CLAIMS

1. A power control method for an uplink control channel, performed by a communication apparatus, comprising:

determining a first uplink control channel for carrying first uplink control information (UCI) and a second uplink control channel for carrying second UCI; and

when a time domain resource of the first uplink control channel and a time domain resource of the second uplink control channel overlap, sending the first UCI and the second UCI over a third uplink control channel by using first power, wherein

the first power is determined based on the number of bits of the first UCI and a size of a time-frequency resource for carrying the first UCI via the third uplink control channel, wherein the priority of the first UCI is higher than the priority of the second UCI.

2. The method according to claim 1, wherein the first power is $P_{\mathrm{PUCCH},b,f,c}(i,q_u,q_d,l)$,

$P_{\mathrm{PUCCH},b,f,c}(i,q_u,q_d,l) = min\{P_{\mathrm{CMAX},f,c}(i), P_{O_PUCCH,b,f,c}(q_u) + 10\log_{10}(2^{\mu}M_{RB,b,f,c}^{PUCCH}(i)) + PL_{b,f,c}(q_d) + \Delta_{\mathrm{F_PUCCH}}(F) + \Delta_{\mathrm{TF},b,f,c}(i) + \mathrm{g}_{b,f,c}(i)\}$,

wherein $P_{CMAX,f,c}(i)$ indicates maximum power that can be sent by a terminal, and z = min(x,y) indicates that z is equal to a smaller value between x and y. $P_{O_PUCCH,b,f,c}(q_u) = P_{O_NOMINAL_PUCCH} + P_{O_UE_PUCCH}(q_u)$. $P_{O_NOMINAL_PUCCH}$ is a value configured by higher layer signaling p0-nominal. If p0-nominal is not configured, $P_{O_NOMINAL_PUCCH}$ is equal to zero. $P_{O_UE_PUCCH}(q_u)$ and $PL_{b,f,c}(q_d)$ are determined based on the spatial relation information of the third uplink control channel. $M_{RB,b,f,c}^{PUCCH}(i)$ is the number of resource blocks allocated for the third uplink control channel. μ indicates a subcarrier spacing used by the third uplink control channel. $\Delta_{\mathrm{F_PUCCH}}(F)$ is a value semi-statically configured by using a higher-layer parameter.

3. The method according to claim 2, wherein, if the third uplink control channel is physical uplink control channel (PUCCH) Fomart 2, PUCCH Format 3 or PUCCH Format 4, $\Delta_{\mathrm{TF},b,f,c}(i)$ is determined based on the number of bits of the first UCI and a size of a time-frequency resource for carrying the first UCI via the third uplink control channel.

4. The method according to claim 3, wherein

$\Delta_{\mathrm{TF},b,f,c}(i) = 10\log_{10}\left(K_1 \cdot \left(n_{\mathrm{HARQ\text{-}ACK}}(i) + O_{\mathrm{SR}}(i) + O_{\mathrm{CSI}}(i)\right) / N_{\mathrm{RE}}(i)\right)$,

wherein $K_1 = 6$, $n_{\mathrm{HARQ\text{-}ACK}}(i)$ indicates the number of bits of the ACK/NACK in the first UCI,

$O_{\mathrm{SR}}(i)$ indicates the number of bits of the scheduling request (SR) in the first UCI, $O_{\mathrm{CSI}}(i)$ indicates the number of bits of the CSI in the first UCI, and $N_{\mathrm{RE}}(i)$ indicates a size of a time-frequency resource for carrying the first UCI in the third uplink control channel.

5. The method according to claim 3, wherein $\Delta_{\mathrm{TF},b,f,c}(i)=10\log_{10}\left(2^{\mathrm{K}_2\cdot \mathrm{BPRE}(i)}-1\right)$

wherein $\mathrm{K}_2 = 2.4$, $\mathrm{BPRE}(i)=\left(O_{\mathrm{ACK}}(i)+O_{\mathrm{SR}}(i)+O_{\mathrm{CSI}}(i)+O_{\mathrm{CRC}}(i)\right)/N_{\mathrm{RE}}(i)$, $O_{ACK}(i)$ indicates the number of bits of the ACK/NACK in the first UCI, $O_{\mathrm{SR}}(i)$ indicates the number of bits of the SR in the first UCI, $O_{\mathrm{CSI}}(i)$ indicates the number of bits of the CSI in the first UCI, $O_{\mathrm{CRC}}(i)$ is the number of check bits of the first UCI, and $N_{\mathrm{RE}}(i)$ indicates a size of a time-frequency resource for carrying the first UCI in the third uplink control channel.

6. The method according to claim 2, wherein, if the third uplink control channel is PUCCH Fomart 1, $\Delta_{\mathrm{TF},b,f,c}(i)$ is determined based on the number of bits of the first UCI and the number of bits of the second UCI.

7. The method according to claim 6, wherein, $\Delta_{\mathrm{TF},b,f,c}(i)=10\log_{10}\left(\frac{N_{\mathrm{ref}}^{\mathrm{PUCCH}}}{N_{\mathrm{symb}}^{\mathrm{PUCCH}}(i)}\right)+\Delta_{\mathrm{UCI}}(i)$

wherein $N_{\mathrm{symb}}^{\mathrm{PUCCH}}(i)$ indicates the number of the symbols occupied by the third uplink control channel, $N_{\mathrm{ref}}^{\mathrm{PUCCH}}$ indicates the number of symbols in one slot, $\Delta_{\mathrm{UCI}}(i)=10\log_{10}\left(O_{\mathrm{UCI}}(i)\right)$, where $O_{\mathrm{UCI}}(i)$ indicates the total number of bits of the first UCI and the second UCI.

8. A power control method for an uplink control channel, performed by a communication apparatus, comprising:

determining a first uplink control channel for carrying first uplink control information (UCI) and a second uplink control channel for carrying second UCI; and

when a time domain resource of the first uplink control channel and a time domain resource of the second uplink control channel overlap, receiving the first UCI and the second UCI from a terminal over a third uplink control channel, wherein transmit power of the third uplink control channel is first power, wherein

the first power is determined based on the number of bits of the first UCI and a size of a time-frequency resource for carrying the first UCI via the third uplink control channel, wherein the priority of the first UCI is higher than the priority of the second UCI.

9. The method according to claim 8, wherein the first power is $P_{\mathrm{PUCCH},b,f,c}(i,q_u,q_d,l)$,

$P_{\mathrm{PUCCH},b,f,c}(i,q_u,q_d,l) = min\{P_{\mathrm{CMAX},f,c}(i), P_{O_PUCCH,b,f,c}(q_u) + 10\log_{10}(2^{\mu}M_{RB,b,f,c}^{PUCCH}(i)) + PL_{b,f,c}(q_d) + \Delta_{\mathrm{F_PUCCH}}(F) + \Delta_{\mathrm{TF},b,f,c}(i) + \mathrm{g}_{b,f,c}(i)\}$,

wherein $P_{CMAX,f,c}(i)$ indicates maximum power that can be sent by a terminal, and z = min(x,y) indicates that z is equal to a smaller value between x and y. $P_{O_PUCCH,b,f,c}(q_u) = P_{O_NOMINAL_PUCCH} + P_{O_UE_PUCCH}(q_u)$. $P_{O_NOMINAL_PUCCH}$ is a value configured by higher layer signaling p0-nominal. If p0-nominal is not configured, $P_{O_NOMINAL_PUCCH}$ is equal to zero. $P_{O_UE_PUCCH}(q_u)$ and $PL_{b,f,c}(q_d)$ are determined based on the spatial relation information of the third uplink control channel. $M_{RB,b,f,c}^{PUCCH}(i)$ is the number of resource blocks allocated for the third uplink control channel. μ indicates a subcarrier spacing used by the third uplink control channel. $\Delta_{\mathrm{F_PUCCH}}(F)$ is a value semi-statically configured by using a higher-layer parameter.

10. The method according to claim 9, wherein, if the third uplink control channel is physical uplink control channel (PUCCH) Fomart 2, PUCCH Format 3 or PUCCH Format 4, $\Delta_{\mathrm{TF},b,f,c}(i)$ is determined based on the number of bits of the first UCI and a size of a time-frequency resource for carrying the first UCI via the third uplink control channel.

11. The method according to claim 10, wherein

$\Delta_{\mathrm{TF},b,f,c}(i) = 10\log_{10}\left(K_1 \cdot \left(n_{\mathrm{HARQ\text{-}ACK}}(i) + O_{\mathrm{SR}}(i) + O_{\mathrm{CSI}}(i)\right) / N_{\mathrm{RE}}(i)\right)$,

wherein $K_1 = 6$, $n_{\mathrm{HARQ\text{-}ACK}}(i)$ indicates the number of bits of the ACK/NACK in the first UCI, $O_{\mathrm{SR}}(i)$ indicates the number of bits of the scheduling request (SR) in the first UCI, $O_{\mathrm{CSI}}(i)$ indicates the number of bits of the CSI in the first UCI, and $N_{\mathrm{RE}}(i)$ indicates a size of a time-frequency resource for carrying the first UCI in the third uplink control channel.

12. The method according to claim 10, wherein $\Delta_{\mathrm{TF},b,f,c}(i) = 10\log_{10}\left(2^{K_2 \cdot \mathrm{BPRE}(i)} - 1\right)$

wherein $K_2 = 2.4$, $\mathrm{BPRE}(i) = \left(O_{\mathrm{ACK}}(i) + O_{\mathrm{SR}}(i) + O_{\mathrm{CSI}}(i) + O_{\mathrm{CRC}}(i)\right) / N_{\mathrm{RE}}(i)$, $O_{ACK}(i)$ indicates the number of bits of the ACK/NACK in the first UCI, $O_{\mathrm{SR}}(i)$ indicates the number of bits of the SR in the first UCI, $O_{\mathrm{CSI}}(i)$ indicates the number of bits of the CSI in the first UCI, $O_{\mathrm{CRC}}(i)$ is the number of check bits of the first UCI, and $N_{\mathrm{RE}}(i)$ indicates a size of a time-frequency resource for carrying the first UCI in the third uplink control channel.

13. The method according to claim 9, wherein, if the third uplink control channel is PUCCH

Fomart 1, $\Delta_{\mathrm{TF},b,f,c}(i)$ is determined based on the number of bits of the first UCI and the number of bits of the second UCI.

14. The method according to claim 13, wherein, $\Delta_{\mathrm{TF},b,f,c}(i)=10\log_{10}\left(\frac{N_{\mathrm{ref}}^{\mathrm{PUCCH}}}{N_{\mathrm{symb}}^{\mathrm{PUCCH}}(i)}\right)+\Delta_{\mathrm{UCI}}(i)$

wherein $N_{\mathrm{symb}}^{\mathrm{PUCCH}}(i)$ indicates the number of the symbols occupied by the third uplink control channel, $N_{\mathrm{ref}}^{\mathrm{PUCCH}}$ indicates the number of symbols in one slot, $\Delta_{\mathrm{UCI}}(i)=10\log_{10}\left(O_{\mathrm{UCI}}(i)\right)$, where $O_{\mathrm{UCI}}(i)$ indicates the total number of bits of the first UCI and the second UCI.

15. A communication apparatus, comprising a module configured to perform the method according to any one of claims 1 to 7, or perform the method according to any one of claims 8 to 14.

16. A communication apparatus, comprising a processor and an interface circuit, wherein the interface circuit is configured to receive a signal from a communication apparatus other than the communication apparatus and transmit the signal to the processor, or send a signal from the processor to a communication apparatus other than the communication apparatus, and the processor is configured to implement the method according to any one of claims 1 to 14 by using a logic circuit or by executing code instructions.

17. A computer-readable storage medium, wherein the storage medium stores a computer program or instructions, and when the computer program or the instructions are executed by a communication apparatus, the method according to any one of claims 1 to 7, or the method according to any one of claims 8 to 14 is implemented.

18. A computer program, wherein when the computer program is executed, the method according to any one of claims 1 to 7, or the method according to any one of claims 8 to 14 is implemented.