oststud — OST-Stud Style and Macros*

Naoki Sean Pross <np@0hm.ch>

Released 2022/11/22

Contents

1 Purpose of this Package **2**

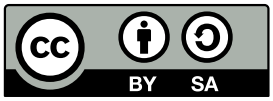
2 Package Options **2**

3 Usage **2**
3.1 Vectors and Vector Calculus . . . 2
3.2 Complex Numbers . . . 3
3.3 Probability Operators . . . 3
3.4 Transformation Operators . . . 3
3.5 References . . . 3
3.6 OST Colors . . . 3
3.7 Sane Defaults . . . 4

4 Implementation **4**
4.1 Dependencies and Parse Options . . . 4
4.2 Bold emphasis . . . 4
4.3 Vectors and Vector Calculus . . . 5
4.4 Complex Numbers . . . 6
4.5 Probability Operators . . . 6
4.6 Transformation Operators . . . 6
4.7 References . . . 7
4.8 OST Colors . . . 7
4.9 Sane Defaults . . . 8

License

This work is licensed under a Creative Commons "Attribution-ShareAlike 4.0 International" license.



*This document corresponds to oststud v0.2, last revised 2022/11/22.

1 Purpose of this Package

This package is made for the OST Studenten organization to provide an easy to use interface that gives a more consistent look and feel for the works produced by its the members. This package is the successor after the fusion of the old `hsrstud` package.

2 Package Options

`dontrenew` Do not renew existing LaTeX commands and environments. This is useful when the package is loaded on a document that is already partially written.

`textvecdiff` Disables the "Nabla" or "Del" notation for vector derivatives. Instead the symbols $\boldsymbol{\nabla}, \boldsymbol{\nabla}\cdot, \boldsymbol{\nabla}\times, \nabla^2, \boldsymbol{\nabla}^2$ are be replaced with grad, div, curl and div grad.

`textvecdiff` *Work in progress.*

`bfemph` *Work in progress.*

`bbprobability` *Work in progress.*

`scrtransforms` *Work in progress.*

3 Usage

3.1 Vectors and Vector Calculus

`\vec` `\uvec` In the physics used by electrical engineers it is common to use bold letters for vectors. If the `dontrenew` option is set a new macro `\bvec` (bold `\vec`) that takes a `{`⟨*symbol*⟩`}` defines the bold vector notation. Otherwise the default vector notation with the tiny ugly arrow ($\vec{u}$) is replaced by bold and the arrow notation saved in `\oldvec`. In vector calculus it is common to denote unit vectors by putting a hat, so there is a macro `\uvec` that does just that:

$$\hat{\mathbf{u}} = \mathbf{u}/u.$$

`\dotp` `\crossp` To differentiate the dot and cross products (between vectors) from normal product between scalars ($a \cdot b$ and $a \times b$), the macros `\dotp` and `\crossp` provide a bold variant:

$$\mathbf{u} \cdot \mathbf{v}, \qquad \mathbf{u} \times \mathbf{v}.$$

`\grad` `\div` `\curl` The macros `\grad`, `\div` and `\curl` provide symbols for the gradient, divergence and curl operators used in vector calculus. If the option `textvecdiff` is set, they symbols are written as words, otherwise they will he written (ab)using the Nabla symbol, i.e. by pretending that the symbol $\boldsymbol{\nabla}$ is a "vector" (sometime referred to as "del") of partial derivates: $\boldsymbol{\nabla} = (\partial_x, \partial_y, \partial_z)^\mathsf{T}$. Unless the option `dontrenew` is set, the division symbol is replaced by the divergence and the symbol $\div$ is saved in `\divsymb`. For a scalar field ϕ or a vector field $\mathbf{F}$ the notation (in order) of the gradient, divergence and curl appear as follows:

$$\boldsymbol{\nabla}\,\phi, \quad \boldsymbol{\nabla}\cdot\mathbf{F}, \quad \boldsymbol{\nabla}\times\mathbf{F}.$$

`\laplacian` `\vlaplacian` Continuing with the (ab)use of the "Nabla" or "Del" notation, the there is a macro `\laplacian` for the Laplacian operator

$$\nabla^2 \equiv \boldsymbol{\nabla} \cdot \boldsymbol{\nabla} \equiv \sum_i \partial_i^2.$$

Notice that the Nabla symbol is not bold, that is because the Laplacian operator results in a scalar value. Though, sometimes in electrodynamics the vector Laplacian is used (which applies the Laplacian operator to each component). To differentiate the two there is a macro `\vlaplacian` which uses the bold nabla symbol: $\boldsymbol{\nabla}^2$. If the option `dontrenew` is set both symbols are replaced by div grad.

3.2 Complex Numbers

Work in progress.

3.3 Probability Operators

Work in progress.

3.4 Transformation Operators

Work in progress.

$$\mathcal{L}\{f(t)\} = F(s) \circ\!\!-\!\!\bullet f(t) \bullet\!\!-\!\!\circ F(s)$$

3.5 References

Work in progress.

3.6 OST Colors

The official OST color palette provides the following "primary" or "accent" colors.

`OSTBlack` `OSTGray` `OSTBlackberry` `OSTRaspberry`

And then there are the other "design colors".

3.7 Sane Defaults

Work in progress.

4 Implementation

4.1 Dependencies and Parse Options

First, we have the dependencies necessary for typesetting.

```
\RequirePackage{xcolor}
\RequirePackage{amsmath}
\RequirePackage{amssymb}
\RequirePackage{bm}
```

This package also sets sane defaults to the following packages.

```
\RequirePackage{hyperref}
\RequirePackage{listings}
```

Then we create the options for the package.

```
\SetupKeyvalOptions{
    family=ost,
    prefix=ost@
}
\DeclareBoolOption[false]{dontrenew}
\DeclareBoolOption[false]{textvecdiff}
\DeclareBoolOption[false]{bfemph}
\DeclareBoolOption[false]{bbprobability}
% \DeclareBoolOption[false]{scrtransforms}
\ProcessLocalKeyvalOptions*
```

4.2 Bold emphasis

`\emph` Change the behaviour of `\emph`.

```
\ifost@bfemph
    \ifost@dontrenew
        \PackageError{The options \noexpand\dontrenew and \noexpand\bfemph cannot be used at
    \fi
```

```
    \long\expandafter\def\csname em \endcsname{%
        \@nomath\em
        \if b\expandafter\@car\f@series\@nil
            \itshape\else\bfseries\fi
    }
\fi
```

4.3 Vectors and Vector Calculus

`\vec` Set up bold notation for vectors.

```
\newcommand{\ost@vec}[1]{\mathbf{\bm{#1}}}
\ifost@dontrenew
    \newcommand{\bvec}[1]{\ost@vec{#1}}
\else
    \let\oldvec\vec
    \renewcommand{\vec}[1]{\ost@vec{#1}}
\fi
```

`\uvec` In vector calculus unit vectors are usually denoted by a hat.

```
\newcommand{\uvec}[1]{\vec{\hat{#1}}}
```

`\dotp` To differentiate them from `\cdot` and `\times` which are for scalars.

`\crossp`

```
\DeclareMathOperator{\dotp}{\boldsymbol\cdot}
\DeclareMathOperator{\crossp}{\boldsymbol\times}
```

`\grad` Gradient of a vector valued scalar functon.

```
\ifost@textvecdiff
    \DeclareMathOperator{\grad}{grad}
\else
    \DeclareMathOperator{\grad}{\vec{\nabla}}
\fi
```

`\div` Divergence operator. If the option `dontrenew` is a new macro `\divg` is defined. Otherwise `\div` is renamed to `\divsymb`.

```
\ifost@textvecdiff
    \DeclareMathOperator{\ost@div}{div}
\else
    \DeclareMathOperator{\ost@div}{\vec{\nabla}\dotp}
\fi
\ifost@dontrenew
    \DeclareMathOperator{\divg}{\ost@div}
\else
    \let\divsymb\div
    \renewcommand{\div}{\ost@div}
\fi
```

`\curl` Curl of a vector field.

```
\ifost@textvecdiff
    \DeclareMathOperator{\curl}{curl}
\else
    \DeclareMathOperator{\curl}{\vec{\nabla}\crossp}
\fi
```

\laplacian Laplacian of a scalar and vector field.
\vlaplacian

```
\ifost@textvecdiff
    \DeclareMathOperator{\laplacian}{\div\grad}
    \DeclareMathOperator{\vlaplacian}{\div\grad}
\else
    \DeclareMathOperator{\laplacian}{\nabla^2}
    \DeclareMathOperator{\vlaplacian}{\vec{\nabla}^2}
\fi
```

4.4 Complex Numbers

\Re Replace the real and imaginary operators to look "normal", that is not using the
\Im Fraktur fonts.

```
\ifost@dontrenew\else
    \renewcommand{\Re}[1]{\mathrm{Re} \left\{#1\right\}}
    \renewcommand{\Im}[1]{\mathrm{Im} \left\{#1\right\}}
\fi
```

4.5 Probability Operators

\E Expectation of a random variable.

```
\ifost@bbprobability
    \DeclareMathOperator{\ost@expectation}{\mathbb{E}}
\else
    \DeclareMathOperator{\ost@expectation}{E}
\fi
\newcommand{\E}[1]{\ost@expectation\left\{#1\right\}}
```

\Var Variance of a random variable.

```
\ifost@bbprobability
    \DeclareMathOperator{\ost@variance}{\mathbb{V}}
\else
    \DeclareMathOperator{\ost@variance}{Var}
\fi
\newcommand{\Var}[1]{\ost@variance\left\{#1\right\}}
```

\Pr Probability operator.

```
\ifost@bbprobability
    \DeclareMathOperator{\ost@probability}{\mathbb{P}}
\else
    \DeclareMathOperator{\ost@probability}{Pr}
\fi
\ifost@dontrenew
    \newcommand{\P}[1]{\ost@probability\left\{#1\right\}}
\else
    \renewcommand{\Pr}[1]{\ost@probability\left\{#1\right\}}
\fi
```

4.6 Transformation Operators

\fourier Fourier transform and its inverse.
\ifourier

```
\DeclareMathOperator{\fourier}{\mathcal{F}}
\DeclareMathOperator{\ifourier}{\mathcal{F}^{-1}}
```

\laplace Laplace transform and its inverse.
\ilaplace
```
\DeclareMathOperator{\laplace}{\mathcal{L}}
\DeclareMathOperator{\ilaplace}{\mathcal{L}^{-1}}
```

\ztransf Z-transform and its inverse.
\iztransf
```
\DeclareMathOperator{\ztransf}{\mathcal{Z}}
\DeclareMathOperator{\iztransf}{\mathcal{Z}^{-1}}
```

\hilbert Hilbert transform.
```
\DeclareMathOperator{\hilbert}{\mathcal{H}}
```

\corresponds Correspondence symbols.
\rcorresponds
```
\newcommand{\corresponds}{%
    \mbox{\setlength{\unitlength}{0.1em}%
        \begin{picture}(20,10)%
          \put(5,3){\circle{4}}%
          \put(7,3){\line(1,0){7}}%
          \put(16,3){\circle*{4}}%
        \end{picture}}}
\newcommand{\rcorresponds}{%
    \mbox{\setlength{\unitlength}{0.1em}%
        \begin{picture}(20,10)%
          \put(5,3){\circle*{4}}%
          \put(7,3){\line(1,0){7}}%
          \put(16,3){\circle{4}}%
        \end{picture}}}
```

4.7 References

\skriptum Reference material in the skriptum (lecture notes) of the course.
\sref
```
\newcommand{\ost@skriptum}{\PackageWarning{No \noexpand\skriptum given}}
\newcommand{\skriptum}[1]{\gdef\ost@skriptum{#1}}
\newcommand{\sref}[1]{%
    \texttt{\textcolor{OSTBlackberry}{#1}}\nocite{\ost@skriptum}}
```

\textbook Reference material in the textbook of the course.
\bref
```
\newcommand{\ost@textbook}{\PackageWarning{No \noexpand\textbook given}}
\newcommand{\textbook}[1]{\gdef\ost@textbook{#1}}
\newcommand{\bref}[1]{%
    \texttt{\textcolor{OSTRaspberry}{#1}}\nocite{\ost@textbook}}
```

4.8 OST Colors

Define the colors according to the OST corporate design. The code was kindly stolen from H. Badertscher's `OSTColors.sty` [**?**]. First there are the "primary colors".

```
\definecolor{OSTBlack}{RGB}{25,25,25}
\definecolor{OSTGray}{RGB}{198,198,198}
\definecolor{OSTBlackberry}{RGB}{140,25,95}
\definecolor{OSTRaspberry}{RGB}{215,40,100}
```

Then the “design colors”.

```
\definecolor{OSTPurple}{RGB}{149,96,164}
\definecolor{OSTDarkPurple}{RGB}{107,56,129}
\definecolor{OSTLightPurple}{RGB}{208,169,208}

\definecolor{OSTGreen}{RGB}{29,175,142}
\definecolor{OSTDarkGreen}{RGB}{0,126,107}
\definecolor{OSTLightGreen}{RGB}{167,213,194}

\definecolor{OSTRed}{RGB}{232,78,15}
\definecolor{OSTDarkRed}{RGB}{195,46,21}
\definecolor{OSTLightRed}{RGB}{243,154,139}

\definecolor{OSTBlue}{RGB}{0,115,176}
\definecolor{OSTDarkBlue}{RGB}{0,115,176}
\definecolor{OSTLightBlue}{RGB}{95,191,237}

\definecolor{OSTOrange}{RGB}{251,186,0}
\definecolor{OSTDarkOrange}{RGB}{209,143,0}
\definecolor{OSTLightOrange}{RGB}{253,214,175}
```

4.9 Sane Defaults

First, set up `hyperref` to not look hideous.

```
\hypersetup{
    colorlinks=true,
    linkcolor=OSTBlack,
    citecolor=OSTBlackberry,
    filecolor=OSTBlack,
    urlcolor=OSTDarkBlue,
}
```

Then create a listings style.

```
\lstdefinestyle{ost-base}{
    belowcaptionskip=\baselineskip,
    breaklines=true,
    frame=none,
    inputencoding=utf8,
    % margin
    xleftmargin=\parindent,
    % numbers
    numbers=left,
    numbersep=5pt,
    numberstyle=\ttfamily\footnotesize\color{OSTGray},
    % background
    backgroundcolor=\color{white},
    showstringspaces=false,
    % default language
    language=TeX,
    % break long lines, and show an arrow where the line was broken
    breaklines=true,
    postbreak=\mbox{\textcolor{OSTDarkBlue}{$\hookrightarrow$}\space},
    % font
    basicstyle=\ttfamily\small,
    identifierstyle=\color{OSTBlack},
    keywordstyle=\color{OSTBlue},
```

```
    commentstyle=\color{OSTGray},
    stringstyle=\color{OSTBlackberry},
}
```

Then we set this style to be default.

```
\lstset{style=ost-base, escapechar=`}
```

Change History

v0.1

General: Initial version 1

v0.2

General: Port features of `hsrstud` . 1

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.

Symbols

\@car 23
\@nil 23
\@nomath 22
\{ . 66, 67, 74, 80, 87, 89
\} . 66, 67, 74, 80, 87, 89

B

\baselineskip 147
\begin 100, 107
\bfemph 19
\bfseries 24
\bm 27
\boldsymbol 35, 36
\bref 116
\bvec 29

C

\cdot 35
\circle 101, 103, 108, 110
\color 156, 158, 167, 168, 169, 170
\corresponds 98
\crossp 35, 56
\csname 21
\curl 53

D

\DeclareBoolOption . 11, 12, 13, 14, 15
\DeclareMathOperator 35, 36, 38, 40, 43, 45, 48, 54, 56, 59, 60, 62, 63, 70, 72, 76, 78, 82, 84, 91, 92, 93, 94, 95, 96, 97
\def 21
\definecolor 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138
\div 42, 59, 60
\divg 48
\divsymb 50
\dontrenew 19
\dotp 35, 45

E

\E 69
\em 22
\emph 17
\end 104, 111
\endcsname 21
\expandafter . . . 21, 23

F

\f@series 23
\footnotesize 156
\fourier 91

G

\gdef 113, 117
\grad 37, 59, 60

H

\hat 34
\hilbert 97
\hookrightarrow . . . 164
\hypersetup 139

I

\if 23
\ifost@bbprobability 69, 75, 81
\ifost@bfemph 17
\ifost@dontrenew . . . 18, 28, 47, 65, 86
\ifost@textvecdiff 37, 42, 53, 58
\ifourier 91
\ilaplace 93
\Im 65
\itshape 24
\iztransf 95

L

\laplace 93
\laplacian 58
\left 66, 67, 74, 80, 87, 89
\let 31, 50
\line 102, 109
\long 21

\lstdefinestyle ... 146
\lstset 172

M

\mathbb 70, 76, 82
\mathbf 27
\mathcal 91, 92, 93, 94, 95, 96, 97
\mathrm 66, 67
\mbox 99, 106, 164

N

\nabla . 40, 45, 56, 62, 63
\nocite 115, 119
\noexpand .. 19, 112, 116

O

\oldvec 31
\ost@div .. 43, 45, 48, 51
\ost@expectation 70, 72, 74
\ost@probability 82, 84, 87, 89
\ost@skriptum 112, 113, 115
\ost@textbook 116, 117, 119
\ost@variance 76, 78, 80
\ost@vec 27, 29, 32

P

\P 87
\PackageError 19
\PackageWarning 112, 116
\parindent 152
\Pr 81
\ProcessLocalKeyvalOptions 16
\put 101, 102, 103, 108, 109, 110

R

\rcorresponds 98
\Re 65
\renewcommand 32, 51, 66, 67, 89
\RequirePackage 1, 2, 3, 4, 5, 6
\right 66, 67, 74, 80, 87, 89

S

\setlength 99, 106
\SetupKeyvalOptions . 7
\skriptum 112
\small 166
\space 164
\sref 112

T

\textbook 116
\textcolor 115, 119, 164
\texttt 115, 119
\times 36
\ttfamily 156, 166

U

\unitlength ... 99, 106
\uvec 34

V

\Var 75
\vec 27, 34, 40, 45, 56, 63
\vlaplacian 58

Z

\ztransf 95