

```
In[1]:= SetDirectory["~/KappaLib"];
<< kappaLib-1.1.m

KappaLib v1.1
```

Define transformation matrices

```
In[3]:= J1 = DiagonalMatrix[{-1, 1, 1, 1}];
J2 = DiagonalMatrix[{1, 1, -1, 1}];
```

```
In[5]:= Det[J1]
Det[J2]
```

```
Out[5]= -1
```

```
Out[6]= -1
```

Metaclass I

```
In[7]:= kappa = emMatrixToKappa [

$$\begin{pmatrix} a1 & 0 & 0 & -b1 & 0 & 0 \\ 0 & a2 & 0 & 0 & -b2 & 0 \\ 0 & 0 & a3 & 0 & 0 & -b3 \\ b1 & 0 & 0 & a1 & 0 & 0 \\ 0 & b2 & 0 & 0 & a2 & 0 \\ 0 & 0 & b3 & 0 & 0 & a3 \end{pmatrix}];$$

```

```
In[8]:= emKappaToMatrix[emCoordinateChange[kappa, J1]] // MatrixForm
```

```
Out[8]/MatrixForm=
```

$$\begin{pmatrix} a1 & 0 & 0 & b1 & 0 & 0 \\ 0 & a2 & 0 & 0 & b2 & 0 \\ 0 & 0 & a3 & 0 & 0 & b3 \\ -b1 & 0 & 0 & a1 & 0 & 0 \\ 0 & -b2 & 0 & 0 & a2 & 0 \\ 0 & 0 & -b3 & 0 & 0 & a3 \end{pmatrix}$$

Metaclass II

```
In[9]:= kappa = emMatrixToKappa [

$$\begin{pmatrix} a1 & -b1 & 0 & 0 & 0 & 0 \\ b1 & a1 & 0 & 0 & 0 & 0 \\ 0 & 0 & a2 & 0 & 0 & -b2 \\ 0 & 1 & 0 & a1 & b1 & 0 \\ 1 & 0 & 0 & -b1 & a1 & 0 \\ 0 & 0 & b2 & 0 & 0 & a2 \end{pmatrix}];$$

```

```
FullSimplify[emKappaToMatrix[emCoordinateChange[kappa, J2]]] // MatrixForm
```

```
Out[10]/MatrixForm=
```

$$\begin{pmatrix} a1 & b1 & 0 & 0 & 0 & 0 \\ -b1 & a1 & 0 & 0 & 0 & 0 \\ 0 & 0 & a2 & 0 & 0 & b2 \\ 0 & 1 & 0 & a1 & -b1 & 0 \\ 1 & 0 & 0 & b1 & a1 & 0 \\ 0 & 0 & -b2 & 0 & 0 & a2 \end{pmatrix}$$

Metaclass III

```
In[11]=
```

```
In[12]:= kappa = emMatrixToKappa [

$$\begin{pmatrix} a1 & -b1 & 0 & 0 & 0 & 0 \\ b1 & a1 & 0 & 0 & 0 & 0 \\ 1 & 0 & a1 & 0 & 0 & -b1 \\ 0 & 0 & 0 & a1 & b1 & 1 \\ 0 & 0 & 1 & -b1 & a1 & 0 \\ 0 & 1 & b1 & 0 & 0 & a1 \end{pmatrix} ];$$

```

```
emKappaToMatrix[emCoordinateChange[kappa, J2]] // MatrixForm
```

```
Out[13]//MatrixForm=
```

$$\begin{pmatrix} a1 & b1 & 0 & 0 & 0 & 0 \\ -b1 & a1 & 0 & 0 & 0 & 0 \\ 1 & 0 & a1 & 0 & 0 & b1 \\ 0 & 0 & 0 & a1 & -b1 & 1 \\ 0 & 0 & 1 & b1 & a1 & 0 \\ 0 & 1 & -b1 & 0 & 0 & a1 \end{pmatrix}$$

Metaclass IV

```
In[14]:= kappa = emMatrixToKappa [

$$\begin{pmatrix} a1 & 0 & 0 & -b1 & 0 & 0 \\ 0 & a2 & 0 & 0 & -b2 & 0 \\ 0 & 0 & a3 & 0 & 0 & a4 \\ b1 & 0 & 0 & a1 & 0 & 0 \\ 0 & b2 & 0 & 0 & a2 & 0 \\ 0 & 0 & a4 & 0 & 0 & a3 \end{pmatrix} ];$$

```

```
emKappaToMatrix[emCoordinateChange[kappa, J1]] // MatrixForm
```

```
Out[15]//MatrixForm=
```

$$\begin{pmatrix} a1 & 0 & 0 & b1 & 0 & 0 \\ 0 & a2 & 0 & 0 & b2 & 0 \\ 0 & 0 & a3 & 0 & 0 & -a4 \\ -b1 & 0 & 0 & a1 & 0 & 0 \\ 0 & -b2 & 0 & 0 & a2 & 0 \\ 0 & 0 & -a4 & 0 & 0 & a3 \end{pmatrix}$$

Metaclass V

```
In[16]:= kappa = emMatrixToKappa [

$$\begin{pmatrix} a1 & -b1 & 0 & 0 & 0 & 0 \\ b1 & a1 & 0 & 0 & 0 & 0 \\ 0 & 0 & a2 & 0 & 0 & a3 \\ 0 & 1 & 0 & a1 & b1 & 0 \\ 1 & 0 & 0 & -b1 & a1 & 0 \\ 0 & 0 & a3 & 0 & 0 & a2 \end{pmatrix} ];$$

```

```
emKappaToMatrix[emCoordinateChange[kappa, J2]] // MatrixForm
```

```
Out[17]//MatrixForm=
```

$$\begin{pmatrix} a1 & b1 & 0 & 0 & 0 & 0 \\ -b1 & a1 & 0 & 0 & 0 & 0 \\ 0 & 0 & a2 & 0 & 0 & -a3 \\ 0 & 1 & 0 & a1 & -b1 & 0 \\ 1 & 0 & 0 & b1 & a1 & 0 \\ 0 & 0 & -a3 & 0 & 0 & a2 \end{pmatrix}$$

Metaclass VI

```
In[18]:= kappa = emMatrixToKappa [
  (
    a1  0  0  -b1  0  0
    0  a2  0  0  a4  0
    0  0  a3  0  0  a5
    b1  0  0  a1  0  0
    0  a4  0  0  a2  0
    0  0  a5  0  0  a3
  )
];
```

```
emKappaToMatrix[emCoordinateChange[kappa, J1]] // MatrixForm
```

```
Out[19]/MatrixForm=
```

$$\begin{pmatrix} a1 & 0 & 0 & b1 & 0 & 0 \\ 0 & a2 & 0 & 0 & -a4 & 0 \\ 0 & 0 & a3 & 0 & 0 & -a5 \\ -b1 & 0 & 0 & a1 & 0 & 0 \\ 0 & -a4 & 0 & 0 & a2 & 0 \\ 0 & 0 & -a5 & 0 & 0 & a3 \end{pmatrix}$$

Metaclass VII

```
In[20]:= kappa = emMatrixToKappa [
  (
    a1  0  0  a4  0  0
    0  a2  0  0  a5  0
    0  0  a3  0  0  a6
    a4  0  0  a1  0  0
    0  a5  0  0  a2  0
    0  0  a6  0  0  a3
  )
];
```

```
emKappaToMatrix[emCoordinateChange[kappa, J1]] // MatrixForm
```

```
Out[21]/MatrixForm=
```

$$\begin{pmatrix} a1 & 0 & 0 & -a4 & 0 & 0 \\ 0 & a2 & 0 & 0 & -a5 & 0 \\ 0 & 0 & a3 & 0 & 0 & -a6 \\ -a4 & 0 & 0 & a1 & 0 & 0 \\ 0 & -a5 & 0 & 0 & a2 & 0 \\ 0 & 0 & -a6 & 0 & 0 & a3 \end{pmatrix}$$