of the secondary systems is not small, consideration of interference between channels may possibly become necessary. However, in order to accurately evaluate such various factors for all of the secondary systems, calculation cost for allocating the transmission power will increase, and extra load will be imposed on a control node controlling the secondary use.

[0008]

Accordingly, it is desirable that a system be provided that suppresses the load to calculate the transmission power of the secondary systems and that appropriately prevents detrimental interference to the primary system.

Solution to Problem

[0009]

According to a first aspect of the present invention, there is provided a communication control device including a power allocation unit configured to: obtain information on a primary system from a server; obtain information on a secondary system; calculate a distance of the secondary system from the primary system based on the obtained information; classify the secondary system into a first group of which the distance from the primary systems is less than a prescribed threshold and a second group of which the distance from the primary system exceeds the prescribed threshold; allocate a transmission power to the first group with a first power allocation method; and allocate a transmission power to the second group with a second power allocation method, wherein the first power allocation method has a greater computational cost than that of the second power allocation method.

[0010]

According to a second aspect of the present invention, there is provided a method for allocating transmission power for secondary use of a frequency channel protected for a primary system to a secondary system, the method including: obtaining information on a primary system from a server; obtaining information on a secondary system; calculating a distance of the secondary system from the primary system based on the obtained information; classifying the secondary system into a first group of which the distance from the primary systems is less than a prescribed threshold and a second group of which the distance from the primary system exceeds the prescribed threshold; allocating a transmission power to the first group with a first power allocation method; and allocating a transmission power to the second group with a second power allocation method, wherein the first power allocation method has a greater computational cost than that of the second power allocation method.

[0011]

According to a third aspect of the present invention, there is provided a computer readable medium on which a program is stored for causing a computer of a communication control device to function as a power allocation unit configured to: obtain information on a primary system from a server; obtain information on a secondary system; calculate a distance of the secondary system from the primary system based on the obtained information; classify the secondary system into a first group of which the distance from the primary systems is less than a prescribed threshold and a second group of which the distance from the primary system exceeds the prescribed threshold; allocate a transmission power to the first group with a first power allocation method; and allocate a transmission power to the second group with a second power allocation method, wherein the first power allocation method has a greater computational cost than that of the second power allocation method.

Advantageous Effects of Invention

[0012]

According to embodiments of the present invention, it is possible to suppress load to calculate transmission power of the secondary systems and to appropriately prevent detrimental interference to the primary system.

Brief Description of Drawings

[0013]

[FIG. 1] FIG. 1 is an explanatory diagram for explaining an interference a node of a primary system suffers upon secondary usage of a frequency.

[FIG. 2] FIG. 2 is an explanatory diagram for explaining an interference in a channel and an interference between channels.

[FIG. 3] FIG. 3 is an explanatory diagram for explaining a configuration of a communication control system according to one embodiment.

[FIG. 4] FIG. 4 is a sequence diagram illustrating an exemplary schematic flow of a communication control processing performed in the communication control system according to one embodiment.

[FIG. 5] FIG. 5 is a block diagram illustrating an exemplary configuration of the communication control device according to one embodiment.

[FIG. 6] FIG. 6 is a flowchart illustrating an exemplary flow of a power allocation process according to one embodiment.

[FIG. 7] FIG. 7 is a block diagram illustrating of an exemplary configuration of a

CLAIMS

1. A communication control device comprising

a power allocation unit configured to:

obtain information on a primary system from a server;

obtain information on a secondary system;

calculate a distance of the secondary system from the primary system based on the obtained information;

classify the secondary system into a first group of which the distance from the primary systems is less than a prescribed threshold and a second group of which the distance from the primary system exceeds the prescribed threshold;

allocate a transmission power to the first group with a first power allocation method; and allocate a transmission power to the second group with a second power allocation method,

wherein the first power allocation method has a greater computational cost than that of the second power allocation method.

2. The communication control device according to claim 1,

wherein the first power allocation method is a method that depends on a path loss regarding each secondary system, and

wherein the second power allocation method is a method that does not depend on a path loss regarding each secondary system.

3. The communication control device according to claim 2,

wherein the second power allocation method is a method to allocate a fixed value or a value requested from each secondary system as a transmission power value to each secondary system.

4. The communication control device according to claim 2,

wherein the second power allocation method is a method to distribute transmission power to each secondary system so that a sum of an accumulative interference amount on a same channel from a plurality of secondary systems to the primary system and an accumulative interference amount between channels does not exceed an acceptable interference amount of the primary system.

5. The communication control device according to claim 2,

wherein the first power allocation method is a method to distribute transmission power into each secondary system so that an accumulative interference amount on a same channel from a plurality of secondary systems to the primary system does not exceed an acceptable interference amount of the primary system.

6. The communication control device according to claim 2,

wherein the first power allocation method is a method to allocate, to the secondary system, a larger transmission power value as a path loss from each secondary system to the primary system becomes larger.

7. The communication control device according to claim 1,

wherein the first power allocation method is a method that considers accumulative interferences from a plurality of secondary systems to the primary system, and

wherein the second power allocation method is a method that does not consider accumulative interferences from a plurality of secondary systems to the primary system.

8. The communication control device according to claim 7,

wherein the second power allocation method is a method to allocate, to the secondary system, a larger transmission power value as a path loss from each secondary system to the primary system becomes larger.

9. The communication control device according to claim 1,

wherein the first power allocation method is a method that considers both an interference from a secondary system to the primary system on a same channel and an interference between channels, and wherein the second power allocation method is a method that does not consider the interference from a secondary system to the primary system between channels.

10. The communication control device according to claim 9,

wherein the second power allocation method is a method to distribute transmission power into each secondary system so that an accumulative interference amount on a same channel from a plurality of secondary systems to the primary system does not exceed an

acceptable interference amount of the primary system.

11. A method for allocating transmission power for secondary use of a frequency channel protected for a primary system to a secondary system, the method comprising:

obtaining information on a primary system from a server;

obtaining information on a secondary system;

calculating a distance of the secondary system from the primary system based on the obtained information;

classifying the secondary system into a first group of which the distance from the primary systems is less than a prescribed threshold and a second group of which the distance from the primary system exceeds the prescribed threshold;

allocating a transmission power to the first group with a first power allocation method; and

allocating a transmission power to the second group with a second power allocation method,

wherein the first power allocation method has a greater computational cost than that of the second power allocation method.

12. A computer readable medium on which a program is stored for causing a computer of a communication control device to function as

a power allocation unit configured to:

obtain information on a primary system from a server;

obtain information on a secondary system; calculate a distance of the secondary system from the primary system based on the obtained information;

classify the secondary system into a first group of which the distance from the primary systems is less than a prescribed threshold and a second group of which the distance from the primary system exceeds the prescribed threshold;

allocate a transmission power to the first group with a first power allocation method; and

allocate a transmission power to the second group with a second power allocation method,

wherein the first power allocation method has a greater computational cost than that of the second power allocation method.