

# naive-ebnf: L<sup>A</sup>T<sub>E</sub>X Package for EBNF in Plain Text\*

Yegor Bugayenko  
yegor256@gmail.com

2024/09/06, 0.0.16

**NB!** Large ENBF snippets may take too long to render!

## 1 Introduction

This package helps render an [Extended Backus-Naur Form](#) using plain text notation:

$\langle \lambda\text{-Expr} \rangle \rightarrow \langle \text{Var} \rangle$ $\quad   \text{"}\lambda\text{" } \langle \text{Var} \rangle \text{"}. \text{" } \langle \text{Expr} \rangle$ $\quad   \text{"}\langle \text{Expr} \rangle \langle \text{Expr} \rangle \text{"}$	<pre>1 \documentclass{minimal} 2 \usepackage{naive-ebnf} 3 \usepackage{mathtools} 4 \begin{document} 5 \begin{ebnf} 6 &lt;\lambda\$-Expr&gt; := &lt;Var&gt; \\ 7      "\$\lambda\$" &lt;Var&gt; "." &lt;Expr&gt; \\ 8      "\char{'\langle' &lt;Expr&gt; &lt;Expr&gt; '\char{'\"}"} 9 \end{ebnf} 10 \end{document}</pre>
---	--

`ebnf` The `ebnf` environment *doesn't* add any formatting to the paragraph, but only replaces the plain text symbols, such as “:=” and “<Var>” with proper L<sup>A</sup>T<sub>E</sub>X commands. The following syntax is understood inside the `ebnf` environment:

- := separates the left-hand side from the right-hand side of the production rule;
- <...> denotes a non-terminal (variable);
- "... " denotes a terminal symbol;
- '...' ' denotes a special non-printable terminal symbol, like 'EOL';
- (... | ...) denotes a series of options to choose from;
- /.../ denotes a regular expression, like /[a-z]+/;
- [...] denotes an optional substitution;
- {...} denotes a zero or more times repetition;
- {...}+ denotes one or more times repetition;

---

\*The sources are in GitHub at [yegor256/naive-ebnf](#)

- `|||` denotes an indent at the beginning of the string.
- `||` denotes an indented vertical bar at the beginning of the string.

**Attention:** The usage of some symbols is prohibited inside terminals. Instead, the following substitutions are recommended:

- `\lparen` and `\rparen` instead of “(” and “)” (from the [mathtools](#) package);
- `\langle` and `\rangle` instead of “<” and “>”;
- `\lbrace` and `\rbrace` instead of “{” and “}” (also [mathtools](#));
- `\lbrack` and `\rbrack` instead of “[” and “]” (also [mathtools](#));
- `\vert` instead of “|”.

They would look even better, if the following notation is used:

- `\char‘\ (` and `\char‘\ )` instead of “(” and “)”;
- `\char‘\ <` and `\char‘\ >` instead of “<” and “>”;
- `\char‘\ {` and `\char‘\ }` instead of “{” and “}”;
- `\char‘\ [` and `\char‘\ ]` instead of “[” and “]”.

`width` There is an optional argument of `ebnf` environment, which sets the width of the left-hand side of each rule (the default width is `6em`):

This EBNF has a larger width of the left hand side than usual: $\langle \text{VeryLongVariable} \rangle \rightarrow \langle X \rangle \mid \langle Y \rangle$ $\langle X \rangle \rightarrow \text{"X" EOL}$ $\langle Y \rangle \rightarrow \text{"Y"}$	<pre> 4   This EBNF has a larger width of \\  5   the left hand side than usual: \par  6   \begin{ebnf}[1.5in]  7   &lt;VeryLongVariable&gt; := &lt;X&gt;   &lt;Y&gt; \\  8   &lt;X&gt; := "X" 'EOL' \\  9   &lt;Y&gt; := "Y" \\  10  \end{ebnf} </pre>
--	---

`\EbnfTerminal` Inside the text, terminals, non-terminals, and special terminals may be formatted using three supplementary commands:  
`\EbnfNonTerminal`  
`\EbnfSpecial`

The non-terminal $\langle \text{Var} \rangle$ in $\lambda$ -calculus may be equal to $v_1, v_2, \dots$ . Application starts with “(” and ends with “)”.	<pre> 6   The non-terminal \EbnfNonTerminal{Var}  7   in \$\lambda\$-calculus may be equal  8   to \$v_1, v_2, \dots\$. Application  9   starts with \EbnfTerminal{ ( } and ends  10  with \EbnfTerminal{ ) }. </pre>
---	---

It's possible to use them in math-mode too, for example:

If “( $f_1(\lambda\text{-Var})$ )” is always true, then $f_1$ is a tautology.	<pre> 6   If \$\EbnfTerminal{ ( } f_1  7   \EbnfNonTerminal{ \$\lambda\$-Var }  8   \EbnfTerminal{ ) }\$ is always true, then  9   \$f_1\$ is a tautology. </pre>
---	---

`\EbnfRegex` A regular expression is possible too:

<pre> ⟨data⟩ → ⟨bool⟩   ⟨integer⟩   ⟨byte⟩ ⟨bool⟩ → "TRUE"   "FALSE" ⟨integer⟩ → /(+ -)?[0-9]+/ ⟨byte⟩ → /[0-9a-f]{2}/ ⟨number⟩ → /[1-9]+/ / [0-9]+/ </pre>	<pre> 6 \begin{ebnf} 7 &lt;data&gt; := &lt;bool&gt;   &lt;integer&gt;   &lt;byte&gt; \\ 8 &lt;bool&gt; := "TRUE"   "FALSE" \\ 9 &lt;integer&gt; := /(+\char‘\ -)?[0-9]+/ \\ 10 &lt;byte&gt; := /[0-9a-f]\char‘\{2\char‘\}/ \\ 11 &lt;number&gt; := /[1-9]+/ / [0-9]+/ 12 \end{ebnf} </pre>
---	--

Special symbols are interpreted correctly, if they stay inside quotes:

<pre> ⟨X⟩ → EOL " '   " ⟨Y⟩ → "&gt;" "&lt;" "[" "]" "/" "\" ⟨Z⟩ → "\LaTeX" "\textdollar" </pre>	<pre> 5 \begin{ebnf} 6 &lt;X&gt; := 'EOL' " '   " \\ 7 &lt;Y&gt; := "&gt;" "&lt;" "[" "]" "/" "\" \\ 8 &lt;Z&gt; := "\LaTeX" "\textdollar" \\ 9 \end{ebnf} </pre>
---	---

Nested brackets work fine too:

<pre> ⟨x⟩ → ("x" ("y"   ("z"   ⟨z⟩))) ⟨y⟩ → [{"x1"} {/[a-z]+/}] ⟨z⟩ → {{{⟨x⟩}+ ⟨y⟩} ⟨z⟩}+ ⟨t⟩ → [⟨x⟩] [⟨y⟩] </pre>	<pre> 5 \begin{ebnf} 6 % There is no meaning in this: 7 &lt;x&gt; := ( "x" ( "y"   ( "z"   &lt;z&gt; ) ) ) \\ 8 &lt;y&gt; := [ [ "x1" ] { /[a-z]+/ } ] \\ 9 &lt;z&gt; := { { { &lt;x&gt; }+ &lt;y&gt; } &lt;z&gt; }+ \\ 10 &lt;t&gt; := [ &lt;x&gt; ] [ &lt;y&gt; ] \\ 11 \end{ebnf} </pre>
--	---

The ||| character allows indenting the text on a new line, allowing breaking long expressions:

<pre> ⟨x⟩ → "beginning"       (⟨y⟩   ⟨z⟩)       "ending" </pre>	<pre> 5 \begin{ebnf} 6 &lt;x&gt; := "beginning" \\ 7     ( &lt;y&gt;   &lt;z&gt; ) \\ 8     "ending" \\ 9 \end{ebnf} 10 \end{document} </pre>
---	---

## 2 Package Options

It's possible to configure the behavior of the package with the help of a few package options:

**bw** By default, some colors are used in the rendered grammar. However, the **bw** package option disables any colors and makes sure the grammar is black-and-white:

```
\usepackage[bw]{naive-ebnf}
```

**trail** The **ebnf** environment is doing pre-processing of the  $\TeX$  commands provided and then let  $\LaTeX$  render them. It may be useful to see the output generated by the pre-processing. The **trail** option (with a file name) asks the package to save the content of the environment after the pre-processing into the file:

```
\usepackage[trail=log.tex]{naive-ebnf}
```

### 3 Implementation

First, we process package options:

```
1 \RequirePackage{pgfopts}
2 \pgfkeys{
3   /ebnf/.cd,
4   bw/.store in=\ebnf@bw,
5   trail/.store in=\ebnf@trail,
6   trail/.default=naive-ebnf.tmp.tex,
7 }
8 \ProcessPgfPackageOptions{/ebnf}
```

Then, we include a few packages, mostly to deal with  $\LaTeX$ 3 expressions:

```
9 \RequirePackage{expl3}
```

`\ebnf@color` Then, we include `xcolor` to colorize the output a bit:

```
10 \makeatletter\ifdefined\ebnf@bw\else
11   \RequirePackage{xcolor}
12 \fi
13 \newcommand\ebnf@color[2]
14   {\ifdefined\ebnf@bw#2\else\textcolor{#1}{#2}\fi}
15 \makeatother
```

`\EbnfTerminal` Then, we define a command to render a single terminal:

```
16 \makeatletter
17 \newcommand\EbnfTerminal[1]{%
18   \relax\ifmmode\else\ttfamily\fi%
19   \ebnf@color{gray}{\relax\ifmmode\textsf{''}\else{\sffamily''}\fi}%
20   #1%
21   \ebnf@color{gray}{\relax\ifmmode\textsf{''}\else{\sffamily''}\fi}}
22 \makeatother
```

`\EbnfTerminal` Then, we define a command to render a single non-terminal:

```
23 \makeatletter
24 \newcommand\EbnfNonTerminal[1]{%
25   \ebnf@color{gray}{\relax\ifmmode\langle\else\(\langle)\}\fi}%
26   \relax\ifmmode\textsf{#1}\else{\sffamily#1}\fi%
27   \ebnf@color{gray}{\relax\ifmmode\rangle\else\(\rangle)\}\fi}}
28 \makeatother
```

`\EbnfSpecial` Then, we define a command to render a single non-terminal:

```
29 \makeatletter
30 \newcommand\EbnfSpecial[1]{\relax\ifmmode\else\ttfamily\fi#1}%
31 \makeatother
```

`\EbnfRegex` Then, we define a command to render a regular expression:

```
32 \makeatletter
33 \newcommand\EbnfRegex[1]{\relax\ifmmode\else\ttfamily\fi/#1/}%
34 \makeatother
```

Then, we define supplementary commands:

```
35 \makeatletter
36 \newcommand\ebnf@optional[1]
```

```

37 {\ebnf@color{gray}{[#1\ebnf@color{gray}{}]}}
38 \newcommand\ebnf@repetition[2][
39   {\ebnf@color{gray}{\{#2\ebnf@color{gray}{\}\(\^{scriptscriptstyle #1}\)}}}
40 \newcommand\ebnf@grouping[1]
41   {\ebnf@color{gray}{(#1\ebnf@color{gray}{})}}
42 \ExplSyntaxOn
43 \newcommand\ebnf@terminal[1]{
44   \tl_set:Nn \l_ebnf_tl {}
45   \tl_set_rescan:Nnn \l_ebnf_tl {} { #1 }
46   \EbnfTerminal{\l_ebnf_tl}
47 }
48 \newcommand\ebnf@special[1]{
49   \tl_set:Nn \l_ebnf_tl {}
50   \tl_set_rescan:Nnn \l_ebnf_tl {} { #1 }
51   \EbnfSpecial{\l_ebnf_tl}
52 }
53 \newcommand\ebnf@nonterminal[1]{
54   \tl_set:Nn \l_ebnf_tl {}
55   \tl_set_rescan:Nnn \l_ebnf_tl {} { #1 }
56   \EbnfNonTerminal{\l_ebnf_tl}
57 }
58 \newcommand\ebnf@regex[1]{
59   \tl_set:Nn \l_ebnf_tl {}
60   \tl_set_rescan:Nnn \l_ebnf_tl {} { #1 }
61   \EbnfRegex{\l_ebnf_tl}
62 }
63 \ExplSyntaxOff
64 \newcommand\ebnf@to
65   {\ebnf@color{gray}{\(\to)}}
66 \newcommand\ebnf@alternation
67   {\ebnf@color{gray}{\(\vert)}}
68 \makeatother

```

ebnf Then, we define the ebnf environment:

```

69 \ExplSyntaxOn
70 \cs_generate_variant:Nn \tl_replace_all:Nnn {Nx}
71 \makeatletter
72 \NewDocumentEnvironment{ebnf}{0{4em}+b}
73   {\tl_set:Nn\ebnf_tmp{#2}}
74   {%
75   \regex_replace_all:nnN
76     { ([^s])\/([^s]) } {\1\\slash{}\2} \ebnf_tmp%
77   \regex_replace_all:nnN
78     { ([^s])< } {\1\\textless{}} \ebnf_tmp%
79   \regex_replace_all:nnN
80     { >([^s]) } {\textgreater{}\1} \ebnf_tmp%
81   \regex_replace_all:nnN
82     { ([^s])'([^s]) } {\1\\textquotesingle{}\2} \ebnf_tmp%
83   \regex_replace_all:nnN { \|\|\| }%
84     {\c{makebox}[#1][r]{ } \ebnf_tmp%
85   \regex_replace_all:nnN
86     { ([^s])\|([^s]) } {\1\\textbar{}\2} \ebnf_tmp%
87   %
88   \regex_replace_all:nnN

```

```

89   { /(.+?) / }%
90   {\c{ebnf@regexp}{\1}} \ebnf_tmp%
91   \cs_new:Npn\ebnf_curled{%
92     \regex_replace_all:nnNT
93     { \[\s(([\^\\s]*([\s[^\]\{\}|\s\(|\)|\{[\^\\s])?)*)\s\}{\+)? }%
94     {\c{ebnf@repetition}{\5}{\1}} \ebnf_tmp \ebnf_curled}%
95   \ebnf_curled%
96   \cs_new:Npn\ebnf_brackets{%
97     \regex_replace_all:nnNT
98     { \[\s(([\^\\s]*([\s[^\]\{\}|\s\(|\)|\{[\^\\s])?)*)\s\)}%
99     {\c{ebnf@grouping}{\1}} \ebnf_tmp \ebnf_brackets}%
100  \ebnf_brackets%
101  \cs_new:Npn\ebnf_squares{%
102    \regex_replace_all:nnNT
103    { \[\s(([\^\\s]*([\s[^\]\{\}|\s\(|\)|\{[\^\\s])?)*)\s\)}%
104    {\c{ebnf@optional}{\1}} \ebnf_tmp \ebnf_squares}%
105  \ebnf_squares%
106  \regex_replace_all:nnN { (<[>]+> \s:=) }%
107  {\c{makebox}[#1][r]{\1}} \ebnf_tmp%
108  \regex_replace_all:nnN { <(.+?)> }%
109  {\c{ebnf@nonterminal}{\1}} \ebnf_tmp%
110  \regex_replace_all:nnN { "(.+)" }%
111  {\c{ebnf@terminal}{\1}} \ebnf_tmp%
112  \regex_replace_all:nnN { '(.+?)' }%
113  {\c{ebnf@special}{\1}} \ebnf_tmp%
114  \regex_replace_all:nnN { \(\|\) }%
115  {\c{makebox}[#1][r]{ \1 }} \ebnf_tmp%
116  \regex_replace_all:nnN { \| }%
117  {\c{ebnf@alternation}{}} \ebnf_tmp%
118  \regex_replace_all:nnN { := }%
119  {\c{ebnf@to}{}} \ebnf_tmp%
120  \tl_put_left:Nn \ebnf_tmp {\noindent}
121  \tl_put_right:Nn \ebnf_tmp {}
122  \ifdefined\ebnf@trail%
123    \newwrite\ebnf@write%
124    \immediate\openout\ebnf@write\ebnf@trail\relax%
125    \immediate\write\ebnf@write{\unexpanded\expandafter{\ebnf_tmp}}%
126    \immediate\closeout\ebnf@write%
127    \message{naive-ebnf:\space pre-processed\space TeX
128      \space saved\space to\space "\ebnf@trail"^^J}%
129  \fi%
130  \ebnf_tmp}
131  \makeatother
132  \ExplSyntaxOff

133 \endinput

```

## Change History

0.0.1	General: First draft. . . . .	4	0.0.3	<code>\EbnfTerminal</code> : Quotes fixed in both text and math modes. . . . .	4
0.0.11	<code>ebnf</code> : Many bugs fixed in the area of regular expression matching. . . . .	5	0.0.4	<code>ebnf</code> : Any symbols are allowed inside <code>\EbnfNonTerminal</code> commands and inside the <code>ebnf</code> environment, where non-terminals are mentioned. . . . .	5
0.0.14	<code>ebnf</code> : One-or-more repetition introduced with <code>{...}+</code> syntax. . . . .	5	0.0.5	General: New package option <code>trail</code> added, to enable saving of the generated $\TeX$ content to a file, for debugging purposes. . . . .	4
0.0.15	<code>ebnf</code> : The iteration removed, only repetition is left, with the second optional parameter. . . . .	5	0.0.6	<code>\EbnfSpecial</code> : New command <code>\EbnfSpecial</code> added, to enable rendering of special non-printable terminal symbols outside of the <code>ebnf</code> environment. . . . .	4
0.0.2	General: Proper parsing of grouping. . . . .	4	0.0.8	<code>\EbnfRegex</code> : New command <code>\EbnfRegex</code> added, to enable rendering of regular expressions outside of the <code>ebnf</code> environment. . . . .	4
	Substitutions suggested for special symbols. . . . .	4			
	<code>\EbnfTerminal</code> : New command <code>\EbnfNonTerminal</code> added, to enable rendering non-terminal symbols outside of the <code>ebnf</code> environment. . . . .	4			
	New command <code>\EbnfTerminal</code> added, to enable rendering terminal symbols outside of the <code>ebnf</code> environment. . . . .	4			

## Index

Numbers written in *italic* refer to the page where the corresponding entry is described; numbers underlined refer to the code line of the definition; numbers in *roman* refer to the code lines where the entry is used.

	<b>Symbols</b>		
\(	25, 27, 39, 65, 67, 98	\ebnf@terminal	43
\)	25, 27, 39, 65, 67, 98	\ebnf@to	64
\+	93	\ebnf@trail	5, 122, 124, 128
\[	103	\ebnf@write	123, 124, 125, 126
\{	39, 93	\EbnfNonTerminal	24, 56
\}	39, 93	\EbnfRegex	32, 61
\]	103	\EbnfSpecial	29, 51
\	83, 86, 114, 116	\EbnfTerminal	16, 23, 46
	<b>Numbers</b>	\endinginput	133
\2	76, 82, 86	\expandafter	125
\5	94	\ExplSyntaxOff	63, 132
	<b>C</b>	\ExplSyntaxOn	42, 69
\c	84, 90, 94, 99, 104, 107, 109, 111, 113, 115, 117, 119		
\closeout	126	<b>I</b>	
\cs	70, 91, 96, 101	\ifdefined	10, 14, 122
	<b>E</b>	\ifmmode	18, 19, 21, 25, 26, 27, 30, 33
\ebnf	69, 73, 76, 78, 80, 82, 84, 86, 90, 91, 94, 95, 96, 99, 100, 101, 104, 105, 107, 109, 111, 113, 115, 117, 119, 120, 121, 125, 130	\immediate	124, 125, 126
\ebnf@alternation	66		
\ebnf@bw	4, 10, 14	<b>L</b>	
\ebnf@color	10, 19, 21, 25, 27, 37, 39, 41, 65, 67	\l	44, 45, 46, 49, 50, 51, 54, 55, 56, 59, 60, 61
\ebnf@grouping	40	\langle	25
\ebnf@nonterminal	53		
\ebnf@optional	36	<b>M</b>	
\ebnf@regex	58	\makeatletter	10, 16, 23, 29, 32, 35, 71
\ebnf@repetition	38	\makeatother	15, 22, 28, 31, 34, 68, 131
\ebnf@special	48	\message	127
		<b>N</b>	
		\newcommand	13, 17, 24, 30, 33, 36, 38, 40, 43, 48, 53, 58, 64, 66
		\NewDocumentEnvironment	72
		\newwrite	123
		\noindent	120
		<b>O</b>	
		\openout	124
		<b>P</b>	
		\pgfkeys	2
		\ProcessPgfPackageOptions	8
		<b>R</b>	
		\rangle	27
		\regex	75, 77, 79, 81, 83, 85, 88, 92, 97, 102, 106, 108, 110, 112, 114, 116, 118
		\relax	18, 19, 21, 25, 26, 27, 30, 33, 124
		\RequirePackage	1, 9, 11
		<b>S</b>	
		\scriptscriptstyle	39
		\sffamily	19, 21, 26
		\space	127, 128
		<b>T</b>	
		\textcolor	14
		\textsf	19, 21, 26
		\tl	44, 45, 49, 50, 54, 55, 59, 60, 70, 73, 120, 121
		\to	65
		\ttfamily	18, 30, 33
		<b>U</b>	
		\unexpanded	125
		<b>V</b>	
		\vert	67
		<b>W</b>	
		\write	125