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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The package **EASYVECTOR**

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 \textit{a} when in scalar, mode and \textbf{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
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\begin{verbatim}
\newvector[\alpha,\beta]{W}
\newvector[X,\mathbf{X}]{X}
\begin{align*}
W = (W[i,j]), \quad & \text{xquad} X = (X[i,j;k])
\end{align*}
\end{verbatim}

\[ \beta = (\alpha_{i,j}), \quad X = (X^k_{i,j}) \]

The structure of the \ldots command is the following

\[ [i, j, \ldots, k; x, y, \ldots, z] \]

where \(i, j, \ldots, k\) are subscripts and \(x, y, \ldots, z\) 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

\begin{verbatim}
\newvector(a)[av]
\newvector(b)[bv]
\begin{align*}
\text{av} &= \pmatrix{ av[1,1] & av[1,2] \\
                 av[2,1] & av[2,2] }, \text{xquad} \bv = \left\{ \bv[\gamma, \bv[i,j;k];a] \right\}
\end{align*}
\end{verbatim}

\[ \mathbf{a} = \begin{pmatrix} a_{1,1} & a_{1,2} \\ a_{2,1} & a_{2,2} \end{pmatrix}, \quad \mathbf{b} = \left\{ b_{\gamma, \beta_{i,j}} \right\} \]

3 \textbf{Use of the ! command}

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

\begin{verbatim}
\newvector(z)[zzz]
\begin{align*}
\text{zzz}[1,2,3] \neq \text{zzz}[1,2,3] \quad \text{xquad} \text{zzz}[1,2,3] \quad \text{xquad} \text{zzz}[1,2,3]
\end{align*}
\end{verbatim}

\[ z_{1,2,3} \neq z_{1,2,3} \]
4 Use of the $\texttt{\textbackslash newcustomvector}$ command

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

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

$\text{a}_1^2$, $a_{32}^1$, $a$

**Important:** For old users (version $< 0.6$) the command $\texttt{\textbackslash customindex}$ is suppressed and the $\texttt{\textbackslash newcustomvector}$ is used instead.

5 The “definevectors” option

This option defines the following vectors for you:

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

for example

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

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

6 The “@” convention

In linear algebra it is common to use the notation $\texttt{A_{\star,j}}$ to denote the vector formed by the $j^{th}$ column of $\texttt{A}$. Note that $\texttt{A}$ is in vector format not in scalar format ($A$).
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We can use “\( \cdot \)” as an index in a vector forcing the vector mode by using @ as follows:

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

\[ A_{\cdot j}, \quad \alpha_{i,j} \]