wireless access network node within a time window of a time length determined according to the CSI reporting time configuration; generating a CSI feedback based on the plurality of CSI-RSs; and reporting, by the wireless terminal device, the CSI feedback to the wireless access network node.

In a first aspect, a method for reporting wireless CSI is disclosed. The method may be performed by a wireless terminal device. The method may comprise receiving, by the wireless terminal device, CSI reference signals (CSI-RSs) transmitted from a wireless access network node; generating, by the wireless terminal device based on measuring the CSI-RSs, one or more indicators associated with one or more nonzero elements in a CSI feedback information in a vector space determined by a set of first basis vectors, a set of second basis vectors, a set of third basis vectors; and transmitting, by the wireless terminal device, information pertaining to the one or more nonzero elements in the CSI feedback information and to the one or more indicators to the wireless access network node.

In another implementation, a method for handling wireless CSI report is disclosed. The method may be performed by a wireless access network node. The method may include transmitting a CSI reporting time configuration from to wireless terminal device; transmitting a series of a plurality of CSI reference signals (CSI-RSs) to the wireless terminal device within a time window of a time length determined according to the CSI reporting time configuration; and receiving a CSI feedback generated by the wireless terminal device based on the plurality of CSI-RSs.

In a second aspect, a method for reporting wireless CSI is discloses. The method may be performed by a wireless access network node. The method may comprise transmitting, by the wireless access network node, CSI reference signals (CSI-RSs) to a wireless terminal device; and receiving, by the wireless access network node, a CSI report based on measurement of the CSI-RSs by the wireless terminal device. The CIS report may comprise information

pertaining to one or more indicators associated with one or

more nonzero elements in a CSI feedback information generated by the wireless terminal device in a vector space determined by a set of first basis vectors, a set of second basis vectors, and a set of third basis vectors; and information pertaining the one or more nonzero elements.

In a third aspect, a wireless communication device comprising one or more processors and one or more memories, wherein the one or more processors are configured to read computer code from the one or more memories to implement the method according to the first aspect.

In a fourth aspect, a wireless communication device comprising one or more processors and one or more memories, wherein the one or more processors are configured to read computer code from the one or more memories to implement the method according to the second aspect.

In some other implementations, a communication device is disclosed. The communication device main include one or more processors and one or more memories, wherein the one or more processors are configured to read computer code from the one or more memories to implement any one of the methods above.

In yet some other implementations, a computer program product is disclosed. The computer program product may include a non-transitory computer-readable program medium with computer code stored thereupon, the computer code, when executed by one or more processors, causing the one or more processors to implement any one of the methods above.

The above embodiments and other aspects and alternatives of their implementations are explained in greater detail in the drawings, the descriptions, and the claims below.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates a wireless access network including a wireless access network node and a user equipment.

FIG. 2 illustrates principles for precoding channel state information reference signal by the wireless access network node of FIG. 1 for improving channel state information feedback by the user equipment of FIG. 1.

FIG. 3 illustrates an exemplary mapping between elements of a channel state information reference sequence and a plurality of radio resource blocks.

CLAIMS

1. A method for reporting wireless channel state information (CSI), comprising:

receiving, by a wireless terminal device, CSI reference signals (CSI-RSs) transmitted from a wireless access network node;

generating, by the wireless terminal device based on measuring the CSI-RSs, one or more indicators associated with one or more nonzero elements in a CSI feedback information in a vector space determined by a set of first basis vectors, a set of second basis vectors, a set of third basis vectors; and

transmitting, by the wireless terminal device, information pertaining to the one or more nonzero elements in the CSI feedback information and to the one or more indicators to the wireless access network node.

2. The method of claim 1, wherein the set of first basis vectors, the set of second basis vectors, the set of third basis vectors are selected by the wireless terminal device from a first codebook, a second codebook, and a third codebook, respectively.

3. The method of claim 1, wherein at least one set of the set of first basis vectors, the set of second basis vectors, and the set of third basis vectors are selected from a set of candidate basis vectors configured by the wireless network access node.

4. The method of claim 1, wherein the information pertaining to the one or more indicators comprises a positional information of the one or more nonzero elements in the vector space.

5. The method of claim 4, wherein the positional information of a nonzero element of the one or more nonzero elements comprises a first index, a second index, and a third index into the set of first basis vectors, the set of second basis vectors, and the set of third basis vectors, respectively.

6. The method of claim 4, wherein the positional information of a nonzero element of the one or more nonzero elements comprises an index representing a linearization of a first index, a second index, and a third index into the set of first basis vectors, the set of second basis vectors, and the set of third basis vectors, respectively.

7. The method of claim 4, wherein:

the vector space is divided into a plurality of sub-vector spaces; and

the positional information of one nonzero element in one sub-vector space comprises:

at least one of:

a first index, a second index, and a third index into the one sub-vector space for the one nonzero element, or

an index representing a linearization of a first index, a second index, and a third index into the one sub-vector space for the one nonzero element; and

a fourth index identifying the one sub-vector space among the plurality of sub-vector spaces.

8. The method of claim 1, wherein the information pertaining to a nonzero element in the CSI feedback information and information pertaining to an indicator associated with the nonzero element are mapped to adjacent locations in an uplink control information when being transmitted to the to the wireless access network node by the wireless terminal device.

9. The method of claim 1, wherein:

the one or more nonzero elements are divided into a plurality of groups based on a priority ranking; and

information pertaining to the one or more nonzero elements and to the one or more indicators are mapped to an uplink control information according to the priority ranking.

10. A method for reporting wireless channel state information (CSI), comprising:

transmitting, by a wireless access network node, CSI reference signals (CSI-RSs) to a wireless terminal device; and

receiving, by a wireless access network node, a CSI report based on measurement of the CSI-RSs by the wireless terminal device,

wherein the CIS report comprises:

information pertaining to one or more indicators associated with one or more nonzero elements in a CSI feedback information generated by the wireless terminal device in a vector space determined by a set of first basis vectors, a set of second basis vectors, and a set of third basis vectors; and

information pertaining the one or more nonzero elements.

11. The method of claim 10, wherein the set of first basis vectors, the set of second basis vectors, the set of third basis vectors are selected by the wireless terminal device from a first codebook, a second codebook, and a third codebook, respectively.

12. The method of claim 10, wherein at least one set of the set of first basis vectors, the set of second basis vectors, and the set of third basis vectors are selected from a set of candidate basis vectors configured by the wireless network access node.

13. The method of claim 10, wherein the information pertaining to the one or more indicators comprises a positional information of the one or more nonzero elements in the vector space.

14. The method of claim 13, wherein the positional information of a nonzero element of the one or more nonzero elements comprises a first index, a second index, and a third index into the set of first basis vectors, the set of second basis vectors, and the set of third basis vectors, respectively.

15. The method of claim 13, wherein the positional information of a nonzero element of the one or more nonzero elements comprises an index representing a linearization of a first index, a second index, and a third index into the set of first basis vectors, the set of second basis

vectors, and the set of third basis vectors, respectively.

16. The method of claim 13, wherein:

the vector space is divided into a plurality of sub-vector spaces; and

the positional information of one nonzero element in one sub-vector space comprises:

at least one of:

a first index, a second index, and a third index into the one sub-vector space for the one nonzero element, or

an index representing a linearization of a first index, a second index, and a third index into the one sub-vector space for the one nonzero element; and

a fourth index identifying the one sub-vector space among the plurality of sub-vector spaces.

17. The method of claim 10, wherein the information pertaining to a nonzero element in the CSI feedback information and information pertaining to an indicator associated with the nonzero element are received by the wireless access network node in adjacent locations in an uplink control information.

18. The method of claim 10, wherein:

the one or more nonzero elements are divided into a plurality of groups based on a

priority ranking; and

information pertaining to the one or more nonzero elements and the information pertaining to the one or more indicators are received by the wireless access network node as mapped in an uplink control information according to the priority ranking.

19. A wireless communication device comprising one or more processors and one or more memories, wherein the one or more processors are configured to read computer code from the one or more memories to implement the method in claim 1.

20. A wireless communication device comprising one or more processors and one or more memories, wherein the one or more processors are configured to read computer code from the one or more memories to implement the method of claim 10.