受験番号：32IPE035

問１.

[Claim 1]

A cardiothoracic ratio calculation device that calculates a cardiothoracic ratio on the basis of a chest X-ray image, the cardiothoracic ratio calculation device comprising:

a measurement position estimation unit that estimates a lung right end position, a lung left end position, a heart right end position, and a heart left end position in the chest X-ray image; and

a cardiothoracic ratio calculation unit that calculates the cardiothoracic ratio on the basis of the estimated lung right end position, lung left end position, heart right end position, and heart left end position, wherein

the measurement position estimation unit divides the chest X-ray image into a plurality of horizontal areas, detects, for each of the horizontal areas, a lung right end candidate and a lung left end candidate on the basis of a pixel value, detects a heart right end candidate and a heart left end candidate on the basis of a differential value of the pixel value in a horizontal direction,

extracts a specific horizontal area on the basis of a distance between a lung midpoint defined by the lung right end candidate and the lung left end candidate and a heart midpoint defined by the heart right end candidate and the heart left end candidate or on the basis of a ratio of the distance to a lung width defined by the lung right end candidate and the lung left end candidate, and estimates a lung right end candidate, a lung left end candidate, a heart right end candidate, and a heart left end candidate in the extracted horizontal area to be the lung right end position, the lung left end position, the heart right end position, and the heart left end position, respectively.

[Claim 2]

The cardiothoracic ratio calculation device according to claim 1, wherein

when the pixel value increases as X-ray transmittance increases,

the measurement position estimation unit detects,

as the lung right end candidate, a position with the lowest pixel

value in an area within a predetermined range from a right end of each of the horizontal areas, and

as the lung left end candidate, a position with the lowest pixel value in an area within a predetermined range from a left end of each of the horizontal areas.

[Claim 3]

The cardiothoracic ratio calculation device according to claim 1 or 2, wherein

the measurement position estimation unit detects,

as the heart right end candidate, a position where the differential value is largest in a negative direction between the lung right end candidate and the lung left end candidate in each of the horizontal areas, and

as the heart left end candidate, a position where the differential value is largest in a positive direction between the lung right end candidate and the lung left end candidate in each of the horizontal areas.

問２.

Conventionally, a technique called a blockchain is known. This technique is a mechanism to synchronize the same record between many nodes on the network, and is called so because, when a new record is added to an existing record, a block as a recording unit is added one after another in a chain while contents (hash) of the immediately preceding block are inherited. In general, the term of blockchain may refer to a structure of a database in which blocks are connected in a chain, but may be used in a broad sense including a mechanism for operating as a P2P network and a mechanism for transaction approval, and the definition of the term is not clear at this time. Therefore, in this specification, in order to prevent confusion between the two meanings, the former used in the narrow sense is referred to as "blockchain", and the latter used in the broad sense is referred to as "blockchain technology".

The blockchain technology has many advantages such as zero downtime, tamper resistance, and low cost, and thus is beginning to attract attention not only as a virtual currency including Bitcoin and its derivative currencies, but also as a method for managing information

on various assets as transactions. For example, Non-Patent Document 1 describes that a blockchain that can play an important role in establishing reliability is used for proof of existence and proof of identity of various documents.

The blockchain technology mainly has a public node method and a private node method. The public node method is a method in which anyone can participate as a node on the network. On the other hand, the private node method is a method in which only those who are authorized can participate as nodes on the network.

問３.

<At the time of occurrence of flashback>

In the burner 100, when the flashback R penetrates from the burner element 15, as shown in FIG. 3(B), the heat-expandable member 22 thermally expands toward the inner peripheral side due to the heat of the flashback R, to form a heat-expandable member 222 in which the opening 22H is closed.

As a result, the opening 22H of the heat-expandable member 222 (22) is closed, which prevents the heat of the flashback R and the ultraviolet ray L emitted by the flame F generated by the burner element 15 from arriving at the flame detection sensor 23.

In this embodiment, a control unit (not shown) is configured to determine that the burner 100 is burning normally, for example, when the flame detection sensor 23 detects the ultraviolet ray L, and determines that a flashback or misfire has occurred when the amount of the ultraviolet ray L detected by the flame detection sensor 23 is equal to or less than a set threshold value (including zero).

As a result, when the burner 100 misfires and does not emit the ultraviolet ray L, when the heat-expandable member 22 thermally expands and the flame detection sensor 23 does not detect the ultraviolet ray L, as shown in FIG. 3(B), and when the amount of the detected ultraviolet ray L is equal to or less than the threshold value, it is determined that a misfire or flashback has occurred in the burner 100.