However, it is not easy to image an object in a measurement area using measurement data of scattered waves. More specifically, estimating measurement data on scattered waves radiated from the measurement area in relation to waves that are incident on the measurement area when the condition in the measurement area is known is called a forward problem and is easy. However, obtaining the condition in the measurement area when measurement data on scattered waves is known is called an inverse problem and is not easy.

[0006]

Moreover, when a plurality of transmitters transmit waves in coordination with each other, and a plurality of receivers receive scattered waves of the waves in coordination with each other, the granularity of information may become coarse, making it potentially difficult to image an object in the measurement area.

[0007]

In view of this, embodiments of the present disclosure provide an imaging device or the like that is capable of efficiently imaging an object in a measurement area using a plurality of transmitters that transmit waves in coordination with each other, and a plurality of receivers that receive scattered waves of the waves in coordination with each other.

[Solution to Problem]

[0008]

An imaging device according to one aspect of the present disclosure includes: one or more transmitter arrays each of which (i) includes a plurality of transmitters that are connected in a first direction and operate in conjunction with each other and (ii) transmits a wave to a measurement area via the plurality of transmitters; one or more receiver arrays each of which (i) includes a plurality of receivers that are connected in a second direction different from the first direction and operate in conjunction with each other and (ii) receives a scattered wave of the wave from the measurement area via the plurality of receivers; and an information processing circuit that images an object in the measurement area using measurement data of the scattered wave, wherein in imaging the object, the information processing circuit: derives, using the measurement data, a scattering field function that receives a transmission position of the wave and a reception position of the scattered wave as input and outputs an amount of the scattered wave at the reception position; derives an imaging function that receives an imaging target position as input and outputs an image intensity at the imaging target position, and is defined using an amount output from the scattering field function in response to inputting the imaging target position into the scattering field function as the transmission position and the reception position; and images the object in the measurement area using the imaging function.

[0008a]

An imaging method according to another aspect of the present disclosure includes: transmitting a wave to a measurement area via a plurality of transmitters included in one or more transmitter arrays in each of which the plurality of transmitters are connected in a first direction and operate in conjunction with each other; receiving a scattered wave of the wave from the measurement area via a plurality of receivers included in one or more receiver arrays in each of which the plurality of receivers are connected in a second direction different from the first direction and operate in conjunction with each other; and imaging an object in the measurement area using measurement data of the scattered wave, wherein the imaging of the object includes: deriving, using the measurement data, a scattering field function that receives a transmission position of the wave and a reception position of the scattered wave as input and outputs an amount of the scattered wave at the reception position; deriving an imaging function that receives an imaging target position as input and outputs an image intensity at the imaging target position, and is defined using an amount output from the scattering field function in response to inputting the imaging target position into the scattering field function as the transmission position and the reception position; and imaging the object in the measurement area using the imaging function.

[0009]

These general or specific aspects may be implemented as a system, a device or apparatus, a method, an integrated circuit, a computer program, or a non-transitory computer-readable recording medium such as a CD-ROM, or any combination thereof.

[Advantageous Effects of Invention]

[0010]

According to embodiments of the present disclosure, it is possible to efficiently image an object in a measurement area using a plurality of transmitters that transmit waves in coordination with each other, and a plurality of receivers that receive scattered waves of the waves in coordination with each other.

[Brief Description of Drawings]

[0011]

[FIG. 1]

FIG. 1 is an external view illustrating an ultrasonic transmission and reception device according to a reference example.

[FIG. 2]

FIG. 2 is a conceptual diagram illustrating an ultrasonic dynamic depth focus according to a reference example.

[FIG. 3]

FIG. 3 is a conceptual diagram illustrating a configuration example of a two-dimensional transceiver element array according to