Model of the channel with the packaged errors *(it has been offered by D. Hilbert)*.

According to this model the communication channel can be in two conditions: "good" and "bad".

When the channel in a "good" condition there are no errors present.

When the channel in a "bad" condition errors arise with probability ***«E»***.

If by element transfer a_i the channel is in a condition "good" then by transfer of a following element a_{i+1} the channel will be in the same condition with probability ***«P»*** and in a condition "bad" - with probability ***«1 - P»***. If by element transfer a_i the channel was in a condition "bad" by element transfer a_{i+1} it can be in the same condition with probability ***«Q»*** and in a condition "good" - with probability ***«1 - Q»***.

If ***«P»*** and ***«Q»*** are great enough, but are not equal among themselves the tendency to preservation of the arisen condition "good" or "bad" is observed, that simulates the channel with packages of errors.

Matrix of transitions of conditions of the channel

$$\begin{Vmatrix} P & 1-P \\ 1-Q & Q \end{Vmatrix}$$

Average probability of a finding of the channel in a good condition

$$P_{good} = \frac{1-Q}{(1-P)+(1-Q)}$$

Average of elements in a good condition

$$m_{good} = \frac{P}{1-P}$$

Average probability of a finding of the channel in bad condition

$$P_{bad} = \frac{1-P}{(1-P)+(1-Q)}$$

Average of elements in bad condition

$$m_{bad} = \frac{Q}{1-Q}$$

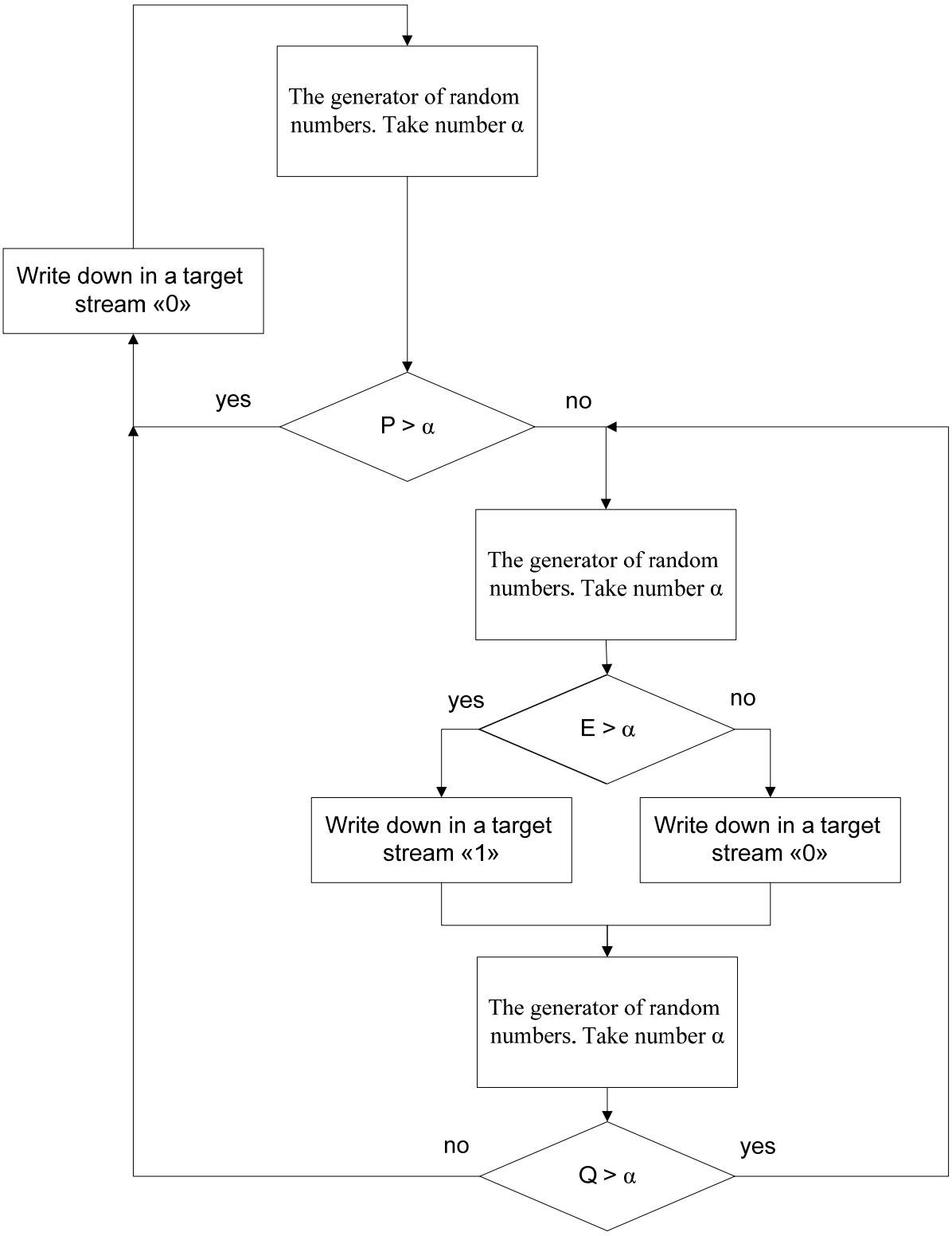
Average probability of occurrence of an error

$$P_{err} = P_{bad} * E$$

For example, if P=0,999; Q=0,9; E=0,5
The communication channel will then look like: the "good" condition of the channel makes (on the average) 999 elements, and then is replaced by a "bad" condition which 99 elements proceed (on the average). And the average probability of an error is equal in the channel 0,0455

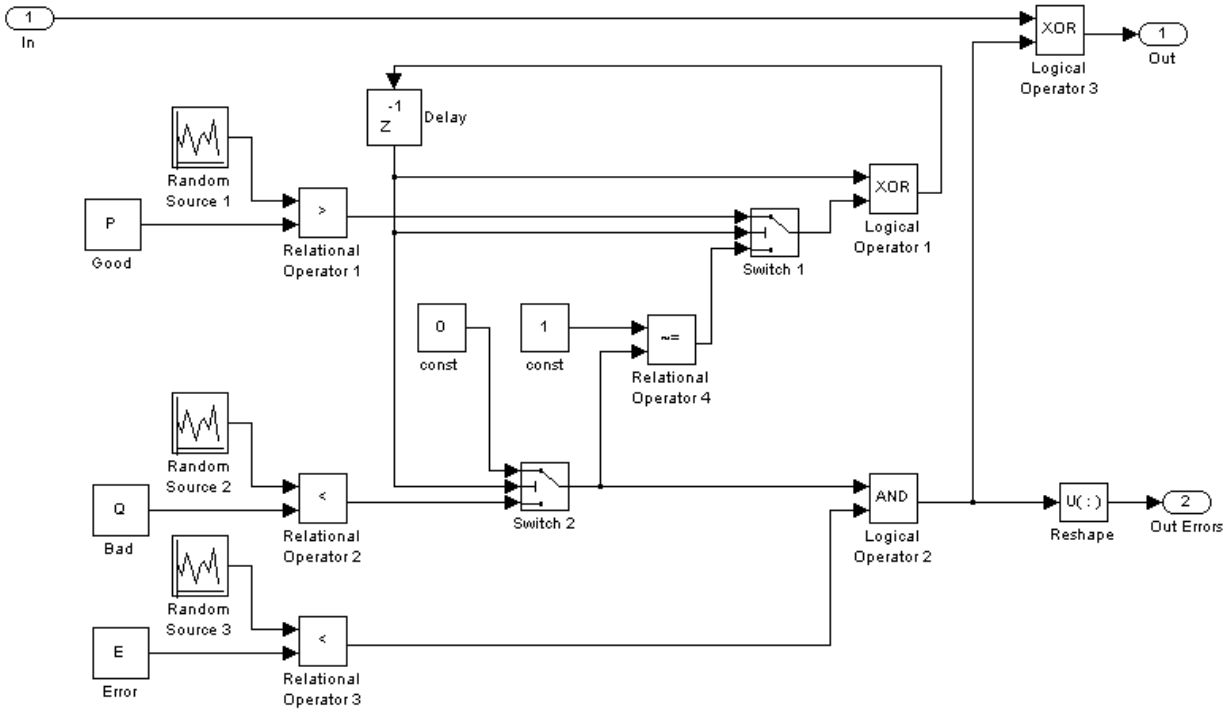
Algorithm of work of a source of errors

Absence of an error is designated as «0»
Error presence is designated as «1»

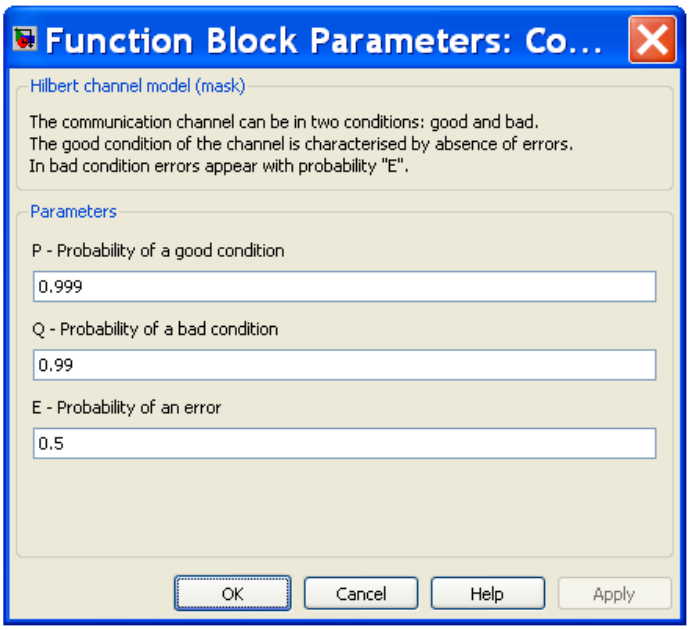


Applied files:

«Hilbert_Channel_Model.mdl» – Model of the channel with the packaged errors.



The model copes in following parametres:
«P» - Probability of a finding of the channel in a "good" condition
«Q» - Probability of a finding of the channel in a "bad" condition
«E» - Probability of occurrence of an error (when the channel in a "bad" condition)



«bursterrorsstream.m» – Function of generation of a stream of the packaged errors

```
% Function of generation of a stream of the packaged errors
function [A] = bursterrorsstream (P, Q, E, N)
% P - Probability of a finding of the channel in a "good" condition
% Q - Probability of a finding of the channel in a "bad" condition
% E - Probability of occurrence of an error
% N - the Minimum size of a returned file
format long
A = zeros();
n = 0;
% While the returned file has not reached the demanded size
while n < N
   n = n + 1;
   b = rand(1);
   % While the channel is in a "good" condition
   while b < P
      % We write down in a file "0"
      A(n) = 0;
      n = n + 1;
      b = rand(1);
   end
   % When the channel has passed in a "bad" condition
   % And if there was an error
   b = rand(1);
   if b < E
      % We write down in a file "1"
      A(n) = 1;
   end
   b = rand(1);
   % While the channel is in a "bad" condition
   while b < Q
      n = n + 1;
      b = rand(1);
      % And if there was an error
      if b < E
         % We write down in a file "1"
         A(n) = 1;
      end
      b = rand(1);
   end
   % When the channel has passed in a "good" condition
   % We write down in a file "0"
   n = n + 1;
   A(n) = 0;
end
end
```