derivations}\end{ccgg}`.

ver-dir give-caus	-t -caus	-ti. -past
$\text{VP}_{\text{inf}} \backslash \text{NP}_{\text{dat}} \backslash \text{NP}_{\text{dat}} \backslash \text{NP}_{\text{acc}}$ $:\lambda x \lambda y \lambda z. \text{give}'_{yxz}$	$(S \backslash \text{NP}_{\text{nom}} \backslash \text{NP}_{\text{case}}) \backslash \text{VP}_{\text{inf}}$ $:\lambda p \lambda x \lambda y. \text{cause}'(px)y$	
$\text{S} \backslash \text{NP}_{\text{nom}} \backslash \text{NP}_{\text{dat}} \backslash \text{NP}_{\text{dat}} \backslash \text{NP}_{\text{dat}} \backslash \text{NP}_{\text{acc}}$ $:\lambda x_1 \lambda x_2 \lambda x_3 \lambda x_4 \lambda x_5. \text{cause}_{1,2}'(\text{cause}'_{1,2}(\text{give}'_{x_1 x_2 x_3})x_4)x_5$ ‘made to let give’, from Turkish		

Here is the ccg-latex code:

```
\begin{ccgg}{3}{ver-dir & -t & -ti.}{give{-caus} & {-caus} & {-past}}
{
\cgf{\cgs{VP}{inf}\bs\cgs{NP}{dat}\bs\cgs{NP}{dat}\bs\cgs{NP}{acc}}
& \cgf{(S\bs\cgs{NP}{nom}\bs\cgs{NP}{case})\bs\cgs{VP}{inf}}\\
\lf{\lambda x \lambda y \lambda z. \so{give}_{yxz}}
& \lf{\lambda p \lambda x \lambda y. \so{cause}(px)y}\\
\cglines{2}{\cgb{3}}\\
\cgres{2}{\cat{S\bs\cgs{NP}{nom}\bs\cgs{NP}{dat}\bs
\cgs{NP}{dat}\bs\cgs{NP}{dat}\bs\cgs{NP}{acc}}}\
\cgres{2}{\lf{\lambda x_1 \lambda x_2 \lambda x_3 \lambda x_4 \lambda x_5.
\so{cause}_{1,2}}
(\sos{cause}_{1,2}(\so{give}_{x_1 x_2 x_3})x_4)x_5}}\[1ex]
\mc{3}{‘made to let give’, from Turkish}
}
\end{ccgg}
```

Note that subscripted semantic objects such as  $\text{cause}_{1,2}'$  are better typeset as  $\text{cause}'_{1,2}$  using `\sos` (for ‘semantic object, subscripted’), rather than `\so`.

An example with slash modalities and centered non-derivability indicator (\*):

$$\frac{*I \text{ will} \quad \text{give} \quad \text{flowers} \quad \text{my very heavy friends.}}{\frac{(VP/NP)/_{\diamond} NP \quad VP \backslash (VP/NP)}{* < \mathbf{B}_x} \quad VP \backslash (VP/NP)}$$

Code:

```
\begin{ccg}{4}{*I~will& give& flowers& my~very~heavy~friends.}
{
&\cat{(VP\fs NP)\fds NP}&\cat{VP\bs(VP\fs NP)}&\cat{VP\bs(VP\fs NP)}\\
&\badline{2}{\cgbx}
}
\end{ccg}
```



Some examples to show slash distancing by pt unit for categories in subscript:

By `cgc-latex`:

John [should]<sub>(S\NP)//IV</sub> walk the dog.

John [wants]<sub>(S\NP)/VP</sub> to walk the dog.

Mary [believes]<sub>(S\NP)/S</sub> that John walked the dog.

And some big ones by `cgc-latex`:

$(S\backslash_{\times}NP)/_{\diamond}IV$

$(S\backslash\backslash NP)/VP$

$(S\backslash NP)//S$

and bigger ones:

$(S\backslash_{\times}NP)/_{\diamond}IV$

$(S\backslash\backslash NP)/VP$

$(S\backslash NP)//S$

Here is the native  $\text{\LaTeX}$  math rendering of above without `cgc-latex` to compare spacing in various sizes:

$(S\backslash_{\times}NP)/_{\diamond}IV$

$(S\backslash\backslash NP)/VP$

$(S\backslash NP)//S$

John [should]<sub>(S\NP)//IV</sub> walk the dog.

John [wants]<sub>(S\NP)/VP</sub> to walk the dog.

Mary [believes]<sub>(S\NP)/S</sub> that John walked the dog.

Check the code:

```
{\Large
$(S\backslash\_times NP)/\_{{\diamond}IV}$\medskip

$(S\backslash\backslash NP)/VP$\medskip

$(S\backslash NP)// S$}\bigskip

John [should]$_{\scriptstyle (S\backslash NP)//IV}$ walk the dog.

John [wants]$_{\scriptstyle (S\backslash\backslash NP)/ VP}$ to walk the dog.

Mary [believes]$_{\scriptstyle (S\backslash NP)/\_{{\diamond}S}}$ that John walked the dog.
```

It generates.

$$(S \backslash_{\times} NP) /_{\diamond} IV$$

$$(S \backslash \backslash NP) / VP$$

$$(S \backslash NP) // S$$

John [should]<sub>(S \ NP) // IV</sub> walk the dog.

John [wants]<sub>(S \ \ NP) / VP</sub> to walk the dog.

Mary [believes]<sub>(S \ NP) /\_{\diamond} S</sub> that John walked the dog.

Not pretty.