

Description

[Title of the invention] Image inspection device, image inspection method, and image inspection program for electronic components

[Technical field]

【0001】

The present invention relates to an image inspection device, an image inspection method, and an image inspection program for electronic components.

[Background technology]

【0002】

Conventionally, there have been devices that perform inspection A, which detects the product position after imaging the product, followed by inspections B and C performed in parallel, which are specialized for detecting various appearance defects, and only when the product is not judged to be rejected in any of the inspections, a comprehensive appearance inspection is performed to judge the inspected product as good (e.g., Patent Document 1, Patent Document 2).

【0003】

In conventional appearance inspections, each inspection has its own image inspection criteria, and the inspection criteria are set so that products with specific types of appearance defects are always rejected (fail). The conventional image inspection criteria were limited to simple inspection criteria that produced one inspection result for one inspection. However, there are defective products that look almost the same as good products in images. Such defective products must also be rejected in the appearance inspection. However, the inspection criteria for each inspection were excessively strict, and some products that were intended to be good were mistakenly determined to be defective.

[Prior art documents]

[Patent documents]

【0004】

[Patent document 1] Japanese Patent No. 6999150

[Patent document 2] Japanese Patent No. 7298825

[Summary of the invention]

[Problems to be solved by the invention]

【0005】

An object of the present invention is to provide an image inspection device, an image inspection method, and an image inspection program for electronic components that can prevent products that are intended to be good from being determined to be defective.

[Means for solving the problem]

【0006】

(1) An image inspection device for electronic components according to one aspect of the present invention comprising a position detection means for detecting a product position based on a captured product image of an electronic component; an image correction means for generating a corrected product image by correcting the product image based on the product position; a first inspection means for performing a first inspection having a

first inspection logic based on the corrected product image and outputting a first inspection result; a salvage inspection means for performing a salvage inspection having a salvage inspection logic different from the first inspection logic when the first inspection logic is a pass/fail judgment and when the first inspection result is a fail, outputting a salvage inspection result; and an overall judgment means for making an overall judgment on the electronic component based on the first inspection result and the salvage inspection result, wherein the first inspection logic is a function for making a pass/fail judgment based on a threshold value set for a parameter for evaluating a defect, and the salvage inspection logic is generated by artificial intelligence that learns based on the relationship between information in the product image or the corrected product image and the inspection results.

(2) In (1) above, the first inspection may be an inspection for detecting dirt or foreign matter on an element body among defects of the electronic component.

(3) In (1) or (2) above, the overall judgment means may make an overall judgment that the product is good when the first inspection result is pass or the salvage inspection result is pass, and make an overall judgment that the product is defective when the first inspection result is fail and the salvage inspection result is fail.

(4) In (1) or (2) above, the second inspection means may be provided to execute a second inspection having a second inspection logic different from the first inspection logic and output a second inspection result, and the overall judgment means may make an overall judgment based on the first inspection result, the salvage inspection result and the second inspection result.

(5) In (4) above, the overall judgment means may make an overall judgment that the product is good when the first inspection result is pass or when the salvage inspection result is pass, and when the second inspection result is pass, and may make an overall judgment that the product is defective when the first inspection result is fail and when the salvage inspection result is fail, or when the second inspection result is fail.

(6) In (1) or (2) above, the first inspection may be an inspection for detecting defects in electronic components.

(7) In (5) above, the second inspection may be an inspection for measuring the dimensions of electronic components.

(8) An image inspection method for electronic components according to one aspect of the present invention comprising a position detection step for detecting a product position based on a captured product image of an electronic component; an image correction step for generating a corrected product image by correcting the product image based on the product position; a first inspection step for performing a first inspection having a first inspection logic based on the corrected product image and outputting a first inspection result; a salvage inspection step for performing a salvage inspection having a salvage inspection logic different from the first inspection logic and outputting a salvage inspection result when the first inspection logic is a pass/fail judgment and the first inspection result is a fail, an overall judgment step for making an overall judgment of the electronic component based on the first inspection result and the salvage inspection result, wherein the first inspection logic is a function for making a pass/fail judgement based on a threshold value set for a parameter for evaluating a defect, and the salvage inspection logic is generated by artificial intelligence that learns based on the relationship between information in the product image or the corrected product image and the inspection results.

(9) An image inspection program for electronic components according to one aspect of the present invention executed on a computer and comprising a position detection function for detecting a product position based on a captured product image of an electronic component; an image correction function for generating a corrected

product image by correcting the product image based on the product position; a first inspection function for performing a first inspection having a first inspection logic based on the corrected product image and outputting a first inspection result; a salvage inspection function for performing a salvage inspection having a salvage inspection logic different from the first inspection logic and outputting a salvage inspection result when the first inspection logic is a pass/fail judgment and the first inspection result is a fail; and an overall judgment function for making an overall judgment on the electronic component based on the first inspection result and the salvage inspection result, wherein the first inspection logic is a function for making a pass/fail judgment based on a threshold value set for a parameter for evaluating a defect, and the salvage inspection logic is generated by artificial intelligence that learns based on the relationship between information in the product image or the corrected product image and the inspection results.

[Advantageous effect of the invention]

【0007】

The present invention can provide an image inspection device, an image inspection method, and an image inspection program for electronic components that can prevent products that are intended to be good from being determined to be defective.

[Brief description of the drawings]

【0008】

[Figure 1] An explanatory diagram providing an overview of the image inspection device for electronic components.

[Figure 2] A diagram showing a flow of the image inspection method using the image inspection device for electronic components.

[Modes for carrying out the invention]

【0009】

(Embodiment)

Hereinafter, an embodiment of the present disclosure will be described with reference to the drawings.

Figure 1 is an explanatory diagram providing an overview of the image inspection device 100 for the electronic component 1. Figure 2 is a diagram showing a flow of the image inspection method using the image inspection device 100 for the electronic component 1. Hereinafter, the same signs or symbols may be assigned to parts having common functions.

【0010】

The image inspection device 100 for the electronic component 1 in the embodiment is used to inspect the appearance of the electronic component 1.

【0011】

The electronic component 1 is a product subject to inspection to determine whether it is good (pass) or defective (fail). The electronic component 1 is a component or element for constructing an electronic device. The electronic component 1 is, for example, a resistor, a capacitor, an inductor, a transistor, a diode, an integrated circuit, etc. The electronic component 1 is used to control current or voltage in an electronic circuit, or to process or transfer information. The electronic component 1 is used in electronic devices such as mobile phones, computers,

automobiles, and home appliances. The electronic component 1 has a three-dimensional shape, such as a hexahedron shape.

【0012】

The image inspection device 100 includes an imaging means C and a control means S. The image inspection device 100, for example, captures an image of the electronic component 1, which is the workpiece that is placed on the top surface of a rotating, disc-shaped, transparent glass transport table and transported by suction, from six sides (front, back, top, bottom, left, right) using an imaging means C such as a camera, and performs an appearance inspection by having a control means S determine whether the captured product image P is pass or fail.

【0013】

The imaging means C includes, as appropriate, a front camera for capturing the front side of the electronic component 1, a rear camera for capturing the rear side of the electronic component 1, a top camera for capturing the top side of the electronic component 1, a bottom camera for capturing the bottom side of the electronic component 1, a right camera for capturing the right side of the electronic component 1 (the inner surface facing the center of rotation of the transport table), and a left camera for capturing the left side of the electronic component 1 (the outer surface facing away from the center of rotation of the transport table). The imaging means C generates a product image P of the electronic component 1. The product image P is sent to the control means S.

【0014】

The control means S is a computer system that includes a CPU, memory (storage medium) such as RAM, ROM and auxiliary storage devices, an external connection interface with input/output devices, a network interface, and a bus. The memory stores an image inspection program which causes the control means S (computer system) to execute the image inspection method according to this embodiment.

【0015】

The CPU is an arithmetic circuit that controls the control means S. The CPU reads out the program stored in ROM or auxiliary storage device into RAM. The CPU executes various processes in the program read out to RAM. The ROM stores the system program, etc. used to control the control means S. The auxiliary storage device stores application programs for executing various processes. The auxiliary storage device is, for example, a HDD, an SSD, etc. The external connection interface is an interface for connecting various devices to the control means S. The external connection interface connects, for example, imaging means C, display, keyboard, etc. to the control means S. The network interface functions to communicate over a network under the control of the CPU. The bus connects the above-mentioned functional units constituting the control means S so that they can communicate with each other.

【0016】

The image inspection device 100 captures an image of the electronic component 1 by an imaging means C, and based on the captured product image P, a control means S judges whether the electronic component 1 good product or defective product (pass or fail).

【0017】

In detail, as shown in Figure 2, the image inspection device 100 of the electronic component 1 of the embodiment (specifically, the control means S of the image inspection device 100) includes a position detection

means 10 that detects a product position PP based on the captured product image P of the electronic component 1, an image correction means 20 that generates a corrected product image Pc by correcting the product image P based on the product position PP, a first inspection means 30 that performs a first inspection T1 having a first inspection logic L1 based on the corrected product image Pc and outputs a first inspection result T1R, a salvage inspection means 40 that performs a salvage inspection Tk having a salvage inspection logic Lk different from the first inspection logic L1 when the first inspection result T1R satisfies a specific condition in the first inspection logic L1 and outputs a salvage inspection result TkR, and an overall judgment means 50 that makes an overall judgment of the electronic component 1 based on the first inspection result T1R and the salvage inspection result TkR. As a result, even if the electronic component 1 that should have been judged as good (pass) is judged as defective (fail) by the first inspection means 30 (hereinafter, this phenomenon may be referred to as overkill), if it is judged as good by the salvage inspection means 40, it will be judged as good by the overall judgment means 50. Therefore, the image inspection device 100 for the electronic component 1 can prevent a product that is intended to be a good product from being judged as defective.

【0018】

The image inspection device 100 may include an inspection logic correction means. The inspection logic correction means is provided between the position detection means 10 or the image correction means 20 and the first inspection means 30 in the information transmission path. The parameters of the first inspection logic L1, the second inspection logic L2, the third inspection logic L3 or the salvage inspection logic Lk are corrected based on the product image P or the corrected product image Pc. The parameters of each inspection logic, i.e., the first inspection logic L1, the second inspection logic L2, the third inspection logic L3, or the salvage inspection logic Lk, may be, for example, functions that determine pass or fail based on a threshold value set for a defect evaluation parameter. The parameters of each inspection logic, i.e., the first inspection logic L1, the second inspection logic L2, the third inspection logic L3 or the salvage inspection logic Lk, may be generated, for example, by an artificial intelligence AI that learns (or has already learned) based on the relationship between the information in the product image P or the corrected product image Pc and the inspection results. This allows the inspection logic to be changed according to the information in the product image P or the corrected product image Pc, so that the inspection results (pass/fail judgment) in each inspection means can be correct.

For example, the first inspection logic L1 may be a function that judges pass or fail based on a threshold value set for a defect evaluation parameter, and the salvage inspection logic Lk may be generated by the artificial intelligence AI that learns based on the relationship between the information in the product image P or corrected product image Pc and the inspection results. As a result, the first inspection T1 does not use a learning artificial intelligence AI, but the repair inspection Tk does use the learning artificial intelligence AI, so that the electronic component 1 (product image P or corrected product image Pc) which is difficult to determine whether it is pass or fail is deliberately judged as fail (overkill), which is a result on the safe side, by the first inspection T1 (first inspection means 30) which does not use the learning artificial intelligence AI and acts as a filter in the first step (by appropriately adjusting the threshold value so that it is more likely to fail), and then this failed electronic component 1 is accurately judged by the salvage inspection Tk (salvage inspection means 40) which uses the learning artificial intelligence AI and acts as a filter in the second step, and an appropriate overall judgment can be made by the overall judgment means 50 using these two-step filters.

【0019】

The image inspection device 100 may optionally include a preliminary inspection means for performing a preliminary inspection before the first inspection T1 by the first inspection means 30.

【0020】

The position detecting means 10 detects the product position PP. The position detection means 10 detects the product position PP, which is defined, for example, by two-dimensional coordinates set on the top surface of the transport table with respect to the rotation axis of the transport table, and the distance and direction (angle) with respect to the rotation axis of the conveying table. The position detection means 10 may detect the product position PP for example, as two-dimensional coordinates with respect to one corner of a rectangular area that can be captured by the imaging means C. The information on the product position PP detected by the position detection means 10 is used for correcting the product image P by the image correction means 20.

【0021】

The image correcting means 20 generates a corrected product image Pc by correcting the product image P based on the product position PP. For example, if the front surface of the electronic component 1 is not perpendicular to the direction of the front camera, image correction means 20 corrects product image P based on product position PP by generating a corrected product image Pc corresponding to an image of the front surface of the electronic component 1 when it is perpendicular to the direction of the front camera. The corrected product image Pc generated by the image correction means 20 is used in the first inspection T1 performed by the first inspection means 30.

【0022】

The first inspection means 30 performs the first inspection T1 having the first inspection logic L1 based on the corrected product image Pc, and outputs the first inspection result T1R. The corrected product image Pc is provided by the image correcting means 20. The first inspection logic L1 is a logic that makes a pass/fail judgement in the first inspection T1. The first inspection logic L1 is a logic that judges the inspection result as fail when a predefined defect is found in the corrected product image Pc and judges the inspection result as pass when no defect is found. The first inspection logic L1 may be, for example, a function that determines pass or fail based on a threshold value set for a defect evaluation parameter. The function may be a model (algorithm) generated by the artificial intelligence AI that has been trained using samples of passed or failed product images as training data.

【0023】

Thus, the first inspection T1 is an inspection for detecting defects in the electronic component 1. Here, a defect is a concept that includes what is generally called a defect in appearance inspection, such as dimensional defects (including dimensions outside the tolerance range or set standard), foreign matter contamination, chipping where a corner or other part is missing, and completely broken appearance. In this way, the first inspection T1 is an inspection for detecting defects in the electronic component 1, so that the electronic component 1 that is really defective can be reliably judged as defective.

【0024】

It is preferable that the first inspection T1 should detect dirt or foreign matter on the element body of the electronic component 1 among other defects. It is more preferable that the first inspection T1 should detect dirt on

the element body of the electronic component 1 among other defects. The element body refers to the remaining part when the electronic component 1 is divided into an electrode part and the remaining part. It has been found that inspection of dirt or foreign matter on the element body is more likely to result in overkill, in which the electronic component 1 that would otherwise be a good product is judged as defective, compared to other defect inspections such as dimensional inspection. Therefore, by setting the first inspection T1 as an inspection to detect dirt or foreign matter on the element body, which is prone to overkill, the electronic component 1 in which dirt or foreign matter on the element body is detected can be initially rejected in the first inspection T1 to be on the safe side, and then a precise pass/fail judgment regarding the dirt or foreign matter on the element body can be made in the salvage inspection Tk that follows after the first inspection T1.

【0025】

The salvage inspection method 40 performs the salvage inspection Tk with the salvage inspection logic Lk different from the first inspection logic L1 and outputs a relief inspection result TkR when the first inspection result T1R satisfies a specific condition in the first inspection logic L1.

【0026】

Specifically, the specific condition is a case where the first inspection result T1R is fail when the first inspection logic L1 is a pass/fail judgment. As a result, even if the first inspection result T1R is fail, the electronic component 1 that would otherwise be a good product can be judged as pass in the salvage inspection Tk by the salvage inspection means 40 and salvaged.

【0027】

The salvage inspection logic Lk is the logic that makes a pass/fail judgement in the salvage inspection Tk. The salvage inspection logic Lk differs from the first inspection logic L1 and is set specifically for inspection of the corrected product image Pc for which the first inspection result T1R is a specific condition (judged as fail) in the first inspection logic L1. The salvage inspection logic Lk is a logic that judges the corrected product image Pc for which the first inspection result T1R is a specific condition (judged as fail) in the first inspection logic L1 as fail if a predefined defect different from the defect defined in the first inspection logic L1 is found, and judges as pass if no defect is found. The types of defects defined in the first inspection logic L1 and the salvage inspection logic Lk may be the same, and the pass/fail criteria for the first inspection logic L1 and the salvage inspection logic Lk may differ. Thus, since the image inspection device 100 includes the salvage inspection means 40, even if the electronic component 1 being inspected is actually a good product and is judged as fail in the first inspection T1, it can be judged as pass in the salvage inspection Tk.

【0028】

The overall judgment means 50 makes an overall judgment of the electronic component 1 based on the first inspection result T1R and the salvage inspection result TkR. Specifically, the overall judgment means 50 makes an overall judgment as good when the first inspection result T1R is pass or the salvage inspection result TkR is pass, and makes an overall judgment as defective when the first inspection result T1R is fail and the salvage inspection result TkR is fail. In other words, the overall judgment means 50 makes an overall judgment of pass if the first inspection result T1R is pass, makes an overall judgment of pass if the first inspection result T1R is fail and the salvage inspection result TkR is pass, and makes an overall judgment of fail if the first inspection result T1R is fail and the salvage inspection result TkR is fail. This means that even if the first inspection result T1R is

fail, the overall judgment is not immediately fail, and even if the first inspection result T1R is fail, the overall judgment is pass if the salvage inspection result TkR is pass. Therefore, the image inspection device 100 can prevent a product that is originally a non-defective product from being judged as a defective product.

【0029】

The image inspection device 100 may include a second inspection means 60 that performs a second inspection T2 having a second inspection logic L2 different from the first inspection logic L1, and outputs a second inspection result T2R. This allows the second inspection T2 to be performed on the electronic component 1 in parallel from a different perspective than the first inspection T1, so that even if the originally defective electronic component 1 passes the first inspection T1, it can be comprehensively judged as defective if it fails the first inspection T2. Therefore, it is possible to prevent products that are actually defective from being judged as good, and the inspection accuracy by the image inspection device 100 can be improved.

【0030】

The overall judgment means 50 makes an overall judgment based on the first inspection result T1R, the salvage inspection result TkR and the second inspection result T2R. As a result, even if the electronic component 1 that is actually defective passes the first inspection T1, if it fails the second inspection T2, it can be finally determined to be defective. Therefore, it is possible to prevent products that are actually good from being judged as defective, and it is also possible to prevent products that are actually defective from being judged as good, thereby improving the inspection accuracy by the image inspection device 100.

【0031】

Specifically, the second inspection T2 is preferably an inspection for measuring the dimensions of the electronic component 1. It was found that inspections that measure dimensions are less likely to cause overkill, in which an electronic component 1 that is actually good but judged as fail, compared to other defect inspections such as inspection for dirt or foreign matter. Therefore, it is preferable to perform the second inspection T2, which measures the dimensions of the electronic component 1 and is an inspection in which an overkill is unlikely to occur, independently and in parallel with the first inspection T1 prior to the salvage inspection Tk.

【0032】

The image inspection device 100 may include a second salvage inspection means, similar to the salvage inspection means 40, which performs a second salvage inspection Tk2 having a second salvage inspection logic Lk2 different from the second inspection logic L2 when the second inspection result T2R satisfies a specific condition in the second inspection logic L2, and outputs a second salvage inspection result TkR2. In other words, the second inspection T2 may be overwritten by the second salvage inspection Tk2, similar to the salvage inspection Tk for the first inspection T1. This further reduces the possibility that a product that is actually good is determined to be defective.

【0033】

The image inspection device 100 may include a third inspection means 70 for performing a third inspection T3 having a third inspection logic L3 different from the first inspection logic L1 of the first inspection T1 and the second inspection logic L2 of the second inspection T2. The third inspection means 70 is independent and parallel to the first inspection means 30 and the second inspection means 60. This allows the electronic component 1 to be inspected from more points of view, improving the accuracy of inspection for defective products.

【0034】

The technical scope of the present invention is not limited to the embodiments described above, and various modifications can be made without departing from the purpose of the present invention.

【0035】

Other components in the embodiments described above can be replaced with well-known components as appropriate without departing from the purpose of the present invention. Furthermore, the above-mentioned modifications may be combined as appropriate without departing from the purpose of the present invention.

【0036】

As described above, the image inspection device 100 for the electronic components 1 according to the embodiment comprises a position detection means 10 for detecting a product position PP based on a captured product image P of the electronic component 1, an image correction means 20 for generating a corrected product image Pc by correcting the product image P based on the product position PP, a first inspection means 30 for performing a first inspection T1 having a first inspection logic L1 based on the corrected product image Pc and outputting a first inspection result T1R, a salvage inspection means 40 for performing a salvage inspection Tk having a salvage inspection logic Lk different from the first inspection logic L1 when the first inspection result T1R satisfies a specific condition in the first inspection logic L1 and outputting a salvage inspection result TkR, and an overall judgment means 50 for making an overall judgment of the electronic component 1 based on the first inspection result T1R and the salvage inspection result TkR. As a result, even if the electronic component 1 that should have been judged as good (pass) is judged as defective (fail) by the first inspection means 30 (hereinafter, this phenomenon may be referred to as overkill), if it is judged as good by the salvage inspection means 40, it will be judged as good by the overall judgment means 50. Therefore, the image inspection device 100 for the electronic component 1 can prevent a product that is intended to be a good product from being judged as defective.

【0037】

The image inspection method of the embodiment comprises a product position detection step of detecting a product position PP based on a captured product image P of the electronic component 1, an image correction step of generating a corrected product image Pc by correcting the product image P based on the product position PP, a first inspection step of performing a first inspection T1 having a first inspection logic L1 based on the corrected product image Pc and outputting a first inspection result T1R, a salvage inspection step of performing a salvage inspection Tk having a salvage inspection logic Lk different from the first inspection logic L1 if the first inspection result T1R satisfies a specific condition in the first inspection logic L1, and outputting a salvage inspection result TkR, and an overall judgment step of making an overall judgment of the electronic component 1 based on the first inspection result T1R and the salvage inspection result TkR. As a result, even if the electronic component 1 that should have been judged as good (pass) is judged as defective (fail) by the first inspection means 30 (hereinafter, this phenomenon may be referred to as overkill), if it is judged as good in the salvage inspection step, it will be judged as good in the overall judgment step. Therefore, according to the image inspection method for the electronic component 1, it is possible to prevent a product that is originally a good product from being judged as defective.

【0038】

The purpose of the image inspection program of the embodiment is to have a computer execute the image inspection method described above. That is, the image inspection program of the embodiment causes a computer to execute the product position detection function that detects the product position PP based on the captured product image P of the electronic component 1, the image correction function that generates a corrected product image Pc by correcting the product image P based on the product position PP, the first inspection function that executes the first inspection T1 having the first inspection logic L1 based on the corrected product image Pc and outputs a first inspection result T1R, the salvage inspection function that executes the salvage inspection Tk having the repair inspection logic Lk different from the first inspection logic L1 when the first inspection result T1R satisfies a specific condition in the first inspection logic L1 and outputs a salvage inspection result TkR, and the overall judgment function that makes an overall judgment of the electronic component 1 based on the first inspection result T1R and the repair inspection result TkR. As a result, even if the electronic component 1 that should have been judged as good (pass) is judged as defective (fail) by the first inspection means 30 (hereinafter, this phenomenon may be referred to as overkill), if it is judged as good in the salvage inspection step, it will be judged as good in the overall judgment step. Therefore, according to the image inspection method for the electronic component 1, it is possible to prevent a product that is originally a good product from being judged as defective.

[Explanation of references]

【0039】

100 Image inspection device, 1 Electronic component, 10 Position detection means, 20 Image correction means, 30 First inspection means, 40 Salvage inspection means, 50 Overall judgment means, 60 Second inspection means, 70 Third inspection means, C Image capture means, S Control means, L1 First inspection logic, L2 Second inspection logic, L3 Third inspection logic, P Product image, T1 First inspection, T1R First inspection result, T2 Second inspection, T2R Second inspection result, T3 Third inspection, Tk Salvage inspection, TkR Salvage inspection result

Scope of claim

[Claim 1]

An image inspection device for electronic components comprising:

- a position detecting means configured to detect the product position based on a captured product image of an electronic component;

- a image correction means configured to generate a corrected product image based on the product position;

- a first inspection means configured to perform a first inspection having a first inspection logic based on the corrected product image and output a first inspection result;

- a salvage inspection means configured to perform a salvage inspection having a salvage inspection logic different from the first inspection logic and output a salvage inspection result when the first inspection logic is a pass/fail judgment and the first inspection result is fail;

- an overall judgement means configured to perform an overall judgement of the electronic component based on the first inspection result and the salvage inspection result;

wherein

- the first inspection logic is a function configured to determine pass or fail based on a threshold value set for a defect evaluation parameter;

- the salvage inspection logic is generated by an artificial intelligence that learns based on the relationship between the information of the product image or the corrected product image and the inspection result.

[Claim 2]

The image inspection device for electronic components according to claim 1,

- wherein the first inspection is an inspection configured to detect dirt or foreign matter on the element body of electronic components among other defects.

[Claim 3]

The image inspection device for electronic components according to claim 1 or claim 2,

- wherein the overall judgment means that makes an overall judgement that the product is good when the first inspection result is pass or the salvage inspection result is pass, and makes an overall judgement that the product is defective when the first inspection result is fail and the salvage inspection result is fail.

[Claim 4]

The image inspection device for electronic components according to claim 1 or claim 2,

- comprising a second inspection means for performing a second inspection having a second inspection logic different from the first inspection logic and output a second inspection result,

- wherein the overall judgment means makes an overall judgment based on the first inspection result, the salvage inspection result, and the second inspection result.

[Claim 5]

The image inspection device for electronic components according to claim 4,

- wherein the overall judgment means that makes an overall judgement that the product is good when the first inspection result is pass or when the salvage inspection result is pass, and the second inspection result is pass, and makes an overall judgement that the product is defective when the first inspection result is fail and the salvage inspection result is fail, or when the second inspection result is fail.

[Claim 6]

The image inspection device for electronic components according to claim 1 or claim 2,
wherein the first inspection is an inspection for detecting defects in electronic components.

[Claim 7]

The image inspection device for electronic components according to claim 5,
wherein the second inspection is an inspection for measuring the dimensions of electronic component.

[Claim 8]

The image inspection method for electronic components comprising:

- a position detection step configured to detect a product position based on a captured product image of an electronic component;

- an image correction step configured to generate a corrected product image by correcting the product image based on the product position;

- a first inspection step configured to perform a first inspection having a first inspection logic based on the corrected product image and output a first inspection result;

- a salvage inspection step configured to perform a salvage inspection having a salvage inspection logic different from the first inspection logic when the first inspection logic is a pass/fail judgment and the first inspection result is fail, and outputting a salvage inspection result;

- an overall judgement step of performing an overall judgement of an electronic component based on the first inspection result and the salvage inspection result;

wherein

- the first inspection logic is a function configured to determine pass or fail based on a threshold value set for a defect evaluation parameter;

- the salvage inspection logic is generated by an artificial intelligence that learns based on the relationship between the information of the product image or the corrected product image and the inspection result.

[Claim 9]

A program for causing a computer to execute:

- a function of detecting a product position based on a captured product image of an electronic component;

- a function of generating a corrected product image by correcting the product image based on the product position;

- a function of performing a first inspection with a first inspection logic based on the corrected product image and outputting a first inspection result;

- a function of performing a salvage inspection having a salvage inspection logic different from the first inspection logic and outputting a salvage inspection result when the first inspection logic is a pass/fail judgment and the first inspection result is fail;

- a function of performing an overall judgement of the electronic component based on the first inspection result and the salvage inspection result;

wherein

- the first inspection logic is a function configured to determine pass or fail based on a threshold value set for a defect evaluation parameter;

the salvage inspection logic is generated by an artificial intelligence that learns based on the relationship between the information of the product image or the corrected product image and the inspection result.