

TRANSMISSION BLOCK PROCESSING METHOD AND APPARATUS, ELECTRONIC DEVICE AND COMPUTER-READABLE STORAGE MEDIUM

TECHNICAL FIELD

[001] The present disclosure relates to the field of communication technologies, and in particular, to methods, apparatuses, electronic devices and computer-readable storage media for processing transmission blocks.

BACKGROUND

[002] Internet of Things (IoT) grows rapidly in recent years. A Machine Type Communication (MTC) technology and a Narrow Band Internet of Things (NB-IoT) technology are typical representatives of cellular Internet of Things technologies. Since the MTC/NB-IoT is widely applied to scenarios (for example, data collection) that mostly do not require high communication capabilities, user equipment for the MTC/NB-IoT doesn't require high communication capability. Thus, for the sake of cost, compared with an ordinary mobile phone, the user equipment for the MTC/NB-IoT allows a great decline in processing capability.

[003] In an MTC/NB-IoT application scenario, for being transmitted from or received by the user equipment, a data packet is divided into a plurality of transmission blocks (TBs). Each transmission block is scheduled through an individual signaling on which a respective blind detection is performed by the user equipment, which results in more power consumption.

[004] In order to overcome the above problems, in a related art, a plurality of transmission blocks are continuously scheduled through one signaling, so that a number of the blind detections performed by a user can be reduced. However, other problems may be introduced due to insufficient processing capabilities of the user equipment.

SUMMARY

[005] In view of the above, embodiments of the present disclosure provides methods and apparatuses for processing transmission blocks, electronic devices, and computer-readable storage media.

[006] According to a first aspect of the embodiments of the present disclosure, a method of processing transmission blocks, applied to user equipment, includes:

[007] receiving a scheduling signaling from a base station, where the scheduling signaling is configured to schedule a plurality of transmission blocks; and

[008] transmitting the plurality of transmission blocks to the base station and/or receiving the plurality of transmission blocks from the base station, where two adjacent transmission

blocks of the plurality of transmission blocks are spaced by a preset time interval.

[009] In some embodiments, the method further includes:

[010] before transmitting the plurality of transmission blocks to the base station or receiving the plurality of transmission blocks from the base station, determining the preset time interval based on a communication protocol with the base station.

[011] In some embodiments, the method further includes:

[012] before transmitting the plurality of transmission blocks to the base station or receiving the plurality of transmission blocks from the base station, determining the preset time interval based on data processing capability information of the user equipment; and

[013] sending the preset time interval to the base station.

[014] In some embodiments, sending the preset time interval to the base station includes:

[015] determining indication information corresponding to the preset time interval based on a pre-stored first association relationship between preset time intervals and indication information; and

[016] sending the indication information to the base station;

[017] where the first association relationship is pre-stored in the base station.

[018] In some embodiments, the method further includes:

[019] before transmitting the plurality of transmission blocks to the base station or receiving the plurality of transmission blocks from the base station, receiving the preset time interval from the base station.

[020] In some embodiments, receiving the preset time interval from the base station includes:

[021] receiving a data size of transmission block from the base station; and

[022] determining the preset time interval corresponding to the data size based on a pre-stored second association relationship between data sizes and preset time intervals;

[023] where the second association relationship is pre-stored in the base station.

[024] In some embodiments, receiving the preset time interval from the base station includes:

[025] determining the preset time interval by receiving a radio resource control signaling and/or a physical downlink control channel message.

[026] In some embodiments, receiving the preset time interval from the base station includes:

[027] determining a plurality of time intervals by receiving a radio resource control signaling; and

[028] determining the preset time interval from the plurality of time intervals by receiving a physical downlink control channel message.

[029] In some embodiments, receiving the preset time interval from the base station includes:

[030] determining a plurality of time intervals based on data processing capability information of the user equipment; and

[031] determining the preset time interval from the plurality of time intervals by receiving a radio resource control signaling or a physical downlink control channel message.

[032] In some embodiments, receiving the preset time interval from the base station includes:

[033] receiving a data size of transmission block from the base station;

[034] determining a plurality of time intervals based on the data size; and

[035] determining the preset time interval from the plurality of time intervals by receiving a radio resource control signaling or a physical downlink control channel message.

[036] According to a second aspect of the embodiments of the present disclosure, a method of processing transmission blocks, applied to a base station, includes:

[037] sending a scheduling signaling to user equipment, where the scheduling signaling is configured to schedule a plurality of transmission blocks; and

[038] transmitting the plurality of transmission blocks to the user equipment and/or receiving the plurality of transmission blocks from the user equipment, where two adjacent transmission blocks of the plurality of transmission blocks are spaced by a preset time interval.

[039] In some embodiments, the method further includes:

[040] before transmitting the plurality of transmission blocks to the user equipment or receiving the plurality of transmission blocks from the user equipment, determining the preset time interval based on a communication protocol with the user equipment.

[041] In some embodiments, the method further includes:

[042] before transmitting the plurality of transmission blocks to the user equipment or receiving the plurality of transmission blocks from the user equipment, receiving the preset time interval from the user equipment.

[043] In some embodiments, receiving the preset time interval from the user equipment includes:

[044] receiving indication information corresponding to the preset time interval from the user equipment; and

[045] determining the preset time interval corresponding to the indication information based on a pre-stored first association relationship between preset time intervals and indication information.

[046] In some embodiments, the method further includes:

[047] before transmitting the plurality of transmission blocks to the user equipment or receiving the plurality of transmission blocks from the user equipment, sending the preset time interval to the user equipment.

[048] In some embodiments, sending the preset time interval to the user equipment includes:

[049] determining a data size of transmission block;

[050] sending the data size to the user equipment; and

[051] determining the preset time interval corresponding to the data size based on a pre-stored second association relationship between data sizes and preset time intervals;

[052] where the second association relationship is pre-stored in the user equipment.

[053] In some embodiments, sending the preset time interval to the user equipment includes:

[054] sending a plurality of time intervals to the user equipment through a radio resource control signaling; and

[055] indicating the preset time interval among the plurality of time intervals to the user equipment through a physical downlink control channel message.

[056] In some embodiments, sending the preset time interval to the user equipment includes:

[057] receiving data processing capability information from the user equipment;

[058] determining a plurality of time intervals based on the data processing capability information;

[059] determining the preset time interval from the plurality of time intervals; and

[060] sending the preset time interval to the user equipment through a radio resource control signaling or a physical downlink control channel message.

[061] In some embodiments, sending the preset time interval to the user equipment includes:

[062] determining a data size of transmission block;

[063] determining a plurality of time intervals based on the data size of transmission block;

[064] determining the preset time interval from the plurality of time intervals; and

[065] sending the preset time interval to the user equipment through a radio resource control signaling or a physical downlink control channel message.

[066] According to a third aspect of the embodiments of the present disclosure, an apparatus for processing transmission blocks, applied to user equipment, includes:

[067] a signaling receiving module, configured to receive a scheduling signaling from a base station, where the scheduling signaling is configured to schedule a plurality of transmission blocks; and

[068] a communicating module, configured to transmit the plurality of transmission blocks

to the base station and/or receive the plurality of transmission blocks from the base station, where two adjacent transmission blocks of the plurality of transmission blocks are spaced by a preset time interval.

[069] In some embodiments, the apparatus further includes:

[070] a first determining module, configured to determine the preset time interval based on a communication protocol with the base station before the communicating module transmits the plurality of transmission blocks to the base station or receives the plurality of transmission blocks from the base station.

[071] In some embodiments, the apparatus further includes:

[072] a second determining module, configured to determine the preset time interval based on data processing capability information of the user equipment before the communicating module transmits the plurality of transmission blocks to the base station or receives the plurality of transmission blocks from the base station; and

[073] an interval sending module, configured to send the preset time interval to the base station.

[074] In some embodiments, the interval sending module includes:

[075] an indication determining submodule, configured to determine indication information corresponding to the preset time interval based on a pre-stored first association relationship between preset time intervals and indication information; and

[076] an indication sending submodule, configured to send the indication information to the base station;

[077] where the first association relationship is pre-stored in the base station.

[078] In some embodiments, the apparatus further includes:

[079] an interval receiving module, configured to receive the preset time interval from the base station before the plurality of transmission blocks are transmitted to the base station or received from the base station.

[080] In some embodiments, the interval receiving module includes:

[081] a data size receiving submodule, configured to receive a data size of transmission block from the base station; and

[082] a correspondence determining module, configured to determine the preset time interval corresponding to the data size based on a pre-stored second association relationship between data sizes and preset time intervals;

[083] where the second association relationship is pre-stored in the base station.

[084] In some embodiments, the interval receiving module includes:

[085] a signaling receiving submodule, configured to determine a plurality of time intervals by receiving a radio resource control signaling; and

[086] a message receiving submodule, configured to determine the preset time interval from the plurality of time intervals by receiving a physical downlink control channel message.

[087] In some embodiments, the interval receiving module includes:

[088] a first interval determining submodule, configured to determine a plurality of time intervals based on data processing capability information of the user equipment; and

[089] a message receiving submodule, configured to determine the preset time interval from the plurality of time intervals by receiving a radio resource control signaling or a physical downlink control channel message.

[090] In some embodiments, the interval receiving module includes:

[091] a data size receiving submodule, configured to receive a data size of transmission block from the base station;

[092] a second interval determining submodule, configured to determine a plurality of time intervals based on the data size; and

[093] a message receiving submodule, configured to determine the preset time interval from the plurality of time intervals by receiving a radio resource control signaling or a physical downlink control channel message.

[094] According to a fourth aspect of the embodiments of the present disclosure, an apparatus for processing transmission blocks, applied to a base station, includes:

[095] a signaling sending module, configured to send a scheduling signaling to user equipment, where the scheduling signaling is configured to schedule a plurality of transmission blocks; and

[096] a communicating module, configured to transmit the plurality of transmission blocks to the user equipment and/or receive the plurality of transmission blocks from the user equipment, where two adjacent transmission blocks of the plurality of transmission blocks are spaced by a preset time interval.

[097] In some embodiments, the apparatus further includes:

[098] an interval determining module, configured to determine the preset time interval based on a communication protocol with the user equipment before the communicating module transmits the plurality of transmission blocks to the user equipment or receives the plurality of transmission blocks from the user equipment.

[0099] In some embodiments, the apparatus further includes:

[0100] an interval receiving module, configured to receive the preset time interval from the user equipment before the communicating module transmits the plurality of transmission blocks to the user equipment or receives the plurality of transmission blocks from the user equipment.

[0101] In some embodiments, the interval receiving module includes:

[0102] an indication receiving submodule, configured to receive indication information corresponding to the preset time interval from the user equipment; and

[0103] a first correspondence determining submodule, configured to determine the preset time interval corresponding to the indication information based on a pre-stored first association relationship between preset time intervals and indication information.

[0104] In some embodiments, the apparatus further includes:

[0105] an interval sending module, configured to send the preset time interval to the user equipment before the communicating module transmits the plurality of transmission blocks to the user equipment or receives the plurality of transmission blocks from the user equipment.

[0106] In some embodiments, the interval sending module includes:

[0107] a data size determining submodule, configured to determine a data size of transmission block;

[0108] a data size sending submodule, configured to send the data size to the user equipment; and

[0109] a second correspondence determining submodule, configured to determine the preset time interval corresponding to the data size based on a pre-stored second association relationship between data sizes and preset time intervals;

[0110] where the second association relationship is pre-stored in the user equipment.

[0111] In some embodiments, the interval sending module includes:

[0112] a signaling sending submodule, configured to send a plurality of time intervals to the user equipment through a radio resource control signaling; and

[0113] a message sending submodule, configured to indicate the preset time interval among the plurality of time intervals to the user equipment through a physical downlink control channel message.

[0114] In some embodiments, the interval sending module includes:

[0115] an information receiving submodule, configured to receive data processing capability information from the user equipment;

[0116] a first interval determining submodule, configured to determine a plurality of time

intervals based on the data processing capability information;

[0117] a second interval determining submodule, configured to determine the preset time interval from the plurality of time intervals; and

[0118] an interval sending submodule, configured to send the preset time interval to the user equipment through a radio resource control signaling or a physical downlink control channel message.

[0119] In some embodiments, the interval sending module includes:

[0120] a data size determining submodule, configured to determine a data size of transmission block;

[0121] a third interval determining submodule, configured to determine a plurality of time intervals based on the data size of transmission block;

[0122] a fourth interval determining submodule, configured to determine the preset time interval from the plurality of time intervals; and

[0123] an interval sending submodule, configured to send the preset time interval to the user equipment through a radio resource control signaling or a physical downlink control channel message.

[0124] According to a fifth aspect of the embodiments of the present disclosure, an electronic device includes:

[0125] a processor; and

[0126] a memory for storing instructions executable by the processor;

[0127] where the processor is configured to perform the method of processing transmission blocks according to any one of the foregoing embodiments.

[0128] According to a sixth aspect of the embodiments of the present disclosure, a computer-readable storage medium having a computer program stored thereon is provided, where when the program is executed by a processor, the steps of the method of processing transmission blocks according to any one of the foregoing embodiments are implemented.

[0129] According to the embodiments of the present disclosure, two adjacent transmission blocks of a plurality of transmission blocks are spaced by a preset time interval. Therefore, compared with the case that the transmission blocks are continuously scheduled in a related art, user equipment can take more time to process a resource corresponding to each of the transmission blocks, so as to ensure that the transmission blocks are transmitted and received well.

BRIEF DESCRIPTION OF THE DRAWINGS

[0130] The drawings related to the description of the embodiments will be briefly introduced to explain the technical solutions provided by the embodiments of the present disclosure more clearly. It is obvious that, the drawings in the following description illustrate only some examples of the present disclosure, and based on these drawings, those of ordinary skill in the art may obtain other drawings without creative work.

[0131] FIG. 1 is a schematic flowchart illustrating a method of processing transmission blocks according to an example of the present disclosure.

[0132] FIG. 2A is a schematic diagram illustrating receiving transmission blocks in the related art.

[0133] FIG. 2B is a schematic diagram illustrating receiving transmission blocks according to an example of the present disclosure.

[0134] FIG. 3 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure.

[0135] FIG. 4 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure.

[0136] FIG. 5 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure.

[0137] FIG. 6 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure.

[0138] FIG. 7 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure.

[0139] FIG. 8 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure.

[0140] FIG. 9 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure.

[0141] FIG. 10 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure.

[0142] FIG. 11 is a schematic flowchart illustrating a method of processing transmission blocks according to an example of the present disclosure.

[0143] FIG. 12 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure.

[0144] FIG. 13 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure.

[0145] FIG. 14 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure.

[0146] FIG. 15 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure.

[0147] FIG. 16 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure.

[0148] FIG. 17 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure.

[0149] FIG. 18 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure.

[0150] FIG. 19 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure.

[0151] FIG. 20 is a schematic block diagram illustrating an apparatus for processing transmission blocks according to an example of the present disclosure.

[0152] FIG. 21 is a schematic block diagram illustrating another apparatus for processing transmission blocks according to an example of the present disclosure.

[0153] FIG. 22 is a schematic block diagram illustrating another apparatus for processing transmission blocks according to an example of the present disclosure.

[0154] FIG. 23 is a schematic block diagram illustrating an interval sending module according to an example of the present disclosure.

[0155] FIG. 24 is a schematic block diagram illustrating another apparatus for processing transmission blocks according to an example of the present disclosure.

[0156] FIG. 25 is a schematic block diagram illustrating an interval receiving module according to an example of the present disclosure.

[0157] FIG. 26 is a schematic block diagram illustrating another interval receiving module according to an example of the present disclosure.

[0158] FIG. 27 is a schematic block diagram illustrating another interval receiving module according to an example of the present disclosure.

[0159] FIG. 28 is a schematic block diagram illustrating another interval receiving module according to an example of the present disclosure.

[0160] FIG. 29 is a schematic block diagram illustrating an apparatus for processing transmission blocks according to an example of the present disclosure.

[0161] FIG. 30 is a schematic block diagram illustrating another apparatus for processing

transmission blocks according to an example of the present disclosure.

[0162] FIG. 31 is a schematic block diagram illustrating another apparatus for processing transmission blocks according to an example of the present disclosure.

[0163] FIG. 32 is a schematic block diagram illustrating an interval sending module according to an example of the present disclosure.

[0164] FIG. 33 is a schematic block diagram illustrating another apparatus for processing transmission blocks according to an example of the present disclosure.

[0165] FIG. 34 is a schematic block diagram illustrating another interval sending module according to an example of the present disclosure.

[0166] FIG. 35 is a schematic block diagram illustrating another interval sending module according to an example of the present disclosure.

[0167] FIG. 36 is a schematic block diagram illustrating another interval sending module according to an example of the present disclosure.

[0168] FIG. 37 is a schematic block diagram illustrating another interval sending module according to an example of the present disclosure.

[0169] FIG. 38 is a structural schematic diagram illustrating a device for processing transmission blocks according to an example of the present disclosure.

[0170] FIG. 39 is a structural schematic diagram illustrating a device for processing transmission blocks according to an example of the present disclosure.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0171] The following, in conjunction with the drawings of the examples of the present disclosure, will clearly and completely describe the technical solutions provided in the embodiments of the present disclosure. It is obvious that the described embodiments are partial embodiments, not all implementations of the present disclosure. Based on the embodiments provided in the present disclosure, all of other embodiments, which can be obtained by those of ordinary skill in the art without creative work, shall fall within the protection scope of this application.

[0172] FIG. 1 is a schematic flowchart illustrating a method of processing transmission blocks according to an example of the present disclosure. The method illustrated in the example may be applied to user equipment. The user equipment may implement its communication based on MTC and/or NB-IoT technologies, with a lower data processing capability than a general mobile phone.

[0173] As illustrated in FIG. 1, the method of processing transmission blocks according to the

example may include the following steps.

[0174] At step S1, a scheduling signaling is received from a base station, where the scheduling signaling is configured to schedule a plurality of transmission blocks. In some embodiments, for each of the transmission blocks, its data size may be identical with or different from another one, without being limited by the present disclosure.

[0175] At step S2, the plurality of transmission blocks are transmitted to the base station and/or the plurality of transmission blocks are received from the base station, where two adjacent transmission blocks of the plurality of transmission blocks are spaced by a preset time interval.

[0176] Regardless of whether the user equipment transmits the plurality of transmission blocks to the base station or receives the plurality of transmission blocks from the base station, the user equipment processes resources on which the transmission blocks are carried. FIG. 2A is a schematic diagram illustrating receiving transmission blocks in the related arts. As illustrated in FIG. 2A, for example, 4 transmission blocks are received from the base station, which respectively correspond to physical downlink shared channel (PDSCH) resources: PDSCH1, PDSCH2, PDSCH3, and PDSCH4. The 4 transmission blocks are continuously scheduled through a physical downlink control channel (PDCCH) signaling, and thus the resources respectively corresponding to the 4 transmission blocks are not to be spaced in time since the 4 transmission blocks are continuously scheduled. Meanwhile, the transmission blocks corresponding to the PDSCH resources may not be obtained unless the user equipment performs operations such as demodulating the PDSCH resources.

[0177] In the case that the user equipment has a low data processing capability, i.e., a slow data processing speed, the user equipment may not complete demodulating the PDSCH1 to obtain the first transmission block within a time period t_1 corresponding to the PDSCH1. Considering that the user equipment has received the PDSCH2 before receiving the PDSCH3, if the first transmission block is not demodulated from the PDSCH1 until the user equipment receives the PDSCH3, it is possible that the user equipment ignores the PDSCH2 and only demodulates the PDSCH3 that is most recently received, which may result in fewer demodulated transmission blocks than the transmission blocks transmitted from the base station.

[0178] According to some examples of the present disclosure, two adjacent transmission blocks of the transmission blocks are spaced by the preset time interval. Therefore, compared with the case that the transmission blocks are continuously scheduled in the related art, the user equipment can take more time to process the resource corresponding to each of the transmission

blocks, so as to ensure that the transmission blocks are transmitted and received well. That is, no transmission is performed during the preset time interval.

[0179] FIG. 2B is a schematic diagram illustrating receiving transmission blocks according to an example of the present disclosure. As illustrated in FIG. 2B, for example, receiving the 4 transmission blocks from the base station is still taken as an example. Since in the plurality of transmission blocks, two adjacent transmission blocks are spaced by the preset time interval t_0 , a time period between receiving the PDSCH1 and receiving the PDSCH2, t_1+t_0 , is given to the user equipment to demodulate the first transmission block from the PDSCH1. Therefore, it can be guaranteed to a large extent that when receiving the PDSCH2, the user equipment has completed the demodulation of another PDSCH resource and thus can demodulate the PDSCH2. Accordingly, it can be guaranteed that the 4 transmission blocks are demodulated by the user equipment, so as to ensure that the transmission blocks are received well.

[0180] FIG. 3 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure. As illustrated in FIG. 3, on the basis of the example illustrated in FIG. 1, the method further includes:

[0181] at step S3, the preset time interval is determined based on a communication protocol with the base station before the plurality of transmission blocks are transmitted to the base station or received from the base station.

[0182] In one embodiment, the preset time interval may be configured in the communication protocol between the base station and the user equipment in advance, so that the user equipment can directly determine the preset time interval based on the communication protocol when communicating with the base station. In some embodiments, the user equipment may determine the preset time interval before transmitting the plurality of transmission blocks to the base station, or the user equipment may determine the preset time interval before receiving the plurality of transmission blocks from the base station.

[0183] FIG. 4 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure. As illustrated in FIG. 4, on the basis of the example illustrated in FIG. 1, the method further includes:

[0184] at step S4, the preset time interval is determined based on data processing capability information of the user equipment before transmitting the plurality of transmission blocks to the base station or receiving the plurality of transmission blocks from the base station; and

[0185] at step S5, the preset time interval is sent to the base station.

[0186] In one embodiment, the user equipment may determine the preset time interval based on its own data processing capability information. For example, the weaker the data processing

capability is, the longer the determined preset time interval may be, while the stronger the data processing capability is, the shorter the determined preset time interval may be. Then, the determined preset time interval may be sent to the base station, so that the base station may also transmit and receive transmission blocks based on the preset time interval, and thereby communicates with the user equipment well. In some embodiments, the user equipment may send the preset time interval to the base station before transmitting the plurality of transmission blocks to the base station, or the user equipment may send the preset time interval to the base station before receiving the plurality of transmission blocks from the base station.

[0187] It should be noted that the user equipment may perform sending the preset time interval to the base station after receiving a trigger message from the base station, or may actively perform it as required, e.g., when a communication connection with the base station is established.

[0188] FIG. 5 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure. As illustrated in FIG. 5, on the basis of the example illustrated in FIG. 4, that the preset time interval is sent to the base station includes:

[0189] at step 501, indication information corresponding to the preset time interval is determined based on a pre-stored first association relationship between preset time intervals and indication information; and

[0190] at step S502, the indication information is sent to the base station;

[0191] where the first association relationship is pre-stored in the base station.

[0192] In one embodiment, the user equipment may first determine the indication information corresponding to the preset time interval and then send the indication information to the base station. Since the base station stores the first association relationship in advance, after receiving the indication information, the base station can determine the preset time interval corresponding to the indication information. Therefore, the base station may also transmit and receive transmission blocks based on the preset time interval, and thereby communicates with the user equipment well.

[0193] For example, the first association relationship may be shown in Table 1:

Indication Information	Preset Time Interval
1	1ms
2	2ms
3	3ms

Table 1

[0194] If an indicator sent by the user equipment is 2, the base station may determine based on the first association relationship that the user equipment is to receive and transmit the transmission blocks by the preset time interval of 2 milliseconds.

[0195] FIG. 6 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure. As illustrated in FIG. 6, on the basis of the example illustrated in FIG. 1, the method further includes:

[0196] at step S6, the preset time interval is received from the base station before the plurality of transmission blocks are transmitted to the base station or received from the base station.

[0197] In one embodiment, the preset time interval may also be configured by the base station and sent to the user equipment, so that the user equipment can transmit and receive the transmission blocks based on the preset time interval. In some embodiments, the user equipment may receive the preset time interval from the base station before transmitting the plurality of transmission blocks to the base station, or the user equipment may receive the preset time interval from the base station before receiving the plurality of transmission blocks from the base station.

[0198] FIG. 7 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure. As illustrated in FIG. 7, on the basis of the example illustrated in FIG. 6, that the preset time interval is received from the base station includes:

[0199] at step S601, a data size of transmission block is received from the base station; and

[0200] at step S602, the preset time interval corresponding to the data size is determined based on a pre-stored second association relationship between data sizes and preset time intervals;

[0201] where the second association relationship is pre-stored in the base station.

[0202] In one embodiment, the base station may determine the data size of transmission blocks to be sent. In particular, the base station may determine the data size of transmission block based on pre-stored configuration information or based on data processing capability

information of the user equipment. Further, data to be transmitted may be divided into the plurality of transmission blocks based on the determined data size.

[0203] After receiving the data size of transmission block, the user equipment may determine the preset time interval corresponding to the data size, and then may transmit and receive the transmission blocks based on the preset time interval. Besides, since the base station stores the second association relationship in advance, based on the second association relationship, the base station can determine the preset time interval corresponding to the data size of transmission block sent to the user equipment by it, so that the base station can also transmit and receive transmission blocks by the preset time interval, and thereby ensures that the communication between the base station and the user equipment can work well. In some embodiments, based on the second association relationship, the larger the data size of transmission block is, the longer the determined preset time interval may be, while the smaller the data size of transmission block is, the shorter the determined preset time interval may be.

[0204] For example, the second association relationship may be shown in Table 2:

Data Size	Preset Time Interval
X bits to Y bits	2ms
Y bits to Z bits	5ms

Table 2

[0205] If the data size of transmission block to be sent is between X bits and Y bits, based on the second association relationship, the user equipment may determine to receive and transmit the transmission blocks by the preset time interval of 2 milliseconds. In some embodiments, the respective values of X, Y, and Z may be configured as required.

[0206] FIG. 8 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure. As illustrated in FIG. 8, on the basis of the example illustrated in FIG. 6, that the preset time interval is received from the base station includes:

[0207] at step 604, a plurality of time intervals are determined by receiving a radio resource control signaling; and

[0208] at step 605, the preset time interval is determined from the plurality of time intervals by receiving a physical downlink control channel message.

[0209] In one embodiment, the base station may first indicate the plurality of time intervals to the user equipment through the radio resource control signaling, and further indicate the preset

time interval among the indicated plurality of time intervals through a physical downlink control channel message. Accordingly, the overhead of the physical downlink control message can be reduced.

[0210] In some embodiments, the time intervals supported by the user equipment constitute a time interval set, a plurality of first characters may be contained in the radio resource control signaling, and there is a correspondence between first characters and time intervals, so that the user equipment may determine the plurality of time intervals in the time interval set based on the plurality of first characters in accordance with the correspondence between first characters and time intervals. Correspondingly, a second character may be included in the physical downlink control channel message, and there is a correspondence between second characters and time intervals, so that the user equipment may determine the preset time interval from the plurality of time intervals based on the second character in accordance with the correspondence between second characters and time intervals.

[0211] For example, the user equipment may support 16 time intervals in total. It occupies 4 bits if the preset time interval is just indicated among the 16 time intervals through the physical downlink control channel message, while only 2 bits if 4 time intervals are first indicated among the 16 time intervals through the radio resource control signaling and then the preset time interval is indicated among the 4 time intervals through the physical download control channel message.

[0212] FIG. 9 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure. As illustrated in FIG. 9, on the basis of the example illustrated in FIG. 6, that the preset time interval is received from the base station includes:

[0213] at step S606, a plurality of time intervals are determined based on data processing capability information of the user equipment; and

[0214] at step S607, the preset time interval is determined from the plurality of time intervals by receiving a radio resource control signaling or a physical downlink control channel message.

[0215] In one embodiment, the user equipment may determine the plurality of time intervals based on its own data processing capability information. For example, the user equipment may support 16 time intervals, and accordingly determine 4 time intervals from the 16 time intervals to match its own data processing capability.

[0216] In addition, the user equipment may also send its own data processing capability information to the base station, and the base station may determine the plurality of time intervals

based on a correspondence between data processing capability information and time intervals as well as based on the received data processing capability information.

[0217] Then, the base station may further indicate the preset time interval among the determined plurality of time intervals through the radio resource control signaling or the physical downlink control channel message, which can accordingly reduce the overhead of the physical downlink control message.

[0218] In some embodiments, a first character may be included in the radio resource control signaling, and there is a correspondence between first characters and time intervals, so that the user equipment may determine the preset time interval from the plurality of time intervals based on the first character in accordance with the correspondence between first characters and time intervals. A second character may be included in the physical downlink control channel message, and there is a correspondence between second characters and time intervals, so that the user equipment may determine the preset time interval from the plurality of time intervals based on the second character in accordance with the correspondence between second characters and time intervals.

[0219] For example, the user equipment may support 16 time intervals in total. It occupies 4 bits if the preset time interval is just indicated among the 16 time intervals through the physical downlink control channel message, while only 2 bits if 4 time intervals are first indicated among the 16 time intervals based on the data processing capability information and then the preset time interval is indicated among the 4 time intervals through the physical download control channel message.

[0220] FIG. 10 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure. As illustrated in FIG. 10, on the basis of the example illustrated in FIG. 6, that the preset time interval is received from the base station includes:

[0221] at step S608, a data size of transmission block is received from the base station;

[0222] at step S609, a plurality of time intervals are determined based on the data size; and

[0223] at step S610, the preset time interval is determined from the plurality of time intervals by receiving a physical downlink control channel message.

[0224] In one embodiment, the base station may determine the data size of transmission block to be sent. For example, the base station may determine the data size of transmission block based on pre-stored configuration information or based on data processing capability information of the user equipment. Further, data to be transmitted may be divided into the

plurality of transmission blocks based on the determined data size.

[0225] The user equipment may determine the plurality of time intervals based on the data size of transmission block sent by the base station. For example, the user equipment may support 16 time intervals, and accordingly determine 4 time intervals from the 16 time intervals to match the data size of transmission block sent by the base station.

[0226] In addition, the base station may further determine the plurality of time intervals based on the determined data size of transmission block in accordance with the correspondence between data sizes of transmission block and time intervals.

[0227] Then, the base station may further indicate the preset time interval among the determined plurality of time intervals through a radio resource control signaling or the physical downlink control channel message, which can accordingly reduce the overhead of the physical downlink control message.

[0228] In some embodiments, a first character may be included in the radio resource control signaling, and there is a correspondence between first characters and time intervals, so that the user equipment may determine the preset time interval from the plurality of time intervals based on the first character in accordance with the correspondence between first characters and time intervals. A second character may be included in the physical downlink control channel message, and there is a correspondence between second characters and time intervals, so that the user equipment may determine the preset time interval from the plurality of time intervals based on the second character in accordance with the correspondence between second characters and time intervals.

[0229] For example, the user equipment may support 16 time intervals in total. It occupies 4 bits if the preset time interval is just indicated among the 16 time intervals through the physical downlink control channel message, while only 2 bits if 4 time intervals are first indicated among the 16 time intervals based on the data size of transmission block and then the preset time interval is indicated among the 4 time intervals through the physical download control channel message.

[0230] FIG. 11 is a schematic flowchart illustrating a method of processing transmission blocks according to an example of the present disclosure. The apparatus for processing transmission blocks illustrated in the example may be applied to a base station. The base station may be a 4G-based base station or a 5G base station. The base station may communicate with the user equipment of the examples illustrated in FIGs. 1-10.

[0231] As illustrated in FIG. 11, the method of processing transmission blocks includes:

[0232] at step S1', a scheduling signaling is sent to the user equipment, where the scheduling signaling is configured to schedule a plurality of transmission blocks; and

[0233] at step S2', the plurality of transmission blocks are transmitted to the user equipment and/or the plurality of transmission blocks are received from the user equipment, where two adjacent transmission blocks of the plurality of transmission blocks are spaced by a preset time interval.

[0234] FIG. 12 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure. As illustrated in FIG. 12, on the basis of the example illustrated in FIG. 11, the method further includes:

[0235] at step S3', the preset time interval is determined based on a communication protocol with the user equipment before the plurality of transmission blocks are transmitted to the user equipment or received from the user equipment.

[0236] FIG. 13 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure. As illustrated in FIG. 13, on the basis of the example illustrated in FIG. 11, the method further includes:

[0237] at step S4', the preset time interval is received from the user equipment before the plurality of transmission blocks are transmitted to the user equipment or received from the user equipment.

[0238] FIG. 14 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure. As illustrated in FIG. 14, based on the example illustrated in FIG. 13, that the preset time interval is received from the user equipment includes:

[0239] at step 401', indication information corresponding to the preset time interval is received from the user equipment; and

[0240] at step 402', the preset time interval corresponding to the indication information is determined based on a pre-stored first association relationship between preset time intervals and indication information.

[0241] FIG. 15 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure. As illustrated in FIG. 15, on the basis of the example illustrated in FIG. 11, the method further includes:

[0242] at step S5', the preset time interval is sent to the user equipment before the plurality of transmission blocks are transmitted to the user equipment or received from the user equipment.

[0243] FIG. 16 is a schematic flowchart illustrating another method of processing

transmission blocks according to an example of the present disclosure. As illustrated in FIG. 16, on the basis of the example illustrated in FIG. 15, that the preset time interval is sent to the user equipment includes:

[0244] at step S501', a data size of transmission block is determined;

[0245] at step S502', the data size is sent to the user equipment; and

[0246] at step S503', the preset time interval corresponding to the data size is determined based on a pre-stored second association relationship between data sizes and preset time intervals;

[0247] where the second association relationship is pre-stored in the user equipment.

[0248] FIG. 17 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure. As illustrated in FIG. 17, on the basis of the example illustrated in FIG. 15, that the preset time interval is sent to the user equipment includes:

[0249] at step S504', a plurality of time intervals are sent to the user equipment through a radio resource control signaling; and

[0250] at step S505', the preset time interval among the plurality of time intervals is indicated to the user equipment through a physical downlink control channel message.

[0251] FIG. 18 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure. As illustrated in FIG. 18, on the basis of the example illustrated in FIG. 15, that the preset time interval is sent to the user equipment includes:

[0252] at step S506', data processing capability information is received from the user equipment;

[0253] at step S507', a plurality of time intervals is determined based on the data processing capability information;

[0254] at step S508', the preset time interval is determined from the plurality of time intervals; and

[0255] at step S509', the preset time interval is sent to the user equipment through a radio resource control signaling or a physical downlink control channel message.

[0256] FIG. 19 is a schematic flowchart illustrating another method of processing transmission blocks according to an example of the present disclosure. As illustrated in FIG. 19, on the basis of the example illustrated in FIG. 15, that the preset time interval is sent to the user equipment includes:

[0257] at step S510', a data size of transmission block is determined;

[0258] at step S511', a plurality of time intervals are determined based on the data size of transmission block;

[0259] at step S512', the preset time interval is determined from the plurality of time intervals; and

[0260] at step S513', the preset time interval is sent to the user equipment through a radio resource control signaling or a physical downlink control channel message.

[0261] Corresponding to the foregoing examples of the method of processing transmission blocks, the present disclosure also provides examples of the apparatus for processing transmission blocks.

[0262] FIG. 20 is a schematic block diagram illustrating an apparatus for processing transmission blocks according to an example of the present disclosure. The apparatus illustrated in the example may be applied to user equipment. The user equipment may implement its communication based on MTC and/or NB-IoT technologies, with a lower data processing capability than a general mobile phone.

[0263] As illustrated in FIG. 20, the apparatus for processing transmission blocks according to the example may include:

[0264] a signaling receiving module 1, configured to receive a scheduling signaling from a base station, where the scheduling signaling is configured to schedule a plurality of transmission blocks; and

[0265] a communicating module 2, configured to transmit the plurality of transmission blocks to the base station and/or receive the plurality of transmission blocks from the base station, where two adjacent transmission blocks of the plurality of transmission blocks are spaced by a preset time interval.

[0266] FIG. 21 is a schematic block diagram illustrating another apparatus for processing transmission blocks according to an example of the present disclosure. As illustrated in FIG. 21, on the basis of the example illustrated in FIG. 20, the apparatus further includes:

[0267] a first determining module 3, configured to determine the preset time interval based on a communication protocol with the base station before the communicating module 2 transmits the plurality of transmission blocks to the base station or receives the plurality of transmission blocks from the base station.

[0268] FIG. 22 is a schematic block diagram illustrating another apparatus for processing transmission blocks according to an example of the present disclosure. As illustrated in FIG.

22, on the basis of the example illustrated in FIG. 20, the apparatus further includes:

[0269] a second determining module 4, configured to determine the preset time interval based on data processing capability information of the user equipment before the communicating module 2 transmits the plurality of transmission blocks to the base station or receives the plurality of transmission blocks from the base station; and

[0270] an interval sending module 5, configured to send the preset time interval to the base station.

[0271] FIG. 23 is a schematic block diagram illustrating an interval sending module according to an example of the present disclosure. As illustrated in FIG. 23, on the basis of the example illustrated in FIG. 22, the interval sending module 5 includes:

[0272] an indication determining submodule 501, configured to determine indication information corresponding to the preset time interval based on a pre-stored first association relationship between preset time intervals and indication information; and

[0273] an indication sending submodule 502, configured to send the indication information to the base station;

[0274] where the first association relationship is pre-stored in the base station.

[0275] FIG. 24 is a schematic block diagram illustrating another apparatus for processing transmission blocks according to an example of the present disclosure. As illustrated in FIG. 24, on the basis of the example illustrated in FIG. 20, the apparatus further includes:

[0276] an interval receiving module 6, configured to receive the preset time interval from the base station before the plurality of transmission blocks are transmitted to the base station or received from the base station.

[0277] FIG. 25 is a schematic block diagram illustrating an interval receiving module according to an example of the present disclosure. As illustrated in FIG. 25, on the basis of the example illustrated in FIG. 24, the interval receiving module 6 includes:

[0278] a data size receiving submodule 601, configured to receive a data size of transmission block from the base station; and

[0279] a correspondence determining submodule 602, configured to determine the preset time interval corresponding to the data size based on a pre-stored second association relationship between data sizes and preset time intervals;

[0280] where the second association relationship is pre-stored in the base station.

[0281] FIG. 26 is a schematic block diagram illustrating another interval receiving module according to an example of the present disclosure. As illustrated in FIG. 26, on the basis of the

example illustrated in FIG. 24, the interval receiving module 6 includes:

[0282] a signaling receiving submodule 603, configured to determine a plurality of time intervals by receiving a radio resource control signaling; and

[0283] a message receiving submodule 604, configured to determine the preset time interval from the plurality of time intervals by receiving a physical downlink control channel message.

[0284] FIG. 27 is a schematic block diagram illustrating another interval receiving module according to an example of the present disclosure. As illustrated in FIG. 27, on the basis of the example illustrated in FIG. 24, the interval receiving module 6 includes:

[0285] a first interval determining submodule 605, configured to determine a plurality of time intervals based on data processing capability information of the user equipment; and

[0286] a message receiving submodule 606, configured to determine the preset time interval from the plurality of time intervals by receiving a radio resource control signaling or a physical downlink control channel message.

[0287] FIG. 28 is a schematic block diagram illustrating another interval receiving module according to an example of the present disclosure. As illustrated in FIG. 28, on the basis of the example illustrated in FIG. 24, the interval receiving module 6 includes:

[0288] a data size receiving submodule 607, configured to receive a data size of transmission block from the base station;

[0289] a second interval determining submodule 608, configured to determine a plurality of time intervals based on the data size; and

[0290] a message receiving submodule 609, configured to determine the preset time interval from the plurality of time intervals by receiving a radio resource control signaling or a physical downlink control channel message.

[0291] FIG. 29 is a schematic block diagram illustrating an apparatus for processing transmission blocks according to an example of the present disclosure. The apparatus for processing transmission blocks illustrated in the example may be applied to a base station. The base station may be a 4G-based base station or a 5G base station. The base station may communicate with the user equipment of the examples illustrated in FIGs. 1-10 and FIGs. 20-28.

[0292] As illustrated in FIG. 29, the apparatus for processing transmission blocks includes:

[0293] a signaling sending module 1', configured to send a scheduling signaling to user equipment, where the scheduling signaling is configured to schedule a plurality of transmission blocks; and

[0294] a communicating module 2', configured to transmit the plurality of transmission blocks to the user equipment and/or receive the plurality of transmission blocks from the user equipment, where two adjacent transmission blocks of the plurality of transmission blocks are spaced by a preset time interval.

[0295] FIG. 30 is a schematic block diagram illustrating another apparatus for processing transmission blocks according to an example of the present disclosure. As illustrated in FIG. 30, on the basis of the example illustrated in FIG. 29, the apparatus for processing transmission blocks further includes:

[0296] an interval determining module 3', configured to determine the preset time interval based on a communication protocol with the user equipment before the communicating module transmits the plurality of transmission blocks to the user equipment or receives the plurality of transmission blocks from the user equipment.

[0297] FIG. 31 is a schematic block diagram illustrating another apparatus for processing transmission blocks according to an example of the present disclosure. As illustrated in FIG. 31, on the basis of the example illustrated in FIG. 29, the apparatus for processing transmission blocks further includes:

[0298] an interval receiving module 4', configured to receive the preset time interval from the user equipment before the communicating module transmits the plurality of transmission blocks to the user equipment or receives the plurality of transmission blocks from the user equipment.

[0299] FIG. 32 is a schematic block diagram illustrating an interval receiving module according to an example of the present disclosure. As illustrated in FIG. 32, on the basis of the example illustrated in FIG. 31, the interval receiving module 4' includes:

[0300] an indication receiving submodule 401', configured to receive indication information corresponding to the preset time interval from the user equipment; and

[0301] a first correspondence determining submodule 402', configured to determine the preset time interval corresponding to the indication information based on a pre-stored first association relationship between preset time intervals and indication information.

[0302] FIG. 33 is a schematic block diagram illustrating another apparatus for processing transmission blocks according to an example of the present disclosure. As illustrated in FIG. 33, on the basis of the example illustrated in FIG. 29, the apparatus for processing transmission blocks further includes:

[0303] an interval sending module 5', configured to send the preset time interval to the user equipment before the communicating module transmits the plurality of transmission blocks to

the user equipment or receives the plurality of transmission blocks from the user equipment.

[0304] FIG. 34 is a schematic block diagram illustrating an interval sending module according to an example of the present disclosure. As illustrated in FIG. 34, on the basis of the example illustrated in FIG. 33, the interval sending module 5' includes:

[0305] a data size determining submodule 501', configured to determine a data size of transmission block;

[0306] a data size sending submodule 502', configured to send the data size to the user equipment; and

[0307] a second correspondence determining submodule 503', configured to determine the preset time interval corresponding to the data size based on a pre-stored second association relationship between data sizes and preset time intervals;

[0308] where the second association relationship is pre-stored in the user equipment.

[0309] FIG. 35 is a schematic block diagram illustrating another interval sending module according to an example of the present disclosure. As illustrated in FIG. 35, on the basis of the example illustrated in FIG. 33, the interval sending module 5' includes:

[0310] a signaling sending submodule 504', configured to send a plurality of time intervals to the user equipment through a radio resource control signaling; and

[0311] a message sending submodule 505', configured to indicate the preset time interval among the plurality of time intervals to the user equipment through a physical downlink control channel message.

[0312] FIG. 36 is a schematic block diagram illustrating another interval sending module according to an example of the present disclosure. As illustrated in FIG. 36, on the basis of the example illustrated in FIG. 33, the interval sending module 5' includes:

[0313] an information receiving submodule 506', configured to receive data processing capability information from the user equipment;

[0314] a first interval determining submodule 507', configured to determine a plurality of time intervals based on the data processing capability information;

[0315] a second interval determining submodule 508', configured to determine the preset time interval from the plurality of time intervals; and

[0316] an interval sending submodule 509', configured to send the preset time interval to the user equipment through a radio resource control signaling or a physical downlink control channel message.

[0317] FIG. 37 is a schematic block diagram illustrating another interval sending module

according to an example of the present disclosure. As illustrated in FIG. 37, on the basis of the example illustrated in FIG. 33, the interval sending module 5' includes:

[0318] a data size determining submodule 510', configured to determine a data size of transmission block;

[0319] a third interval determining submodule 511', configured to determine a plurality of time intervals based on the data size of transmission block;

[0320] a fourth interval determining submodule 512', configured to determine the preset time interval from the plurality of time intervals; and

[0321] an interval sending submodule 509', configured to send the preset time interval to the user equipment through a radio resource control signaling or a physical downlink control channel message.

[0322] Regarding the apparatus in the foregoing examples, the specific manner in which each module performs its operation has been described in detail in the examples of the corresponding method, and will not be repeated here.

[0323] Since the apparatus examples essentially correspond to the method examples, reference may be made to the description of related parts of the method examples. The apparatus examples described above are merely illustrative, where the units described as separate members may be or not be physically separated, and the members displayed as units may be or not be physical units, i.e., may be located in one place, or may be distributed to a plurality of network units. Some or all of the modules may be selected according to actual needs to achieve the objectives of the implementations of the examples. It can be understood and implemented by those of ordinary skill in the art without any creative effort.

[0324] FIG. 38 is a structural schematic diagram illustrating a device for processing transmission blocks according to an example of the present disclosure. The device 3800 may be provided as a base station. As illustrated in FIG. 38, the device 3800 includes a processing component 3822, a wireless transmission/reception component 3824, an antenna component 3826, and a signal processing part peculiar to the wireless interface. The processing component 3822 may further include one or more processors. One of the processors in the processing component 3822 may be configured to perform the method of processing transmission blocks described by any one of the foregoing examples illustrated in FIGs. 11-19.

[0325] FIG. 39 is a structural schematic diagram illustrating a device 3900 for processing transmission blocks according to an example of the present disclosure. For example, the device 3900 may be a mobile phone, a computer, a digital broadcasting terminal, a messaging device,

a game console, a tablet device, a medical device, a fitness device, a personal digital assistant, and the like.

[0326] As illustrated in FIG. 39, the device 3900 may include one or more of the following components: a processing component 3902, a memory 3904, a power supply component 3906, a multimedia component 3908, an audio component 3910, an input/output (I/O) interface 3912, a sensor component 3914, and a communication component 3916.

[0327] The processing component 3902 generally controls the overall operations of the device 3900, such as operations associated with display, phone calls, data communications, camera operations, and recording operations. The processing element 3902 may include one or more processors 3920 to execute instructions to complete all or part of the steps of the above method illustrated in FIGs. 1-10. In addition, the processing component 3902 may include one or more modules which facilitate the interaction between the processing component 3902 and other components. For example, the processing component 3902 may include a multimedia module to facilitate the interaction between the multimedia component 3908 and the processing component 3902.

[0328] The memory 3904 is configured to store various types of data to support the operation of the device 3900. Examples of such data include instructions for any application or method operated on the device 3900, contact data, phonebook data, messages, pictures, videos, and the like. The memory 3904 may be implemented by any type of volatile or non-volatile storage device or a combination thereof, such as static random access memory (SRAM), electrically erasable programmable read only memory (EEPROM), erasable programmable Read Only Memory (EPROM), programmable Read Only Memory (PROM), Read Only Memory (ROM), Magnetic Memory, Flash Memory, Disk or Optical Disk.

[0329] The power supply component 3906 provides power to different components of the device 3900. The power supply component 3906 may include a power management system, one or more power supplies, and other components associated with generating, managing, and distributing power for the device 3900.

[0330] The multimedia component 3908 includes a screen providing an output interface between the device 3900 and a user. In some embodiments, the screen may include a liquid crystal display (LCD) and a touch panel (TP). If the screen includes the TP, the screen may be implemented as a touch screen to receive input signals from the user. The TP may include one or more touch sensors to sense touches, swipes, and gestures on the TP. The touch sensors may not only sense a boundary of a touch or swipe, but also sense a lasting time and a pressure associated with the touch or swipe. In some embodiments, the multimedia component 3908

includes a front camera and/or a rear camera. The front camera and/or rear camera may receive external multimedia data when the device 3900 is in an operating mode, such as a photographing mode or a video mode. Each front camera and rear camera may be a fixed optical lens system or have focal length and optical zooming capability.

[0331] The audio component 3910 is configured to output and/or input an audio signal. For example, the audio component 3910 includes a microphone (MIC) that is configured to receive an external audio signal when the device 3900 is in an operating mode, such as a call mode, a recording mode, and a voice recognition mode. The received audio signal may be further stored in the memory 3904 or sent via the communication component 3916. In some embodiments, the audio component 3910 also includes a speaker for outputting an audio signal.

[0332] The I/O interface 3912 provides an interface between the processing component 3902 and a peripheral interface module. The above peripheral interface module may be a keyboard, a click wheel, buttons, or the like. These buttons may include but not limited to, a home button, a volume button, a start button and a lock button.

[0333] The sensor component 3914 includes one or more sensors to provide the device 3900 with status assessments in various aspects. For example, the sensor component 3914 may detect an open/closed state of the device 3900 and a relative positioning of components such as the display and keypad of the device 3900, and the sensor component 3914 may also detect a change in position of the device 3900 or a component of the device 3900, the presence or absence of user contact with the device 3900, orientation or acceleration/deceleration of the device 3900, and temperature change of the device 3900. The sensor component 3914 may include a proximity sensor configured to detect the presence of a nearby object without any physical contact. The sensor component 3914 may further include an optical sensor, such as a Complementary Metal-Oxide-Semiconductor (CMOS) or Charged Coupled Device (CCD) image sensor which is used in imaging applications. In some embodiments, the sensor component 3914 may also include an acceleration sensor, a gyro sensor, a magnetic sensor, a pressure sensor, or a temperature sensor.

[0334] The communication component 3916 is configured to facilitate wired or wireless communication between the device 3900 and other devices. The device 3900 may access a wireless network based on a communication standard, such as WiFi, 2G or 3G, or a combination thereof. In an exemplary embodiment, the communication component 3916 receives broadcast signals or broadcast related information from an external broadcast management system via a broadcast channel. In an exemplary embodiment, the communication component 3916 also

includes a near field communication (NFC) module to facilitate short-range communication. For example, the NFC module may be implemented based on a radio frequency identification (RFID) technology, an infrared data association (IrDA) technology, an ultra-wideband (UWB) technology, a Bluetooth® (BT) technology and other technologies.

[0335] In some exemplary embodiments, the device 3900 may be implemented by one or more Application Specific Integrated Circuits (ASICs), Digital Signal Processors (DSPs), Digital Signal Processing Devices (DSPDs), Programmable Logic Devices (PLDs), Field Programmable Gate Arrays (FPGAs), controllers, microcontrollers, microprocessors, or other electronic components for performing the method of processing transmission blocks described in any of the above examples.

[0336] In some exemplary embodiments, there is also provided a non-transitory computer-readable storage medium including instructions, such as the memory 3904 including instructions executable by the processor 3920 of the device 3900 to implement the above methods illustrated in FIGs. 1-10. For example, the non-transitory computer-readable storage medium may be a Read-Only Memory (ROM), a Random Access Memory (RAM), a CD-ROM, a magnetic tape, a floppy disk, an optical data storage device, and the like.

[0337] Other implementations of the present disclosure will be readily apparent to those skilled in the art after implementing the disclosure by referring to the specification. The present disclosure is intended to cover any variations, uses, or adaptations of the present disclosure that are in accordance with the general principles thereof and include common general knowledge or conventional technical means in the art that are not disclosed in the present disclosure. The specification and examples therein are only illustrative, and the scope and spirit of the present disclosure are to be indicated by appended claims.

[0338] It should be understood that the present disclosure is not limited to the above described accurate structures illustrated in the drawings, and various modifications and changes can be made to the present disclosure without departing from the scope thereof. The scope of the present disclosure is to be limited only by the appended claims.

[0339] It should be noted that the relational terms such as “first” and “second” used herein are merely intended to distinguish one entity or operation from another entity or operation rather than to require or imply any such actual relationship or order existing between these entities or operations. Also, the term “including”, “containing”, or any variation thereof is intended to encompass non-exclusive inclusion, so that a process, method, article, or device including a series of elements includes not only those elements but also other elements not listed explicitly

or those elements inherent to such a process, method, article, or device. Without more limitations, an element defined by the statement “including a...” shall not be precluded to include additional same elements present in a process, method, article or device including the element.

[0340] The method and apparatus provided by the examples of the present disclosure are described in detail above. Specific examples are used in this disclosure to illustrate the principle and the implementations of the present disclosure. The description of the above examples is only used to help understand the methods and its core idea of the present disclosure. Moreover, those skilled in the art can change both the specific implementations and the application scope according to the idea of the present disclosure. In summary, the content of this specification should not be construed as a limitation to the present disclosure.

CLAIMS

1. A method of processing transmission blocks, applied to user equipment, wherein the user equipment is a Narrow Band Internet of Things (NB-IoT) type device, or a Machine Type Communication (MTC) type device, and the method comprising:

5 receiving a scheduling signaling from a base station, wherein the scheduling signaling is configured to schedule a plurality of transmission blocks; and
transmitting the plurality of transmission blocks to the base station and/or receiving the plurality of transmission blocks from the base station,
wherein two adjacent transmission blocks of the plurality of transmission blocks are spaced
10 by a preset time interval; and
no transmission is performed during the preset time interval.

2. The method according to claim 1, further comprising:

before transmitting the plurality of transmission blocks to the base station and/or receiving
15 the plurality of transmission blocks from the base station, determining the preset time interval based on a communication protocol with the base station.

3. The method according to claim 1, further comprising:

before transmitting the plurality of transmission blocks to the base station and/or receiving
20 the plurality of transmission blocks from the base station, determining the preset time interval based on data processing capability information of the user equipment; and
sending the preset time interval to the base station.

4. The method according to claim 3, wherein sending the preset time interval to the base
25 station comprises:

determining indication information corresponding to the preset time interval based on a pre-stored first association relationship between preset time intervals and indication information; and

sending the indication information to the base station;
30 wherein the first association relationship is pre-stored in the user equipment and the base station.

5. The method according to claim 1, further comprising:

before transmitting the plurality of transmission blocks to the base station and/or receiving the plurality of transmission blocks from the base station, receiving the preset time interval from the base station.

5 6. The method according to claim 5, wherein receiving the preset time interval from the base station comprises:

receiving a data size of transmission block from the base station; and

determining the preset time interval corresponding to the data size based on a pre-stored second association relationship between data sizes and preset time intervals;

10 wherein the second association relationship is pre-stored in the user equipment and the base station.

7. The method according to claim 5, wherein receiving the preset time interval from the base station comprises:

15 determining a plurality of time intervals by receiving a radio resource control signaling; and

determining the preset time interval from the plurality of time intervals by receiving a physical downlink control channel message.

20 8. The method according to claim 5, wherein receiving the preset time interval from the base station comprises:

determining a plurality of time intervals based on data processing capability information of the user equipment; and

25 determining the preset time interval from the plurality of time intervals by receiving a radio resource control signaling or a physical downlink control channel message.

9. The method according to claim 5, wherein receiving the preset time interval from the base station comprises:

receiving a data size of transmission block from the base station;

30 determining a plurality of time intervals based on the data size; and

determining the preset time interval from the plurality of time intervals by receiving a radio resource control signaling or a physical downlink control channel message.

10. The method according to claim 1, wherein the preset time interval is configured to demodulate the previous transmission block.

5 11. The method according to claim 1, wherein two adjacent transmission blocks of the plurality of transmission blocks are spaced by the preset time interval with a same length.

12. The method according to claim 1, wherein the plurality of transmission blocks are with the same size.

10 13. A method of processing transmission blocks, applied to a base station and comprising: sending a scheduling signaling to user equipment, wherein the user equipment is a Narrow Band Internet of Things (NB-IoT) type device, or a Machine Type Communication (MTC) type device, and the scheduling signaling is configured to schedule a plurality of transmission blocks; and

15 transmitting the plurality of transmission blocks to the user equipment and/or receiving the plurality of transmission blocks from the user equipment,

wherein two adjacent transmission blocks of the plurality of transmission blocks are spaced by a preset time interval; and

no transmission is performed during the preset time interval.

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14. The method according to claim 13, further comprising:

before transmitting the plurality of transmission blocks to the user equipment and/or receiving the plurality of transmission blocks from the user equipment, determining the preset time interval based on a communication protocol with the user equipment.

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15. The method according to claim 13, further comprising:

before transmitting the plurality of transmission blocks to the user equipment and/or receiving the plurality of transmission blocks from the user equipment, receiving the preset time interval from the user equipment.

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16. The method according to claim 15, wherein receiving the preset time interval from the user equipment comprises:

receiving indication information corresponding to the preset time interval from the user equipment; and

determining the preset time interval corresponding to the indication information based on a pre-stored first association relationship between preset time intervals and indication information.

17. The method according to claim 13, further comprising:

before transmitting the plurality of transmission blocks to the user equipment and/or receiving the plurality of transmission blocks from the user equipment, sending the preset time interval to the user equipment.

18. The method according to claim 17, wherein sending the preset time interval to the user equipment comprises:

determining a data size of transmission block;

sending the data size to the user equipment; and

determining the preset time interval corresponding to the data size based on a pre-stored second association relationship between data sizes and preset time intervals;

wherein the second association relationship is pre-stored in the user equipment and the base station.

19. The method according to claim 17, wherein sending the preset time interval to the user equipment comprises:

sending a plurality of time intervals to the user equipment through a radio resource control signaling; and

indicating the preset time interval among the plurality of time intervals to the user equipment through a physical downlink control channel message.

20. The method according to claim 17, wherein sending the preset time interval to the user equipment comprises:

receiving data processing capability information from the user equipment;

determining a plurality of time intervals based on the data processing capability information;

determining the preset time interval from the plurality of time intervals; and

sending the preset time interval to the user equipment through a radio resource control signaling or a physical downlink control channel message.

5 21. The method according to claim 17, wherein sending the preset time interval to the user equipment comprises:
 determining a data size of transmission block;
 determining a plurality of time intervals based on the data size of transmission block;
 determining the preset time interval from the plurality of time intervals; and
10 sending the preset time interval to the user equipment through a radio resource control signaling or a physical downlink control channel message.

22. The method according to claim 13, wherein the preset time interval is configured to demodulate the previous transmission block.

15 23. The method according to claim 13, wherein two adjacent transmission blocks of the plurality of transmission blocks are spaced by the preset time interval with a same length.

24. The method according to claim 13, wherein the plurality of transmission blocks are with the same size.

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