

Claims

1. Method for processing a data signal received via a communication channel, comprising

- 5 • determining a first matrix comprising components describing characteristics of the communication channel
- inverting the first matrix by
 - 10 o sub-dividing the first matrix into at least four sub matrices
 - o inverting a first sub matrix of the four sub matrices
 - o generating a second matrix by multiplying a second sub matrix of the four sub matrices with the inverted first matrix and a third sub matrix of the
 - 15 four sub matrices
 - o determining the difference matrix between the second matrix and a fourth sub matrix of the four sub matrices
 - o inverting the difference matrix
 - 20 o calculating the inverted matrix based on the inverted difference matrix
- processing the data signal using the inverted first matrix.

25 2. Method according to claim 1, wherein the first matrix is inverted according to Strassen's method for matrix inversion.

3. Method according to claim 1 or 2, wherein the communication channel is a radio communication channel.

30 4. Method according to any one of the claims 1 to 3, wherein the received data signal is processed for estimating a sent data signal that was received as the received data signal.

5. Method according to claim 4, wherein the sent data signal is transmitted using a plurality of transmit antennas.
- 5 6. Method according to claim 5, wherein the sent data signal is transmitted according to Groupwise Space Time Block Coding.
7. Method according to any one of the claims 4 to 6, wherein
10 the sent data signal is transmitted using OFDM modulation.
8. Method according to any one of the claims 1 to 7, wherein at least one of the four sub matrices has Alamouti structure.
- 15 9. Method according to claim 8, wherein the first matrix consists of sub matrices having Alamouti structure.
10. Method according to any one of the claims 1 to 9, wherein the inverted matrix is used for performing a filter operation
20 on the received data signal.
11. Method according to claim 10, wherein the received data signal is linearly filtered using the inverted matrix.
- 25 12. Method according to claim 11, wherein the received data signal is filtered according to a zero forcing interference suppression method, a linear mean squared error detection method or an interference cancellation method.
- 30 13. Method according to any one of the claims 1 to 12, wherein the first matrix is generated from a channel matrix modelling the transmission characteristics of the communication channel.

14. Method according to claim 13, wherein the first matrix is a sub matrix of the channel matrix.

5 15. Method according to claim 13, wherein the first matrix is the channel matrix.

16. Method according to claim 13, wherein the first matrix is a product of matrices, one factor being the channel matrix or
10 the hermitian of the channel matrix.

17. Data processing unit for processing a data signal received via a communication channel,

- 15 • comprising a determining unit configured to determine a first matrix comprising components describing characteristics of the communication channel
- comprising an inverting unit configured to invert the first matrix by
 - 20 o sub-dividing the first matrix into at least four sub matrices
 - o inverting a first sub matrix of the four sub matrices
 - o generating a second matrix by multiplying a second sub matrix of the four sub matrices with the
25 inverted first matrix and a third sub matrix of the four sub matrices
 - o determining the difference matrix between the second matrix and a fourth sub matrix of the four sub matrices
 - 30 o inverting the difference matrix
 - o calculating the inverted matrix based on the inverted difference matrix

- wherein the data processing unit is configured to process the data signal using the inverted first matrix.

18. A computer program product, which, when executed by a
5 computer, makes the computer perform a method for processing
a data signal received via a communication channel,
comprising

- determining a first matrix comprising components describing characteristics of the communication channel
- 10 • inverting the first matrix by
 - o sub-dividing the first matrix into at least four sub matrices
 - o inverting a first sub matrix of the four sub matrices
 - 15 o generating a second matrix by multiplying a second sub matrix of the four sub matrices with the inverted first matrix and a third sub matrix of the four sub matrices
 - o determining the difference matrix between the
 - 20 second matrix and a fourth sub matrix of the four sub matrices
 - o inverting the difference matrix
 - o calculating the inverted matrix based on the inverted difference matrix
- 25 • processing the data signal using the inverted first matrix.

Claims

1. Method for processing a data signal received via a communication channel, comprising: determining a first matrix
5 comprising components describing characteristics of the communication channel; inverting the first matrix by: subdividing the first matrix into at least four sub matrices, inverting a first sub matrix of the four sub matrices, generating a second matrix by multiplying a second sub matrix
10 of the four sub matrices with the inverted first matrix and a third sub matrix of the four sub matrices, determining the difference matrix between the second matrix and a fourth sub matrix of the four sub matrices, inverting the difference matrix, calculating the inverted matrix based on the inverted
15 difference matrix; and processing the data signal using the inverted first matrix.
2. Method according to claim 1, wherein the first matrix is inverted according to Strassen's method for matrix inversion.
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3. Method according to claim 1, wherein the communication channel is a radio communication channel.
4. Method according to claim 1, wherein the received data
25 signal is processed for estimating a sent data signal that was received as the received data signal.
5. Method according to claim 4, wherein the sent data signal is transmitted using a plurality of transmit antennas.
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6. Method according to claim 5, wherein the sent data signal is transmitted according to Groupwise Space Time Block Coding.

7. Method according to claim 4, wherein the sent data signal is transmitted using OFDM modulation.

5 8. Method according to claim 1, wherein at least one of the four sub matrices has Alamouti structure.

9. Method according to claim 8, wherein the first matrix consists of sub matrices having Alamouti structure.

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10. Method according to claim 1, wherein the inverted matrix is used for performing a filter operation on the received data signal.

15 11. Method according to claim 10, wherein the received data signal is linearly filtered using the inverted matrix.

12. Method according to claim 11, wherein the received data signal is filtered according to a zero forcing interference suppression method, a linear mean squared error detection method or an interference cancellation method.

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13. Method according to claim 1, wherein the first matrix is generated from a channel matrix modelling the transmission characteristics of the communication channel.

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14. Method according to claim 13, wherein the first matrix is a sub matrix of the channel matrix.

30 15. Method according to claim 13, wherein the first matrix is the channel matrix.

16. Method according to claim 13, wherein the first matrix is

a product of matrices, one factor being the channel matrix or the hermitian of the channel matrix.

17. Data processing unit for processing a data signal
5 received via a communication channel, comprising a
determining unit configured to determine a first matrix
comprising components describing characteristics of the
communication channel; comprising an inverting unit
configured to invert the first matrix by: sub-dividing the
10 first matrix into at least four sub matrices, inverting a
first sub matrix of the four sub matrices, generating a
second matrix by multiplying a second sub matrix of the four
sub matrices with the inverted first matrix and a third sub
matrix of the four sub matrices, determining the difference
15 matrix between the second matrix and a fourth sub matrix of
the four sub matrices, inverting the difference matrix,
calculating the inverted matrix based on the inverted
difference matrix; wherein the data processing unit is
configured to process the data signal using the inverted
20 first matrix.

18. A computer program product, which, when executed by a
computer, makes the computer perform a method for processing
a data signal received via a communication channel,
25 comprising: determining a first matrix comprising components
describing characteristics of the communication channel;
inverting the first matrix by: sub-dividing the first matrix
into at least four sub matrices, inverting a first sub matrix
of the four sub matrices, generating a second matrix by
30 multiplying a second sub matrix of the four sub matrices with
the inverted first matrix and a third sub matrix of the four
sub matrices, determining the difference matrix between the
second matrix and a fourth sub matrix of the four sub

matrices, inverting the difference matrix, calculating the inverted matrix based on the inverted difference matrix; and processing the data signal using the inverted first matrix.