

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

KappaLib v1.1

Petrov routine loaded

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

$$\mathbf{V} = \begin{pmatrix} \mathbf{LL1} & 1 & 0 & 0 & 0 & 0 \\ 0 & \mathbf{LL1} & 1 & 0 & 0 & 0 \\ 0 & 0 & \mathbf{LL1} & 0 & 0 & 0 \\ 0 & 0 & 0 & \mathbf{LL2} & 1 & 0 \\ 0 & 0 & 0 & 0 & \mathbf{LL2} & 1 \\ 0 & 0 & 0 & 0 & 0 & \mathbf{LL2} \end{pmatrix};$$

$$\mathbf{W} = \begin{pmatrix} 0 & 0 & -1 & 0 & 0 & 0 \\ 0 & -1 & 0 & 0 & 0 & 0 \\ -1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \end{pmatrix};$$

### ■ Solve S manually

$$\text{In[7]:= } \mathbf{mat} = \begin{pmatrix} \mathbf{lam1} & 0 & 0 & 0 & 0 & 0 \\ \frac{1}{\sqrt{2}} & \frac{\mathbf{lam2}+\mathbf{lam1}}{2} & -\frac{1}{\sqrt{2}} & 0 & \frac{1}{2}(-\mathbf{lam2}+\mathbf{lam1}) & 0 \\ 0 & 0 & \mathbf{lam2} & 0 & 0 & 0 \\ 0 & \frac{1}{\sqrt{2}} & 0 & \mathbf{lam1} & \frac{1}{\sqrt{2}} & 0 \\ \frac{1}{\sqrt{2}} & \frac{1}{2}(-\mathbf{lam2}+\mathbf{lam1}) & \frac{1}{\sqrt{2}} & 0 & \frac{\mathbf{lam1}+\mathbf{lam2}}{2} & 0 \\ 0 & \frac{1}{\sqrt{2}} & 0 & 0 & -\frac{1}{\sqrt{2}} & \mathbf{lam2} \end{pmatrix};$$

Petrov[mat]

S = Table[ToExpression["s" <> ToString[i] <> ToString[j]], {i, 1, 6}, {j, 1, 6}];

j1 = Flatten[Transpose[S].B.S - W];

j2 = Flatten[mat.S - S.V];

Out[8]/MatrixForm=

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & \mathbf{lam1} \\ 0 & \frac{\mathbf{lam1}-\mathbf{lam2}}{2} & 0 & -\frac{1}{\sqrt{2}} & \frac{\mathbf{lam1}+\mathbf{lam2}}{2} & \frac{1}{\sqrt{2}} \\ 0 & 0 & 0 & \mathbf{lam2} & 0 & 0 \\ 0 & -\frac{1}{\sqrt{2}} & \mathbf{lam2} & 0 & \frac{1}{\sqrt{2}} & 0 \\ 0 & \frac{\mathbf{lam1}+\mathbf{lam2}}{2} & 0 & \frac{1}{\sqrt{2}} & \frac{\mathbf{lam1}-\mathbf{lam2}}{2} & \frac{1}{\sqrt{2}} \\ \mathbf{lam1} & \frac{1}{\sqrt{2}} & 0 & 0 & \frac{1}{\sqrt{2}} & 0 \end{pmatrix}$$

In[12]:= exp = Join[j1, j2];

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In[13]:= sub = {lam1 → LL2, lam2 → LL1, s14 → 0, s15 → 0, s31 → 0, s32 → 0, s34 → 0, s11 → 0,
  s35 → 0, s12 → 0, s21 → s51, s24 → -s54, s51 → 0, s54 → 0, s36 → 0, s64 → 0, s13 → 0,
  s41 → 0, s22 → -s52, s42 → 0, s25 → s55, s61 → -Sqrt[2] s52, s65 → 0, s66 → 0, s43 → 0,
  s26 → s56, s44 → Sqrt[2] s55, s55 → s16 / Sqrt[2], s23 → -s53, s52 → s33 / Sqrt[2],
  s62 → -Sqrt[2] s53, s53 → 0, s45 → Sqrt[2] s56, s63 → 0, s56 → 0, s33 → 1, s16 → 1, s46 → 0};
Simplify[Sort[Union[exp //. sub], emSize[#1] ≤ emSize[#2] &]] // MatrixForm
Simplify[s //. sub] // MatrixForm
```

Out[14]/MatrixForm=

$$\begin{pmatrix} 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}$$

Out[15]/MatrixForm=

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

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In[16]:= (* export .pdf *)
NotebookPrint[SelectedNotebook[],
  "/www/user/fdahl/papers/Conjugation/notebooks/ClassXX_Solve.pdf"]
```