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 an eNode B (eNB) comprising:

circuitry which, in operation, maps one or more repetitions of control information in a search space region to a first user equipment (UE), 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 among at least three repetition numbers of the control information, 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, and wherein a span of subframes to which the first plurality of sub-regions are mapped is greater than a span 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 to the first UE.

In another aspect, the present disclosure refers to a communication method comprising: mapping, by an eNode B (eNB), one or more repetitions of control information in a search space region to a first user equipment (UE), 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 among at least three repetition numbers of the control information, 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, and wherein a span of subframes to which the first plurality of sub-regions are mapped is greater than a span of subframes to which the second plurality of sub-regions are mapped; and transmitting, by the eNB, the one or more repetitions of the control information to the first UE.

In yet another aspect, the present disclosure refers to a user equipment (UE) comprising: a receiver which, in operation, receives one or more repetitions of control information in a search space region from an eNode B (eNB), 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 among at least three repetition numbers of the control information, 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, and wherein a span of subframes to which the first plurality of sub-regions are mapped is greater than a span 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 user equipment (UE), one or more repetitions of control information in a search space region from an eNode B (eNB), 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 among at least three repetition numbers of the control information, 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, and wherein a span of subframes to which the first plurality of sub-regions are mapped is greater than a span 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

CLAIMS

WHAT IS CLAIMED IS:

1. An eNode B (eNB) comprising:

circuitry which, in operation, maps one or more repetitions of control information in a search space region to a first user equipment (UE),

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 among at least three repetition numbers of the control information,

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, and

wherein a span of subframes to which the first plurality of sub-regions are mapped is greater than a span 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 to the first UE.

2. The eNB 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 eNB according to claim 1, wherein the search space region is determined based on physical layer signaling.

4. A communication method comprising:

mapping, by an eNode B (eNB), one or more repetitions of control information in a search space region to a first user equipment (UE),

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 among at least three repetition numbers of the control information,

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, and

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

transmitting, by the eNB, the one or more repetitions of the control information to the first UE.

5. The communication method according to claim 4, 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.

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

7. A user equipment (UE) comprising:

a receiver which, in operation, receives one or more repetitions of control information in a search space region from an eNode B (eNB),

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 among at least three repetition numbers of the control information,

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, and

wherein a span of subframes to which the first plurality of sub-regions are mapped is greater than a span 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.

8. The communication apparatus according to claim 7, 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.

9. The communication apparatus according to claim 7, wherein the search space region is determined based on physical layer signaling.

10. A communication method comprising:

receiving, by a user equipment (UE), one or more repetitions of control information in a search space region from an eNode B (eNB),

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 among at least three repetition numbers of the control information,

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, and

wherein a span of subframes to which the first plurality of sub-regions are mapped is greater than a span 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.

11. The communication method according to claim 10, 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.

12. The communication method according to claim 10, wherein the search space region is determined based on physical layer signaling.