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(54) **SPATIAL STREAM DETERMINING METHOD, BASE STATION, AND USER EQUIPMENT**

VERFAHREN ZUR BESTIMMUNG RÄUMLICHER STRÖME, BASISSTATION UND BENUTZERGERÄT

PROCÉDÉ DE DÉTERMINATION DE FLUX SPATIAL, STATION DE BASE ET ÉQUIPEMENT UTILISATEUR

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Description

TECHNICAL FIELD

[0001] The present invention relates to the field of wireless communications technologies, and in particular, to a spatial stream determining method, a base station, and user equipment.

BACKGROUND

[0002] In a 3rd Generation Partnership Project Long Term Evolution (Long Term Evolution, LTE for short) system, user equipment feeds back obtained channel state information (Channel State Information, CSI for short) of a downlink channel to a base station, and the base station selects an appropriate communications data modulation and coding scheme, a data transmission speed, and a transmission subband for the user equipment according to the channel state information that is fed back. A multi-user multiple-input multiple-output (Multi User Multiple-Input Multiple-Output, MU-MIMO for short) communications manner is introduced to LTE R10, that is, a multi-antenna mechanism is introduced to an user equipment end, and multiple user equipments communicate simultaneously. In this mechanism, a quantity of antennas at an evolved NodeB (Evolved Node B, eNodeB for short) end is relatively large. By introducing multiple antennas to the user equipment end, single user equipment may establish multiple data streams with an eNodeB, thereby bringing a higher spatial multiplexing gain.

[0003] Document US 2011/299626 A1 discloses feedback of channel state information for MIMO and subband scheduling in a wireless communication system.

[0004] Document US 2008/260051 A1 discloses a method and apparatus for transmitting information simultaneously to multiple destinations over shared wireless resources.

[0005] Document US 2011/211662 A1 discloses antenna grouping and group-based enhancement for MIMO systems.

[0006] In the prior art, user equipment feeds back channel state report (Chanel State Report, CSR for short) information to a base station based on a code word granularity, that is, feeds back, to the base station, overall channel quality information of a spatial stream included in each code word for information transmission between the user equipment and the base station, and the base station schedules a downlink resource according to a status of overall channel quality of the spatial stream in each code word; however, the method may cause improper spatial stream scheduling that is performed by the base station, thereby resulting in a waste of system resources.

SUMMARY

[0007] Embodiments of the present invention provide a spatial stream determining method, a base station, and user equipment, so as to resolve a problem that system resources are wasted due to improper spatial stream scheduling.

[0008] The invention is defined in the independent claims. Additional features of the invention are provided in the dependent claims. In the following, parts of the description and drawings referring to embodiments which are not covered by the claims are not presented as embodiments of the invention, but as examples useful for understanding the invention.

[0009] In the spatial stream determining method provided by the embodiments of the present invention, a base station sends a feedback mode indication to user equipment, where the feedback mode indication is used to instruct the user equipment to feed back, based on a group granularity, channel state report CSR information, and each group granularity includes at least one spatial stream, and then receives channel state report CSR information of each group granularity that is sent by the user equipment, and finally, the base station can determine, according to the CSR information of each group granularity, a spatial stream used to transmit data to the user equipment. Because the user equipment uses at least one spatial stream as a group granularity to report the CSR information, the CSR information is more accurate, thereby improving properness of selecting, by the base station for a user, a spatial stream used to transmit data, and improving utilization of system resources.

BRIEF DESCRIPTION OF DRAWINGS

[0010] To describe the technical solutions in the embodiments of the present invention or in the prior art more clearly, the following briefly describes the accompanying drawings required for describing the embodiments or the prior art. Apparently, the accompanying drawings in the following description show some embodiments of the present invention, and persons of ordinary skill in the art may still derive other drawings from these accompanying drawings without creative efforts.

FIG. 1 is a streamchart of a spatial stream determining method according to an embodiment of the present invention;

FIG. 2 is a streamchart of a spatial stream determining method according to another embodiment of the present invention;

FIG. 3 is a streamchart of a spatial stream determining method according to still another embodiment of the present invention;

FIG. 4 is a streamchart of a spatial stream determining method according to yet another embodiment of the present invention;

FIG. 5 is a schematic structural diagram of a base station according to an embodiment of the present invention;

FIG. 6 is a schematic structural diagram of a base station according to another embodiment of the

present invention;

FIG. 7 is a schematic structural diagram of a base station according to still another embodiment of the present invention;

FIG. 8 is a schematic structural diagram of user equipment according to an embodiment of the present invention;

FIG. 9 is a schematic structural diagram of user equipment according to another embodiment of the present invention;

FIG. 10 is a schematic structural diagram of a base station according to yet another embodiment of the present invention; and

FIG. 11 is a schematic structural diagram of user equipment according to still another embodiment of the present invention.

DESCRIPTION OF EMBODIMENTS

[0011] The invention is defined by the appended claims. To make the objectives, technical solutions, and advantages of the embodiments of the present invention clearer, the following clearly and completely describes the technical solutions in the embodiments of the present invention with reference to the accompanying drawings in the embodiments of the present invention. Apparently, the described embodiments are some but not all of the embodiments of the present invention. All other embodiments obtained by persons of ordinary skill in the art based on the embodiments of the present invention without creative efforts shall fall within the protection scope of the present invention.

[0012] Technologies described in this specification may be applied to various communications systems, for example, current 2G and 3G communications systems and a next-generation communications system, for example, a Global System for Mobile Communications (Global System for Mobile communications, GSM for short), a Code Division Multiple Access (Code Division Multiple Access, CDMA for short) system, a Time Division Multiple Access (Time Division Multiple Access, TDMA for short) system, a Wideband Code Division Multiple Access (Wideband Code Division Multiple Access Wireless, WCDMA for short) system, a Frequency Division Multiple Access (Frequency Division Multiple Addressing, FDMA for short) system, an Orthogonal Frequency-Division Multiple Access (Orthogonal Frequency-Division Multiple Access, OFDMA for short) system, a single-carrier FDMA (SC-FDMA) system, a General Packet Radio Service (General Packet Radio Service, GPRS for short) system, a Long Term Evolution (Long Term Evolution, LTE for short) system, and other communications systems.

[0013] User equipment in this application may be wireless user equipment or wired user equipment. The wireless user equipment may refer to equipment that provides a user with voice and/or data connectivity, a handheld device with a radio connection function, or another processing device connected to a radio modem. The wireless user equipment may communicate with one or more core networks by using a radio access network (Radio Access Network, RAN for short). The wireless user equipment may be mobile user equipment, such as a mobile phone (also referred to as a "cellular" phone) and a computer with mobile user equipment, for example, may be a portable, pocket-sized, handheld, computer built-in, or in-vehicle mobile apparatus, which exchanges voice and/or data with the radio access network. For example, it may be a device such as a personal communication service (Personal Communication Service, PCS for short) phone, a cordless telephone set, a Session Initiation Protocol (SIP) phone, a wireless local loop (Wireless Local Loop, WLL for short) station, or a personal digital assistant (Personal Digital Assistant, PDA for short). The wireless user equipment may also be referred to as a system, a subscriber unit (Subscriber Unit), a subscriber station (Subscriber Station), a mobile station (Mobile Station), a mobile terminal (Mobile), a remote station (Remote Station), an access point (Access Point), a remote user equipment (Remote Terminal), an access user equipment (Access Terminal), a user terminal (User Terminal), a user agent (User Agent), a user device (User Device), or user equipment (User Equipment).

[0014] Abase station involved in this application may be a base station (Base Transceiver Station, BTS for short) in CDMA, or may be a base station NodeB in WCDMA, or may be an evolved NodeB (EvolutionalNode B, eNB or eNodeB for short) in LTE, which is not limited in the present invention; however, for ease of description, the following embodiment uses a NodeB as an example for description.

[0015] FIG. 1 is a streamchart of a spatial stream determining method according to an embodiment of the present invention. As shown in FIG. 1, the method in this embodiment may include:

[0016] Step 101: A base station sends a feedback mode indication to user equipment, where the feedback mode indication is used to instruct the user equipment to feed back, based on a group granularity, channel state report CSR information, and each group granularity includes at least one spatial stream.

[0017] Specifically, a feedback mode indication sent by the base station to user equipment in a cell is based on a group granularity, and each group granularity includes at least one spatial stream, so that the user equipment feeds back channel information according to a group granularity of a spatial stream.

[0018] Step 102: The base station receives CSR information of each group granularity that is sent by the user equipment.

[0019] In an embodiment of the present invention, specifically, the CSR information of each group granularity includes: information about an average value of channel quality of spatial streams in each group granularity, and information about a difference between the channel quality of each spatial stream and the average value. After

acquiring channel quality information of each spatial stream, the user equipment may generate the information about the average value of the channel quality of the spatial streams, and the information about the difference between the channel quality of each spatial stream and the average value according to the channel quality information and report the information to the base station.

[0020] In another embodiment of the present invention, the base station receives the CSR information sent by the user equipment, where the CSR information includes channel quality information of each spatial stream in each group granularity, and the base station may obtain through calculation, according to the channel quality information of each spatial stream in each group granularity, information about an average value of channel quality of the spatial streams, and information about a difference between the channel quality of each spatial stream and the average value.

[0021] Optionally, before receiving the CSR information of each group granularity that is sent by the user equipment, the base station may further send configuration information to the user equipment, where the configuration information includes at least one of the following parameters: a quantity of spatial streams included in each group granularity, a time-frequency resource occupied by the CSR information, and feedback manner information of CSR information of different packet granularities.

[0022] For example, 20 spatial streams that can transmit data exist between the user equipment and the base station, when each group granularity includes one spatial stream, specifically, the user equipment collects channel quality information of each spatial stream, that is, collects channel quality information of 20 spatial streams, then obtains a set of CSR information according to the channel quality information by using one spatial stream as one group, that is, generates 20 sets of CSR information, and then feeds back the 20 sets of CSR information to the base station, and in this case, the base station receives the 20 sets of CSR information. When each group granularity includes two spatial streams, specifically, the user equipment also collects the channel quality information of each spatial stream, that is, collects the channel quality information of the 20 spatial streams, then obtains a set of CSR information according to the channel quality information by using two spatial streams as one group, that is, generates 10 sets of CSR information, and then feeds back the 10 sets of CSR information to the base station, and in this case, the base station receives the 10 sets of CSR information.

[0023] Further, the quantity of spatial streams included in each group granularity is configured by the base station according to a real-time situation of a channel. When a transmission speed of the channel is stable and signal quality is relatively strong, the quantity of spatial streams included in each group granularity may be as less as possible, that is, the CSR information sent by a user to the base station is more accurate, for example, each group granularity may include one spatial stream; however, when the transmission speed of the channel is not stable and the signal quality is relatively weak, the quantity of spatial streams included in each group granularity may be appropriately increased, for example, each group granularity may include two spatial streams or three spatial streams. However, the quantity of spatial streams included in each group granularity is less than a quantity of spatial streams included in each code word. Optionally, the quantity of spatial streams included in each group granularity is less than the quantity of spatial streams included in each code word. Feedback manners of the CSR information of different packet granularities may be a periodic feedback manner or a non-periodic feedback manner, where the periodic feedback manner and the non-periodic feedback manner further include reporting an overall bandwidth, or selecting and reporting a best part of a bandwidth by the user equipment.

[0024] Step 103: The base station determines, according to the CSR information of each group granularity, a spatial stream used to transmit data to the user equipment.

[0025] Specifically, after receiving the CSR information sent by the user equipment, the base station predicts, according to the information about the average value of the channel quality of the spatial streams in each group granularity, and the information about the difference between the channel quality of each spatial stream and the average value in the CSR information, a data transmission speed of a spatial stream included in each group granularity, and then calculates, according to the predicted data transmission speed and by comprehensively considering a performance requirement of a system, for example, balance between spatial streams for transmitting data to user equipments, performance weights of the spatial streams included in each group granularity, so that a group of spatial streams with best performance are selected to perform data transmission, that is, a spatial stream with a maximum weight is selected to perform data transmission; or spatial streams may also be selected in a balanced manner according to the information about the average value of the channel quality of the spatial streams in each group granularity, and the information about the difference between the channel quality of each spatial stream and the average value, so that utilization of a spatial stream is improved.

[0026] Optionally, the base station attempts to select mutually orthogonal spatial streams according to the CSR information of each group granularity.

[0027] For example, a cell has 10 user equipments, and each user equipment establishes 20 spatial streams with an eNodeB. In the present invention, the base station acquires CSR information of total 200 spatial streams uploaded by the user equipments, so that the base station may select, according to CSR information of all spatial streams of each user equipment, spatial streams with good quality to perform data transmission, and orthogonality between the selected spatial streams is highest;

therefore, the base station may select 10 spatial streams with relatively good channel quality from first user equipment, five spatial streams with relatively good channel quality from second user equipment, and the like, and the selected spatial streams may be separated from each other or may be next to each other, as long as channel quality is relatively good and orthogonality between two spatial streams is highest. Because the orthogonality between the selected spatial streams is highest, interlayer interference at a user equipment end is relatively easy to be eliminated.

[0028] In the spatial stream determining method provided by this embodiment of the present invention, a base station sends a feedback mode indication to user equipment, where the feedback mode indication is used to instruct the user equipment to feed back, based on a group granularity, channel state report CSR information, and each group granularity includes at least one spatial stream, and then receives CSR information of each group granularity that is sent by the user equipment, and the base station can determine, according to the CSR information of each group granularity, a spatial stream used to transmit data to the user equipment. Because the user equipment uses at least one spatial stream as a group granularity to report the CSR information, the CSR information is more accurate, thereby improving properness of selecting, by the base station for a user, a spatial stream used to transmit data, and further improving utilization of system resources.

[0029] FIG. 2 is a streamchart of a spatial stream determining method according to another embodiment of the present invention. As shown in FIG. 2, the method in this embodiment may include:

[0030] Step 201: User equipment receives a feedback mode indication sent by a base station, where the feedback mode indication is used to instruct the user equipment to feed back, based on a group granularity, channel state report CSR information, and each group granularity includes at least one spatial stream.

[0031] Specifically, the user equipment receives the feedback mode indication sent by the base station, and the user equipment feeds back the CSR information according to the feedback mode indication, and each group granularity includes at least one spatial stream.

[0032] Step 202: The user equipment measures channel quality information of each spatial stream, and obtains CSR information of each group granularity according to the channel quality information.

[0033] Optionally, before the user equipment measures the channel quality information of each spatial stream, the user equipment receives a configuration message sent by the base station, where the configuration message includes at least one of the following parameters: a quantity of spatial streams included in each group granularity, a time-frequency resource occupied by the CSR information, and feedback manner information of CSR information of different packet granularities.

[0034] For example, 20 spatial streams that can transmit data exist between the user equipment and the base station, when each group granularity includes one spatial stream, specifically, the user equipment collects channel quality information of each spatial stream, that is, collects channel quality information of 20 spatial streams, then obtains a set of CSR information according to the channel quality information by using one spatial stream as one group, that is, generates 20 sets of CSR information, and then feeds back the 20 sets of CSR information to the base station, and in this case, the base station receives the 20 sets of CSR information. When each group granularity includes two spatial streams, specifically, the user equipment also collects the channel quality information of each spatial stream, that is, collects the channel quality information of the 20 spatial streams, then obtains a set of CSR information according to the channel quality information by using two spatial streams as one group, that is, generates 10 sets of CSR information, and then feeds back the 10 sets of CSR information to the base station, and in this case, the base station receives the 10 sets of CSR information.

[0035] The quantity of spatial streams included in each group granularity is configured by the base station according to a real-time situation of a channel. When a transmission speed of the channel is stable and signal quality is relatively strong, the quantity of spatial streams included in each group granularity may be as less as possible, that is, the CSR information sent to the base station is more accurate, for example, each group granularity may include one spatial stream; however, when the transmission speed of the channel is not stable and the signal quality is relatively weak, the quantity of spatial streams included in each group granularity may be appropriately increased, for example, each group granularity may include two spatial streams or three spatial streams. However, the quantity of spatial streams included in each group granularity is less than a quantity of spatial streams included in each code word.

[0036] In an embodiment of the present invention, after measuring the channel quality information of each spatial stream according to the feedback mode indication and the configuration information, the user equipment analyzes the channel quality information of each spatial stream to obtain information about an average value of channel quality of spatial streams in each group granularity, and information about a difference between the channel quality of each spatial stream and the average value, and then sends the information as the CSR information to the base station, so that the base station may directly determine, for the user equipment according to the information, a spatial stream used to transmit data.

[0037] In another embodiment of the present invention, after measuring the channel quality information of each spatial stream according to the feedback mode indication and the configuration information, the user equipment sends the channel quality information as the CSR information to the base station, so that the base station obtains through analysis information about an average val-

ue of channel quality of spatial streams in each group granularity, and information about a difference between the channel quality of each spatial stream and the average value according to the channel quality information, and then the base station determines, for the user equipment according to the information about the average value of the channel quality of the spatial streams in each group granularity, and the information about the difference between the channel quality of each spatial stream and the average value that are obtained through analysis, a spatial stream used to transmit data.

[0038] Feedback manners of the CSR information of different packet granularities may be a periodic feedback manner or a non-periodic feedback manner, where the periodic feedback manner and the non-periodic feedback manner further include reporting an overall bandwidth, or selecting and reporting a best part of a bandwidth by the user equipment.

[0039] Step 203: The user equipment sends the CSR information of each group granularity to the base station according to the feedback mode indication.

[0040] In an embodiment of the present invention, after measuring the channel quality information of each spatial stream according to the feedback mode indication and the configuration information, the user equipment analyzes the channel quality information of each spatial stream to obtain information about an average value of channel quality of spatial streams in each group granularity, and information about a difference between the channel quality of each spatial stream and the average value, and then sends the information as the CSR information to the base station.

[0041] In another embodiment of the present invention, after measuring the channel quality information of each spatial stream according to the feedback mode indication and the configuration information, the user equipment sends the channel quality information as the CSR information to the base station.

[0042] In the spatial stream determining method provided by this embodiment of the present invention, user equipment receives a feedback mode indication sent by a base station, where the feedback mode indication is used to instruct the user equipment to feed back, based on a group granularity, channel state report CSR information, and each group granularity includes at least one spatial stream, and then the user equipment measures channel quality information of each spatial stream, and obtains CSR information of each group granularity according to the channel quality information, and finally sends the CSR information of each group granularity to the base station according to the feedback mode indication. Because the user equipment uses at least one spatial stream as a group granularity to report the CSR information, the CSR information is more accurate, thereby improving properness of selecting, by the base station for a user, a spatial stream used to transmit data, and further improving utilization of system resources.

[0043] FIG. 3 is a streamchart of a spatial stream determining method according to still another embodiment of the present invention. As shown in FIG. 3, this embodiment provides a specific interaction process between a base station and user equipment, and a quantity of spatial streams included in a group granularity is one. The method includes:

Step 301: A base station sends a group granularity-based feedback mode indication to user equipment.

[0044] Specifically, the base station sends a group granularity-based feedback mode indication to user equipment in a cell, to instruct the user equipment to feed back, in the unit of a group granularity, channel state report CSR information.

[0045] Step 302: The base station sends, to the user equipment, configuration information transmitted in feedback mode.

[0046] Specifically, the base station sends configuration information in group granularity-based feedback mode to the user equipment in the cell, where the configuration information includes: a quantity of spatial streams included in each group granularity, a time-frequency resource occupied by the CSR information, and feedback manner information of CSR information of different packet granularities.

[0047] A quantity of spatial streams included in each group granularity is one.

[0048] Feedback manners of CSR information of different packet granularities may be a periodic feedback manner or a non-periodic feedback manner, where the periodic feedback manner and the non-periodic feedback manner further include reporting an overall bandwidth, or selecting and reporting a best part of a bandwidth by the user equipment.

[0049] Step 303: The user equipment feeds back group granularity-based CSR information.

[0050] Specifically, after the user equipment measures channel quality information of each spatial stream, because the group granularity is one spatial stream, the user equipment sends the measured channel quality information of each spatial stream as the CSR information to the base station.

[0051] Step 304a: The base station sends scheduling information.

[0052] Specifically, the base station determines, according to the CSR information of each spatial stream, a spatial stream used to transmit data to the user equipment.

[0053] After receiving the channel quality information of each spatial stream in each group granularity that is sent by the user equipment, the base station predicts a data transmission speed of each spatial stream, and then calculates, according to the predicted data transmission speed and by comprehensively considering a performance requirement of a system, for example, balance between spatial streams for transmitting data to user equipments, performance weights of the spatial streams, so that a group of spatial streams with best performance are selected to perform data transmission, that is, a spatial

stream with a maximum weight is selected to perform data transmission.

[0054] Optionally, the base station selects, according to the CSR information of each spatial stream, channels that are as mutually orthogonal as possible to transmit data for a user.

[0055] Step 304b: The base station transmits data to a user.

[0056] Specifically, after selecting the group of spatial streams with the best performance for a user, the base station uses these spatial streams to transmit user data.

[0057] In the spatial stream determining method provided by this embodiment of the present invention, a base station sends, to user equipment, a group granularity-based feedback mode indication and configuration information transmitted in feedback mode, the user equipment receives the feedback mode indication and the configuration information, measures channel quality information of each spatial stream, and feeds back the channel quality information to the base station, and the base station selects, according to fed back CSR information, a group of spatial streams with best performance to perform data transmission. Because a group granularity includes one spatial stream, reported CSR information is more accurate, thereby ensuring properness of selecting, by the base station for a user, a spatial stream used to transmit data, and fully using system resources.

[0058] FIG. 4 is a streamchart of a spatial stream determining method according to yet another embodiment of the present invention. As shown in FIG. 4, this embodiment provides a specific interaction process between a base station and user equipment, and a quantity of spatial streams included in a group granularity is greater than or equal to two and is less than a quantity of spatial streams included in each code word. The method includes:

Step 401: A base station sends a group granularity-based feedback mode indication to user equipment.

[0059] Specifically, the base station sends a group granularity-based feedback mode indication to user equipment in a cell, to instruct the user equipment to feed back, in the unit of a group granularity, channel state report CSR information.

[0060] Step 402: The base station sends, to the user equipment, configuration information transmitted in feedback mode.

[0061] Specifically, the base station sends configuration information in group granularity-based feedback mode to the user equipment in the cell, where the configuration information includes: a quantity of spatial streams included in each group granularity, a time-frequency resource occupied by the CSR information, and feedback manner information of CSR information of different packet granularities.

[0062] The quantity of spatial streams included in each group granularity may be configured by the base station according to a real-time situation of a channel. When a transmission speed of the channel is stable and signal quality is relatively strong, the quantity of spatial streams included in each group granularity may be as less as possible, that is, the CSR information sent to the base station is more accurate, for example, each group granularity may include one spatial stream; however, when the transmission speed of the channel is not stable and the signal quality is relatively weak, the quantity of spatial streams included in each group granularity may be appropriately increased, for example, each group granularity may include two spatial streams or three spatial streams. However, the quantity of spatial streams included in each group granularity is less than a quantity of spatial streams included in each code word.

[0063] In this embodiment, each group granularity includes one spatial stream.

[0064] Feedback manners of CSR information of different packet granularities may be a periodic feedback manner or a non-periodic feedback manner, where the periodic feedback manner and the non-periodic feedback manner further include reporting an overall bandwidth, or selecting and reporting a best part of a bandwidth by the user equipment. Step 403: The user equipment feeds back group granularity-based CSR information.

[0065] Specifically, after the user equipment in the cell receives the group granularity-based feedback mode indication and the configuration information that are sent by the base station, the user equipment first collects channel quality information of each spatial stream and then analyzes the channel quality information of each spatial stream according to the feedback mode indication and the configuration information, to obtain information about an average value of channel quality of spatial streams in each group granularity, and information about a difference between the channel quality of each spatial stream and the average value, and then sends CSR information to the base station, where the CSR information includes the information about the average value of the channel quality of the spatial streams in each group granularity, and the information about the difference between the channel quality of each spatial stream and the average value.

[0066] Optionally, after the user equipment in the cell receives the group granularity-based feedback mode indication and the configuration information that are sent by the base station, the user equipment first collects channel quality information of each spatial stream and then sends the channel quality information as CSR information to the base station, so that the base station obtains through analysis information about an average value of channel quality of spatial streams in each group granularity, and information about a difference between the channel quality of each spatial stream and the average value according to the channel quality information, and then the base station determines, for the user equipment according to the information about the average value of the channel quality of the spatial streams in each group granularity, and the information about the difference between the channel quality of each spatial stream

and the average value that are obtained through analysis, a spatial stream used to transmit data.

[0067] Step 404a: The base station sends scheduling information.

[0068] Specifically, after receiving the information about the average value of the channel quality of the spatial streams in each group granularity, and the information about the difference between the channel quality of each spatial stream and the average value that are sent by the user equipment, the base station predicts a data transmission speed of a spatial stream included in each group granularity, and then calculates, according to the predicted data transmission speed and by comprehensively considering a performance requirement of a system, for example, balance between spatial streams for transmitting data to user equipments, performance weights of the spatial streams included in each group granularity, so that a group of spatial streams with best performance are selected to perform data transmission, that is, a spatial stream with a maximum weight is selected to perform data transmission.

[0069] Optionally, when the CSR information uploaded by the user equipment and received by the base station includes the channel quality information of each spatial stream in each group granularity, the base station obtains the information about the average value of the channel quality of the spatial streams, and the information about the difference between the channel quality of each spatial stream and the average value according to the channel quality information of each spatial stream in each group granularity, predicts a data transmission speed of a spatial stream included in each group granularity, and then calculates, according to the predicted data transmission speed and by comprehensively considering a performance requirement of a system, for example, balance between spatial streams for transmitting data to user equipments, performance weights of the spatial streams included in each group granularity, so that a group of spatial streams with best performance are selected to perform data transmission, that is, a spatial stream with a maximum weight is selected to perform data transmission.

[0070] Optionally, the base station selects, according to the CSR information of each spatial stream in each group granularity, channels that are as mutually orthogonal as possible to transmit data for a user.

[0071] Step 404b: The base station transmits data to a user.

[0072] Specifically, after selecting the group of spatial streams with the best performance for a user, the base station uses these spatial streams to transmit user data.

[0073] In the spatial stream determining method provided by this embodiment of the present invention, a base station sends, to user equipment, a group granularity-based feedback mode indication and configuration information transmitted in feedback mode, the user equipment receives the feedback mode indication and the configuration information, and feeds back CSR information of each group granularity, and finally, the base station can determine, according to the CSR information of each group granularity, a spatial stream used to transmit data to the user equipment. Because a quantity of spatial streams included in the group granularity is less than a quantity of spatial streams included in a code word, the CSR information is more accurate, thereby improving properness of selecting, by the base station for a user, a spatial stream used to transmit data, and further improving utilization of system resources.

[0074] FIG. 5 is a schematic structural diagram of a base station according to an embodiment of the present invention. As shown in FIG. 5, the base station 100 includes a first sending module 101, a receiving module 102, and a first determining module 103, where

the first sending module 101 is configured to send a feedback mode indication to user equipment, where the feedback mode indication is used to instruct the user equipment to feed back, based on a group granularity, channel state report CSR information, and each group granularity includes at least one spatial stream;

the receiving module 102 is configured to receive CSR information of each group granularity that is sent by the user equipment; and

the first determining module 103 is configured to determine, according to the CSR information of each group granularity, a spatial stream used to transmit data to the user equipment.

[0075] In addition, as shown in FIG. 6, the base station may further include a second sending module 104, configured to: before the receiving module 102 receives the CSR information of each group granularity that is sent by the user equipment, send configuration information to the user equipment, where the configuration information includes at least one of the following parameters: a quantity of spatial streams included in each group granularity, a time-frequency resource occupied by the CSR information, and feedback manner information of CSR information of different packet granularities.

[0076] Optionally, the CSR information of each group granularity includes: information about an average value of channel quality of spatial streams in each group granularity, and information about a difference between the channel quality of each spatial stream and the average value.

[0077] Further, as shown in FIG. 7, the base station 100 may further include a second determining module 105, where

the CSR information of each group granularity includes: channel quality information of each spatial stream in each group granularity; and

the second determining module 105 is configured to: after the receiving module 102 receives the CSR information of each group granularity that is sent by the user equipment, determine information about an

average value of channel quality of spatial streams in each group granularity, and information about a difference between the channel quality of each spatial stream and the average value according to the channel quality information of each spatial stream in each group granularity.

[0078] Optionally, the quantity of spatial streams included in each group granularity is less than a quantity of spatial streams included in each code word.

[0079] The base station provided by this embodiment of the present invention is a device for performing the spatial stream determining method provided by Embodiment 1 of the present invention, and for a specific process of performing the spatial stream determining method by the base station, reference may be made to related descriptions in the method embodiment in FIG. 1, and details are not described herein again.

[0080] FIG. 8 is a schematic structural diagram of user equipment according to an embodiment of the present invention. As shown in FIG. 8, the user equipment 200 includes a first receiving module 201, a measuring module 202, and a sending module 203, where

the first receiving module 201 is configured to receive a feedback mode indication sent by a base station, where the feedback mode indication is used to instruct the user equipment to feed back, based on a group granularity, channel state report CSR information, and each group granularity includes at least one spatial stream;
the measuring module 202 is configured to measure channel quality information of each spatial stream, and obtain CSR information of each group granularity according to the channel quality information; and
the sending module 203 is configured to send the CSR information of each group granularity to the base station according to the feedback mode indication received by the first receiving module 201.

[0081] In addition, as shown in FIG. 9, the user equipment 200 may further include a second receiving module 204, configured to: before the measuring module 202 measures the channel quality information of each spatial stream, receive configuration information sent by the base station, where the configuration information includes at least one of the following parameters: a quantity of spatial streams included in each group granularity, a time-frequency resource occupied by the CSR information, and feedback manner information of CSR information of different packet granularities.

[0082] Optionally, the CSR information of each group granularity includes: information about an average value of channel quality of spatial streams in each group granularity, and information about a difference between the channel quality of each spatial stream and the average value; or the CSR information of each group granularity includes: channel quality information of each spatial stream in each group granularity.

[0083] Optionally, the quantity of spatial streams included in each group granularity is less than a quantity of spatial streams included in each code word.

[0084] The user equipment provided by this embodiment of the present invention is a device for performing the spatial stream determining method provided by Embodiment 2 of the present invention, and for a specific process of performing the spatial stream determining method by the user equipment, reference may be made to related descriptions in the method embodiment in FIG. 2, and details are not described herein again.

[0085] FIG. 10 is a schematic structural diagram of a base station according to yet another embodiment of the present invention. As shown in FIG. 10, the base station 300 includes a transmitter 301, a receiver 302, and a processor 303, where

the transmitter 301 is configured to send a feedback mode indication to user equipment, where the feedback mode indication is used to instruct the user equipment to feed back, based on a group granularity, channel state report CSR information, and each group granularity includes at least one spatial stream;
a receiver 302 is configured to receive CSR information of each group granularity that is sent by the user equipment; and
the processor 303 is configured to determine, according to the CSR information of each group granularity, a spatial stream used to transmit data to the user equipment.

[0086] Optionally, the transmitter 301 is further configured to: before the receiver 302 receives the CSR information of each group granularity that is sent by the user equipment, send configuration information to the user equipment, where the configuration information includes at least one of the following parameters: a quantity of spatial streams included in each group granularity, a time-frequency resource occupied by the CSR information, and feedback manner information of CSR information of different packet granularities.

[0087] Optionally, the CSR information of each group granularity includes: information about an average value of channel quality of spatial streams in each group granularity, and information about a difference between the channel quality of each spatial stream and the average value.

[0088] Optionally, the CSR information of each group granularity includes: channel quality information of each spatial stream in each group granularity.

[0089] The processor 303 is further configured to: after the receiver 302 receives the CSR information of each group granularity that is sent by the user equipment, determine information about an average value of channel quality of spatial streams in each group granularity, and information about a difference between the channel qual-

ity of each spatial stream and the average value according to the channel quality information of each spatial stream in each group granularity.

[0090] Optionally, the quantity of spatial streams included in each group granularity is less than a quantity of spatial streams included in each code word.

[0091] The base station provided by this embodiment of the present invention is a device for performing the spatial stream determining method provided by Embodiment 1 of the present invention, and for a specific process of performing the spatial stream determining method by the base station, reference may be made to related descriptions in the method embodiment in FIG. 1, and details are not described herein again.

[0092] FIG. 11 is a schematic structural diagram of user equipment according to still another embodiment of the present invention. As shown in FIG. 11, the user equipment 400 includes a receiver 401, a processor 402, and a transmitter 403, where

the receiver 401 is configured to receive a feedback mode indication sent by a base station, where the feedback mode indication is used to instruct the user equipment to feed back, based on a group granularity, channel state report CSR information, and each group granularity includes at least one spatial stream;

the processor 402 is configured to measure channel quality information of each spatial stream, and obtain CSR information of each group granularity according to the channel quality information; and

the transmitter 403 is configured to send the CSR information of each group granularity to the base station according to the feedback mode indication received by the receiver 401.

[0093] Optionally, the receiver 401 is further configured to: before the processor 402 measures the channel quality information of each spatial stream, receive configuration information sent by the base station, where the configuration information includes at least one of the following parameters: a quantity of spatial streams included in each group granularity, a time-frequency resource occupied by the CSR information, and feedback manner information of CSR information of different packet granularities.

[0094] Optionally, the CSR information of each group granularity includes: information about an average value of channel quality of spatial streams in each group granularity, and information about a difference between the channel quality of each spatial stream and the average value; or the CSR information of each group granularity includes: channel quality information of each spatial stream in each group granularity.

[0095] Optionally, the quantity of spatial streams included in each group granularity is less than a quantity of spatial streams included in each code word.

[0096] The user equipment provided by this embodiment of the present invention is a device for performing the spatial stream determining method provided by Embodiment 2 of the present invention, and for a specific process of performing the spatial stream determining method by the user equipment, reference may be made to related descriptions in the method embodiment in FIG. 2, and details are not described herein again.

Claims

1. A spatial stream determining method, comprising:

sending (101), by a base station, a feedback mode indication to user equipment, wherein the feedback mode indication is used to instruct the user equipment to feed back, based on a group granularity, channel state report, CSR, information, and each group granularity comprises at least one spatial stream;

sending (302, 402), by the base station, configuration information to the user equipment, wherein the configuration information comprises at least one of the following parameters: a quantity of spatial streams comprised in each group granularity, a time-frequency resource occupied by the CSR information, and feedback manner information of CSR information of different packet granularities;

receiving (102), by the base station, CSR information of each group granularity that is sent by the user equipment; and

determining (103), by the base station according to the CSR information of each group granularity, a spatial stream used to transmit data to the user equipment;

wherein the CSR information of each group granularity comprises: information about an average value of channel quality of spatial streams in each group granularity, and information about a difference between the channel quality of each spatial stream and the average value;

wherein the quantity of spatial streams comprised in each group granularity is less than a quantity of spatial streams comprised in each code word.

2. A spatial stream determining method, comprising:

receiving (201), by user equipment, a feedback mode indication sent by a base station, wherein the feedback mode indication is used to instruct the user equipment to feed back, based on a group granularity, channel state report, CSR, information, and each group granularity comprises at least one spatial stream;

receiving (302, 402), by the user equipment, configuration information sent by the base sta-

tion, wherein the configuration information comprises at least one of the following parameters: a quantity of spatial streams comprised in each group granularity, a time-frequency resource occupied by the CSR information, and feedback manner information of CSR information of different packet granularities;
measuring (202), by the user equipment, channel quality information of each spatial stream, and obtaining CSR information of each group granularity according to the channel quality information; and
sending (203), by the user equipment, the CSR information of each group granularity to the base station according to the feedback mode indication;
wherein the CSR information of each group granularity comprises: information about an average value of channel quality of spatial streams in each group granularity, and information about a difference between the channel quality of each spatial stream and the average value;
wherein the quantity of spatial streams comprised in each group granularity is less than a quantity of spatial streams comprised in each code word.

3. A base station (100), comprising:

a first sending module (101), configured to send a feedback mode indication to user equipment, wherein the feedback mode indication is used to instruct the user equipment to feed back, based on a group granularity, channel state report, CSR, information, and each group granularity comprises at least one spatial stream;
a receiving module (102), configured to receive CSR information of each group granularity that is sent by the user equipment;
a first determining module (103), configured to determine, according to the CSR information of each group granularity, a spatial stream used to transmit data to the user equipment; and
a second sending module (104), configured to: before the receiving module receives the CSR information of each group granularity that is sent by the user equipment, send configuration information to the user equipment, wherein the configuration information comprises at least one of the following parameters: a quantity of spatial streams comprised in each group granularity, a time-frequency resource occupied by the CSR information, and feedback manner information of CSR information of different packet granularities;
wherein the CSR information of each group granularity comprises: information about an average value of channel quality of spatial streams in each group granularity, and information about a difference between the channel quality of each spatial stream and the average value;
wherein the quantity of spatial streams comprised in each group granularity is less than a quantity of spatial streams comprised in each code word.

4. User equipment (200), comprising:

a first receiving module (201), configured to receive a feedback mode indication sent by a base station, wherein the feedback mode indication is used to instruct the user equipment to feed back, based on a group granularity, channel state report, CSR, information, and each group granularity comprises at least one spatial stream;
a measuring module (202), configured to measure channel quality information of each spatial stream, and obtain CSR information of each group granularity according to the channel quality information;
a sending module (203), configured to send the CSR information of each group granularity to the base station according to the feedback mode indication received by the receiving module; and
a second receiving module (204), configured to: before the measuring module measures the channel quality information of each spatial stream, receive configuration information sent by the base station, wherein the configuration information comprises at least one of the following parameters: a quantity of spatial streams comprised in each group granularity, a time-frequency resource occupied by the CSR information, and feedback manner information of CSR information of different packet granularities;
wherein the CSR information of each group granularity comprises: information about an average value of channel quality of spatial streams in each group granularity, and information about a difference between the channel quality of each spatial stream and the average value;
wherein the quantity of spatial streams comprised in each group granularity is less than a quantity of spatial streams comprised in each code word.

Patentansprüche

1. Verfahren zum Bestimmen eines räumlichen "Streams", das Folgendes umfasst:

Senden (101), durch eine Basisstation, einer Rückmeldungsmodusangabe an ein Benutzergerät, wobei die Rückmeldungsmodusangabe

verwendet wird, um das Benutzergerät anzuweisen, basierend auf einer Gruppengranularität Kanalstatusbericht- bzw. CSR(Channel State Report)-Informationen zurückzumelden, und jede Gruppengranularität wenigstens einen räumlichen "Stream" umfasst;
Senden (302, 402), durch die Basisstation, von Konfigurationsinformationen an das Benutzergerät, wobei die Konfigurationsinformationen wenigstens einen der folgenden Parameter umfassen: eine Quantität räumlicher "Streams", die in jeder Gruppengranularität enthalten sind, eine Zeitfrequenzressource, die durch die CSR-Informationen belegt wird, und Rückmeldungsartinformationen von CSR-Informationen unterschiedlicher Paketgranularitäten;
Empfangen (102), durch die Basisstation, von CSR-Informationen jeder Gruppengranularität, die durch das Benutzergerät gesendet werden; und
Bestimmen (103), durch die Basisstation gemäß den CSR-Informationen jeder Gruppengranularität, eines räumlichen "Streams", der zum Übertragen von Daten an das Benutzergerät verwendet wird;
wobei die CSR-Informationen jeder Gruppengranularität Folgendes umfassen:

Informationen über einen Durchschnittswert einer Kanalqualität räumlicher "Streams" in jeder Gruppengranularität und Informationen über eine Differenz zwischen der Kanalqualität jedes räumlichen "Streams" und dem Durchschnittswert;
wobei die Quantität räumlicher "Streams", die in jeder Gruppengranularität enthalten sind, geringer als eine Quantität räumlicher "Streams" ist, die in jedem Codewort enthalten sind.

2. Verfahren zum Bestimmen eines räumlichen "Streams", das Folgendes umfasst:

Empfangen (201), durch ein Benutzergerät, einer Rückmeldungsmodusangabe, die durch eine Basisstation gesendet wird, wobei die Rückmeldungsmodusangabe verwendet wird, um das Benutzergerät anzuweisen, basierend auf einer Gruppengranularität Kanalstatusbericht- bzw. CSR-Informationen zurückzumelden, und jede Gruppengranularität wenigstens einen räumlichen "Stream" umfasst;
Empfangen (302, 402), durch das Benutzergerät, von Konfigurationsinformationen, die durch die Basisstation gesendet werden, wobei die Konfigurationsinformationen wenigstens einen der folgenden Parameter umfassen: eine Quantität räumlicher "Streams", die in jeder Gruppengranularität enthalten sind, eine Zeitfrequenzressource, die durch die CSR-Informationen belegt wird, und Rückmeldungsartinformationen von CSR-Informationen unterschiedlicher Paketgranularitäten;
Messen (202), durch das Benutzergerät, von Kanalqualitätsinformationen jedes räumlichen "Streams" und Erhalten von CSR-Informationen jeder Gruppengranularität gemäß den Kanalqualitätsinformationen; und
Senden (203), durch das Benutzergerät, der CSR-Informationen jeder Gruppengranularität an die Basisstation gemäß der Rückmeldungsmodusangabe;
wobei die CSR-Informationen jeder Gruppengranularität Folgendes umfassen:

Informationen über einen Durchschnittswert einer Kanalqualität räumlicher "Streams" in jeder Gruppengranularität und Informationen über eine Differenz zwischen der Kanalqualität jedes räumlichen "Streams" und dem Durchschnittswert;
wobei die Quantität räumlicher "Streams", die in jeder Gruppengranularität enthalten sind, geringer als eine Quantität räumlicher "Streams" ist, die in jedem Codewort enthalten sind.

3. Basisstation (100), die Folgendes umfasst:

ein erstes Sendemodul (101), das zum Senden einer Rückmeldungsmodusangabe an ein Benutzergerät konfiguriert ist, wobei die Rückmeldungsmodusangabe verwendet wird, um das Benutzergerät anzuweisen, basierend auf einer Gruppengranularität Kanalstatusbericht- bzw. CSR-Informationen zurückzumelden, und jede Gruppengranularität wenigstens einen räumlichen "Stream" umfasst;
ein Empfangsmodul (102), das zum Empfangen von CSR-Informationen jeder Gruppengranularität konfiguriert ist, die durch das Benutzergerät gesendet werden;
ein erstes Bestimmungsmodul (103), das zum Bestimmen, gemäß den CSR-Informationen jeder Gruppengranularität, eines räumlichen "Streams" konfiguriert ist, der zum Übertragen von Daten an das Benutzergerät verwendet wird; und
ein zweites Sendemodul (104), das zu Folgendem konfiguriert ist: bevor das Empfangsmodul die CSR-Informationen jeder Gruppengranularität empfängt, die durch das Benutzergerät gesendet werden, Senden von Konfigurationsinformationen an das Benutzergerät, wobei die Konfigurationsinformationen wenigstens einen der folgenden Parameter umfassen: eine Quan-

tität räumlicher "Streams", die in jeder Gruppengranularität enthalten sind, eine Zeitfrequenzressource, die durch die CSR-Informationen belegt wird, und Rückmeldungsartinformationen von CSR-Informationen unterschiedlicher Paketgranularitäten;
wobei die CSR-Informationen jeder Gruppengranularität Folgendes umfassen:

Informationen über einen Durchschnittswert einer Kanalqualität räumlicher "Streams" in jeder Gruppengranularität und Informationen über eine Differenz zwischen der Kanalqualität jedes räumlichen "Streams" und dem Durchschnittswert;
wobei die Quantität räumlicher "Streams", die in jeder Gruppengranularität enthalten sind, geringer als eine Quantität räumlicher "Streams" ist, die in jedem Codewort enthalten sind.

4. Benutzergerät (200), das Folgendes umfasst:

ein erstes Empfangsmodul (201), das zum Empfangen einer Rückmeldungsmodusangabe konfiguriert ist, die durch eine Basisstation gesendet wird, wobei die Rückmeldungsmodusangabe verwendet wird, um das Benutzergerät anzuweisen, basierend auf einer Gruppengranularität Kanalstatusbericht- bzw. CSR-Informationen zurückzumelden, und jede Gruppengranularität wenigstens einen räumlichen "Stream" umfasst;
ein Messmodul (202), das zum Messen von Kanalqualitätsinformationen jedes räumlichen "Streams" und Erhalten von CSR-Informationen jeder Gruppengranularität gemäß den Kanalqualitätsinformationen konfiguriert ist;
ein Sendemodul (203), das zum Senden der CSR-Informationen jeder Gruppengranularität an die Basisstation gemäß der Rückmeldungsmodusangabe konfiguriert ist, die durch das Empfangsmodul empfangen wird; und
ein zweites Empfangsmodul (204), das zu Folgendem konfiguriert ist: bevor das Messmodul die Kanalqualitätsinformationen jedes räumlicher "Streams" misst, Empfangen von Konfigurationsinformationen, die durch die Basisstation gesendet werden, wobei die Konfigurationsinformationen wenigstens einen der folgenden Parameter umfassen: eine Quantität räumlicher "Streams", die in jeder Gruppengranularität enthalten sind, eine Zeitfrequenzressource, die durch die CSR-Informationen belegt wird, und Rückmeldungsartinformationen von CSR-Informationen unterschiedlicher Paketgranularitäten;
wobei die CSR-Informationen jeder Gruppengranularität Folgendes umfassen:

Informationen über einen Durchschnittswert einer Kanalqualität räumlicher "Streams" in jeder Gruppengranularität und Informationen über eine Differenz zwischen der Kanalqualität jedes räumlichen "Streams" und dem Durchschnittswert;
wobei die Quantität räumlicher "Streams", die in jeder Gruppengranularität enthalten sind, geringer als eine Quantität räumlicher "Streams" ist, die in jedem Codewort enthalten sind.

Revendications

1. Procédé de détermination de flux spatial, comprenant :

l'envoi (101), par une station de base, d'une indication de mode retour à un équipement utilisateur, l'indication de mode retour étant utilisée pour donner l'instruction à l'équipement utilisateur de retourner, sur la base d'une granularité de groupe, des informations de rapport d'état de canal, CSR, et chaque granularité de groupe comprenant au moins un flux spatial ;
l'envoi (302, 402), par la station de base, d'informations de configuration à l'équipement utilisateur, les informations de configuration comprenant au moins un des paramètres suivants : une quantité de flux spatiaux contenus dans chaque granularité de groupe, une ressource temporo-fréquentielle occupée par les informations CSR, et des informations de manière de retour d'informations CSR de différentes granularités de paquet ;
la réception (102), par la station de base, d'informations CSR de chaque granularité de groupe qui sont envoyées par l'équipement utilisateur ; et
la détermination (103), par la station de base en fonction des informations CSR de chaque granularité de groupe, d'un flux spatial utilisé pour transmettre des données à l'équipement utilisateur ;
dans lequel les informations CSR de chaque granularité de groupe comprennent : des informations sur une valeur moyenne de qualité de canal de flux spatiaux dans chaque granularité de groupe, et des informations sur une différence entre la qualité de canal de chaque flux spatial et la valeur moyenne ;
dans lequel la quantité de flux spatiaux contenus dans chaque granularité de groupe est inférieure à une quantité de flux spatiaux contenus dans chaque mot-code.

2. Procédé de détermination de flux spatial, comprenant :

la réception (201), par un équipement utilisateur, d'une indication de mode retour envoyée par une station de base, l'indication de mode retour étant utilisée pour donner l'instruction à l'équipement utilisateur de retourner, sur la base d'une granularité de groupe, des informations de rapport d'état de canal, CSR, et chaque granularité de groupe comprenant au moins un flux spatial ;

la réception (302, 402), par l'équipement utilisateur, d'informations de configuration envoyées par la station de base, les informations de configuration comprenant au moins un des paramètres suivants : une quantité de flux spatiaux contenus dans chaque granularité de groupe, une ressource temporo-fréquentielle occupée par les informations CSR, et des informations de manière de retour d'informations CSR de différentes granularités de paquet ;

la mesure (202), par l'équipement utilisateur, d'informations de qualité de canal de chaque flux spatial, et l'obtention d'informations CSR de chaque granularité de groupe en fonction des informations de qualité de canal ; et

l'envoi (203), par l'équipement utilisateur, des informations CSR de chaque granularité de groupe à la station de base en fonction de l'indication de mode retour ;

dans lequel les informations CSR de chaque granularité de groupe comprennent : des informations sur une valeur moyenne de qualité de canal de flux spatiaux dans chaque granularité de groupe, et des informations sur une différence entre la qualité de canal de chaque flux spatial et la valeur moyenne ;

dans lequel la quantité de flux spatiaux contenus dans chaque granularité de groupe est inférieure à une quantité de flux spatiaux contenus dans chaque mot-code.

3. Station de base (100), comprenant :

un premier module d'envoi (101), configuré pour envoyer une indication de mode retour à un équipement utilisateur, l'indication de mode retour étant utilisée pour donner l'instruction à l'équipement utilisateur de retourner, sur la base d'une granularité de groupe, des informations de rapport d'état de canal, CSR, et chaque granularité de groupe comprenant au moins un flux spatial ;

un module de réception (102), configuré pour recevoir des informations CSR de chaque granularité de groupe qui sont envoyées par l'équipement utilisateur ;

un premier module de détermination (103), configuré pour déterminer, en fonction des informations CSR de chaque granularité de groupe, un flux spatial utilisé pour transmettre des données à l'équipement utilisateur ; et

un deuxième module d'envoi (104), configuré pour : avant que le module de réception reçoive les informations CSR de chaque granularité de groupe qui sont envoyées par l'équipement utilisateur, envoyer des informations de configuration à l'équipement utilisateur, les informations de configuration comprenant au moins un des paramètres suivants : une quantité de flux spatiaux contenus dans chaque granularité de groupe, une ressource temporo-fréquentielle occupée par les informations CSR, et des informations de manière de retour d'informations CSR de différentes granularités de paquet ;

dans laquelle les informations CSR de chaque granularité de groupe comprennent :

des informations sur une valeur moyenne de qualité de canal de flux spatiaux dans chaque granularité de groupe, et des informations sur une différence entre la qualité de canal de chaque flux spatial et la valeur moyenne ;

dans laquelle la quantité de flux spatiaux contenus dans chaque granularité de groupe est inférieure à une quantité de flux spatiaux contenus dans chaque mot-code.

4. Équipement utilisateur (200), comprenant :

un premier module de réception (201), configuré pour recevoir une indication de mode retour envoyée par une station de base, l'indication de mode retour étant utilisée pour donner l'instruction à l'équipement utilisateur de retourner, sur la base d'une granularité de groupe, des informations de rapport d'état de canal, CSR, et chaque granularité de groupe comprenant au moins un flux spatial ;

un module de mesure (202), configuré pour mesurer des informations de qualité de canal de chaque flux spatial, et obtenir des informations CSR de chaque granularité de groupe en fonction des informations de qualité de canal ;

un module d'envoi (203), configuré pour envoyer les informations CSR de chaque granularité de groupe à la station de base en fonction de l'indication de mode retour reçue par le module de réception ; et

un deuxième module de réception (204), configuré pour : avant que le module de mesure mesure les informations de qualité de canal de chaque flux spatial, recevoir des informations de configuration envoyées par la station de base,

les informations de configuration comprenant au moins un des paramètres suivants : une quantité de flux spatiaux contenus dans chaque granularité de groupe, une ressource temporo-fréquentielle occupée par les informations CSR, et des informations de manière de retour d'informations CSR de différentes granularités de paquet ;

dans lequel les informations CSR de chaque granularité de groupe comprennent : des informations sur une valeur moyenne de qualité de canal de flux spatiaux dans chaque granularité de groupe, et des informations sur une différence entre la qualité de canal de chaque flux spatial et la valeur moyenne ;

dans lequel la quantité de flux spatiaux contenus dans chaque granularité de groupe est inférieure à une quantité de flux spatiaux contenus dans chaque mot-code.

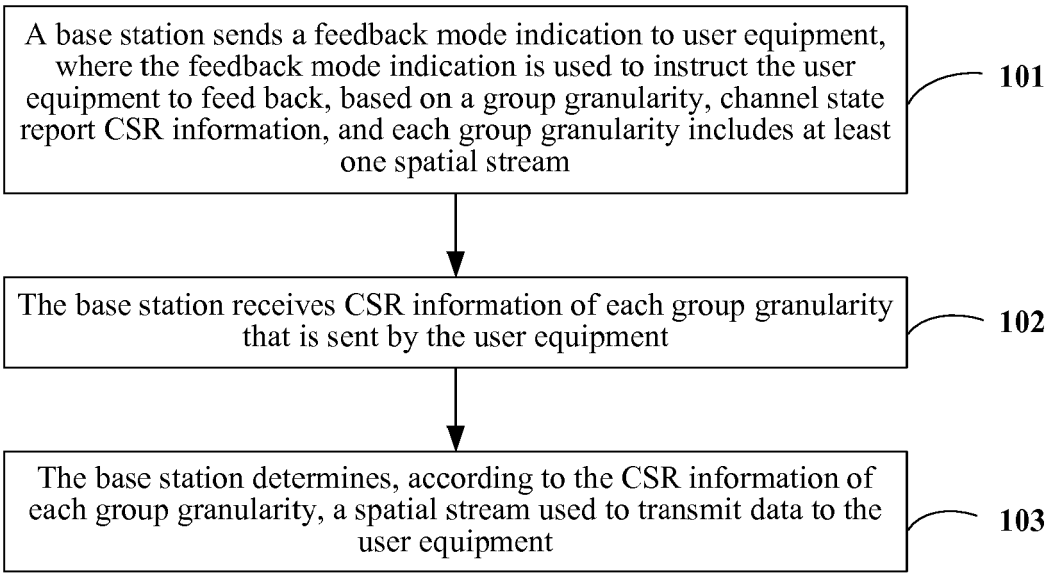
A base station sends a feedback mode indication to user equipment, where the feedback mode indication is used to instruct the user equipment to feed back, based on a group granularity, channel state report CSR information, and each group granularity includes at least one spatial stream
101
The base station receives CSR information of each group granularity that is sent by the user equipment
102
The base station determines, according to the CSR information of each group granularity, a spatial stream used to transmit data to the user equipment
103

FIG. 1

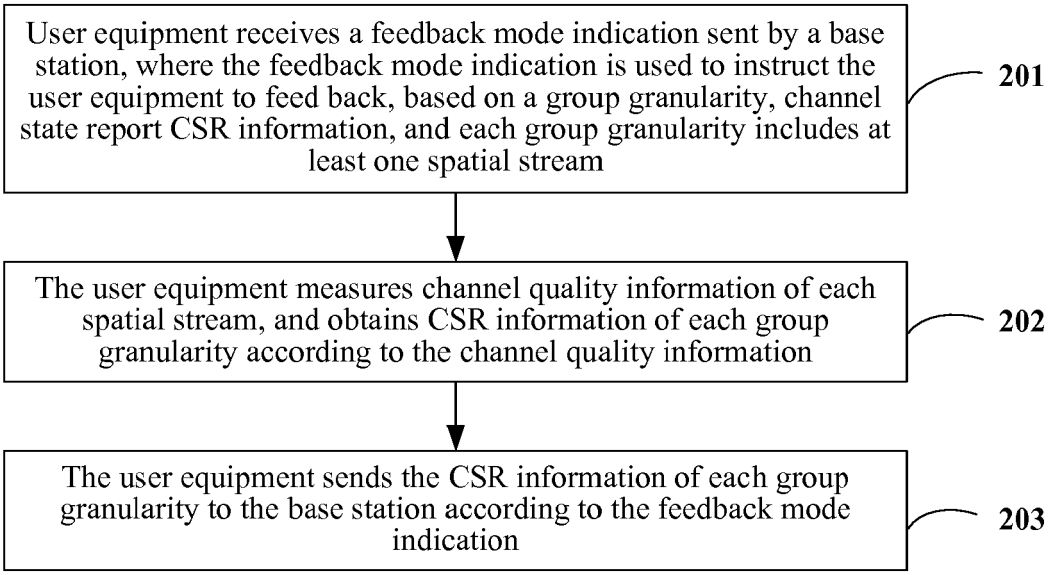
User equipment receives a feedback mode indication sent by a base station, where the feedback mode indication is used to instruct the user equipment to feed back, based on a group granularity, channel state report CSR information, and each group granularity includes at least one spatial stream
201
The user equipment measures channel quality information of each spatial stream, and obtains CSR information of each group granularity according to the channel quality information
202
The user equipment sends the CSR information of each group granularity to the base station according to the feedback mode indication
203

FIG. 2

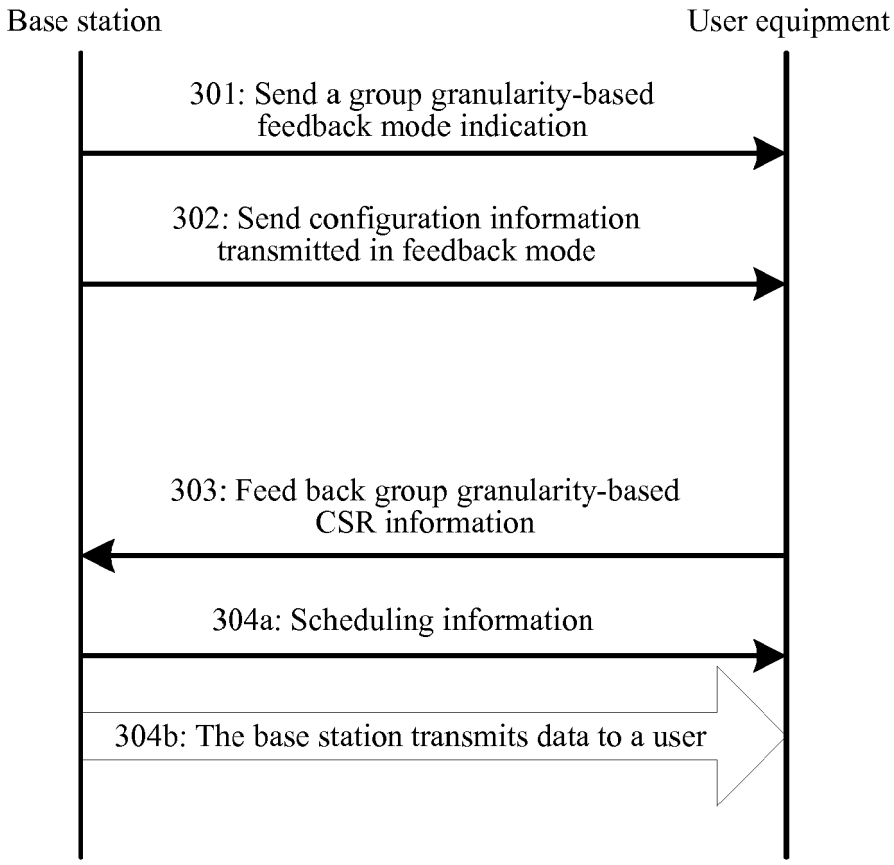
Base station
User equipment
301: Send a group granularity-based feedback mode indication
302: Send configuration information transmitted in feedback mode
303: Feed back group granularity-based CSR information
304a: Scheduling information
304b: The base station transmits data to a user

FIG. 3

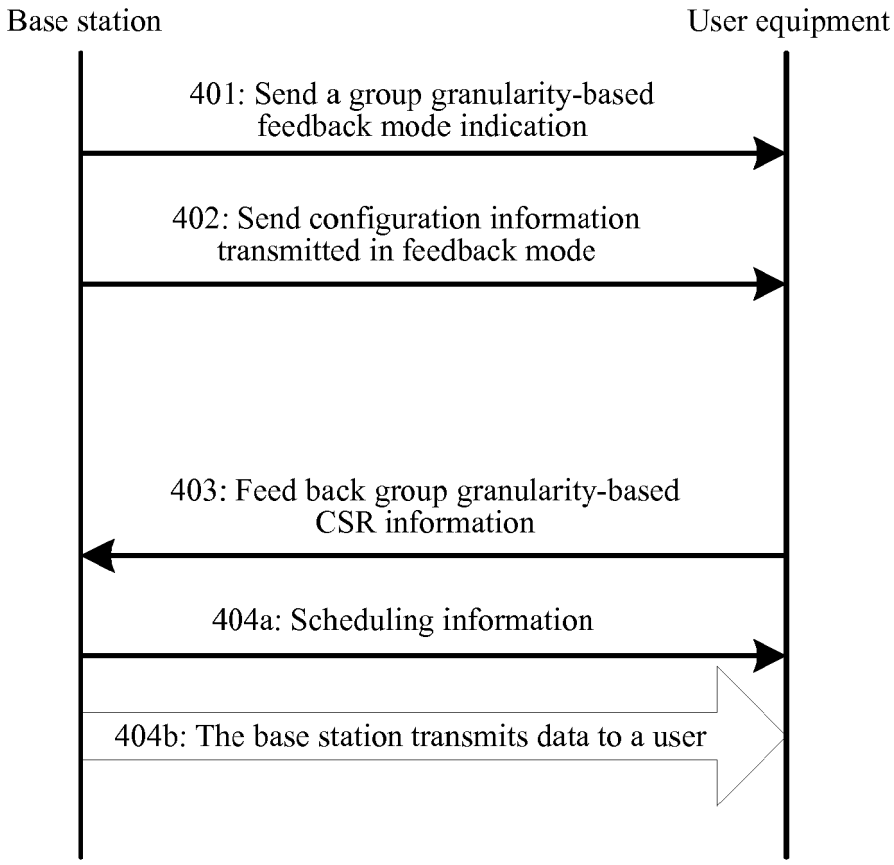
Base station
User equipment
401: Send a group granularity-based feedback mode indication
402: Send configuration information transmitted in feedback mode
403: Feed back group granularity-based CSR information
404a: Scheduling information
404b: The base station transmits data to a user

FIG. 4

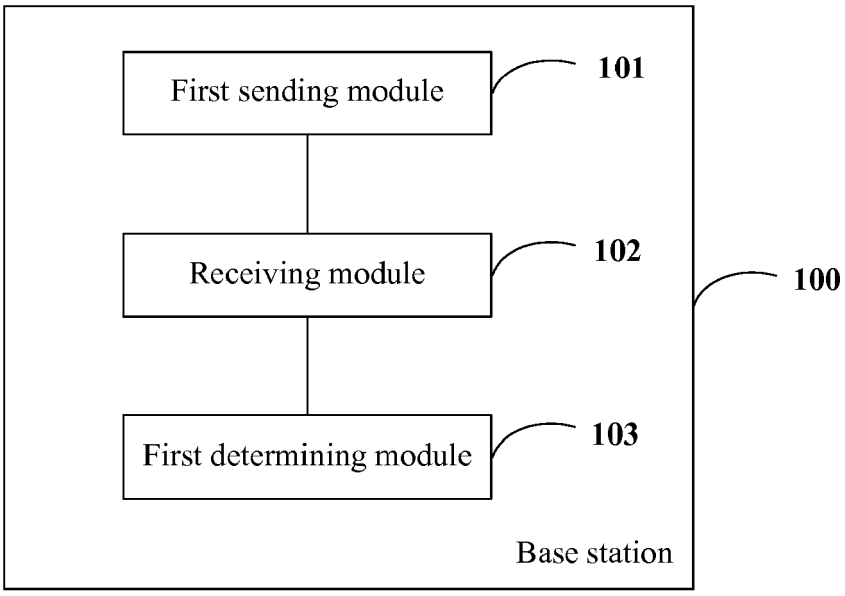
First sending module
101
Receiving module
102
100
First determining module
103
Base station

FIG. 5

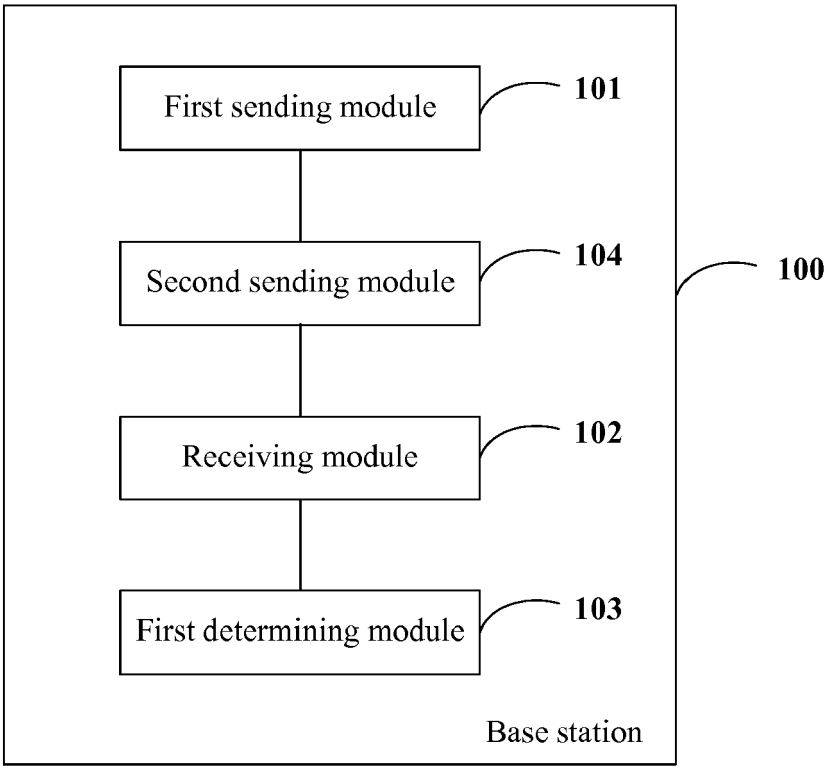
First sending module
101
Second sending module
104
100
Receiving module
102
First determining module
103
Base station

FIG. 6

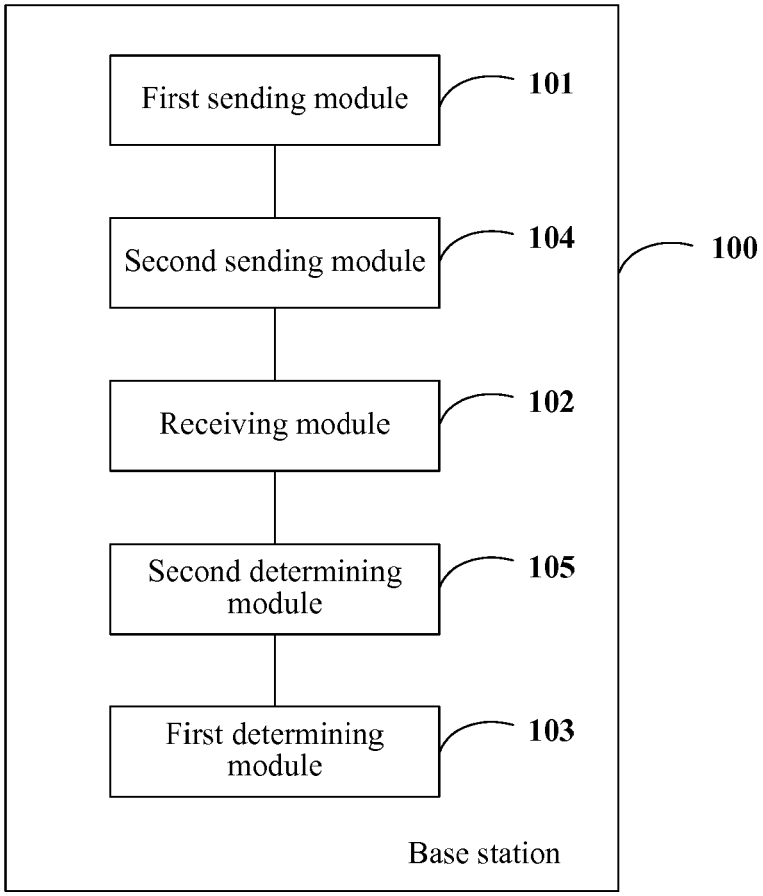
First sending module
101
Second sending module
104
100
Receiving module
102
Second determining module
105
First determining module
103
Base station

FIG. 7

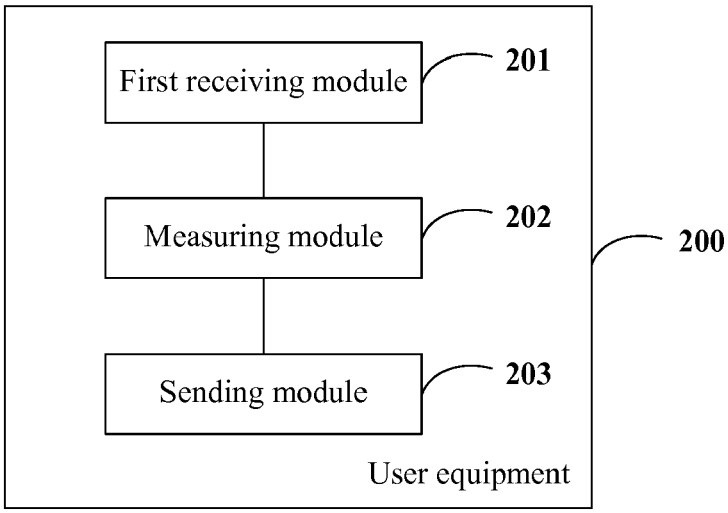
First receiving module
201
Measuring module
202
200
Sending module
203
User equipment

FIG. 8

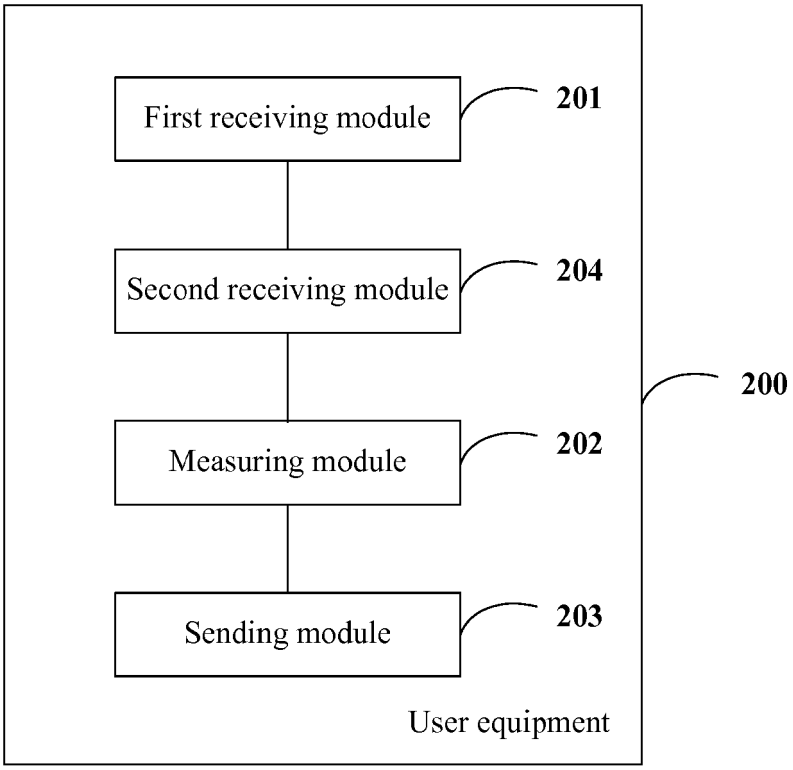
First receiving module
201
Second receiving module
204
Measuring module
202
Sending module
203
200
User equipment

FIG. 9

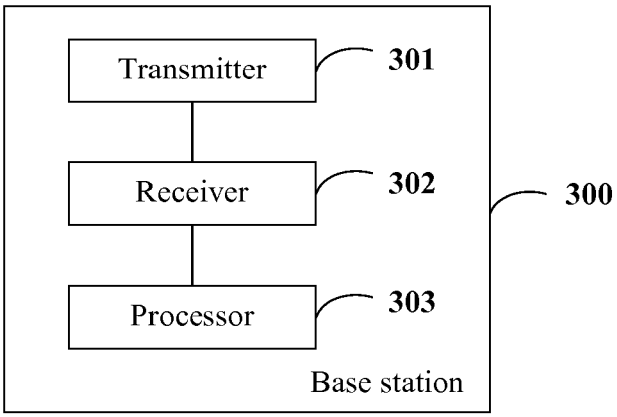
Transmitter
301
Receiver
302
300
Processor
303
Base station

FIG. 10

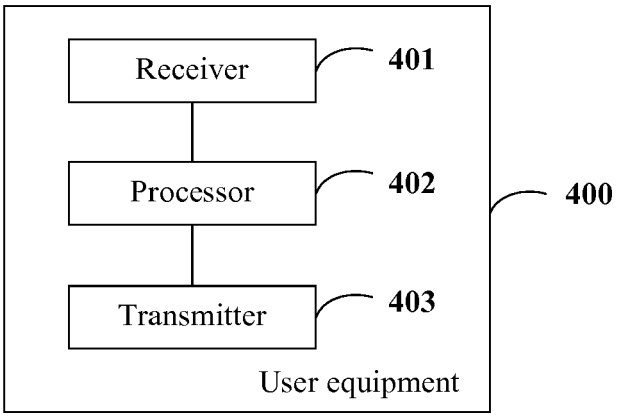
Receiver
401
Processor
402
400
Transmitter
403
User equipment

FIG. 11

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 2011299626 A1 **[0003]**
- US 2008260051 A1 **[0004]**
- US 2011211662 A1 **[0005]**