WIRELESS COMMUNICATION METHOD, ENODB AND USER EQUIPMENT

TECHNICAL FIELD

The present disclosure relates to the field of wireless communication, and in particular, to wireless communication methods, an eNode B (eNB) and a user equipment (UE).

BACKGROUND

Machine-Type Communication (MTC) is an important revenue stream for operators and has a huge potential from the operator perspective. Based on the market and operators' requirements, one of the important requirements of MTC is improving the coverage of MTC UEs. To enhance the MTC coverage, almost all of the physical channels need to be enhanced. Repetition in time domain is the main method to improve the coverage of the channels. At the receiver side, the receiver combines all the repetitions of the channel and decodes the information.

Another requirement of MTC is power consumption reduction at UE side. One efficient method to reduce the power consumption is to reduce the active time of UE, in other words, to reduce UE's unnecessary blind detection, reception and transmission.

SUMMARY

In one aspect, the present disclosure refers to a communication apparatus comprising: circuitry which, in operation, maps one or more repetitions of control information in a search space region, wherein the search space region includes a first plurality of sub-

regions of different lengths for a largest repetition number of the control information, wherein the search space region includes a second plurality of sub-regions of different lengths for a second-largest repetition number of the control information, and wherein an interval of subframes to which the first plurality of sub-regions are mapped is greater than an interval of subframes to which the second plurality of sub-regions are mapped; and a transmitter which, in operation, transmits the one or more repetitions of the control information.

In another aspect, the present disclosure refers to a communication method comprising: mapping, by a communication apparatus, one or more repetitions of control information in a search space region, wherein the search space region includes a first plurality of sub-regions of different lengths for a largest repetition number of the control information, wherein the search space region includes a second plurality of sub-regions of different lengths for a second-largest repetition number of the control information, and wherein an interval of subframes to which the first plurality of sub-regions are mapped is greater than an interval of subframes to which the second plurality of sub-regions are mapped; and transmitting, by the communication apparatus, the one or more repetitions of the control information.

In yet another aspect, the present disclosure refers to a communication apparatus comprising: a receiver which, in operation, receives one or more repetitions of control information in a search space region, wherein the search space region includes a first plurality of sub-regions of different lengths for a largest repetition number of the control information, wherein the search space region includes a second plurality of sub-regions of different lengths for a second-largest repetition number of the control information, and wherein an interval of subframes to which the first plurality of sub-regions are mapped is greater than an interval of subframes to which the second plurality of sub-regions are mapped; and circuitry which, in operation, demodulates the one or more repetitions of the control information.

In yet another aspect, the present disclosure refers to a communication method comprising: receiving, by a communication apparatus, one or more repetitions of control information in a search space region, wherein the search space region includes a first plurality of sub-regions of different lengths for a largest repetition number of the control information, wherein the search space region includes a second plurality of sub-regions of different lengths for a second-largest repetition number of the control information, and wherein an interval of subframes to which the first plurality of sub-regions are mapped is greater than an interval of subframes to which the second plurality of sub-regions are mapped; and demodulating, by the communication apparatus, the one or more repetitions of the control information.

In a first example of the present disclosure, there is provided a wireless communication method performed by an eNode B (eNB), comprising transmitting repetitions of control channel(s) in a control region to a first user equipment (UE) in a coverage

enhancement level, wherein the control region comprises multiple sub-regions each of which can be used to transmit repetitions of one control channel; possible sub-region(s) allocated from the multiple sub-regions for transmitting one control channel to the first UE in the coverage enhancement level start from the same subframe; and the possible sub-region(s) for the first UE in the specific coverage enhancement level constitute a subset of a set of available sub-regions for the coverage enhancement level in the eNB's perspective.

In a second example of the present disclosure, there is provided a wireless communication method performed by a user equipment (UE), comprising receiving repetitions of control channel(s) transmitted from an eNode B (eNB) in a control region to the UE in a coverage enhancement level, wherein the control region comprises multiple sub-regions each of which can be used to transmit repetitions of one control channel; possible sub-region(s) that the UE in the coverage enhancement level needs to monitor for one control channel in the control region start from the same subframe; and the possible sub-region(s) for the UE in the specific coverage enhancement level constitute a subset of a set of available sub-regions for the coverage enhancement level in the eNB's perspective.

In a third example of the present disclosure, there is provided an eNode B (eNB) for wireless communication, comprising a transmitting unit configured to transmit repetitions of control channel(s) in a control region to a first user equipment (UE) in a coverage enhancement level, wherein the control region comprises multiple sub-regions each of which can be used to transmit repetitions of one control channel; possible sub-region(s) allocated from the multiple sub-regions for transmitting one control channel to the first UE in the coverage enhancement level start from the same subframe; and the possible sub-region(s) for the first UE in the specific coverage enhancement level constitute a subset of a set of available sub-regions for the coverage enhancement level in the eNB's perspective.

In a fourth example of the present disclosure, there is provided a user equipment (UE) for wireless communication, comprising a receiving unit configured to receive repetitions of control channel(s) transmitted from an eNode B (eNB) in a control region to the UE in a coverage enhancement level, wherein the control region comprises multiple sub-regions each of which can be used to transmit repetitions of one control channel; possible sub-region(s) that the UE in the coverage enhancement level needs to monitor for one control channel in the control region start from the same subframe; and the possible sub-region(s) for the UE in the specific coverage enhancement level constitute a subset of a set of available sub-regions for the coverage enhancement level in the eNB's perspective.

According to the present disclosure, it is possible to reduce the UE's power consumption, decrease the number of blind decoding and reduce buffer size.

The foregoing is a summary and thus contains, by necessity, simplifications, generalization, and omissions of details. Other examples, features, and advantages of the devices and/or processes and/or other subject matters described herein will become apparent in the teachings set forth herein. The summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other features of the present disclosure will become more fully apparent from the following description and appended claims, taken in conjunction with

CLAIMS

WHAT IS CLAIMED IS:

1. A communication apparatus comprising:

circuitry which, in operation, maps one or more repetitions of control information in a search space region,

wherein the search space region includes a first plurality of sub-regions of different lengths for a largest repetition number of the control information,

wherein the search space region includes a second plurality of sub-regions of different lengths for a second-largest repetition number of the control information, and

wherein an interval of subframes to which the first plurality of sub-regions are mapped is greater than an interval of subframes to which the second plurality of sub-regions are mapped; and

a transmitter which, in operation, transmits the one or more repetitions of the control information.

2. The communication apparatus according to claim 1, wherein the first plurality of sub-regions are determined based on the largest repetition number of the control information, and the second plurality of sub-regions are determined based on the second-largest repetition number of the control information.

3. The communication apparatus according to claim 1, wherein the first plurality of sub-regions for the largest repetition number of the control information are mapped to a same starting subframe, and the second plurality of sub-regions for the second-largest repetition number of the control information are mapped to a same starting subframe.

4. The communication apparatus according to claim 1, wherein the search space region is determined based on physical layer signaling.

5. A communication method comprising:

mapping, by a communication apparatus, one or more repetitions of control information in a search space region,

wherein the search space region includes a first plurality of sub-regions of different lengths for a largest repetition number of the control information,

wherein the search space region includes a second plurality of sub-regions of different lengths for a second-largest repetition number of the control information, and

wherein an interval of subframes to which the first plurality of sub-regions are mapped is greater than an interval of subframes to which the second plurality of sub-regions are mapped; and

transmitting, by the communication apparatus, the one or more repetitions of the control information.

6. The communication method according to claim 5, wherein the first plurality of sub-regions are determined based on the largest repetition number of the control information, and the second plurality of sub-regions are determined based on the second-largest repetition number of the control information.

7. The communication method according to claim 5, wherein the first plurality of sub-regions for the largest repetition number of the control information are mapped to a same starting subframe, and the second plurality of sub-regions for the second-largest repetition number of the control information are mapped to a same starting subframe.

8. The communication method according to claim 5, wherein the search space region is determined based on physical layer signaling.

9. A communication apparatus comprising:

a receiver which, in operation, receives one or more repetitions of control information in a search space region,

wherein the search space region includes a first plurality of sub-regions of different lengths for a largest repetition number of the control information,

wherein the search space region includes a second plurality of sub-regions of different lengths for a second-largest repetition number of the control information, and

wherein an interval of subframes to which the first plurality of sub-regions are mapped is greater than an interval of subframes to which the second plurality of sub-regions are mapped; and

circuitry which, in operation, demodulates the one or more repetitions of the control information.

10. The communication apparatus according to claim 9, wherein the first plurality of sub-regions are determined based on the largest repetition number of the control information, and the second plurality of sub-regions are determined based on the second-largest repetition number of the control information.

11. The communication apparatus according to claim 9, wherein the first plurality of sub-regions for the largest repetition number of the control information are mapped to a same starting subframe, and the second plurality of sub-regions for the second-largest repetition number of the control information are mapped to a same starting subframe.

12. The communication apparatus according to claim 9, wherein the search space region is determined based on physical layer signaling.

13. A communication method comprising:

receiving, by a communication apparatus, one or more repetitions of control information in a search space region,

wherein the search space region includes a first plurality of sub-regions of different lengths for a largest repetition number of the control information,

wherein the search space region includes a second plurality of sub-regions of different lengths for a second-largest repetition number of the control information, and

wherein an interval of subframes to which the first plurality of sub-regions are mapped is greater than an interval of subframes to which the second plurality of sub-regions are mapped; and

demodulating, by the communication apparatus, the one or more repetitions of the control information.

14. The communication method according to claim 13, wherein the first plurality of sub-regions are determined based on the largest repetition number of the control information, and the second plurality of sub-regions are determined based on the second-largest repetition number of the control information.

15. The communication method according to claim 13, wherein the first plurality of sub-regions for the largest repetition number of the control information are mapped to a same starting subframe, and the second plurality of sub-regions for the second-largest repetition number of the control information are mapped to a same starting subframe.

16. The communication method according to claim 13, wherein the search space region is determined based on physical layer signaling.