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Part: 1

HMM Signal Source

Innehållsförteckning

Source Code

See attached Zip-file.

Calculated $P(S_t=j)$

For $t=1$:
$P(S_1=1)=0,75$ and $P(S_1=2)=0,25$

For $t=2$:
$P($
$S_2=1)=\sum_{i=1}^{N} a_{ij}P(S_1=i)=a_{11}P(S_1=1)+a_{21}P(S_1=2)=0,99\cdot 0,75+0,03\cdot 0,25=0,75$
$P($
$S_2=2)=\sum_{i=1}^{N} a_{ij}P(S_1=i)=a_{12}P(S_1=1)+a_{22}P(S_1=2)=0,01\cdot 0,75+0,97\cdot 0,25=0,25$

$P(S_t=j)$ is a stationary process since: $P(S_1=1)=P(S_2=1)$, $P(S_1=2)=P(S_2=2)$.

Calculated mean and variance

$$E[X] = E_Z[E_X[X|Z]] = w_1 E_X[X|Z=1] + w_2 E_X[X|Z=2] = w_1 \cdot \mu_1 + w_2 \cdot \mu_2 = 0{,}75 \cdot 0 + 0{,}25 \cdot 3 =$$

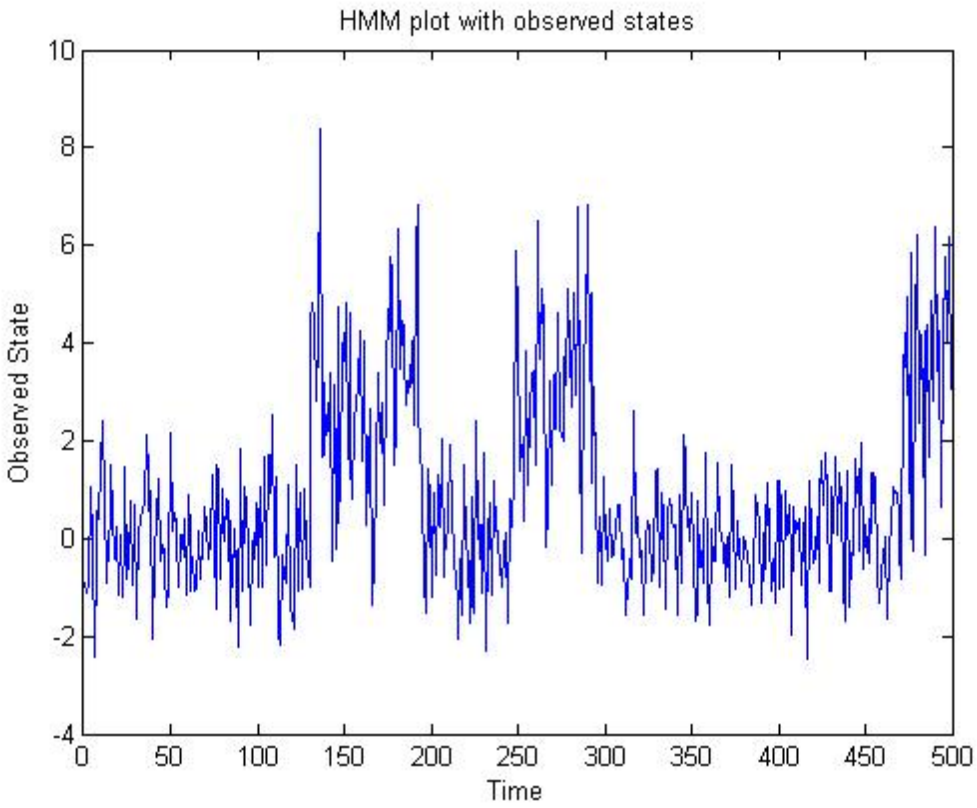
$$var[X] = E_Z[var_X[X|Z]] + var_Z[E_X[X|Z]] = w_1 \cdot var_X[X|Z=1] + w_2 \cdot var_X[X|Z=2] +$$

$$= 0{,}75 \cdot 1^2 + 0{,}75 \cdot 2^2 + 0{,}75(0-0{,}75)^2 + 0{,}25(3-0{,}75)^2 = 3{,}4375$$

And our practical test runs gave us these values:

Mean:	0.6939
Variance:	3.3076

A Sample chart



Here we can observe that this particular plot has two states and that the chain should be something like 1.....1, 2...2,1...1,2...2,1.....1,2...2 (the ellipsis describes a continuation of the preceding number). The chart varied from plot to plot a lot but we observed similar behaviour on the others(with different state transitions).

Our finite MarkovChain

We constructed a very simple test, we simply changed the given example so that it was impossible to escape state 2. We asked the test to give us 100 states but we knew that we shouldn't get that many since a finite chain should terminate earlier. Our tests terminated on anything between 1 and 100. This is very plausible because the transistion probability was set to 1% .