In[1]:=
```
SetDirectory["/www/user/fdahl/papers/Conjugation/"];
<< kappaLib.m
<< Petrov.m
```

```
KappaLib v1.1

Petrov routine loaded
```

- **Class IV: (11 1bar(1) 1bar(1))**

In[4]:=
$$B = \begin{pmatrix} 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \end{pmatrix};$$

In[5]:=
$$V = \begin{pmatrix} lambda1 & 0 & 0 & 0 & 0 & 0 \\ 0 & lambda2 & 0 & 0 & 0 & 0 \\ 0 & 0 & sigma1 & tau1 & 0 & 0 \\ 0 & 0 & -tau1 & sigma1 & 0 & 0 \\ 0 & 0 & 0 & 0 & sigma2 & tau2 \\ 0 & 0 & 0 & 0 & -tau2 & sigma2 \end{pmatrix};$$

In[6]:=
```
Eigenvalues[V]
```

Out[6]= {lambda1, lambda2, sigma1 − ⅈ tau1, sigma1 + ⅈ tau1, sigma2 − ⅈ tau2, sigma2 + ⅈ tau2}

In[7]:=
$$W = \begin{pmatrix} eps1 & 0 & 0 & 0 & 0 & 0 \\ 0 & eps2 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 0 \end{pmatrix};$$

In[8]:=
```
Eigenvalues[W]
```

Out[8]= {−1, −1, 1, 1, eps1, eps2}

- **Since eps1 and eps2 have same block size, we assume that eps1 <= eps2.**
  We also know that W should have signature (+++---).

In[9]:=
```
Sort[Eigenvalues[W] /. {eps1 → -1, eps2 → -1}]
Sort[Eigenvalues[W] /. {eps1 → -1, eps2 → 1}]
Sort[Eigenvalues[W] /. {eps1 → 1, eps2 → 1}]
```

Out[9]= {−1, −1, −1, −1, 1, 1}

Out[10]= {−1, −1, −1, 1, 1, 1}

Out[11]= {−1, −1, 1, 1, 1, 1}

■ Only sign possibility is eps1 = -1, eps2 = +1

In[12]:=
```
W = W /. {eps1 → -1, eps2 → 1};
W // MatrixForm
Eigenvalues[W]
```

Out[13]//MatrixForm=

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

Out[14]= {-1, -1, -1, 1, 1, 1}

In[15]:= (* Permutation 5,5 with leading B *)

$$S = \begin{pmatrix} 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ -\frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} & 0 & 0 & 0 & 0 \end{pmatrix};$$

■ Check that S is in set mathcal(S)

In[16]:=
```
Transpose[S].B.S == W
```

Out[16]= True

■ Compute result

In[17]:=
```
res = S.V.Inverse[S];
res // MatrixForm
```

Out[18]//MatrixForm=

$$\begin{pmatrix} \text{sigma1} & 0 & 0 & -\text{tau1} & 0 & 0 \\ 0 & \text{sigma2} & 0 & 0 & -\text{tau2} & 0 \\ 0 & 0 & \frac{\text{lambda1}}{2}+\frac{\text{lambda2}}{2} & 0 & 0 & -\frac{\text{lambda1}}{2}+\frac{\text{lambda2}}{2} \\ \text{tau1} & 0 & 0 & \text{sigma1} & 0 & 0 \\ 0 & \text{tau2} & 0 & 0 & \text{sigma2} & 0 \\ 0 & 0 & -\frac{\text{lambda1}}{2}+\frac{\text{lambda2}}{2} & 0 & 0 & \frac{\text{lambda1}}{2}+\frac{\text{lambda2}}{2} \end{pmatrix}$$

In[19]:=
```
Petrov[res]
```

Out[19]//MatrixForm=

$$\begin{pmatrix} -\text{tau1} & 0 & 0 & 0 & 0 & \text{sigma1} \\ 0 & -\text{tau2} & 0 & 0 & \text{sigma2} & 0 \\ 0 & 0 & \frac{1}{2}(-\text{lambda1}+\text{lambda2}) & \frac{\text{lambda1}+\text{lambda2}}{2} & 0 & 0 \\ 0 & 0 & \frac{\text{lambda1}+\text{lambda2}}{2} & \frac{1}{2}(-\text{lambda1}+\text{lambda2}) & 0 & 0 \\ 0 & \text{sigma2} & 0 & 0 & \text{tau2} & 0 \\ \text{sigma1} & 0 & 0 & 0 & 0 & \text{tau1} \end{pmatrix}$$

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In[20]:=
```
NotebookPrint[SelectedNotebook[],
 "/www/user/fdahl/papers/Conjugation/notebooks/ClassIV.pdf"]
```