In[453]:=
```
(*Kurtosis Gradient Laplace*)
x = RandomVariate[LaplaceDistribution[0, 1], 10 000];
y = RandomVariate[LaplaceDistribution[0, 1], 10 000];
A = {{5, 10}, {10, 2}};
mt = A.{x, y};
mt = mt - Mean[Transpose[mt]];
```

In[458]:=
```
ma = Transpose[mt];
ListPlot[{ma[[All]]}, PlotRange → {{-30, 30}, {-30, 30}}];
```

In[460]:=
```
Covariance[Transpose[mt]]
```

Out[460]=
```
{{240.227, 136.593}, {136.593, 205.368}}
```

In[461]:=
```
Eigenvalues[Covariance[Transpose[mt]]]
```

Out[461]=
```
{360.498, 85.0971}
```

In[462]:=
```
Eigenvectors[Covariance[Transpose[mt]]]
```

Out[462]=
```
{{-0.750525, -0.660842}, {0.660842, -0.750525}}
```

In[463]:=
```
d12 = 1 / Sqrt[Eigenvalues[Covariance[Transpose[mt]]][[1]]]
d22 = 1 / Sqrt[Eigenvalues[Covariance[Transpose[mt]]][[2]]]
dmat = DiagonalMatrix[{d12, d22}]
```

Out[463]=
```
0.0526682
```

Out[464]=
```
0.108403
```

Out[465]=
```
{{0.0526682, 0.}, {0., 0.108403}}
```

In[466]:=
```
emat = Transpose[Eigenvectors[Covariance[Transpose[mt]]]]
```

Out[466]=
```
{{-0.750525, 0.660842}, {-0.660842, -0.750525}}
```

In[467]:=
```
vmat = emat.dmat.Transpose[emat]
```

Out[467]=
```
{{0.0770084, -0.0276434}, {-0.0276434, 0.0840631}}
```

In[468]:=
```
x = RandomVariate[LaplaceDistribution[0, 1], 10 000];
y = RandomVariate[LaplaceDistribution[0, 1], 10 000];
mt = A.{x, y};
mt = mt - Mean[Transpose[mt]];
```

In[472]:=
```
zmat = vmat.mt;
```

In[473]:=
```
za = Transpose[zmat];
ListPlot[{za[[All]]}, PlotRange → {{-3, 3}, {-3, 3}}];
```

In[475]:=
```
w = {1, 0};

(*w={2,20};//N*)

(*w=w/Norm[w]//N*)
epsilon = 0.00001;
n = Length[x];
cnt = 1;
wbefore = w;
While[cnt < n,
 wbefore = w;
 w = w + (a / (a + cnt)) * (Sign[Kurtosis[w.zmat] - 3] *
       (1 / n) * Sum[((w.zmat[[All, i]])^3) * zmat[[All, i]], {i, 1, n}]);
 w = w / Norm[w];
 Print["cnt=", cnt];
 Print["w=", w];
 ++cnt;
 If[1 - epsilon <= Abs[w.wbefore] && Abs[w.wbefore] <= 1 + epsilon,
  Print["収束した:"];
  Print["w=", w];
  Print["cnt=", cnt];
  Print["Abs[w.wbefore]=", Abs[w.wbefore]];
  cnt = n;
 ]
]
Kurtosis[w.zmat] - 3
```

```
cnt=1
w={0.997837, -0.0657397}
cnt=2
w={0.994378, -0.105888}
cnt=3
w={0.99156, -0.12965}
cnt=4
w={0.989634, -0.143613}
cnt=5
w={0.988408, -0.15182}
cnt=6
w={0.987654, -0.156653}
cnt=7
w={0.987197, -0.159506}
収束した:
w={0.987197, -0.159506}
cnt=8
Abs[w.wbefore]=0.999996
```

Out[481]=
```
2.72264
```

In[482]:=
```
(* True Value*)
tmat = vmat.A;
truemat = {};
i = 1;
While[i ≤ 2,
  truemat = Append[truemat, tmat[[All, i]] / Norm[tmat[[All, i]]]];
  i++;
 ];
truemat = Transpose[truemat];
MatrixForm[truemat]
```

Out[487]//MatrixForm=

$$\begin{pmatrix} 0.152805 & 0.988714 \\ 0.988256 & -0.149813 \end{pmatrix}$$

```
Kurtosis[NormalDistribution[]]
```

3