[0005]

However, it is not easy to visualize the three-dimensional structure of each scatterer included in an object in a region using waves. Specifically, when the state in the region is known, obtaining the data of the scattered waves radiated from the region relative to the waves incident on the region is called a forward problem, which is easy. On the other hand, when the scattered wave data is known, obtaining the state in the region is called an inverse problem, which is not easy.

[0006]

In addition, for a single wave transmission, a plurality of scattering (reflections) may occur in the region. In other words, not only the first-order scattering corresponding to single scattering, but also the second-order scattering corresponding to two scattering, the third-order scattering corresponding to three scattering and the like may occur. Scattering more than once is also called multiple scattering. In some cases, data on scattered waves caused by multiple scattering may be obtained through measurement. An analytical method that considers only the first-order scattering but does not consider multiple scattering cannot accurately obtain the state in the region.

[0007]

In view of the above, embodiments of the present disclosure provide an imaging device and the like that is capable of visualizing, with high accuracy, the three-dimensional structure of one or more scatterers included in an object in a region, using waves.

[Solution to Problem]

[0008]

According to a first aspect of the present disclosure, there is provided an imaging device including: a plurality of transmitters which are disposed on both sides of a region to be measured, and each of which transmits a wave to the region; a plurality of receivers which are disposed on the both sides, and each of which receives the wave; and an information processing circuit which derives an imaging function corresponding to a scattering field function related to scattering of the wave according to a correspondence between measurement data obtained by the plurality of transmitters and the plurality of receivers and a composition of a plurality of functions related to multiple first-order scattering forming multiple scattering, and visualizes a three-dimensional structure of a scatterer included in an object in the region, using the imaging function.

[0008a]

According to a second aspect of the present disclosure, there is provided an imaging method including: transmitting, by each of a

plurality of transmitters disposed on both sides of the region, a wave to a region to be measured; receiving, by each of a plurality of receivers disposed on the both sides, the wave from the region; and deriving an imaging function corresponding to a scattering field function related to scattering of the wave according to a correspondence between measurement data obtained by the plurality of transmitters and the plurality of receivers and a composition of a plurality of functions related to multiple first-order scattering forming multiple scattering, and visualizing a three-dimensional structure of a scatterer included in an object in the region, using the imaging function.

[0009]

General and specific aspects disclosed above may be implemented using a system, a device, a method, an integrated circuit, a computer program, or a computer-readable non-transitory recording medium such as a CD-ROM, or any combination of systems, devices, methods, integrated circuits, computer programs, or recording media.

[Advantageous Effects of Invention]

[0010]

According to embodiments of the present disclosure, it is possible to visualize, with high accuracy, the three-dimensional structure of one or more scatterers included in an object in a region, using waves.

[Brief Description of Drawings]

[0011]

[FIG. 1]

FIG. 1 is a conceptual diagram illustrating an example of multiple scattering orders according to an embodiment.

[FIG. 2]

FIG. 2 is a diagram illustrating four types of scattering states corresponding to four types of fundamental solutions of a scattering field equation.

[FIG. 3]

FIG. 3 is a conceptual diagram relating to a definition of the Green’s function.

[FIG. 4]

FIG. 4 is a conceptual diagram illustrating an application example of fundamental solutions of a scattering field.

[FIG. 5]

FIG. 5 illustrates wave propagation paths.