CLAIMS

What is claimed is:

1. A space debris collision avoidance method taking into account a task of orbit altitude adjustment, comprising:

acquiring a collision risk value of a spacecraft and space debris within a target time period, in a case that the spacecraft has a continuous orbit change requirement; and

controlling the spacecraft with a target control strategy at a second moment, in a case that the collision risk value at a first moment within the target time period is greater than a preset value,

wherein the second moment is earlier than the first moment;

wherein the target control strategy comprises at least one of the following:

increasing an amount of orbit control, reducing an amount of orbit control, increasing a number of times of orbit control, reducing a number of times of orbit control and combining avoidance control;

before acquiring the collision risk value of the spacecraft and space debris within the target time period, the method further comprising:

acquiring an orbit control strategy corresponding to the continuous orbit change requirement in a case that the spacecraft has the continuous orbit change requirement, and acquiring an orbit control ephemeris forecast based on an orbit determination result in the orbit control strategy;

wherein acquiring the collision risk value of the spacecraft and space debris within the target time period comprises:

acquiring the collision risk value of the spacecraft and space debris within the target time period based on the orbit control ephemeris forecast and space data;

wherein controlling the spacecraft with the target control strategy at the second moment comprises:

determining a target factor based on the first moment;

determining a target orbit control arc segment that is able to execute the target control strategy in a target orbit of the spacecraft based on the target factor;

executing the target control strategy for the target orbit control arc segment;

wherein the target time period is a period of time in the future set by an operator or determined by history conditions of the spacecraft,

the first moment is a calculated collision moment of the spacecraft and the space debris;

the target factor is a constraint condition of measurement and control, lighting, and energy.

2. The space debris collision avoidance method taking into account the task of orbit altitude adjustment according to claim 1, after determining the target orbit control arc segment that is able to execute the target control strategy in the target orbit of the spacecraft based on the target factor, and before executing the target control strategy for the target orbit control arc segment, the method further comprising:

re-determining the collision risk value of the spacecraft and the space debris within the target time period based on the target control strategy and the target orbit control arc segment;

executing the target control strategy for the target orbit control arc segment, in a case that the re-determined collision risk value is less than or equal to the preset value;

re-determining an orbit control arc segment that is able to execute the target control strategy in the target orbit of the spacecraft based on the target factor, in a case that the collision risk value is greater than the preset value.

3. The space debris collision avoidance method taking into account the task of orbit altitude adjustment according to claim 1, wherein the combining avoidance control comprises at least two of increasing the amount of orbit control, reducing the amount of orbit control, increasing the number of times of orbit control, reducing the number of times of orbit control, before controlling the spacecraft with the target control strategy at the second moment, the method further comprising:

determining a second target strategy in a case that the collision risk value at the first moment within the target time period is greater than the preset value, wherein the second target strategy is at least one of increasing the amount of orbit control, reducing the amount of orbit control, increasing the number of times of orbit control, and reducing the number of times of orbit control;

re-determining the collision risk value of the spacecraft and the space debris within the target time period based on the second target strategy;

determining the target control strategy being the combining avoidance control in a case that the re-determined collision risk value is greater than the preset value.

4. A space debris collision avoidance apparatus taking into account a task of orbit altitude adjustment, comprising:

a first acquisition module, configured to acquire a collision risk value of a spacecraft and space debris within a target time period, in a case that the spacecraft has a continuous orbit change requirement; and

a control module, configured to control the spacecraft with a target control strategy at a second moment, in a case that the collision risk value at a first moment within the target time period is greater than a preset value,

wherein the second moment is earlier than the first moment;

wherein the target control strategy comprises at least one of the following:

increasing an amount of orbit control, reducing an amount of orbit control, increasing a number of times of orbit control, reducing a number of times of orbit control and combining avoidance control,

the apparatus further comprising:

a second acquisition module, configured to acquire an orbit control strategy corresponding to the continuous orbit change requirement in a case that the spacecraft has the continuous orbit change requirement, and acquire an orbit control ephemeris forecast based on an orbit determination result in the orbit control strategy;

a first determination module, configured to acquire the collision risk value of the spacecraft and space debris within the target time period based on the orbit control ephemeris forecast and space data;

the control module further comprising:

a first sub-module, configured to determine a target factor based on the first moment;

a second sub-module, configured to determine a target orbit control arc segment that is able to execute the target control strategy in a target orbit of the spacecraft based on the target factor;

a third sub-module, configured to execute the target control strategy for the target orbit control arc segment;

wherein the target time period is a period of time in the future set by an operator or determined by history conditions of the spacecraft,

the first moment is a calculated collision moment of the spacecraft and the space debris;

the target factor is a constraint condition of measurement and control, lighting, and energy.

5. The space debris collision avoidance apparatus taking into account the task of orbit altitude adjustment according to claim 4, further comprising:

a first determination module, configured to re-determine the collision risk value of the spacecraft and the space debris within the target time period based on the target control strategy and the target orbit control arc segment;

wherein the control module further comprises a fourth sub-module, configured to execute the target control strategy for the target orbit control arc segment, in a case that the re-determined collision risk value is less than or equal to the preset value;

re-determine an orbit control arc segment that is able to execute the target control strategy in the target orbit of the spacecraft based on the target factor, in a case that the collision risk value is greater than the preset value.

6. The space debris collision avoidance apparatus taking into account the task of orbit altitude adjustment according to claim 4, further comprising:

wherein the combining avoidance control comprises at least two of increasing the amount of orbit control, reducing the amount of orbit control, increasing the number of times of orbit control, reducing the number of times of orbit control,

a second determination module, configured to determine a second target strategy in a case that the collision risk value at the first moment within the target time period is greater than the preset value, wherein the second target strategy is at least one of increasing the amount of orbit control, reducing the amount of orbit control, increasing the number of times of orbit control, and reducing the number of times of orbit control;

re-determine the collision risk value of the spacecraft and the space debris within the target time period based on the second target strategy;

determine the target control strategy being the combining avoidance control in a case that the re-determined collision risk value is greater than the preset value.