diag() — Create diagonal matrix

Description

diag() creates diagonal matrices.

diag(Z), Z a matrix, extracts the principal diagonal of Z to create a new matrix. Z must be square.
diag(z), z a vector, creates a new matrix with the elements of z on its diagonal.

Syntax

numeric matrix  diag(numeric matrix Z)

numeric matrix  diag(numeric vector z)

Remarks and examples

Do not confuse diag() with its functional inverse, diagonal(); see [M-5] diagonal(). diag() creates a matrix from a vector (or matrix); diagonal() extracts the diagonal of a matrix into a vector.

Use of diag() should be avoided because it wastes memory. The colon operators will allow you to use vectors directly:

<table>
<thead>
<tr>
<th>Desired calculation</th>
<th>Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>diag(v)*X,</td>
<td>v:*X</td>
</tr>
<tr>
<td>v is a column</td>
<td>v:*X</td>
</tr>
<tr>
<td>v is a row</td>
<td>v’:*X</td>
</tr>
<tr>
<td>v is a matrix</td>
<td>diagonal(v):*X</td>
</tr>
<tr>
<td>X*diag(v)</td>
<td></td>
</tr>
<tr>
<td>v is a column</td>
<td>X:*v’</td>
</tr>
<tr>
<td>v is a row</td>
<td>X:*v</td>
</tr>
<tr>
<td>v is a matrix</td>
<td>X:*diagonal(v)’</td>
</tr>
</tbody>
</table>

In the above table, it is assumed that v is real. If v might be complex, the transpose operators that appear must be changed to transposeonly() calls, because we do not want the conjugate. For instance, v’:*X would become transposeonly(v):*X.
Conformability

diag(Z):

\[
\begin{align*}
Z & : \quad m \times n \\
\text{result} & : \quad \min(m, n) \times \min(m, n)
\end{align*}
\]

diag(z):

\[
\begin{align*}
z & : \quad 1 \times n \quad \text{or} \quad n \times 1 \\
\text{result} & : \quad n \times n
\end{align*}
\]

Diagnostics

None.

Also see

[M-5] \texttt{diag()} — Replace diagonal of a matrix
[M-5] \texttt{diagonal()} — Extract diagonal into column vector
[M-5] \texttt{isdiagonal()} — Whether matrix is diagonal
[M-4] \textbf{Manipulation} — Matrix manipulation