

受験番号 : 32IPE009

問 1 .

1. A cardiothoracic ratio calculation apparatus for calculating a cardiothoracic ratio based on a chest X-ray image, the apparatus comprising:

a measurement position estimation unit configured to estimate a right-end position of lungs, a left-end position of the lungs, a right-end position of a heart, a left-end position of the heart in the chest X-ray image; and

a cardiothoracic ratio calculation unit configured to calculate a cardiothoracic ratio based on the right-end position of the lungs, the left-end position of the lungs, the right-end position of the heart, and the left-end position of the heart that have been estimated, wherein

the measurement position estimation unit

divides the chest X-ray image into a plurality of horizontal regions, and, for each of the horizontal regions, detects a candidate right-end of the lungs and a candidate left-end of the lungs based on pixel values, and detects a candidate right-end of the heart and a candidate left-end of the heart based on horizontal differential values of the pixel values, and

extracts a specified horizontal region based on a distance between a midpoint between the lungs defined by the candidate right-end of the lungs and the candidate left-end of the lungs, and a midpoint of the heart defined by the candidate right-end of the heart and the candidate left-end of the heart, or a ratio of the distance to a width of the lungs defined by the candidate right-end of the lungs and the candidate left-end of the lungs, and estimates a candidate right-end of the lungs, a candidate left-end of the lungs, a candidate right-end of the heart, and a candidate left-end of the heart in the extracted horizontal region, as a right-end position of the lungs, a left-end position of the lungs, a right-end position of the heart, and a left-end position of the heart.

2. The cardiothoracic ratio calculation apparatus according to claim 1, wherein the measurement position estimation unit

detects, as a candidate right-end of the lungs, a position having a smallest pixel value in a region within a certain range from a right end of the horizontal region, and

detects, as a candidate left-end of the lungs, a position having a

smallest pixel value in a region within a certain range from a left end of the horizontal region,

where a larger pixel value indicates higher transmittance of X-ray.

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

the measurement position estimation unit

detects, as a candidate right-end of the heart, a position having a largest negative differential value between the candidate right-end of the lungs and the candidate left-end of the lungs in the horizontal region, and

detects, as a candidate left-end of the heart, a position having a largest positive differential value between the candidate right-end of the lungs and the candidate left-end of the lungs in the horizontal region.

問 2.

Technology called blockchain has conventionally been known. This technology synchronizes identical records among multiple nodes in a network. The blockchain is named for its mechanism in which, when new records are added to an existing record, blocks serving as recording units are sequentially added in a chain while copying a content (a hash) of the previous block. Although the term "blockchain" may generally refer to a database structure in which blocks are linked in a chain, it may be used in a broader sense including a system that works as a P2P network, and a system of approving transactions, and thus the definition of blockchain is yet unclear at present. The present specification therefore uses the term "blockchain" when it is used in the former narrow sense, and uses the term "blockchain technology" when it is used in the latter broader sense, to prevent confusion between them.

Having many advantages such as zero down time, difficulty in tampering, and low cost, the blockchain technology has started gathering attention as a technique to manage, in a form of transaction, not only virtual currencies including bitcoin and its derivative currencies but also information on various assets. For example, Non Patent Literature 1 describes using the blockchain, which can play an important role in ensuring reliability, as proof of existence of various documents and proof of identity.

The blockchain technology includes two major types: the public node type and the private node type. The public node type allows everyone to participate as a node in a network, while the private node type allows only people who have been permitted as nodes in a network to participate.

問 3.

<When back fire occurs>

When back fire R enters the burner 100 from the burner element 15, the heat of the back fire R causes the thermal expansion member 22 to thermally expand toward the inner circumference side, forming a thermal expansion member 222 with the opening 22H closed, as illustrated in Fig. 3 (B).

As a result, the closure of the opening 22H of the thermal expansion member 222(22) prevents the heat of the back fire R and ultraviolet radiation L emitted from the fire F generate by the burner element 15 from reaching the fire detection sensor 23.

In the present embodiment, a controller (not illustrated) is configured to, for example, determine that the burner 100 is performing combustion normally when the fire detection sensor 23 detects the ultraviolet radiation L, and determine that back fire or misfire has occurred when the quantity of ultraviolet radiation L detected by the fire detection sensor 23 is equal to or smaller than a preset threshold (including zero).

Thus, the controller determines that misfire of backfire has occurred at the burner 100 when misfire occurs at the burner 100 and the ultraviolet radiation L is not generated, or when the fire detection sensor 23 fails to detect the ultraviolet radiation L or the detected quantity of ultraviolet radiation L is equal to or smaller than the threshold due to the thermal expansion of the thermal expansion member 22 as illustrated in Fig. 3(B).