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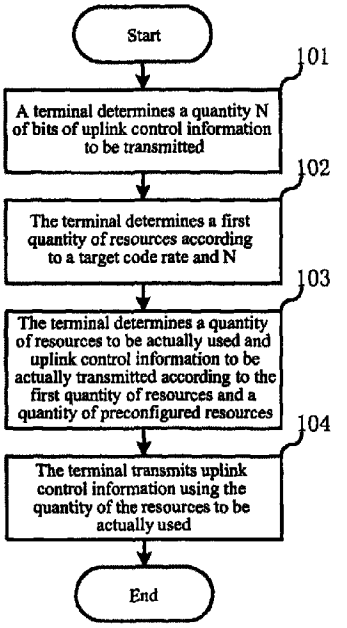
(54) Titre : PROCEDE DE DETERMINATION DE RESSOURCES DE CANAL DE COMMANDE DE LIAISON MONTANTE, TERMINAL ET DISPOSITIF COTE RESEAU

(54) Title: UPLINK CONTROL CHANNEL RESOURCE DETERMINING METHOD, TERMINAL, AND NETWORK SIDE DEVICE



(57) Abrégé/Abstract:
The present application relates to the field of wireless communications, and provides an uplink control channel resource determining method, a terminal, and a network side device. When an actually transmitted uplink control signaling has a wide value range, the problem of how to effectively prevent time-frequency resources from being wasted is resolved. According to the present invention, a terminal determines the number N of uplink control signaling bits to be transmitted; the terminal determines the number of first resources according to a target encoding rate and N; the terminal determines the number of resources actually used according to the number of the first resources and the number of pre-configured resources; and the terminal transmits the uplink control signaling by means of the number of resources actually used.

Abstract

The present application relates to the field of wireless communications, and provides an uplink control channel resource determining method, a terminal, and a network side device. When an actually transmitted uplink control signaling has a wide value range, the problem of how to effectively prevent time-frequency resources from being wasted is resolved. According to the present invention, a terminal determines the number N of uplink control signaling bits to be transmitted; the terminal determines the number of first resources according to a target encoding rate and N; the terminal determines the number of resources actually used according to the number of the first resources and the number of pre-configured resources; and the terminal transmits the uplink control signaling by means of the number of resources actually used.

Uplink Control Channel Resource Determining Method, Terminal, and Network Side Device

Technical Field

The present application relates to the field of wireless communication, and more particular, to technologies for determining uplink control channel resources.

Background

In order to ensure the demodulation performance of uplink control channels in a 5G New Radio (NR) system, a network device may respectively configure the maximum code rate of uplink control information being able to be carried by different terminals (the lower a code rate is, the larger a corresponding uplink coverage radius is, and the lower a probability that the terminal transmission power is limited).

In addition, it is determined in the NR that a resource corresponding to an uplink control channel for transmitting feedback response information is jointly indicated through a higher layer signaling and a dynamic signaling by a base station. That is, a plurality of available resources (time domain, frequency domain, code domain) are preconfigured through a higher layer signaling, and a dynamic signaling indicates one of them for actual transmission. Since a time/frequency domain size of a resource is semi-statically configured by a higher layer signaling, the flexibility is limited. When a value range of a size of uplink control information (UCI) actually transmitted is very large, transmission of the UCI using a preconfigured resource may cause a resource waste, i.e. when UCI bits are few, many frequency domain resources (PRBs) and/or time domain resources (symbols) are still occupied for transmission.

Summary

A purpose of the present application is to provide a method for determining uplink control channel resources, a terminal, and a network side device, which solve a problem of how to effectively prevent resource waste when a value range of a size of uplink control information actually transmitted is very large.

In order to solve the problem, the present application discloses a method for determining uplink control channel resources, including: determining, by a terminal, a quantity N of bits of uplink control information to be transmitted; determining, by the terminal, a first quantity of

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resources according to a target code rate and the N; determining, by the terminal, a quantity of resources to be actually used according to the first quantity of resources and a quantity of preconfigured resources, wherein the quantity of the resources to be actually used is not greater than the quantity of the preconfigured resources; and transmitting, by the terminal, uplink control information using the quantity of the resources to be actually used.

In a preferred embodiment, the determining, by the terminal, the quantity of the resources to be actually used according to the first quantity of resources and the quantity of the preconfigured resources, includes: determining, by the terminal, the quantity of the resources to be actually used and uplink control information to be actually transmitted according to the first quantity of resources and the quantity of the preconfigured resources, wherein a quantity of bits of the uplink control information to be actually transmitted is not greater than N.

In a preferred embodiment, the target code rate is configured by a network side device.

In a preferred embodiment, the quantity of the preconfigured resources and the first quantity of resources include: a quantity of frequency domain resource blocks occupied by an uplink control channel; or a quantity of resource elements occupied by an uplink control channel.

In a preferred embodiment, the quantity of the preconfigured resources is determined by one of the following manners: indicating through a higher layer signaling; or preconfiguring at least one available resource through a higher layer signaling, and indicating one of the at least one available resource through downlink control information.

In a preferred embodiment, the determining, by the terminal, the quantity of the resources to be actually used according to the first quantity of resources and the quantity of the preconfigured resources, includes: when the first quantity of resources is not greater than the quantity of the preconfigured resources, the quantity of the resources to be actually used is equal to the first quantity of resources.

In a preferred embodiment, the terminal determines that the resources to be actually used are first Q resources of the preconfigured resources, and the Q is the first quantity of resources.

In a preferred embodiment, the determining, by the terminal, the quantity of the resources to be actually used according to the first quantity of resources and the quantity of the preconfigured resources, includes: when the first quantity of resources is greater than the quantity of the preconfigured resources, the quantity of the resources to be actually used is equal to the quantity of the preconfigured resources.

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In a preferred embodiment, in the act of the terminal transmitting the uplink control information using the quantity of the resources to be actually used, what is transmitted is the uplink control information to be transmitted.

In a preferred embodiment, the determining, by the terminal, the quantity of the resources to be actually used according to the first quantity of resources and the quantity of the preconfigured resources, includes: when the first quantity of resources is greater than the quantity of the preconfigured resources, the terminal determines a second quantity of bits of uplink control information according to the target code rate and the quantity of the preconfigured resources.

In a preferred embodiment, the determining, by the terminal, the second quantity of bits of the uplink control information according to the target code rate and the quantity of the preconfigured resources, includes: performing signaling compression on the uplink control information to be transmitted, and obtaining new uplink control information to be transmitted, wherein a quantity of bits of the new uplink control information to be transmitted is not greater than the second quantity of bits of the uplink control information.

In a preferred embodiment, the obtaining the new uplink control information to be transmitted, further includes: the quantity of the resources to be actually used is equal to the quantity of the preconfigured resources.

In a preferred embodiment, the obtaining the new uplink control information to be transmitted, further includes: determining, by the terminal, a third quantity of resources according to the target code rate and the quantity of bits of the new uplink control information to be transmitted; wherein the quantity of the resources to be actually used is equal to the third quantity of resources.

In a preferred embodiment, the transmitted uplink control information is the new uplink control information to be transmitted.

The present application further discloses a method for determining uplink control channel resources, including: determining, by a network side device, a quantity N of bits of uplink control information to be received; determining, by the network side device, a first quantity of resources according to a target code rate and the N; determining, by the network side device, a quantity of resources to be actually used according to the first quantity of resources and a quantity of preconfigured resources, wherein the quantity of the resources to be actually used is not greater than the quantity of the preconfigured resources; and receiving, by the network side

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device, uplink control information using the quantity of the resources to be actually used.

In a preferred embodiment, the quantity of the preconfigured resources and the first quantity of resources include: a quantity of frequency domain resource blocks occupied by an uplink control channel; or a quantity of resource elements occupied by an uplink control channel.

In a preferred embodiment, the quantity of the preconfigured resources is determined by one of the following manners: indicating through a higher layer signaling; or preconfiguring at least one available resource through a higher layer signaling, and indicating one of the at least one available resource through downlink control information.

In a preferred embodiment, the determining, by the network side device, the quantity of resources to be actually used according to the first quantity of resources and the quantity of preconfigured resources, includes: when the first quantity of resources is not greater than the quantity of the preconfigured resources, the quantity of the resources to be actually used is equal to the first quantity of resources.

In a preferred embodiment, the resources to be actually used are first Q resources of the preconfigured resources, and the Q is the first quantity of resources.

In a preferred embodiment, the determining, by the network side device, the quantity of resources to be actually used according to the first quantity of resources and the quantity of preconfigured resources, includes: when the first quantity of resources is greater than the quantity of the preconfigured resources, the quantity of the resources to be actually used is equal to the quantity of the preconfigured resources.

In a preferred embodiment, in the act of receiving, by the network side device, the uplink control information using the quantity of the resources to be actually used, what is received is the uplink control information to be received.

In a preferred embodiment, the determining, by the network side device, the quantity of resources to be actually used according to the first quantity of resources and the quantity of preconfigured resources, includes: determining, by the network side device, a second quantity of bits of uplink control information according to the target code rate and the quantity of the preconfigured resources when the first quantity of resources is greater than the quantity of the preconfigured resources.

In a preferred embodiment, the determining, by the network side device, the second quantity of bits of the uplink control information according to the target code rate and the

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quantity of the preconfigured resources, includes: the quantity of the resources to be actually used is equal to the quantity of the preconfigured resources.

In a preferred embodiment, the determining, by the network side device, the second quantity of bits of the uplink control information according to the target code rate and the quantity of the preconfigured resources, includes: determining, by the network side device, a third quantity of resources according to the target code rate and a quantity of bits of new uplink control information to be transmitted, wherein the new uplink control information to be transmitted is obtained after signaling compression is performed on the uplink control information to be transmitted, and the quantity of bits of the new uplink control information to be transmitted is not greater than the second quantity of bits of the uplink control information; and the quantity of the resources to be actually used is equal to the third quantity of resources.

The present application further discloses a terminal, which includes: a signaling bit quantity determination module, used for determining a quantity N of bits of uplink control information to be transmitted; a first quantity of resources determination module, used for determining a first quantity of resources according to a target code rate and the N; a practical resource quantity determination module, used for determining a quantity of resources to be actually used according to the first quantity of resources and a quantity of preconfigured resources, wherein the quantity of the resources to be actually used is not greater than the quantity of the preconfigured resources; and a transmission module, used for transmitting uplink control information by using the quantity of the resources to be actually used.

In a preferred embodiment, the practical resource quantity determination module is further used for determining the quantity of the resources to be actually used and uplink control information to be actually transmitted according to the first quantity of resources and the quantity of the preconfigured resources, wherein a quantity of bits of the uplink control information to be actually transmitted is not greater than N.

In a preferred embodiment, the target code rate is configured by a network side device; the quantity of the preconfigured resources and the first quantity of resources include: a quantity of frequency domain resource blocks occupied by an uplink control channel; or a quantity of resource elements occupied by an uplink control channel.

In a preferred embodiment, the quantity of the preconfigured resources is determined by one of the following manners: indicating through a higher layer signaling; or preconfiguring at least one available resource through a higher layer signaling, and indicating one of the at least one available resource through downlink control information.

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In a preferred embodiment, the practical resource quantity determination module is further used for, when the first quantity of resources is not greater than the quantity of the preconfigured resources, the quantity of the resources to be actually used is equal to the first quantity of resources.

In a preferred embodiment, the terminal determines that the resources to be actually used are first Q resources of the preconfigured resources, and the Q is the first quantity of resources.

In a preferred embodiment, the practical resource quantity determination module is further used for, when the first quantity of resources is greater than the quantity of the preconfigured resources, the quantity of the resources to be actually used is equal to the quantity of the preconfigured resources.

In a preferred embodiment, what the transmission module transmits is the uplink control information to be transmitted.

In a preferred embodiment, the practical resource quantity determination module is further used for determining a second quantity of bits of uplink control information according to the target code rate and the quantity of the preconfigured resources when the first quantity of resources is greater than the quantity of the preconfigured resources.

In a preferred embodiment, further including: a signaling compression module, used for performing signaling compression on the uplink control information to be transmitted, and obtaining new uplink control information to be transmitted, wherein a quantity of bits of the new uplink control information to be transmitted is not greater than the second quantity of bits of the uplink control information.

In a preferred embodiment, the quantity of the resources to be actually used is equal to the quantity of the preconfigured resources; or the terminal determines a third quantity of resources according to the target code rate and the quantity of bits of the new uplink control information to be transmitted; wherein the quantity of the resources to be actually used is equal to the third quantity of resources.

In a preferred embodiment, the uplink control information transmitted by the transmission module is the new uplink control information to be transmitted.

The present application further discloses a network side device, which includes: a signaling bit quantification module, used for determining a quantity N of bits of uplink control information to be received; a first resource quantification module, used for determining a first quantity of resources according to a target code rate and the N; a practical resource

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quantification module, used for determining a quantity of resources to be actually used according to the first quantity of resources and a quantity of preconfigured resources, wherein the quantity of the resources to be actually used is not greater than the quantity of the preconfigured resources; and a receiving module, used for receiving uplink control information using the quantity of the resources to be actually used.

In a preferred embodiment, the quantity of the preconfigured resources and the first quantity of resources include: a quantity of frequency domain resource blocks occupied by an uplink control channel; or a quantity of resource elements occupied by an uplink control channel.

In a preferred embodiment, the quantity of the preconfigured resources is determined by one of the following manners: indicating through a higher layer signaling; or preconfiguring at least one available resource through a higher layer signaling, and indicating one of the at least one available resource through downlink control information.

In a preferred embodiment, the practical resource quantification module is further used for, when the first quantity of resources is not greater than the quantity of the preconfigured resources, the quantity of the resources to be actually used is equal to the first quantity of resources.

In a preferred embodiment, the resources to be actually used are first Q resources of the preconfigured resources, and the Q is the first quantity of resources.

In a preferred embodiment, the practical resource quantification module is further used for, when the first quantity of resources is greater than the quantity of the preconfigured resources, the quantity of the resources to be actually used is equal to the quantity of the preconfigured resources.

In a preferred embodiment, what the receiving module receives is the uplink control information to be received.

In a preferred embodiment, the practical resource quantification module is further used for, the network side device determines a second quantity of bits of uplink control information according to the target code rate and the quantity of the preconfigured resources when the first quantity of resources is greater than the quantity of the preconfigured resources.

In a preferred embodiment, the quantity of the resources to be actually used is equal to the quantity of the preconfigured resources.

In a preferred embodiment, the practical resource quantification module is further used

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for determining a third quantity of resources according to the target code rate and a quantity of bits of new uplink control information to be transmitted, wherein the new uplink control information to be transmitted is obtained after signaling compression is performed on the uplink control information to be transmitted, and the quantity of bits of the new uplink control information to be transmitted is not greater than the second quantity of bits of the uplink control information; and the quantity of the resources to be actually used is equal to the third quantity of resources.

Compared with the related art, the embodiments of the present application may effectively prevent the problem of waste of time-frequency resources when a value range of a size of UCI actually transmitted is very large.

A large number of technical features are recorded in the specification of the present application and distributed in various technical solutions. If all possible combinations of technical features (i.e. technical solutions) of the present application are listed, the specification will be too lengthy. In order to avoid the problem, various technical features disclosed in the summary of the present application, various technical features disclosed in the following embodiments and examples, and various technical features disclosed in the drawings may be freely combined with each other to form various new technical solutions (all of which are deemed to have been recorded in the specification), unless such combination of technical features is not technically feasible. For example, if feature A+B+C is disclosed in one example, feature A+B+D+E is disclosed in another example, and features C and D are equivalent technical means that play the same role, and technically, one of C and D may be chosen and C and D cannot be used at the same time, and feature E may be technically combined with feature C, then the solution of A+B+C+D should not be considered as already recorded because of technical infeasibility, while the solution of A+B+C+E should be considered as already recorded.

Brief Description of Drawings

FIG. 1 is a flowchart of a method for determining uplink control channel resources in a first embodiment of the present invention.

FIG. 2 is a flowchart of a method for determining uplink control channel resources in a second embodiment of the present invention.

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Detailed Description

In the following description, many technical details are set forth in order to enable readers to better understand the present application. However, one of ordinary skill in the art may understand that technical solutions claimed in the present application may be realized even without these technical details and various variations and modifications based on the following embodiments.

Description of some concepts is as follows.

5G: 5th Generation Mobile Communication Technology.

NR: Radio Access Part of 5G (5th Generation Mobile Communication Technology), abbreviation for New Radio.

PUCCH: abbreviation for Physical Uplink Control Channel.

SR: uplink Scheduling Request, abbreviation for Scheduling Request.

OFDM: abbreviation for Orthogonal Frequency Division Multiplexing.

UCI: abbreviation for Uplink Control Information.

PRB: abbreviation for Physical Resource Block.

The following outlines some of innovations of the present application.

A terminal determines a first quantity of resources according to a quantity N of bits of uplink control information to be transmitted and a target code rate, and if the first quantity of resources is less than or equal to a quantity of preconfigured resources, the first quantity of resources is used as a quantity of resources to be actually used to transmit the N-bit uplink control information. If the first quantity of resources is greater than the quantity of the preconfigured resources, then an upper limit of a quantity of bits of uplink control information allowed to be transmitted by the quantity of the preconfigured resources is determined. According to the upper limit and the target code rate, the quantity T of bits of the uplink control information to be transmitted (at this time, a specific content of the uplink control information is also changed correspondingly) is re-determined by means of signaling compression, etc. (a specific manner of signaling compression is not limited in the present invention). Then, the previous N is replaced by the T and the method is iterated to finally determine the quantity of the resources to be actually used. In this way, a problem of resource waste caused by mismatch between a semi-statically determined quantity of pre-configured resources and the quantity of the resources actually used is avoided.

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The above contents are only some innovations of the present invention, and other innovations and many variations are described in detail in the following embodiments.

In order to make objects, technical solutions, and advantages of the present application clearer, the embodiments of the present application will be described in further detail below with reference to the accompanying drawings.

A first embodiment of the present invention relates to a method for determining uplink control channel resources. FIG. 1 is a flowchart of the method for determining uplink control channel resources. The method for determining uplink control channel resources includes acts 101-104.

In act 101, a terminal determines a quantity N of bits of uplink control information to be transmitted, wherein N is a positive integer.

After that, entering act 102, the terminal determines a first quantity of resources according to a target code rate and N. Optionally, the target code rate may be configured by a network side device. Optionally, the target code rate may be predetermined according to a protocol.

After that, entering act 103, the terminal determines a quantity of resources to be actually used and uplink control information to be actually transmitted according to the first quantity of resources and a quantity of preconfigured resources, wherein the quantity of the resources to be actually used is not greater than the quantity of the preconfigured resources and a quantity of bits of uplink control information to be actually transmitted is not greater than N. The act of determining the uplink control information to be actually transmitted is optional, or in other words, only the quantity of the resources to be actually used may be determined, and the uplink control information to be actually transmitted may be the uplink control information to be transmitted without re-determination.

After that, entering act 104, the terminal transmits uplink control information using the quantity of the resources to be actually used. Optionally, what is actually transmitted is the uplink control information to be transmitted initially. Optionally, what is actually transmitted is new uplink control information after a processing such as signaling compression.

When a value range of a size of UCI actually transmitted is very large, the problem of waste of time-frequency resources may be effectively prevented.

Terminals may be various, such as smart phones, tablet computers, desktop computers, notebook computers, customized wireless terminals, Internet of Things nodes, wireless

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communication modules, etc., as long as wireless communication may be performed with a network side according to an agreed communication protocol.

There are many possibilities for the quantity of the preconfigured resources and the first quantity of resources, for example, a quantity of frequency domain resource blocks occupied by an uplink control channel, a quantity of resource elements occupied by an uplink control channel, etc.

There are many ways for determining the quantity of the preconfigured resources, for example, indicating through a higher layer signaling; or, preconfiguring at least one available resource through a higher layer signaling, and indicating one of the at least one available resource through downlink control information.

The act 103 may be implemented in various ways. The following are examples.

Optionally, when the first quantity of resources is not greater than the quantity of the preconfigured resources, the quantity of the resources to be actually used is equal to the first quantity of resources (assuming that the first quantity of resources is Q), wherein the resources to be actually used may be first Q resources, last Q resources, or Q resources in other agreed positions of the preconfigured resources, etc.

Optionally, when the first quantity of resources is greater than the quantity of the preconfigured resources, the quantity of the resources to be actually used is equal to the quantity of the preconfigured resources. At this time, the uplink control information to be transmitted (i.e., the N-bit uplink control information to be transmitted in the act 101) is transmitted in the act 104.

Optionally, when the first quantity of resources is greater than the quantity of the preconfigured resources, the terminal determines a second quantity of bits of uplink control information according to the target code rate and the quantity of the preconfigured resources. Signaling compression needs to be performed on the uplink control information to be transmitted to obtain new uplink control information to be transmitted, and a quantity of bits of the new uplink control information to be transmitted is less than or equal to the second quantity of bits of the uplink control information. The quantity of the resources to be actually used is equal to the quantity of the preconfigured resources.

Optionally, when the first quantity of resources is greater than the quantity of the preconfigured resources, the terminal determines a second quantity of bits of uplink control information according to the target code rate and the quantity of the preconfigured resources.

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Signaling compression needs to be performed on the uplink control information to be transmitted to obtain new uplink control information to be transmitted, and a quantity of bits of the new uplink control information to be transmitted is less than or equal to the second quantity of bits of the uplink control information. Further, replacing a position of N in the act 101 with the quantity T of bits of the new uplink control information to be transmitted, the entire flow returns from the act 103 to the act 101. Specifically, the terminal determines a third quantity of resources according to the target code rate and the quantity of bits of the new uplink control information to be transmitted. The quantity of the resources to be actually used is equal to the third quantity of resources. The transmitted uplink control information is the new uplink control information to be transmitted.

In order to explain the embodiment more clearly and in detail, several specific examples are described below.

Embodiment one: the terminal determines that a target code rate is $r_{\max}=1/2$, and a quantity N of bits of uplink control information to be transmitted is equal to 8. The quantity of the preconfigured resources is 2 PRBs (each PRB includes 12 carriers). The terminal uses 2 symbols of PUCCH to transmit uplink control information (i.e. occupying 2 time domain symbols), wherein overhead of reference signals contained in the PUCCH is 1/3, and the PUCCH adopts QPSK modulation, and a corresponding modulation level Q is equal to 2.

The terminal determines that the first quantity of resources is $\left\lceil \frac{N}{r_{\max}\cdot Q\cdot N_{UCI\_RE}} \right\rceil = \left\lceil \frac{8}{1/2\cdot 2\cdot (12\cdot 2\cdot 2/3)} \right\rceil = 1$, wherein N_{UCI_RE} is a quantity of REs occupied by UCI in a PRB.

The first quantity of resources is less than the quantity of the preconfigured resources, and the terminal determines to transmit the uplink control information using one PRB.

Embodiment two: the terminal determines that a target code rate is $r_{\max}=1/8$, and a quantity N of bits of uplink control information to be transmitted is equal to 10. The quantity of the preconfigured resources is 2 PRBs (each PRB includes 12 carriers). The terminal uses 2 symbols of PUCCH to transmit uplink control information (i.e. occupying 2 time domain symbols), wherein overhead of reference signals contained in the PUCCH is 1/3, and the PUCCH adopts QPSK modulation, and a corresponding modulation level Q is equal to 2.

The terminal determines that the first quantity of resources is

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$\left\lceil \frac{N}{r_{\max} \cdot Q \cdot N_{UCI\_RE}} \right\rceil = \left\lceil \frac{10}{1/8 \cdot 2 \cdot (12 \cdot 2 \cdot 2/3)} \right\rceil = 3$, wherein N_{UCI_RE} is a quantity of REs occupied by UCI in a PRB.

The first quantity of resources is greater than the quantity of the preconfigured resources, and the terminal determines that the second quantity of bits of the uplink control information is $T = \lfloor r_{\max} \cdot Q \cdot N_{UCI\_RE} \cdot N_{configured} \rfloor = \lfloor 1/8 \cdot 2 \cdot (12 \cdot 2 \cdot 2/3) \cdot 2 \rfloor = 8$, wherein $N_{configured}$ is the quantity of the preconfigured resources.

The terminal compresses the bits of the uplink control information to be transmitted to obtain new uplink control information to be transmitted, of which a quantity of bits is not greater than 8. The terminal transmits the new uplink control information to be transmitted.

Embodiment three: based on the Embodiment two, if due to limitation of UCI compression manner, the terminal determines that a quantity of bits of uplink control information to be actually transmitted is $T < \lfloor r_{\max} \cdot Q \cdot N_{UCI\_RE} \cdot N_{configured} \rfloor$, and it is assumed that T=4.

The terminal further determines a quantity of resources actually needed to transmit the 4-bit uplink control information $\left\lceil \frac{N}{r_{\max} \cdot Q \cdot N_{UCI\_RE}} \right\rceil = \left\lceil \frac{4}{1/8 \cdot 2 \cdot (12 \cdot 2 \cdot 2/3)} \right\rceil = 1$.

The terminal determines to use one PRB to transmit the 4-bit compressed uplink control information.

A second embodiment of the present invention relates to a method for determining uplink control channel resources.

The first embodiment is a method at a terminal side for determining uplink control channel resources, and the second embodiment is a method at a network side for determining uplink control channel resources. Technical concepts of the two embodiments are the same, but locations of the implementations are different, and relevant details may be used interchangeably. FIG. 2 is a flowchart of the method for determining uplink control channel resources.

In act 201, a network side device determines a quantity N of bits of uplink control information to be received, wherein N is a positive integer.

After that, entering act 202, the network side device determines a first quantity of resources according to a target code rate and N. Optionally, the target code rate may be configured by a network side device. Optionally, the target code rate may be predetermined

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according to a protocol.

After that, entering act 203, the network side device determines a quantity of resources to be actually used according to the first quantity of resources and a quantity of preconfigured resources, wherein the quantity of the resources to be actually used is not greater than the quantity of the preconfigured resources.

After that, entering act 204, the network side device receives uplink control information using the quantity of the resources to be actually used.

There are many possibilities for the quantity of the preconfigured resources and the first quantity of resources, for example, a quantity of frequency domain resource blocks occupied by an uplink control channel, a quantity of resource elements occupied by an uplink control channel, etc.

There are many ways for determining the quantity of the preconfigured resources, for example, indicating through a higher layer signaling; or, preconfiguring at least one available resource through a higher layer signaling, and indicating one of the at least one available resource through downlink control information.

The act 203 may be implemented in various ways. The following are examples.

Optionally, when the first quantity of resources is not greater than the quantity of the preconfigured resources, the quantity of the resources to be actually used is equal to the first quantity of resources (assuming that the first quantity of resources is Q), wherein the resources to be actually used may be first Q resources, last Q resources, or Q resources in other agreed positions of the preconfigured resources, etc.

Optionally, when the first quantity of resources is greater than the quantity of the preconfigured resources, the quantity of the resources to be actually used is equal to the quantity of the preconfigured resources. In this case, in the act 204, what is actually received is uplink control information of N bits.

Optionally, when the first quantity of resources is greater than the quantity of the preconfigured resources, the network side device determines a second quantity of bits of uplink control information according to the target code rate and the quantity of the preconfigured resources. The quantity of the resources to be actually used is equal to the quantity of the preconfigured resources. In this case, in the act 204, what is actually received is uplink control information after signaling compression.

Optionally, when the first quantity of resources is greater than the quantity of the

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preconfigured resources, the network side device determines a second quantity of bits of uplink control information according to the target code rate and the quantity of the preconfigured resources. The network side device determines a third quantity of resources according to the target code rate and a quantity of bits of new uplink control information to be received, wherein the new uplink control information to be received is obtained after signaling compression is performed on the uplink control information to be received, and the quantity of bits of the new uplink control information to be received is not greater than the second quantity of bits of the uplink control information. The quantity of the resources to be actually used is equal to the third quantity of resources. In this case, actually iteration is performed by returning to the act 201 according to the quantity of bits (replacing N in the act 201) of the new uplink control information to be received after signaling compression.

A third embodiment of the present invention relates to a terminal. The terminal includes following modules.

A signaling bit quantity determination module is used for determining a quantity N of bits of uplink control information to be transmitted.

A first quantity of resources determination module is used for determining a first quantity of resources according to a target code rate and N. Optionally, the target code rate may be configured by a network side device. Optionally, the target code rate may be predetermined according to a protocol.

A practical resource quantity determination module is used for determining a quantity of resources to be actually used and uplink control information to be actually transmitted according to the first quantity of resources and a quantity of preconfigured resources, wherein the quantity of the resources to be actually used is not greater than the quantity of the preconfigured resources and a quantity of bits of the uplink control information to be actually transmitted is not greater than N. The determination for the uplink control information to be actually transmitted is optional.

A signaling compression module is used for performing signaling compression on the uplink control information to be transmitted to obtain new uplink control information to be transmitted. The signaling compression module is optional.

A transmission module is used for transmitting uplink control information by using the quantity of the resources to be actually used. Optionally, what is actually transmitted is uplink control information to be transmitted initially. Optionally, what is actually transmitted is new

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uplink control information after a processing such as signaling compression.

There are many possibilities for the quantity of the preconfigured resources and the first quantity of resources, for example, a quantity of frequency domain resource blocks occupied by an uplink control channel, a quantity of resource elements occupied by an uplink control channel, etc.

There are many ways for determining the quantity of the preconfigured resources, for example, indicating through a higher layer signaling; or, preconfiguring at least one available resource through a higher layer signaling, and indicating one of the at least one available resource through downlink control information.

The practical resource quantity determination module has many ways for implementation, and the following are examples.

Optionally, when the practical resource quantity determination module determines that the first quantity of resources is not greater than the quantity of the preconfigured resources, the quantity of the resources to be actually used is equal to the first quantity of resources (assuming that the first quantity of resources is Q), wherein the resources to be actually used may be first Q resources, last Q resources, or Q resources in other agreed positions of the preconfigured resources, etc.

Optionally, when the practical resource quantity determination module determines that the first quantity of resources is greater than the quantity of the preconfigured resources, the quantity of the resources to be actually used is equal to the quantity of the preconfigured resources. In this case, what the transmission module transmits is the uplink control information to be transmitted.

Optionally, when the practical resource quantity determination module determines that the first quantity of resources is greater than the quantity of the preconfigured resources, the terminal determines a second quantity of bits of uplink control information according to the target code rate and the quantity of the preconfigured resources. In this case, the signaling compression module performs signaling compression on the uplink control information to be transmitted to obtain the new uplink control information to be transmitted, wherein a quantity of bits of the new uplink control information to be transmitted is not greater than the second quantity of bits of the uplink control information. The quantity of the resources to be actually used is equal to the quantity of the preconfigured resources.

Optionally, when the practical resource quantity determination module determines that

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the first quantity of resources is greater than the quantity of the preconfigured resources, the terminal determines a second quantity of bits of uplink control information according to the target code rate and the quantity of the preconfigured resources. In this case, the signaling compression module performs signaling compression on the uplink control information to be transmitted to obtain the new uplink control information to be transmitted, wherein a quantity of bits of the new uplink control information to be transmitted is not greater than the second quantity of bits of the uplink control information. The terminal determines a third quantity of resources according to the target code rate and the quantity of bits of the new uplink control information to be transmitted. The quantity of the resources to be actually used is equal to the third quantity of resources. The uplink control information transmitted by the transmission module is the new uplink control information to be transmitted.

The first embodiment is a method embodiment corresponding to the embodiment, and the embodiment may be implemented in cooperation with the first embodiment. The relevant technical details mentioned in the first embodiment are still valid in the embodiment, and will not be repeated here in order to reduce repetition. Correspondingly, the relevant technical details mentioned in the embodiment may be applied in the first embodiment.

A fourth embodiment of the present invention relates to a network side device. The network side device includes following modules.

A signaling bit quantification module is used for determining a quantity N of bits of uplink control information to be received.

A first resource quantification module is used for determining a first quantity of resources according to a target code rate and N. Optionally, the target code rate may be configured by the network side device. Optionally, the target code rate may be predetermined according to a protocol.

A practical resource quantification module is used for determining a quantity of resources to be actually used according to the first quantity of resources and a quantity of preconfigured resources, wherein the quantity of the resources to be actually used is not greater than the quantity of the preconfigured resources.

A receiving module is used for receiving uplink control information through the quantity of the resources to be actually used.

There are many possibilities for the quantity of the preconfigured resources and the first quantity of resources, for example, a quantity of frequency domain resource blocks occupied by

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an uplink control channel, a quantity of resource elements occupied by an uplink control channel, etc.

There are many ways for determining the quantity of the preconfigured resources, for example, indicating through a higher layer signaling; or, preconfiguring at least one available resource through a higher layer signaling, and indicating one of the at least one available resource through downlink control information.

The practical resource quantification module has many ways for implementation. The following are examples.

Optionally, when the practical resource quantification module determines that the first quantity of resources is not greater than the quantity of the preconfigured resources, the quantity of the resources to be actually used is equal to the first quantity of resources (assuming that the first quantity of resources is Q), wherein the resources to be actually used may be first Q resources, last Q resources, or Q resources in other agreed positions of the preconfigured resources, etc.

Optionally, when the practical resource quantification module determines that the first quantity of resources is greater than the quantity of the preconfigured resources, the quantity of the resources to be actually used is equal to the quantity of the preconfigured resources. In this case, what the receiving module actually receives is the uplink control information (of N bits) to be received.

Optionally, when the practical resource quantification module determines that the first quantity of resources is greater than the quantity of the preconfigured resources, a second quantity of bits of uplink control information is determined according to the target code rate and the quantity of the preconfigured resources. The quantity of the resources to be actually used is equal to the quantity of the preconfigured resources. In this case, what the receiving module actually receives is uplink control information after signaling compression.

Optionally, when the practical resource quantification module determines that the first quantity of resources is greater than the quantity of the preconfigured resources, a second quantity of bits of uplink control information is determined according to the target code rate and the quantity of the preconfigured resources. A third quantity of resources is determined according to the target code rate and a quantity of bits of new uplink control information to be received, wherein the new uplink control information to be received is obtained after signaling compression is performed on the uplink control information to be received, and the quantity of

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bits of the new uplink control information to be received is not greater than the second quantity of bits of the uplink control information. The quantity of the resources to be actually used is equal to the third quantity of resources. In this case, what the receiving module actually receives is uplink control information after signaling compression.

The second embodiment is a method embodiment corresponding to the embodiment, and the embodiment may be implemented in cooperation with the second embodiment. The relevant technical details mentioned in the second embodiment are still valid in the embodiment, and will not be repeated here in order to reduce repetition. Correspondingly, the relevant technical details mentioned in the embodiment may be applied in the second embodiment.

Various method embodiments of the present invention may be implemented in software, hardware, firmware, etc. Whether the present invention is implemented in software, hardware or firmware, codes of instructions may be stored in any type of computer accessible memory (e.g., permanent or modifiable, volatile or nonvolatile, solid or non-solid, fixed or replaceable medium). Similarly, the memory may be, for example, a Programmable Array Logic (PAL), a Random Access Memory (RAM), a Programmable Read Only Memory (PROM), a Read-Only Memory (ROM), an electrically erasable programmable ROM (EEPROM), a magnetic disk, an optical disk, or a Digital Versatile Disc (DVD).

It should be noted that various units mentioned in various device embodiments of the present invention are logical units. Physically, a logical unit may be a physical unit, a part of a physical unit, or a combination of multiple physical units. Physical implementations of these logical units are not the most important. A combination of functions implemented by these logical units is a key to solving the technical problem raised by the present invention. In addition, in order to highlight innovative parts of the present invention, the device embodiments of the present invention do not introduce units that are not closely related to solving the technical problem raised by the present invention, which does not mean that there are no other units in the device embodiments.

It should be noted that in the present application documents of the patent, relational terms such as first and second etc. are only used to distinguish one entity or operation from another entity or operation, and do not necessarily require or imply any such actual relationship or order between these entities or operations. Moreover, the terms "include", "contain" or any other variation thereof are intended to cover a non-exclusive inclusion, such that a process, method, article, or device that includes a list of elements not only includes those elements but also includes other elements not expressly listed, or further includes elements inherent to such

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process, method, article, or device. Without further restrictions, an element defined by a statement "include one" does not exclude presence of another identical element in the process, method, article or device that includes the element. In the present application document of the patent, if it is mentioned that an act is executed according to an element, it means that the act is executed according to at least the element, which includes two cases: the act is executed only according to the element, and the act is executed according to the element and another element. Multiple, multiple times, multiple types and other expressions include two, two times, two types, two or more, two times or more, two types or more.

It should be understood that after reading the teachings of the present application, those skilled in the art may make various variations or modifications to the present application, and these equivalent forms also fall within the scope of protection claimed in the present application.

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What is claimed is:

1. A method for determining uplink control channel resources, comprising:

determining, by a terminal, a first quantity of resources according to a target code rate and a quantity N of bits of uplink control information to be transmitted;

when the first quantity of resources is less than or equal to a quantity of preconfigured resources, transmitting, by the terminal, the uplink control information by using the first quantity of resources;

when the first quantity of resources is greater than the quantity of the preconfigured resources,

calculating, by the terminal, a second quantity of bits of uplink control information according to the target code rate and the quantity of the preconfigured resources;

performing signaling compression on the uplink control information to be transmitted, and obtaining new uplink control information to be transmitted, wherein a quantity of bits of the new uplink control information to be transmitted is less than or equal to the second quantity of bits of uplink control information; and

transmitting, by the terminal, the new uplink control information by using the quantity of preconfigured resources.

2. The method for determining uplink control channel resources according to claim 1, wherein the target code rate is configured by a network side device.

3. The method for determining uplink control channel resources according to claim 1, wherein the quantity of the preconfigured resources and the first quantity of resources comprise:

a quantity of frequency domain resource blocks occupied by an uplink control channel; or

a quantity of resource elements occupied by an uplink control channel.

4. The method for determining uplink control channel resources according to claim 1, wherein the quantity of the preconfigured resources is determined by one of the following manners:

indicating through a higher layer signaling; or

preconfiguring at least one available resource through a higher layer signaling, and indicating one of the at least one available resource through downlink control information.

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5. The method for determining uplink control channel resources according to claim 1, wherein the terminal transmits the uplink control information by using first Q resources of the preconfigured resources, and the Q is the first quantity of resources.

6. A method for determining uplink control channel resources, comprising:

determining, by a network side device, a first quantity of resources according to a target code rate and a quantity N of bits of uplink control information to be received;

when the first quantity of resources is less than or equal to a quantity of preconfigured resources, receiving, by the network side device, the uplink control information by using the first quantity of resources;

when the first quantity of resources is greater than the quantity of the preconfigured resources,

receiving, by the network side device, new uplink control information by using the quantity of preconfigured resources, wherein the new uplink control information to be received is generated by signaling compression on the uplink control information to be received, and the quantity of bits of the new uplink control information to be received is less than or equal to a second quantity of bits of uplink control information which is calculated according to the target code rate and the quantity of the preconfigured resources.

7. The method for determining uplink control channel resources according to claim 6, wherein the quantity of the preconfigured resources and the first quantity of resources comprise:

a quantity of frequency domain resource blocks occupied by an uplink control channel; or

a quantity of resource elements occupied by an uplink control channel.

8. The method for determining uplink control channel resources according to claim 6, wherein the quantity of the preconfigured resources is determined by one of the following manners:

indicating through a higher layer signaling; or

preconfiguring at least one available resource through a higher layer signaling, and indicating one of the at least one available resource through downlink control information.

9. The method for determining uplink control channel resources according to claim 6, wherein the network side device receives the uplink control information by using first Q resources of the preconfigured resources, and the Q is the first quantity of resources.

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10. A terminal, comprising a processor and a memory, wherein the memory is configured to store a computer program and the processor is configured to call and execute the computer program stored in the memory to perform the method according to any one of claims 1-5.

11. A network side device, comprising a processor and a memory, wherein the memory is configured to store a computer program and the processor is configured to call and execute the computer program stored in the memory to perform the method according to any one of claims 6-9.

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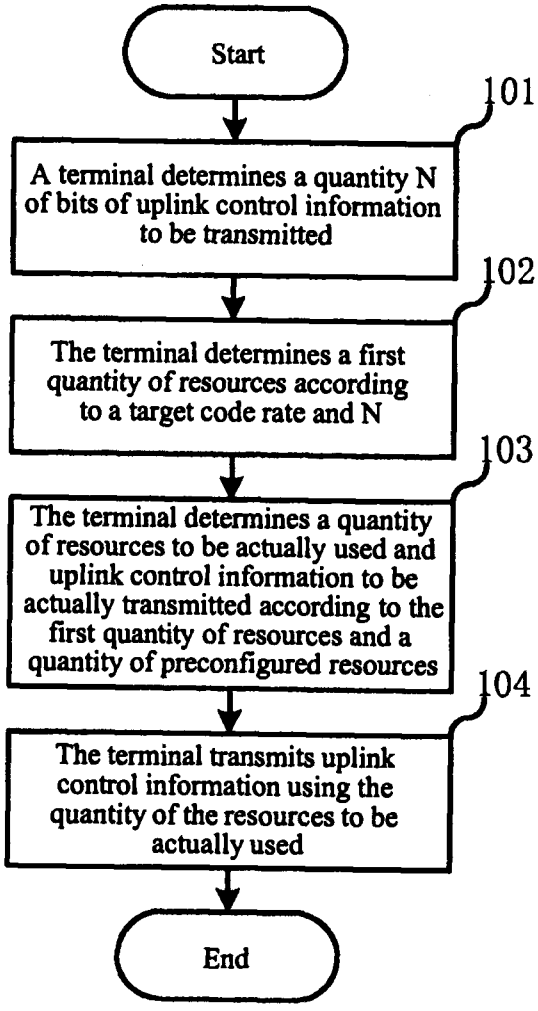

Start
101
A terminal determines a quantity N of bits of uplink control information to be transmitted
102
The terminal determines a first quantity of resources according to a target code rate and N
103
The terminal determines a quantity of resources to be actually used and uplink control information to be actually transmitted according to the first quantity of resources and a quantity of preconfigured resources
104
The terminal transmits uplink control information using the quantity of the resources to be actually used
End

FIG. 1

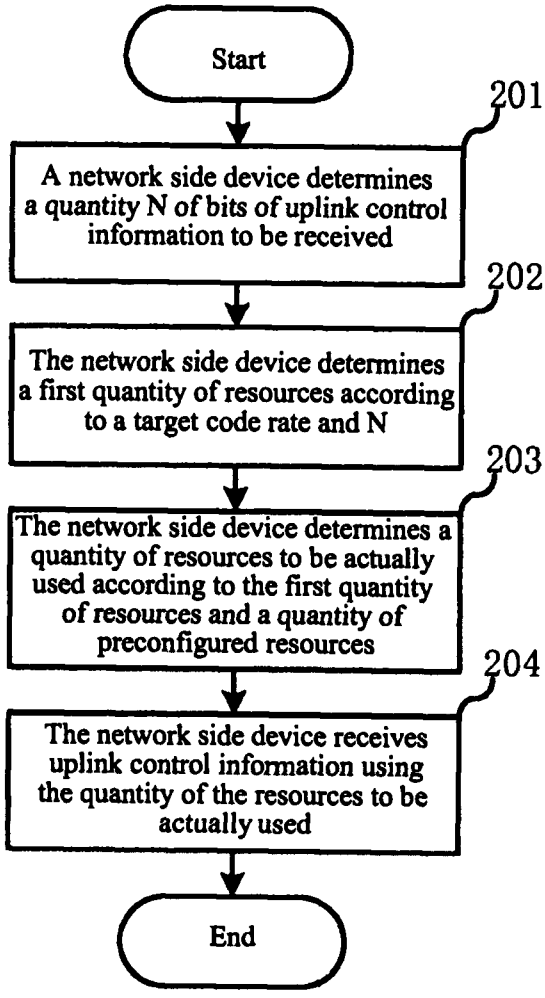
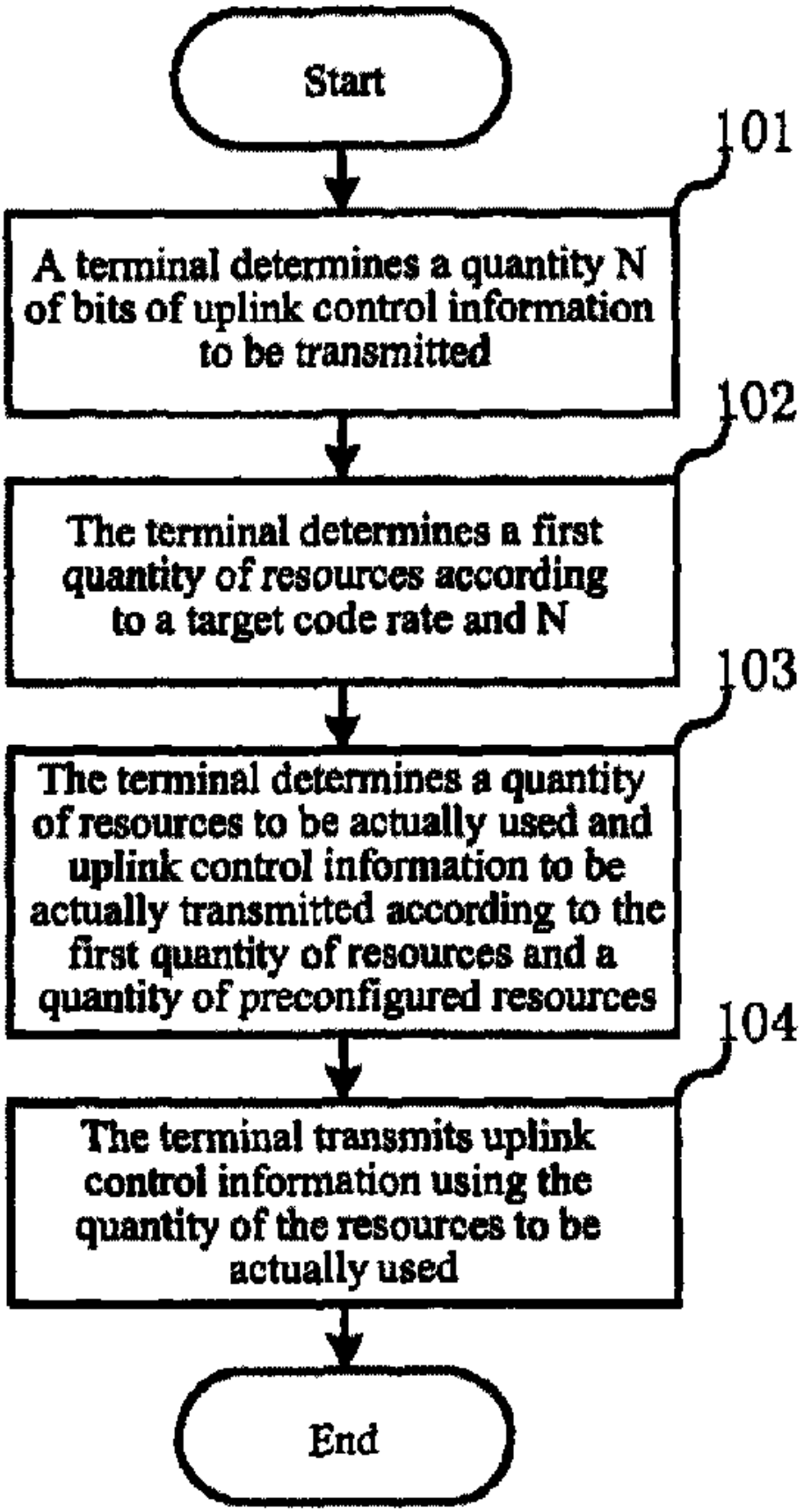

Start
201
A network side device determines a quantity N of bits of uplink control information to be received
202
The network side device determines a first quantity of resources according to a target code rate and N
203
The network side device determines a quantity of resources to be actually used according to the first quantity of resources and a quantity of preconfigured resources
204
The network side device receives uplink control information using the quantity of the resources to be actually used
End

FIG. 2


Start
101
A terminal determines a quantity N of bits of uplink control information to be transmitted
102
The terminal determines a first quantity of resources according to a target code rate and N
103
The terminal determines a quantity of resources to be actually used and uplink control information to be actually transmitted according to the first quantity of resources and a quantity of preconfigured resources
104
The terminal transmits uplink control information using the quantity of the resources to be actually used
End