

# The package **EASYVECTOR**

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## Abstract

The **EASYVECTOR** package is a simple macro package that provides a C-like syntax for writing vectors or matrices.

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## 1 Some examples with **EASYVECTOR**

The package is loaded by means of the usual way:

```
\documentclass{article}
.
.
\usepackage[spacesep,definevectors]{easyvector}
.
.
```

The package option `spacesep` means that the separator for the indices is the command `\smallspace` instead of “,” (comma).

The package option `definevectors` means that the command `\aa,...,\zz` and `\AA,...,\ZZ` are predefined as vectors. It also defines the commands `\Balpha`, `\Bbeta` and so on, as bold greek vectors. The latex commands `\aa`, `\AA`, `\gg`, `\ll`, `\ss`, `\SS`, `\tt` are saved in the commands `\oldxx` where **xx** is the name of the old command.

## 2 Use of the `\newvector` command

The general syntax of `\newvector` command is

```
\newvector[\cmda,\cmdb]{cmd}
```

or

```
\newvector(a)[cmd]
```

In the first case, it creates the new command (macro) `\cmd` which executes `\cmda` when in scalar mode and `\cmdb` when in vector mode. In the second case it creates a new command `\cmd` which substitutes the letter `\mathit{a}` when in scalar, mode and `\mathbf{a}` when in vector mode. Scalar mode is activated when `\cmd` is immediately followed by `[`. In scalar mode everything between `[` and `]` (with balancing) is assumed to be as an index. For example the commands

```
\newvector[\alpha,\beta]{W}
\newvector[X,\mathbf{X}]{X}
\[ \W = (\W[i,j]), \quad \X = (\X[i,j;k]) \]
```

$$\beta = (\alpha_{i,j}), \quad \mathbf{X} = (X_{i,j}^k)$$

The structure of the **[...]** command is the following

```
[i,j,...,k;x,y,...,z]
```

where **i, j, ..., k** are subscripts and **x, y, ..., z** are superscripts. The comma “,” is used as a separator between different indices, and the semi-colon “;” separates subscripts and superscripts. There are no limits on the number of indices, and the code is reentrant, as the following example illustrates

```
\newvector(a)[av]
\newvector(b)[bv]
\[ \av = \pmatrix{ \av[1,1] & \av[1,2] \cr
                  \av[2,1] & \av[2,2] \cr}, \quad
   \bv = \left\{ \bv[\gamma,\bv[i,j;k];a] \right\}
\]
```

$$\mathbf{a} = \begin{pmatrix} a_{1,1} & a_{1,2} \\ a_{2,1} & a_{2,2} \end{pmatrix}, \quad \mathbf{b} = \left\{ b_{\gamma, b_{i,j}^k}^a \right\}$$

### 3 Use of the **!** command

It is possible to enforce vector mode also when using indices by using the character **!** before **[**

```
\newvector(z)[zzz]
\[ \zzz[1,2,3] \neq \zzz![1,2,3] \]
```

$$z_{1,2,3} \neq \mathbf{z}_{1,2,3}$$

## 4 Use of the `\newcustomvector` command

In some circumstances the command `\newcustomvector` can be useful. It is essentially the `\newvector` command with an extra argument that is a macro to manage the index part.

```
\def\myindex[#1,#2,#3]{_{#1}_{#2}}^{#3}}
\newcustomvector[\mathtt{a},\mathbf{a}]{aaa}\myindex
\[\aaa[1,2,3], \quad \aaa[3,2,1], \quad \aaa \]
```

---


$$\mathbf{a}_{12}^3, \quad \mathbf{a}_{32}^1, \quad \mathbf{a}$$

**Important:** For old users (version < 0.6) the command `\customindex` is suppressed and the `\newcustomvector` is used instead.

## 5 The “definevectors” option

This option defines the following vectors for you:

```
\aa,\bb,...,\zz      \AA,\BB,...,\ZZ
\Balpha,\Bbeta,...,\Bomega
```

for example

```
\[
  \Balpha[i,j], \quad \Balpha,
  \quad \BB[i,j], \quad \BB,
\]
```

---


$$\alpha_{i,j}, \quad \alpha, \quad B_{i,j}, \quad \mathbf{B},$$

## 6 The “@” convention

In linear algebra it is common to use the notation  $\mathbf{A}_{\bullet,j}$  to denote the vector formed by the  $j^{th}$  column of  $\mathbf{A}$ . Note that  $\mathbf{A}$  is in vector format not in scalar format ( $A$ ).

We can use “•” as an index in a vector forcing the vector mode by using @ as follows:

```
\[ \AA[@,j], \quad \Balpha[i,j;@] \]
```

$$\mathbf{A}_{\bullet,j}, \quad \alpha_{i,j}^{\bullet}$$