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Information saving apparatus, method, and program and analysis record generation apparatus, method, and program for recognizing correction made in image analysis record

Abstract

An information saving apparatus includes at least one processor, in which the processor is configured to analyze an image to derive a plurality of pieces of property information indicating properties of a structure of interest included in the image, generate an image analysis record including at least a portion of the plurality of pieces of property information, receive a correction of the property information by a user, and save the derived property information and the corrected property information in a distinguishable manner.

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References Cited

U.S. PATENT DOCUMENTS

Patent No.	Issued Date	Patentee Name	U.S. Cl.	CPC
5807256	12/1997	Taguchi	600/300	G06T 7/11
2005/0107690	12/2004	Soejima	600/425	G16H 30/20
2007/0083396	12/2006	Kanada et al.	N/A	N/A
2010/0189366	12/2009	Iizuka et al.	N/A	N/A
2013/0315456	12/2012	Marugame	382/128	G06T 7/0012
2019/0267132	12/2018	Fuchigami et al.	N/A	N/A
2019/0279751	12/2018	Nakamura et al.	N/A	N/A
2020/0160993	12/2019	Xie	N/A	G06T 7/0012
2020/0410678	12/2019	Song	N/A	G06N 3/08

FOREIGN PATENT DOCUMENTS

Patent No.	Application Date	Country	CPC
H0731591	12/1994	JP	N/A
2007122679	12/2006	JP	N/A
2009082443	12/2008	JP	N/A
2009259000	12/2008	JP	N/A
2011125402	12/2010	JP	N/A
2016040688	12/2015	JP	N/A
2017068801	12/2016	JP	N/A
2018110040	12/2017	JP	N/A
2019149130	12/2018	JP	N/A
2019153250	12/2018	JP	N/A

OTHER PUBLICATIONS

"Office Action of Japan Counterpart Application", issued on Oct. 17, 2023, with English translation thereof, p. 1-p. 7. cited by applicant

"International Search Report (Form PCT/ISA/210) of PCT/JP2021/007977," mailed on Jun. 8, 2021, with English translation thereof, pp. 1-5. cited by applicant

"Written Opinion of the International Searching Authority (Form PCT/ISA/237)" of PCT/JP2021/007977, mailed on Jun. 8, 2021, with English translation thereof, pp. 1-6. cited by applicant

“Office Action of Japan Counterpart Application”, issued on Jan. 7, 2025, with English translation thereof, p. 1-p. 8. cited by applicant

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Background/Summary

CROSS REFERENCE TO RELATED APPLICATIONS (1) The present application is a Continuation of PCT International Application No. PCT/JP2021/007977, filed on Mar. 2, 2021, which claims priority to Japanese Patent Application No. 2020-035800, filed on Mar. 3, 2020. Each application above is hereby expressly incorporated by reference, in its entirety, into the present application.

BACKGROUND
Technical Field
(1) The present disclosure relates to an information saving apparatus, method, and program and an analysis record generation apparatus, method, and program.
Related Art
(2) In recent years, advances in medical devices, such as computed tomography (CT) apparatuses and magnetic resonance imaging (MRI) apparatuses, have enabled image diagnosis using high-resolution medical images with higher quality. In particular, since a region of a lesion can be accurately analyzed by image diagnosis using CT images, MRI images, and the like, appropriate treatment is being performed based on the analyzed result.
(3) In addition, image diagnosis is also made by analyzing a medical image via computer-aided diagnosis (CAD) using a learning model in which machine learning is performed by deep learning or the like, discriminating properties such as the shape, density, position, and size of structures of interest such as abnormal shadow candidates included in the medical images, and acquiring them as an analysis result. The analysis result acquired by CAD is associated with examination information such as a patient name, gender, age, and a modality that has acquired the medical image, and is saved in a database. The medical image and the analysis result are transmitted to a terminal of a radiologist who interprets the medical images. The radiologist interprets the medical image by referring to the transmitted medical image and analysis result and creates an interpretation report, in his or her own terminal.
(4) Meanwhile, with the improvement of the performance of the CT apparatus and the MRI apparatus described above, the number of medical images to be interpreted is also increasing. However, since the number of radiologists has not kept up with the number of medical images, it is desired to reduce the burden of the image interpretation work of the radiologists. Therefore, various methods have been proposed to support the creation of medical documents such as interpretation reports. For example, JP2019-153250A proposes a method for automatically generating a sentence to be included in an interpretation report based on keywords input by a radiologist and on information indicating a property of a structure of interest (hereinafter referred to as property information) included in an analysis result of a medical image. In the methods described in JP2019-153250A, a sentence relating to medical care (hereinafter referred to as a medical sentence) is created by using a learning model in which machine learning is performed, such as a recurrent neural network trained to generate a sentence from characters representing the input property information. By automatically generating the medical sentence as in the method described in JP2019-153250A, it is possible to reduce a burden on a radiologist at the time of creating a medical

document such as an interpretation report.
(5) Incidentally, the automatically generated interpretation report may be corrected by the radiologist. In addition, in the case of comparing with time, in describing the latest medical image interpretation report, the past medical image interpretation report is often referred to. Therefore, a method of extracting the corrected part of the corrected interpretation report (see JP2011-125402A) and a method of extracting the difference between the past medical image interpretation report and the latest medical image interpretation report (see JP2007-122679A) have been proposed.
(6) In a learning model that generates an image analysis record such as a sentence from an image, such as a learning model that generates an interpretation report from a medical image, there is a user's preference for the content and expression of the analysis record, and it is desired to construct a learning model that reflects that preference. As the user's preference, for example, regarding property information analyzed from the image, which property information should be reflected in the final analysis record and the like can be mentioned.
(7) However, depending on the content of supervised training data used to train the learning model, or depending on the learning limits of the learning model, the generated image analysis record may not match the user's preference. In such cases, the user needs to correct the generated image analysis record. Here, in a case where the image analysis record is a sentence, if the sentences before and after the correction are compared using the methods described in JP2011-125402A and JP2007-122679A, it is possible to recognize which part of the sentence has been corrected.
(8) However, in the case of the methods described in JP2011-125402A and JP2007-122679A, although the corrected part of the image analysis record can be known, it is not possible to recognize which of the property information acquired by analyzing the image has been corrected. Since the learning model generates an image analysis record from the property information, it is difficult to construct a learning model according to the user's preference unless it is known which of the property information has been corrected.

SUMMARY OF THE INVENTION

(9) The present disclosure has been made in view of the above circumstances, and an object thereof is to be able to recognize which of property information derived by analyzing an image has been corrected in a case where an image analysis record generated from the image has been corrected.
(10) According to an aspect of the present disclosure, there is provided an information saving apparatus comprising at least one processor, in which the processor is configured to analyze an image to derive a plurality of pieces of property information indicating properties of a structure of interest included in the image, generate an image analysis record including at least a portion of the plurality of pieces of property information, receive a correction of the property information by a user, and save the derived property information and the corrected property information in a distinguishable manner.
(11) In the information saving apparatus according to the aspect of the present disclosure, the processor may be configured to display the image analysis record on the display.
(12) In the information saving apparatus according to the aspect of the present disclosure, the processor may be configured to receive at least one of deletion of the property information included in the displayed image analysis record or addition of the property information not included in the image analysis record as the correction.
(13) In the information saving apparatus according to the aspect of the present disclosure, the processor may display an entirety or a portion of the derived property information on the display, and receive the correction based on selection of the displayed property information by the user.
(14) The information saving apparatus according to the aspect of the present disclosure may further comprise a learning model trained to output the image analysis record in a case where the property information is input.
(15) In the information saving apparatus according to the aspect of the present disclosure, the processor may be configured to generate a sentence including at least a portion of the property

information as the image analysis record.
(16) In the information saving apparatus according to the aspect of the present disclosure, the image may be a medical image, and the sentence may be a medical sentence related to the structure of interest included in the medical image.
(17) According to another aspect of the present disclosure, there is provided an analysis record generation apparatus comprising at least one processor, in which the processor is configured to derive a plurality of pieces of property information indicating properties of a structure of interest included in a target image to be analyzed, and refer to the information saved by the information saving apparatus according to the aspect of the present disclosure to generate a target image analysis record including at least a portion of the property information.
(18) In the analysis record generation apparatus according to the aspect of the present disclosure, the processor may be configured to specify the saved information including property information that matches the property information derived from the target image, and generate an image analysis record associated with the specified saved information as the target image analysis record.
(19) In the analysis record generation apparatus according to the aspect of the present disclosure, the processor may be further configured to generate another target image analysis record including at least a portion of the derived property information without reference to the saved information.
(20) The expression “to generate another target image analysis record . . . , without reference to . . . ” means to generate another target image analysis record without referring to the saved information.
(21) In the analysis record generation apparatus according to the aspect of the present disclosure, the processor may be configured to display the target image analysis record and the other target image analysis record on a display.
(22) In the analysis record generation apparatus according to the aspect of the present disclosure, the processor may be configured to receive selection of either the displayed target image analysis record or the displayed other target image analysis record.
(23) In the analysis record generation apparatus according to the aspect of the present disclosure, the processor may be configured to generate a sentence including at least a portion of the property information as the target image analysis record.
(24) In the analysis record generation apparatus according to the aspect of the present disclosure, the image may be a medical image, and the sentence may be a medical sentence related to the structure of interest included in the medical image.
(25) According to another aspect of the present disclosure, there is provided an information saving method comprising: analyzing an image to derive a plurality of pieces of property information indicating properties of a structure of interest included in the image; generating an image analysis record including at least a portion of the plurality of pieces of property information; receiving a correction of the property information by a user; and saving the derived property information and the corrected property information in a distinguishable manner.
(26) According to another aspect of the present disclosure, there is provided an analysis record generation method comprising: deriving a plurality of pieces of property information indicating properties of a structure of interest included in a target image to be analyzed; and referring to the information saved by the information saving apparatus according to the aspect of the present disclosure to generate a target image analysis record including at least a portion of the property information.
(27) In addition, the information saving method and the analysis record generation method according to the aspects of the present disclosure may be provided as a program for causing a computer to execute the methods.
(28) According to the aspects of the present disclosure, it is possible to recognize which of property information derived by analyzing an image has been corrected in a case where an image analysis record generated from the image has been corrected.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

(1) FIG. **1** is a diagram showing a schematic configuration of a medical information system to which an information saving apparatus and an analysis record generation apparatus according to an embodiment of the present disclosure are applied.

(2) FIG. **2** is a diagram showing a schematic configuration of the information saving apparatus and the analysis record generation apparatus according to the present embodiment.

(3) FIG. **3** is a functional configuration diagram of the information saving apparatus and the analysis record generation apparatus according to the present embodiment.

(4) FIG. **4** is a diagram showing an example of supervised training data for training a first learning model.

(5) FIG. **5** is a diagram for describing property information derived by an analysis unit.

(6) FIG. **6** is a diagram schematically showing a configuration of a recurrent neural network.

(7) FIG. **7** is a diagram showing an example of a display screen of a medical sentence.

(8) FIG. **8** is a diagram showing an example of a display screen of a corrected medical sentence.

(9) FIG. **9** is a diagram for describing saved information showing a saved result of property information.

(10) FIG. **10** is a diagram showing an example of a display screen of a target medical sentence and an alternative plan.

(11) FIG. **11** is a flowchart showing an information saving process performed in the present embodiment.

(12) FIG. **12** is a flowchart showing an analysis record generation process performed in the present embodiment.

(13) FIG. **13** is a diagram showing an example of a display screen of a medical sentence and a collation result.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

(14) Hereinafter, embodiments of the present disclosure will be described with reference to the drawings. First, a configuration of a medical information system **1** to which an information saving apparatus and an analysis record generation apparatus according to the present embodiment are applied will be described. FIG. **1** is a diagram showing a schematic configuration of the medical information system **1**. The medical information system **1** shown in FIG. **1** is, based on an examination order from a doctor in a medical department using a known ordering system, a system for imaging an examination target part of a subject, storing a medical image acquired by the imaging, interpreting the medical image by a radiologist and creating an interpretation report, and viewing the interpretation report and observing the medical image to be interpreted in detail by the doctor in the medical department that is a request source.

(15) As shown in FIG. **1**, in the medical information system **1**, a plurality of imaging apparatuses **2**, a plurality of interpretation workstations (WSs) **3** that are interpretation terminals, a medical care WS **4**, an image server **5**, an image database (hereinafter referred to as an image DB) **6**, a report server **7**, and a report database (hereinafter referred to as a report DB) **8** are communicably connected to each other through a wired or wireless network **10**.

(16) Each apparatus is a computer on which an application program for causing each apparatus to function as a component of the medical information system **1** is installed. The application program is recorded on a recording medium, such as a digital versatile disc (DVD) or a compact disc read only memory (CD-ROM), and distributed, and is installed on the computer from the recording medium. Alternatively, the application program is stored in a storage apparatus of a server computer connected to the network **10** or in a network storage in a state in which it can be accessed from the outside, and is downloaded to and installed on the computer in response to a request.

(17) The imaging apparatus **2** is an apparatus (modality) that generates a medical image showing a diagnosis target part of the subject by imaging the diagnosis target part. Specifically, examples of the modality include a simple X-ray imaging apparatus, a CT apparatus, an MRI apparatus, a positron emission tomography (PET) apparatus, and the like. The medical image generated by the imaging apparatus **2** is transmitted to the image server **5** and is saved in the image DB **6**.
(18) The interpretation WS **3** is a computer used by, for example, a radiologist of the radiology department to interpret a medical image and to create an interpretation report, and encompasses an information saving apparatus and an analysis record generation apparatus (hereinafter, represented by the information saving apparatus) **20** according to the present embodiment. In the interpretation WS **3**, a viewing request for a medical image to the image server **5**, various image processing for the medical image received from the image server **5**, display of the medical image, input reception of comments on findings regarding the medical image, and the like are performed. In the interpretation WS **3**, an analysis process for medical images and input comments on findings, support for creating an interpretation report based on the analysis result, a registration request and a viewing request for the interpretation report to the report server **7**, and display of the interpretation report received from the report server **7** are performed. The above processes are performed by the interpretation WS **3** executing software programs for respective processes.
(19) The medical care WS **4** is a computer used by a doctor in a medical department to observe an image in detail, view an interpretation report, create an electronic medical record, and the like, and is configured to include a processing apparatus, a display apparatus such as a display, and an input apparatus such as a keyboard and a mouse. In the medical care WS **4**, a viewing request for the image to the image server **5**, display of the image received from the image server **5**, a viewing request for the interpretation report to the report server **7**, and display of the interpretation report received from the report server **7** are performed. The above processes are performed by the medical care WS **4** executing software programs for respective processes.
(20) The image server **5** is a general-purpose computer on which a software program that provides a function of a database management system (DBMS) is installed. The image server **5** comprises a storage in which the image DB **6** is configured. This storage may be a hard disk apparatus connected to the image server **5** by a data bus, or may be a disk apparatus connected to a storage area network (SAN) or a network attached storage (NAS) connected to the network **10**. In a case where the image server **5** receives a request to register a medical image from the imaging apparatus **2**, the image server **5** prepares the medical image in a format for a database and registers the medical image in the image DB **6**.
(21) Image data of the medical image acquired by the imaging apparatus **2** and accessory information are registered in the image DB **6**. The accessory information includes, for example, an image identification (ID) for identifying each medical image, a patient ID for identifying a subject, an examination ID for identifying an examination, a unique ID (unique identification (UID)) allocated for each medical image, examination date and examination time at which a medical image is generated, the type of imaging apparatus used in an examination for acquiring a medical image, patient information such as the name, age, and gender of a patient, an examination part (an imaging part), imaging information (an imaging protocol, an imaging sequence, an imaging method, imaging conditions, the use of a contrast medium, and the like), and information such as a series number or a collection number in a case where a plurality of medical images are acquired in one examination.
(22) In addition, in a case where the viewing request from the interpretation WS **3** and the medical care WS **4** is received through the network **10**, the image server **5** searches for a medical image registered in the image DB **6** and transmits the searched for medical image to the interpretation WS **3** and to the medical care WS **4** that are request sources.
(23) The report server **7** incorporates a software program for providing a function of a database management system to a general-purpose computer. In a case where the report server **7** receives a

request to register the interpretation report from the interpretation WS **3**, the report server **7** prepares the interpretation report in a format for a database and registers the interpretation report in the report DB **8**.

(24) In the report DB **8**, an interpretation report including at least the comments on findings created by the radiologist using the interpretation WS **3** is registered. The interpretation report may include, for example, information such as a medical image to be interpreted, an image ID for identifying the medical image, a radiologist ID for identifying the radiologist who performed the interpretation, a lesion name, lesion position information, information for accessing a medical image including a specific region, and property information.

(25) Further, in a case where the report server **7** receives the viewing request for the interpretation report from the interpretation WS **3** and the medical care WS **4** through the network **10**, the report server **7** searches for the interpretation report registered in the report DB **8**, and transmits the searched for interpretation report to the interpretation WS **3** and to the medical care WS **4** that are request sources.

(26) In the present embodiment, it is assumed that the medical image is a three-dimensional CT image consisting of a plurality of tomographic images with a lung as a diagnosis target, and an interpretation report on an abnormal shadow included in the lung is created as a medical document by interpreting the CT image in the interpretation WS **3**. The medical image is not limited to the CT image, and any medical image such as an Mill image and a two-dimensional image acquired by a simple X-ray imaging apparatus can be used.

(27) The network **10** is a wired or wireless local area network that connects various apparatuses in a hospital to each other. In a case where the interpretation WS **3** is installed in another hospital or clinic, the network **10** may be configured to connect local area networks of respective hospitals through the Internet or a dedicated line.

(28) Next, the information saving apparatus and the analysis record generation apparatus according to the present embodiment will be described. FIG. **2** describes the hardware configuration of the information saving apparatus and the analysis record generation apparatus according to the present embodiment. In FIG. **2**, the information saving apparatus **20** represents the information saving apparatus and the analysis record generation apparatus. As shown in FIG. **2**, the information saving apparatus **20** includes a central processing unit (CPU) **11**, a non-volatile storage **13**, and a memory **16** as a temporary storage area. Further, the information saving apparatus **20** includes a display **14** such as a liquid crystal display, an input device **15** such as a keyboard and a mouse, and a network interface (I/F) **17** connected to the network **10**. The CPU **11**, the storage **13**, the display **14**, the input device **15**, the memory **16**, and the network I/F **17** are connected to a bus **18**. The CPU **11** is an example of a processor in the present disclosure.

(29) The storage **13** is realized by a hard disk drive (HDD), a solid state drive (SSD), a flash memory, and the like. An information saving program **12**A and an analysis record generation program **12**B are stored in the storage **13** as a storage medium. The CPU **11** reads out the information saving program **12**A and the analysis record generation program **12**B from the storage **13**, loads the read-out programs into the memory **16**, and executes the loaded information saving program **12**A and analysis record generation program **12**B.

(30) Next, the functional configuration of the information saving apparatus and the analysis record generation apparatus according to the present embodiment will be described. FIG. **3** is a diagram showing the functional configuration of the information saving apparatus and the analysis record generation apparatus according to the present embodiment. As shown in FIG. **3**, the information saving apparatus (and analysis record generation apparatus) **20** comprises an image acquisition unit **21**, an analysis unit **22**, an analysis record generation unit **23**, a display control unit **24**, a correction unit **25**, a save control unit **26**, and a communication unit **27**. Then, in a case where the CPU **11** executes the information saving program **12**A and the analysis record generation program **12**B, the CPU **11** functions as the image acquisition unit **21**, the analysis unit **22**, the analysis record

generation unit **23**, the display control unit **24**, the correction unit **25**, the save control unit **26**, and the communication unit **27**.

(31) In the present embodiment, the image acquisition unit **21**, the analysis unit **22**, the analysis record generation unit **23**, the display control unit **24**, and the communication unit **27** have a common configuration in the information saving program **12**A and the analysis record generation program **12**B.

(32) The image acquisition unit **21** acquires a medical image for creating an interpretation report from the image server **5** according to an instruction from the input device **15** by the radiologist who is an operator. Also, the medical image includes a target medical image to be analyzed, which will be described later.

(33) The analysis unit **22** analyzes the medical image to derive property information indicating the property of the structure of interest such as an abnormal shadow candidate included in the medical image. To this end, the analysis unit **22** has a first learning model **22**A in which machine learning is performed so as to discriminate an abnormal shadow candidate in the medical image and to discriminate the property of the discriminated abnormal shadow candidate. In the present embodiment, the first learning model **22**A consists of a convolutional neural network (CNN) in which deep learning is performed using supervised training data so as to discriminate whether or not each pixel (voxel) in the medical image represents an abnormal shadow candidate, and to discriminate a property of a pixel in a case where the pixel represents an abnormal shadow candidate.

(34) FIG. **4** is a diagram showing an example of supervised training data for training a first learning model. As shown in FIG. **4**, supervised training data **30** includes a medical image **32** including an abnormal shadow **31** and property information **33** about the abnormal shadow. In the present embodiment, it is assumed that the abnormal shadow **31** is a lung nodule, and the property information **33** indicates a plurality of properties of the lung nodule. For example, as the property information **33**, the location of the abnormal shadow, the size of the abnormal shadow, the shape of the boundary (clear and irregular), the type of absorption value (solid type and frosted glass type), the presence or absence of spicula, whether it is a tumor or a nodule, the presence or absence of pleural contact, the presence or absence of pleural invagination, the presence or absence of pleural infiltration, the presence or absence of a cavity, and the presence or absence of calcification are used. Regarding the abnormal shadow **31** included in the supervised training data **30** shown in FIG. **4**, the property information **33** indicates, as shown in FIG. **4**, that the location of the abnormal shadow is under the left lung pleura, the size of the abnormal shadow is 4.2 cm in diameter, the shape of the boundary is irregular, the absorption value is a solid type, spicula is present, it is a tumor, pleural contact is present, pleural invagination is present, pleural infiltration is absent, a cavity is absent, and calcification is absent. In addition, in FIG. **4**, + is given in the case of “presence”, and − is given in the case of “absence”. The first learning model **22**A is constructed by training a neural network using a large amount of supervised training data as shown in FIG. **4**. For example, by using the supervised training data **30** shown in FIG. **4**, the first learning model **22**A is trained to discriminate the abnormal shadow **31** included in the medical image **32** in a case where the medical image **32** shown in FIG. **4** is input, and output the property information **33** shown in FIG. **4** with regard to the abnormal shadow **31**.

(35) Further, as the first learning model **22**A, any learning model such as, for example, a support vector machine (SVM) can be used in addition to the convolutional neural network.

(36) Note that the learning model for detecting the abnormal shadow candidate from the medical image and the learning model for detecting the property information of the abnormal shadow candidate may be constructed separately. Further, the property information derived by the analysis unit **22** is saved in the storage **13**. FIG. **5** is a diagram for describing the property information derived by the analysis unit **22**. As shown in FIG. **5**, the property information **35** derived by the analysis unit **22** is assumed to be “under left lung pleura”, “4.2 cm”, “irregular”, “solid”, “no

spicula", "tumor", "with pleural contact", "with pleural invagination", "no pleural infiltration", "no cavity", and "no calcification".

(37) The analysis record generation unit **23** generates an image analysis record by using the property information derived by the analysis unit **22**. In the present embodiment, a medical sentence is generated as an image analysis record. The analysis record generation unit **23** consists of a second learning model **23**A that has been trained to generate a sentence from the input information. As the second learning model **23**A, for example, a recurrent neural network can be used. FIG. **6** is a diagram schematically showing a configuration of a recurrent neural network. As shown in FIG. **6**, the recurrent neural network **40** consists of an encoder **41** and a decoder **42**. The property information derived by the analysis unit **22** is input to the encoder **41**. For example, property information indicating "under left lung pleura", "4.2 cm", "spicula +" and "tumor" is input to the encoder **41**. The decoder **42** is trained to document character information, and generates a sentence from the input property information. Specifically, from the above-mentioned property information indicating "under left lung pleura", "4.2 cm", "spicula +" and "tumor", a medical sentence "A 4.2 cm diameter tumor having spicula is found under the left lung pleura." is generated. In FIG. **6**, "EOS" indicates the end of the sentence (end of sentence).

(38) In this way, in order to output the medical sentence by inputting the property information, the recurrent neural network **40** is constructed by training the encoder **41** and the decoder **42** using a large amount of supervised training data consisting of a combination of the property information and the medical sentence.

(39) The display control unit **24** displays the medical sentence generated by the analysis record generation unit **23** on the display **14**. FIG. **7** is a diagram showing an example of a display screen of a medical sentence according to the present embodiment. As shown in FIG. **7**, a display screen **50** includes an image display region **51** and a sentence display region **52**. In the image display region **51**, a slice image SL**1** that is most likely to specify the abnormal shadow candidate detected by the analysis unit **22** is displayed. The slice image SL**1** includes an abnormal shadow candidate **53**, and the abnormal shadow candidate **53** is surrounded by a rectangular region **54**.

(40) In the sentence display region **52**, a medical sentence **55** generated by the analysis record generation unit **23** is displayed. The medical sentence **55** is "An irregular tumor with a maximum lateral diameter of 4.2 cm is found under the left lung pleura. It is in contact with the chest wall and pleural invagination is found, but no infiltration is found." The property information used in the medical sentence **55** is "under left lung pleura", "irregular", "4.2 cm", "tumor", "with chest wall contact", "with pleural invagination", and "no pleural infiltration" among the property information derived by the analysis unit **22**.

(41) Below the image display region **51**, a correction button **58**A and a confirmation button **58**B are displayed.

(42) The radiologist interprets the abnormal shadow candidate **53** in the slice image SL**1** displayed in the image display region **51**, and determines the suitability of the medical sentence **55** displayed in the sentence display region **52**.

(43) In a case where the radiologist wants to correct the medical sentence **55**, he or she uses the input device **15** to select the correction button **58**A. Thereby, the correction unit **25** receives corrections by the radiologist for the property information. That is, the medical sentence **55** displayed in the sentence display region **52** can be manually corrected by input from the input device **15**. Further, by selecting the confirmation button **58**B, the medical sentence **55** displayed in the sentence display region **52** can be confirmed with its contents. In this case, the medical sentence **55** is transcribed in an interpretation report, and the interpretation report to which the medical sentence **55** has been transcribed is transmitted to the report server **7** together with the slice image SL**1** and stored therein.

(44) At the time when the radiologist selects the correction button **58**A to correct the medical sentence **55**, in a case where there is a property that is included in the abnormal shadow **31**, but is

lacking in the medical sentence **55**, the radiologist corrects the medical sentence **55** to add the lacking property. In this case, the radiologist inputs the lacking property using the input device **15**. For example, in the present embodiment, it is assumed that spicula is found in the abnormal shadow **31**, but the medical sentence **55** lacks the description of spicula. In this case, the radiologist inputs the property information of "spicula" using the input device **15**. Thereby, the correction unit **25** corrects the medical sentence **55** to add the property information of "spicula".

(45) In addition, in a case where there is an unnecessary property that is not seen in the medical image in the medical sentence **55**, or there is a property that is seen in the medical image but is considered by the radiologist to be unnecessary in the medical sentence **55**, the radiologist corrects the medical sentence **55** to delete unnecessary properties. For example, in the present embodiment, in a case where the property of being in contact with the chest wall is unnecessary, the radiologist deletes the property information of "in contact with the chest wall" using the input device **15**. Thereby, the correction unit **25** corrects the medical sentence **55** to delete the property information of "in contact with the chest wall".

(46) FIG. **8** is a diagram showing an example of a display screen of a corrected medical sentence. As shown in FIG. **8**, in a sentence display region **52**, a corrected medical sentence **59** obtained by correcting the medical sentence **55** is displayed. The corrected medical sentence **59** is "A tumor having an irregular shape and spicula and a maximum lateral diameter of 4.2 cm is found under the left lung pleura. Pleural invagination is found, but no infiltration is found."

(47) Here, in a case where the medical sentence **55** is corrected as shown in FIG. **8**, the property information is corrected so that "no spicula" is corrected to "with spicula" and "with chest wall contact" is corrected to "no chest wall contact".

(48) In a case where the radiologist selects the confirmation button **58**B without making corrections, the medical sentence **55** displayed in the sentence display region **52** can be confirmed with its contents. In this case, the medical sentence **55** is transcribed in an interpretation report, and the interpretation report to which the medical sentence **55** has been transcribed is transmitted to the report server **7** through the communication unit **27** together with the slice image SL**1** and stored therein. Further, in a case where the radiologist selects the confirmation button **58**B after the correction, the corrected medical sentence **59** can be confirmed with its contents. In this case, the corrected medical sentence **59** is transcribed in an interpretation report, and the interpretation report to which the corrected medical sentence **59** has been transcribed is transmitted to the report server **7** through the communication unit **27** together with the slice image SL**1** and saved information **45** to be described later and stored therein. In the report server **7**, the interpretation report and the saved information **45** are associated and saved.

(49) The save control unit **26** saves the property information derived by the analysis unit **22** and the corrected property information received by the correction unit **25** in the storage **13** in a distinguishable manner. FIG. **9** is a diagram for describing saved information showing a saved result of property information. As shown in FIG. **9**, in the property information derived by the analysis unit **22** shown in FIG. **5**, the saved information **45** is corrected so that "no spicula" is corrected to "with spicula" and "with chest wall contact" is corrected to "no chest wall contact". In the saved information **45**, a flag of +1 is given to the property information corrected from "no" to "with", a flag of −1 is given to the property information corrected from "with" to "no", and a flag of 0 is given to the property information not corrected. As a result, in the saved information **45**, the property information derived by the analysis unit **22** and the corrected property information can be distinguished by a flag. The saved information **45** saved in the storage **13** is transmitted to the report server **7** together with the interpretation report and saved therein as described above.

(50) On the other hand, in a case where the image acquisition unit **21** of the information saving apparatus **20** acquires the medical image to be analyzed (hereinafter referred to as the target medical image), the analysis unit **22** analyzes the target medical image to derive the property information of the target medical image. Further, the analysis record generation unit **23** generates a

target medical sentence from the property information of the target medical image without reference to the saved information **45** saved in the report server **7**, that is, without referring to the saved information **45**. Specifically, the analysis record generation unit **23** generates a target medical sentence by using only the property information derived by the analysis unit **22**. The target medical sentence without reference to the saved information **45** corresponds to another target image analysis record of the present disclosure. Further, the analysis record generation unit **23** refers to the saved information **45** saved in the report server **7** and generates a target medical sentence as an alternative plan from the property information of the target medical image.

(51) Hereinafter, generation of an alternative plan will be described. First, the analysis record generation unit **23** specifies the saved information **45** including the property information that matches the property information of the target medical image derived by the analysis unit **22** by searching the report server **7**. Note that it is assumed that the property information and the saved information **45** include the location and size of the abnormal shadow, but the saved information **45** in which the property items excluding the location and size of the abnormal shadow match is specified. For example, in a case where the property information of the target medical image is "tumor", "with pleural invagination", and "no infiltration", the analysis record generation unit **23** searches for the saved information **45** including the property information of "tumor", "with pleural invagination", and "no infiltration". Then, the analysis record generation unit **23** acquires an interpretation report associated with the saved information **45** that matches the property information of the target medical image from the report server **7**.

(52) Here, the fact that the property information matches includes not only the case where all the property information except the location and size of the abnormal shadow among the plurality of pieces of property information matches, but also the case where the majority of the plurality of pieces of property information, for example, 80% or more and even 90% or more of the plurality of pieces of property information match.

(53) In a case where there are a plurality of pieces of saved information **45** that match the property information of the target medical image, it can be selected according to the criteria such as the one with a new creation date or the one created by the radiologist who is operating the interpretation WS **3**. Alternatively, the number of interpretation reports to be acquired may be limited to search for saved information that matches the property information. Then, the analysis record generation unit **23** rewrites the location and size of the abnormal shadow in the acquired interpretation report to the location and size of the abnormal shadow included in the property information of the target medical image, and generates an alternative plan. Note that the saved information **45** that matches the property information of the target medical image may not be saved in the report server **7**. In such a case, it is assumed that no alternative plan is generated in the present embodiment.

(54) The display control unit **24** displays the target medical sentence and an alternative plan of the target medical sentence on the display **14**. FIG. **10** is a diagram showing a display screen of a target medical sentence and an alternative plan. Note that FIG. **10** shows only one alternative plan. As shown in FIG. **10**, a display screen **70** includes an image display region **71** and a sentence display region **72**. In the image display region **71**, a slice image SL**2** that is most likely to specify the abnormal shadow candidate detected by the analysis unit **22** from the target medical image is displayed. The slice image SL**2** includes an abnormal shadow candidate **73**, and the abnormal shadow candidate **73** is surrounded by a rectangular region **74**.

(55) In the sentence display region **72**, a target medical sentence **75** and an alternative plan **76** generated by the analysis record generation unit **23** are displayed. The target medical sentence **75** is "A tumor having an irregular shape and spicula and a maximum lateral diameter of 4.2 cm is found under the left lung pleura. Pleural invagination is found, but no infiltration is found." The alternative plan **76** is "An irregular tumor with a maximum lateral diameter of 4.2 cm is found under the left lung pleura. It is in contact with the chest wall and pleural invagination is found, but no infiltration is found."

(56) Below the image display region **71**, a correction button **78**A and a confirmation button **78**B are displayed.
(57) The radiologist interprets the abnormal shadow candidate **73** in the slice image SL**2** displayed in the image display region **71**, and determines the suitability of the target medical sentence **75** and the alternative plan **76** displayed in the sentence display region **72**.
(58) In a case where the radiologist disagrees with either the target medical sentence **75** or the alternative plan **76** and wants to make corrections, he or she uses the input device **15** to select the correction button **78**A. Thereby, the medical sentence **75** displayed in the sentence display region **72** can be corrected in the same manner as described above by input from the input device **15**.
(59) On the other hand, in a case where the radiologist adopts either the target medical sentence **75** or the alternative plan **76**, the radiologist selects either the target medical sentence **75** or the alternative plan **76** using the input device **15** and selects the confirmation button **78**B, thereby confirming either the target medical sentence **75** or the alternative plan **76** with its contents. In this case, any of the selected target medical sentence **75** and alternative plan **76** is transcribed in the interpretation report, and the interpretation report to which the sentence has been transcribed is transmitted to the report server **7** together with the slice image SL**2** and stored therein.
(60) The communication unit **27** exchanges information between the information saving apparatus **20** and the external device via the network I/F**17**.
(61) Next, a process performed in the present embodiment will be described. FIG. **11** is a flowchart showing an information saving process performed in the present embodiment. It is assumed that the medical image to be interpreted is acquired from the image server **5** by the image acquisition unit **21** and is saved in the storage **13**. The process is started in a case where an instruction to create an interpretation report is given by the radiologist, and the analysis unit **22** analyzes the medical image to derive property information indicating the property of the structure of interest such as an abnormal shadow candidate included in the medical image (Step ST**1**). Next, the analysis record generation unit **23** generates a medical sentence related to the medical image based on the property information as an image analysis record (Step ST**2**). Then, the display control unit **24** displays the medical sentence generated by the analysis record generation unit **23** on the sentence display region **52** of the display screen **50** displayed on the display **14** (Step ST**3**).
(62) Next, the display control unit **24** determines whether or not the correction button **58**A displayed on the display screen **50** is selected (Step ST**4**). In a case where Step ST**4** is affirmative, the correction unit **25** receives the correction of the property information included in the medical sentence displayed in the sentence display region **52** using the input device **15** (Step ST**5**). Subsequently, the correction unit **25** determines whether or not the confirmation button **58**B is selected (Step ST**6**). In a case where Step ST**6** is negative, the process returns to Step ST**5** and the correction is continuously received. In a case where Step ST**6** is affirmative, the save control unit **26** saves the derived property information and the corrected property information in the storage **13** in a distinguishable manner (Step ST**7**). Then, the display control unit **24** transcribes the corrected medical sentence to the interpretation report, the communication unit **27** transmits the interpretation report to which the corrected medical sentence is transcribed to the report server **7** together with the slice image SL**1** (transmission of interpretation report: Step ST**8**), and the process ends.
(63) On the other hand, in a case where Step ST**4** is negative, the display control unit **24** determines whether or not the confirmation button **58**B is selected (Step ST**9**). In a case where Step ST**9** is negative, the process returns to Step ST**4**. In a case where Step ST**9** is affirmative, the process proceeds to Step ST**8**, the display control unit **24** transcribes the medical sentence to the interpretation report, the communication unit **27** transmits the interpretation report to which the medical sentence is transcribed to the report server **7** together with the slice image SL**1**, and the process ends.
(64) Next, a process performed in a case where the saved information in which the derived property information and the corrected property information are saved in a distinguishable manner is saved

in the storage **13** will be described. FIG. **12** is a flowchart showing an analysis record generation process performed in the present embodiment. It is assumed that the medical image to be interpreted is acquired from the image server **5** by the image acquisition unit **21** and is saved in the storage **13**. Further, it is assumed that the saved information **45** in which the derived property information and the corrected property information are saved in a distinguishable manner is also saved in the storage **13**.

(65) The process is started in a case where an instruction to create an interpretation report is given by the radiologist, and the analysis unit **22** analyzes the medical image to derive property information indicating the property of the structure of interest such as an abnormal shadow candidate included in the medical image (Step ST**11**). Next, the analysis record generation unit **23** generates a target medical sentence regarding the target medical image as an image analysis record based on the property information derived by the analysis unit **22** without reference to the saved information **45**, that is, without referring to the saved information **45** (Step ST**12**). Further, the analysis record generation unit **23** refers to the saved information **45** saved in the report server **7** and generates a target medical sentence regarding the target medical image as an alternative plan (Step ST**13**). Then, the display control unit **24** displays the target medical sentence **75** and the alternative plan **76** generated by the analysis record generation unit **23** on the sentence display region **52** of the display screen **50** displayed on the display **14** (display of medical sentence: Step ST**14**).

(66) Next, the display control unit **24** receives the selection of either the target medical sentence **75** or the alternative plan **76** (Step ST**15**). Further, the display control unit **24** determines whether or not the correction button **78**A displayed on the display screen is selected (Step ST**16**). In a case where Step ST**16** is affirmative, the correction unit **25** receives the correction of the property information included in the selected medical sentence using the input device **15** (Step ST**17**). Subsequently, the correction unit **25** determines whether or not the confirmation button **78**B is selected (Step ST**18**). In a case where Step ST**18** is negative, the process returns to Step ST**17** and the correction is continuously received. In a case where Step ST**18** is affirmative, the save control unit **26** saves the derived property information and the corrected property information in the storage **13** in a distinguishable manner (Step ST**19**). Then, the display control unit **24** transcribes the selected and corrected medical sentence to the interpretation report, the communication unit **27** transmits the interpretation report to which the medical sentence is transcribed to the report server **7** together with the slice image SL**1** (transmission of interpretation report: Step ST**20**), and the process ends.

(67) On the other hand, in a case where Step ST**16** is negative, the display control unit **24** determines whether or not the confirmation button **78**B is selected (Step ST**21**). In a case where Step ST**21** is negative, the process returns to Step ST**16**. In a case where Step ST**21** is affirmative, the process proceeds to Step ST**20**, the display control unit **24** transcribes the selected medical sentence to the interpretation report, the communication unit **27** transmits the interpretation report to which the medical sentence is transcribed to the report server **7** together with the slice image SL**1**, and the process ends.

(68) In this way, in the present embodiment, a plurality of pieces of property information indicating the properties of the structure of interest included in the image are derived, an image analysis record including at least a portion of the plurality of pieces of property information is generated, a correction of the property information by a user is received, and the derived property information and the corrected property information are saved in a distinguishable manner. Therefore, by referring to the saved information that has been saved, it is possible to recognize which of property information derived by analyzing an image has been corrected in a case where an image analysis record generated from the image has been corrected.

(69) In addition, regarding the target medical image, in addition to the target medical sentence generated based on the property information derived from the target medical image without

referring to the saved information **45**, by displaying an alternative plan that refers to the saved information, it is possible to increase the choices of sentences to be transcribed in the interpretation report. Therefore, the radiologist can transcribe the medical sentence describing the desired property information into the interpretation report.

(70) Although the target medical sentence is generated using only the property information derived by the analysis unit **22** for the target medical image in the above embodiment, the present disclosure is not limited thereto. An alternative plan generated by referring only to the saved information **45** may be used as the target medical sentence without generating the target medical sentence using only the property information derived by the analysis unit **22** for the target medical image.

(71) Although the medical sentence **55** displayed in the sentence display region **52** of the display screen **50** is corrected by using the input device **15** in the above embodiment, the present disclosure is not limited thereto. FIG. **13** is a diagram showing another example of a display screen of a medical sentence according to the present embodiment. As shown in FIG. **13**, a display screen **80** includes an image display region **81**, a property information display region **82**, and a sentence display region **83**. In the image display region **81**, a slice image SL**3** that is most likely to specify the abnormal shadow candidate detected by the analysis unit **22** is displayed. The slice image SL**3** includes an abnormal shadow candidate **84**, and the abnormal shadow candidate **84** is surrounded by a rectangular region **85**.

(72) In the property information display region **82**, buttons **82**A to **821** for respectively designating the shape of the boundary (clear and irregular), the type of absorption value (solid type and frosted glass type), the presence or absence of spicula, whether it is a tumor or a nodule, the presence or absence of pleural contact, the presence or absence of pleural invagination, the presence or absence of pleural infiltration, the presence or absence of a cavity, and the presence or absence of calcification are displayed.

(73) In the sentence display region **83**, a medical sentence **86** generated by the analysis record generation unit **23** is displayed. The medical sentence **86** is “An irregular tumor with a maximum lateral diameter of 4.2 cm is found under the left lung pleura. It is in contact with the chest wall and pleural invagination is found, but no infiltration is found.” The property information used in the medical sentence **86** is “under left lung pleura”, “irregular”, “4.2 cm”, “tumor”, “with chest wall contact”, “with pleural invagination”, and “no pleural infiltration” among the property information derived by the analysis unit **22**.

(74) Note that, below the image display region **81**, a correction button **88**A and a confirmation button **88**B are displayed. The functions of the correction button **88**A and the confirmation button **88**B are the same as those of the correction buttons **58**A and **78**A and the confirmation buttons **58**B and **78**B described above, and detailed description thereof will be thus omitted here.

(75) The radiologist can correct the medical sentence **86** by selecting a desired button for the property information displayed in the property information display region **82**. For example, by selecting the button **82**C, it is possible to correct “no spicula” to “with spicula”. Further, by selecting the button **82**E, it is possible to correct “with pleural contact” to “no pleural contact”. As a result, in the sentence display region **83**, the corrected medical sentence of “A tumor having an irregular shape and spicula and a maximum lateral diameter of 4.2 cm is found under the left lung pleura. Pleural invagination is found, but no infiltration is found” is displayed.

(76) By correcting the property information included in the medical sentence on the display screen in this way, it becomes possible to save the derived property information and the corrected property information as in the above embodiment in a distinguishable manner.

(77) Also, in the above embodiments, the creation support process for the medical document such as the interpretation report is performed by generating the medical sentence using the medical image with the lung as the diagnosis target, but the diagnosis target is not limited to the lung. In addition to the lung, any part of a human body such as a heart, liver, brain, and limbs can be

diagnosed. In this case, for each learning model of the analysis unit **22** and the analysis record generation unit **23**, learning models that perform the analysis process and the analysis record process according to the diagnosis target are prepared, a learning model that performs the analysis process and the analysis record generation process according to the diagnosis target is selected, and a process of generating an analysis record is executed.

(78) In addition, although the technique of the present disclosure is applied to the case of creating an interpretation report as an analysis record in the above embodiments, the technique of the present disclosure can also be applied to a case of creating medical documents other than the interpretation report, such as an electronic medical record and a diagnosis report, as an analysis record.

(79) Further, although the image analysis record is generated using the medical image in the above embodiment, the present disclosure is not limited thereto. Of course, the technology of the present disclosure can also be applied even in a case where an image analysis record targeting any image other than a medical image is generated. For example, the technique of the present disclosure can be applied even in a case where the image of the chemical formula of the compound is analyzed, the type of cyclic hydrocarbon and the type of functional group are derived as property information, and the name of the compound is generated as an image analysis record from the derived property information.

(80) Further, in each of the above embodiments, for example, as hardware structures of processing units that execute various kinds of processing, such as the image acquisition unit **21**, the analysis unit **22**, the analysis record generation unit **23**, the display control unit **24**, the correction unit **25**, the save control unit **26**, and the communication unit **27**, various processors shown below can be used. As described above, the various processors include a programmable logic device (PLD) as a processor of which the circuit configuration can be changed after manufacture, such as a field programmable gate array (FPGA), a dedicated electrical circuit as a processor having a dedicated circuit configuration for executing specific processing such as an application specific integrated circuit (ASIC), and the like, in addition to the CPU as a general-purpose processor that functions as various processing units by executing software (programs).

(81) One processing unit may be configured by one of the various processors, or may be configured by a combination of the same or different kinds of two or more processors (for example, a combination of a plurality of FPGAs or a combination of the CPU and the FPGA). In addition, a plurality of processing units may be configured by one processor.

(82) As an example where a plurality of processing units are configured by one processor, first, there is a form in which one processor is configured by a combination of one or more CPUs and software as typified by a computer, such as a client or a server, and this processor functions as a plurality of processing units. Second, there is a form in which a processor for realizing the function of the entire system including a plurality of processing units via one integrated circuit (IC) chip as typified by a system on chip (SoC) or the like is used. In this way, various processing units are composed of one or more of the above-described various processors as hardware structures.

(83) Furthermore, as the hardware structure of the various processors, more specifically, an electrical circuit (circuitry) in which circuit elements such as semiconductor elements are combined can be used.

Claims

1. An information saving apparatus comprising at least one processor, wherein the processor is configured to analyze an image to derive a plurality of pieces of property information indicating properties of a structure of interest included in the image, generate an image analysis record including at least a portion of the plurality of pieces of property information, wherein the portion of the plurality of pieces of property information included in the image analysis record comprises first

property information and second property information, receive a correction of the first property information in the image analysis record by a user, and save the second property information and the corrected first property information as saved information in a distinguishable manner.

2. The information saving apparatus according to claim 1, wherein the processor is configured to display the image analysis record on a display.

3. The information saving apparatus according to claim 2, wherein the processor is configured to receive at least one of deletion of the first property information included in the displayed image analysis record or addition of the first property information not included in the image analysis record as the correction.

4. The information saving apparatus according to claim 2, wherein the processor is configured to display an entirety or a portion of the plurality of pieces of property information on the display, and receive the correction based on selection of the first property information by the user.

5. The information saving apparatus according to claim 1, further comprising a learning model trained to output the image analysis record in a case where at least a portion of the plurality of pieces of property information is input.

6. The information saving apparatus according to claim 1, wherein the processor is configured to generate a sentence including at least a portion of the plurality pieces of the property information as the image analysis record.

7. The information saving apparatus according to claim 6, wherein the image is a medical image, and the sentence is a medical sentence related to the structure of interest included in the medical image.

8. The information saving apparatus according to claim 1, wherein a first flag and a second flag are respectively given to the corrected first property information and the second property information in the saved information, wherein the first flag indicates that a correction has been subject to the first property information, and wherein the second flag indicates that no correction has been subject to the second property information.

9. An analysis record generation apparatus comprising at least one processor, wherein the processor is configured to derive a plurality of pieces of property information indicating properties of a structure of interest included in a target image to be analyzed, and refer to the saved information saved by the information saving apparatus according to claim 1 to generate a target image analysis record including at least a portion of the plurality of pieces of the property information.

10. The analysis record generation apparatus according to claim 9, wherein the processor is configured to specify the saved information including property information that matches the property information derived from the target image, and generate an image analysis record associated with the specified saved information as the target image analysis record.

11. The analysis record generation apparatus according to claim 9, wherein the processor is further configured to generate another target image analysis record including at least a portion of the plurality of pieces of property information without reference to the saved information.

12. The analysis record generation apparatus according to claim 11, wherein the processor is configured to display the target image analysis record and the other target image analysis record on a display.

13. The analysis record generation apparatus according to claim 12, wherein the processor is configured to receive selection of either the displayed target image analysis record or the displayed other target image analysis record.

14. The analysis record generation apparatus according to claim 9, wherein the processor is configured to generate a sentence including at least a portion of the plurality of pieces of property information as the target image analysis record.

15. The analysis record generation apparatus according to claim 14, wherein the image is a medical image, and the sentence is a medical sentence related to the structure of interest included in the medical image.

16. An analysis record generation method comprising: deriving a plurality of pieces of property information indicating properties of a structure of interest included in a target image to be analyzed; and referring to the saved information saved by the information saving apparatus according to claim 1 to generate a target image analysis record including at least a portion of the plurality of pieces of property information.

17. A non-transitory computer-readable storage medium that stores an analysis record generation program for causing a computer to execute a procedure comprising: deriving a plurality of pieces of property information indicating properties of a structure of interest included in a target image to be analyzed; and referring to the saved information saved by the information saving apparatus according to claim 1 to generate a target image analysis record including at least a portion of the plurality of pieces of property information.

18. An information saving method comprising: analyzing an image to derive a plurality of pieces of property information indicating properties of a structure of interest included in the image; generating an image analysis record including at least a portion of the plurality of pieces of property information, wherein the portion of the plurality of pieces of property information included in the image analysis record comprises first property information and second property information; receiving a correction of the first property information in the image analysis record by a user; and saving the second property information and the corrected first property information as saved information in a distinguishable manner.

19. A non-transitory computer-readable storage medium that stores an information saving program for causing a computer to execute a procedure comprising: analyzing an image to derive a plurality of pieces of property information indicating properties of a structure of interest included in the image; generating an image analysis record including at least a portion of the plurality of pieces of property information, wherein the portion of the plurality of pieces of property information included in the image analysis record comprises first property information and second property information; receiving a correction of the first property information in the image analysis record by a user; and saving the second property information and the corrected first property information as saved information in a distinguishable manner.