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

```
KappaLib v1.1

Petrov routine loaded
```

■ Class VI: (1111 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]:=
$$V = \begin{pmatrix} \text{lambda1} & 0 & 0 & 0 & 0 & 0 \\ 0 & \text{lambda2} & 0 & 0 & 0 & 0 \\ 0 & 0 & \text{lambda3} & 0 & 0 & 0 \\ 0 & 0 & 0 & \text{lambda4} & 0 & 0 \\ 0 & 0 & 0 & 0 & \text{sigma1} & \text{tau1} \\ 0 & 0 & 0 & 0 & -\text{tau1} & \text{sigma1} \end{pmatrix};$$

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

Out[6]=
```
{lambda1, lambda2, lambda3, lambda4, sigma1 - i tau1, sigma1 + i tau1}
```

In[7]:=
$$W = \begin{pmatrix} \text{eps1} & 0 & 0 & 0 & 0 & 0 \\ 0 & \text{eps2} & 0 & 0 & 0 & 0 \\ 0 & 0 & \text{eps3} & 0 & 0 & 0 \\ 0 & 0 & 0 & \text{eps4} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 0 \end{pmatrix};$$

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

Out[8]=
```
{-1, 1, eps1, eps2, eps3, eps4}
```

In[9]:=
```
(* We know that NN should have signature (3,3) and since the first
  4 blocks have the same size we shouuld have eps1 ≤ eps2 ≤ eps3 ≤ eps4 *)
```

In[10]:=
```
Sort[Eigenvalues[W /. {eps1 → -1, eps2 → -1, eps3 → -1, eps4 → -1}]]
Sort[Eigenvalues[W /. {eps1 → -1, eps2 → -1, eps3 → -1, eps4 → 1}]]
Sort[Eigenvalues[W /. {eps1 → -1, eps2 → -1, eps3 → 1, eps4 → 1}]]
Sort[Eigenvalues[W /. {eps1 → -1, eps2 → 1, eps3 → 1, eps4 → 1}]]
Sort[Eigenvalues[W /. {eps1 → 1, eps2 → 1, eps3 → 1, eps4 → 1}]]
```

Out[10]=
```
{-1, -1, -1, -1, -1, 1}
```

Out[11]=
```
{-1, -1, -1, -1, 1, 1}
```

Out[12]=
```
{-1, -1, -1, 1, 1, 1}
```

Out[13]=
```
{-1, -1, 1, 1, 1, 1}
```

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

In[15]:=
```
W = W /. {eps1 → -1, eps2 → -1, eps3 → 1, eps4 → 1};
W // MatrixForm
Eigenvalues[W]
```

Out[16]//MatrixForm=

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

Out[17]= {-1, -1, -1, 1, 1, 1}

In[18]:=
```
(* Permutation 4,4 with leading B *)
```

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

■ Check that S is in set mathcal(S)

In[19]:=
```
Transpose[S].B.S == W
```

Out[19]= True

■ Compute result

In[20]:=
```
res = S.V.Inverse[S];
res // MatrixForm
```

Out[21]//MatrixForm=

$$\begin{pmatrix} \text{sigma1} & 0 & 0 & -\text{tau1} & 0 & 0 \\ 0 & \frac{\text{lambda1}}{2}+\frac{\text{lambda3}}{2} & 0 & 0 & -\frac{\text{lambda1}}{2}+\frac{\text{lambda3}}{2} & 0 \\ 0 & 0 & \frac{\text{lambda2}}{2}+\frac{\text{lambda4}}{2} & 0 & 0 & -\frac{\text{lambda2}}{2}+\frac{\text{lambda4}}{2} \\ \text{tau1} & 0 & 0 & \text{sigma1} & 0 & 0 \\ 0 & -\frac{\text{lambda1}}{2}+\frac{\text{lambda3}}{2} & 0 & 0 & \frac{\text{lambda1}}{2}+\frac{\text{lambda3}}{2} & 0 \\ 0 & 0 & -\frac{\text{lambda2}}{2}+\frac{\text{lambda4}}{2} & 0 & 0 & \frac{\text{lambda2}}{2}+\frac{\text{lambda4}}{2} \end{pmatrix}$$

In[22]:=
```
Petrov[res]
```

Out[22]//MatrixForm=

$$\begin{pmatrix} -\text{tau1} & 0 & 0 & 0 & 0 \\ 0 & \frac{1}{2}(-\text{lambda1}+\text{lambda3}) & 0 & 0 & \frac{\text{lambda1}+\text{lambda3}}{2} \\ 0 & 0 & \frac{1}{2}(-\text{lambda2}+\text{lambda4}) & \frac{\text{lambda2}+\text{lambda4}}{2} & 0 \\ 0 & 0 & \frac{\text{lambda2}+\text{lambda4}}{2} & \frac{1}{2}(-\text{lambda2}+\text{lambda4}) & 0 \\ 0 & \frac{\text{lambda1}+\text{lambda3}}{2} & 0 & 0 & \frac{1}{2}(-\text{lambda1}+\text{lambda} \\ \text{sigma1} & 0 & 0 & 0 & 0 \end{pmatrix}$$

Export notebook as .pdf

In[23]:=
```
NotebookPrint[SelectedNotebook[],
 "/www/user/fdahl/papers/Conjugation/notebooks/ClassVI.pdf"]
```