

受験番号 : 32IPE040

問 1 .

1. A cardiothoracic ratio calculation apparatus that calculates a cardiothoracic ratio on the basis of a thorax x-ray image, the cardiothoracic ratio calculation apparatus comprising:

a measurement position estimating 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 thorax x-ray image; and

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

wherein the measurement position estimating unit divides the thorax x-ray image into a plurality of horizontal-direction regions and, for each of the horizontal-direction regions, detects a candidate lung right end and a candidate lung left end on the basis of pixel values and also detects a candidate heart right end and a candidate heart left end on the basis of horizontal-direction derivative values of pixel values, and

wherein, on the basis of a distance between a lung intermediate point and a heart intermediate point, the lung intermediate point being defined by the candidate lung right end and the candidate lung left end, the heart intermediate point being defined by the candidate heart right end and the candidate heart left end, or on the basis of a ratio of the distance to a lung width defined by the candidate lung right end and the candidate lung left end, the measurement position estimating unit further extracts a specific horizontal-direction region to estimate, as the lung right end position, the lung left end position, the heart right end position, and the heart left end position, the candidate lung right end, the candidate lung left end, the candidate heart right end, and the candidate heart left end in the extracted horizontal-direction region.

2. The cardiothoracic ratio calculation apparatus according to claim 1,

wherein, if a pixel value is set to a larger value as an x-ray transmittance is higher, the measurement position estimating unit detects, as the candidate lung right end, a position at which the pixel value is the smallest in a region within a predetermined range from a right end of the horizontal-direction region, and detects, as the candidate lung left end, a position at which the pixel value is the smallest in a region within a predetermined range from a left end of the horizontal-direction region.

3. The cardiothoracic ratio calculation apparatus according to claim 1 or 2, wherein the measurement position estimating unit detects, as the candidate heart right end, a position at which the derivative value is the largest in a negative direction between the candidate lung right end and the candidate lung left end in the horizontal-direction region, and detects, as the candidate heart left end, a position at which the derivative value is the largest in a positive direction between the candidate lung right end and the candidate lung left end in the horizontal-direction region.

問 2 .

A technology called blockchain has been conventionally known. This technology is a mechanism for synchronizing the same record among a large number of nodes on a network. In a case where a new record is added to existing records, a block serving as a record unit is added one after another in the form of a chain while taking over the content (hash) of the previous block. That is why this technology is called blockchain. Currently, the definition of the term “blockchain” is unclear because it may typically indicate the structure of a database in which blocks are linked in the form of a chain and may also be used in a broad sense including a mechanism working as a P2P network, a mechanism of approving transactions, and so on. Thus, in order to prevent confusion between the above two meanings, in this specification, the term “blockchain” is used to indicate the former meaning of a narrow sense, and the term “blockchain technology” is used to indicate the latter meaning of a broad sense.

Since the blockchain technology has many advantages such as zero downtime, difficulty of falsification, and low cost, the blockchain technology is beginning to attract attention also as a method of managing, as transactions, information regarding various kinds of property, not only cryptocurrency including bitcoin and its derivatives. For example, Non-Patent Document 1 describes the use of the blockchain, which may play an important role for establishing reliability, for existence proof or identify proof of various documents.

For the blockchain technology, mainly, a public node scheme and a private node scheme are present. The public node scheme is a scheme in which any person can participate as a node on a network. On the other hand, the private node scheme is a scheme in which only a person who is permitted as a node on a network can participate.

問 3 .

<In case of backfire>

If backfire R enters the burner 100 from the burner element 15, as illustrated in Fig. 3B, the heat of the backfire R makes the thermally expandable member 22 thermally expand toward the inner circumference, and thus, a thermally expandable member 222 that obstructs the opening 22H is formed.

As a result, obstruction of the opening 22H of the thermally expandable member 222 (22) suppresses the reach of the heat of the back fire R and the ultraviolet light L emitted from the flame F generated in the burner element 15 to the flame detection sensor 23.

In this embodiment, for example, a control unit (not illustrated) is configured to determine that the burner 100 is normally performing burning while the flame detection sensor 23 is detecting the ultraviolet light L, and to determine that backfire is generated or the flame is extinguished if the light amount of the ultraviolet light L detected by the flame detection sensor 23 is less than or equal to a set threshold (including zero).

As a result, if the ultraviolet light L is not emitted as a result of flame extinction in the burner 100, and if the flame detection sensor 23 does not detect the ultraviolet light L or if the detected light amount of the ultraviolet light L is less than or equal to the threshold as a result of thermal expansion of the thermally expandable member 22, as illustrated in Fig. 3B, it is determined that the flame is extinguished or backfire is generated in the burner 100.