

naive-ebnf: L^AT_EX Package for EBNF in Plain Text*

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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:

$\begin{array}{l} \langle \lambda\text{-Expr} \rangle \rightarrow \langle \text{Var} \rangle \\ \quad \text{ "}\lambda\text{" } \langle \text{Var} \rangle \text{ "}. " \langle \text{Expr} \rangle \\ \quad \text{ "(" } \langle \text{Expr} \rangle \langle \text{Expr} \rangle \text{ ")" } \end{array}$	<pre>1 \documentclass{minimal} 2 \usepackage{naive-ebnf} 3 \usepackage{mathtools} 4 \begin{document} 5 \begin{ebnf} 6 <\$\lambda\$-Expr> := <Var> \\ 7 "\$\lambda\$" <Var> "." <Expr> \\ 8 "\char{'\" <Expr> <Expr> "\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^AT_EX 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 an indented vertical bar at the beginning of the string.

*The sources are in GitHub at [yegor256/naive-ebnf](https://github.com/yegor256/naive-ebnf)

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: $\langle \text{VeryLongVariable} \rangle \rightarrow \langle X \rangle \mid \langle Y \rangle$ $\langle X \rangle \rightarrow \text{"X"} \text{ EOL}$ $\langle Y \rangle \rightarrow \text{"Y"}$	<pre> 4 This EBNF has a larger width of \ 5 the left hand side than usual: \par 6 \begin{ebnf}[1.5in] 7 <VeryLongVariable> := <X> <Y> \ 8 <X> := "X" 'EOL' \ 9 <Y> := "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 λ -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>
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It’s possible to use them in math-mode too, for example:

If “($f_1 \langle \lambda\text{-Var} \rangle$)” 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>
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`\EbnfRegex` A regular expression is possible too:

$\begin{aligned} \langle \text{data} \rangle &\rightarrow \langle \text{bool} \rangle \mid \langle \text{integer} \rangle \mid \langle \text{byte} \rangle \\ \langle \text{bool} \rangle &\rightarrow \text{"TRUE"} \mid \text{"FALSE"} \\ \langle \text{integer} \rangle &\rightarrow / (+ -)? [0-9]+ / \\ \langle \text{byte} \rangle &\rightarrow / [0-9a-f] \{2\} / \end{aligned}$	<pre> 6 \begin{ebnf}[1.5in] 7 <data> := <bool> <integer> <byte> \\ 8 <bool> := "TRUE" "FALSE" \\ 9 <integer> := /(+\char'\'-)?[0-9]+/ \\ 10 <byte> := /[0-9a-f]\char'\{2\}\char'\}/ \\ 11 \end{ebnf} </pre>
---	---

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

$\begin{aligned} \langle X \rangle &\rightarrow \text{EOL} \text{"'" " "} \\ \langle Y \rangle &\rightarrow \text{">" "<" "[" "]" "/" "\"} \\ \langle Z \rangle &\rightarrow \text{"\LaTeX" "\textdollar"} \end{aligned}$	<pre> 5 \begin{ebnf}[1.5in] 6 <X> := 'EOL' "'' " " \\ 7 <Y> := ">" "<" "[" "]" "/" "\" \\ 8 <Z> := "\LaTeX" "\textdollar" \\ 9 \end{ebnf} </pre>
--	--

Nested brackets work fine too:

$\begin{aligned} \langle x \rangle &\rightarrow (\text{"x"} (\text{"y"} \mid (\text{"z"} \mid \langle z \rangle))) \\ \langle y \rangle &\rightarrow [\text{"x1"}] / [a-z] + / \\ \langle z \rangle &\rightarrow \{ \{ \langle x \rangle \} \langle y \rangle \} \langle z \rangle \} \\ \langle t \rangle &\rightarrow [\langle x \rangle] [\langle y \rangle] \end{aligned}$	<pre> 5 \begin{ebnf}[1.5in] 6 <x> := ("x" ("y" ("z" <z>))) \\ 7 <y> := [["x1"] { /[a-z]+/ }] \\ 8 <z> := { { { <x> } <y> } <z> } \\ 9 <t> := [<x>] [<y>] \\ 10 \end{ebnf} </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 gammar 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 L^AT_EX3 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\textrm{''}\else\sffamily''\fi}%
20   #1%
21   \ebnf@color{gray}{\relax\ifmmode\textrm{''}\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\textrm{#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[1]
39   {\ebnf@color{gray}{\{ }#1\ebnf@color{gray}{ \}}
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 { ([^ ] ) / ( [^ ] ) } { \1 \\slash{} \2 } \ebnf_tmp%
77 \regex_replace_all:nnN
78 { ([^ ] ) < } { \1 \\textless{} } \ebnf_tmp%
79 \regex_replace_all:nnN
80 { > ([^ ] ) } { \\textgreater{} \1 } \ebnf_tmp%
81 \regex_replace_all:nnN
82 { ([^ ] ) ' ([^ ] ) } { \1 \\textquotesingle{} \2 } \ebnf_tmp%
83 \regex_replace_all:nnN
84 { ([^ ] ) \ | ( [^ ] ) } { \1 \\textbar{} \2 } \ebnf_tmp%
85 %
86 \regex_replace_all:nnN { \ / ( . + ? ) / \ } %
87 {\c{ebnf@regex}{\1}} \ebnf_tmp%
88 \cs_new:Npn\ebnf_curled{%
89 \regex_replace_all:nnNT
90 { \{ \ ( ( [^ ] ) * ( \ [^ ] \ | \ ( \ | \ ( [^ ] ) ? ) * ) \ } } %
91 {\c{ebnf@repetition}{\1}} \ebnf_tmp \ebnf_curled}%
92 \ebnf_curled%
93 \cs_new:Npn\ebnf_brackets{%
94 \regex_replace_all:nnNT
95 { \ ( \ ( ( [^ ] ) * ( \ [^ ] \ ( [ ] | \ ( \ | \ ( [^ ] ) ? ) * ) \ ) } %
96 {\c{ebnf@grouping}{\1}} \ebnf_tmp \ebnf_brackets}%
97 \ebnf_brackets%
98 \cs_new:Npn\ebnf_squares{%
99 \regex_replace_all:nnNT
100 { \ [ \ ( ( [^ ] ) * ( \ [^ ] \ [ ] | \ ( \ | \ ( [^ ] ) ? ) * ) \ ] } %

```

```

101   {\c{ebnf@optional}{\1}} \ebnf_tmp \ebnf_squares}%
102 \ebnf_squares%
103 \regex_replace_all:nnN { (<[~>]+?>\ :=) }%
104   {\c{makebox}[#1][r]{\1}} \ebnf_tmp%
105 \regex_replace_all:nnN { <(.*?)> }%
106   {\c{ebnf@nonterminal}{\1}} \ebnf_tmp%
107 \regex_replace_all:nnN { "(.+?)" }%
108   {\c{ebnf@terminal}{\1}} \ebnf_tmp%
109 \regex_replace_all:nnN { '(.+?)' }%
110   {\c{ebnf@special}{\1}} \ebnf_tmp%
111 \regex_replace_all:nnN { \\(\|) }%
112   {\c{makebox}[#1][r]{ \| }} \ebnf_tmp%
113 \regex_replace_all:nnN { \| }%
114   {\c{ebnf@alternation}{}} \ebnf_tmp%
115 \regex_replace_all:nnN { := }%
116   {\c{ebnf@to}{}} \ebnf_tmp%
117 \tl_put_left:Nn \ebnf_tmp {\noindent}
118 \tl_put_right:Nn \ebnf_tmp {}
119 \ifdefined\ebnf@trail%
120   \newwrite\ebnf@write%
121   \immediate\openout\ebnf@write\ebnf@trail\relax%
122   \immediate\write\ebnf@write{\unexpanded\expandafter{\ebnf_tmp}}%
123   \immediate\closeout\ebnf@write%
124   \message{naive-ebnf:\space pre-processed\space TeX
125     \space saved\space to\space "\ebnf@trail"^^J}%
126 \fi%
127 \ebnf_tmp}
128 \makeatother
129 \ExplSyntaxOff

130 \endinput

```

Change History

0.0.1	General: First draft.	3	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
0.0.11	<code>ebnf</code> : Many bugs fixed in the area of regular expression matching.	5			
0.0.2	General: Proper parsing of grouping. . .	3	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.	3
	Substitutions suggested for special symbols.	3			
	<code>\EbnfTerminal</code> : New command <code>\EbnfNonTerminal</code> added, to enable rendering non-terminal symbols outside of the <code>ebnf</code> environment.	4	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
	New command <code>\EbnfTerminal</code> added, to enable rendering terminal symbols outside of the <code>ebnf</code> environment.	4	0.0.8	<code>\EbnfRegex</code> : New command <code>\EbnfRegex</code> added, to enable rendering of regular expresions outside of the <code>ebnf</code> environment. . .	4
0.0.3	<code>\EbnfTerminal</code> : Quotes fixed in both text and math modes.	4			

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