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METHOD AND SYSTEM FOR INSPECTING A SURFACE WITH ARTIFICIAL INTELLIGENCE ASSIST

Abstract

A system identifying an area of interest of an inspection surface is disclosed. A controller includes a machine learning model trained using stored images defining an area of interest on the inspection surface. A laser projector for projecting laser indicia onto the inspection surface is spatially located relative to the inspection surface enabling the laser projector to project the laser indicia onto the area of interest. An imager includes an image sensor system generates a current image of the inspection surface and signals the current image to the controller. The machine learning model is directed to the area of interest of the current image as identified by the laser indicia and the machine learning model implementing the neural network to inspect the current image of the area of interest as defined by the laser indicia enabling localized inspection of the inspection surface.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS [0001] The present application is a Continuation of U.S. application Ser. No. 18/087,250 filed on Dec. 22, 2022, which claims priority to U.S. Provisional Patent Application No. 63/331,064 filed on Apr. 14, 2022, which is hereby incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] The present invention relates generally towards automated inspection of surfaces. More specifically, the present invention relates towards the use of artificial intelligence for inspection of surfaces using laser projected indicia to improve efficiency.

BACKGROUND

[0003] Inspection of mass production components is increasingly important to meet and maintain high quality manufacturing standards. Early inspection processes used in mass production facilities made use of periodic human inspection to achieve modest improvements in quality production. Statistical process controls assisted with this effort. However, poor efficiency and human error has made these efforts inadequate to meet modern quality standards. To meet these ever-increasing quality standards higher percentages of production must be inspected in many instances rendering the use of human inspection mostly obsolete. Therefore, efforts have been made to implement machine vision inspection using cameras and sensors to inspect whether a component has been properly assembled to a work surface. However, this inspection scheme fails when the assembly is quite large, such as, for example, when the assembly is a prefabricated construction, a building component such as a truss, large aerospace members, wind turbine blades and the like. Additionally, it becomes difficult to inspect moderately sized surfaces when assembly rates are very high and only small areas of interest require inspection.

[0004] In some instances, artificial intelligence (“AI”) has been implemented with moderate success. In these systems, computer vision algorithms such as template matching, feature extraction and matching combined with Machine Learning (“ML”) algorithms have been implemented. More recently, Deep-Learning (“DL”) and neural networks have been identified as feasible for AI inspection due to the implementation of learning-based algorithms. Learning based DL neural networks such as Convolutional Neural Networks (“CNN”) is an example of such algorithms. These CNN's can be trained to learn from images of a template to generate a machine learning model used to inspect assembled components. It is thought that ever increasing accuracy may be achieved through machine learning.

[0005] CNN's using sophisticated algorithms can approach human logic and accuracy. These CNN's can be trained to detect anomalies in the images of the parts under inspection by using the AI model that is trained from stored images and the like as is known to those of ordinary skill in the art. However, the computation cost for such CNN algorithms limits their ability to process larger images of very large objects on industrial scales. Even training such AI models to inspect small objects is problematic when included within a large, detected image or high-volume manufacturing processes.

[0006] Therefore, it would be desirable to develop an AI model for industrial inspection that would be economically feasible and provide efficiency in mass production settings not previously achieved.

SUMMARY

[0007] A system for identifying an area of interest of an inspection surface includes a laser projector and an imager. A controller includes a machine learning model (a neural network model) that is trained using stored images of an area of interest on the inspection surface. The laser projector that projects laser indicia onto the inspection surface is spatially located relative to the inspection surface enabling the accurate projection of the laser indicia onto the area of interest. The imager includes an image sensor system for generating a current image of the inspection surface and signaling the current image to the controller. The machine learning model directs inspection to the area of interest of the current image as identified by the laser indicia and the machine learning model implements the neural network to inspect the current image of the area of interest that is defined by the laser indicia enabling localized inspection of the inspection surface.

[0008] The use of strategically projected laser indicia upon an inspection surface provides the ability to reduce complexity of code and analysis by way of CNN or any other AI model. Illumination of an area of interest of an inspection surface with laser indicia is easily identified by an imager, or more specifically a camera. Making use of a pixelated sensor enables a controller to conduct CNN algorithms that are significantly simplified when compared to a similar algorithm required to inspect an entirety of the inspection surface. Once identified, the area of interest, and more specifically the area defined by the laser indicia, is analyzed while the system the rest of the work surface or inspection surface. It is also possible for the controller to analyze only the laser indicia when processing the CNN or any other AI model. The inventive process of the present application even eliminates reliance upon comparing computer aided design (CAD) data for the purpose of determining accurate assembly of a component when performing inspection analysis further reducing complexity of the computer code and increasing speed of the inspection. CAD data is used to accurately locate the area of interest on an inspection surface when registering spatial location of the laser projector with the inspection surface. Once the projector has been spatially located relative to the inspection surface by way of conventional laser projection processes the CAD data need not be further involved in the inspection process because the AI algorithms are used for the inspection analysis. This dual system of CAD directed laser projection and AI inspection improves accuracy of inspection while also increasing inspection efficiency. Therefore, the combination of AI and laser projection enables a broad implementation of the benefits of each system for machine inspection not previously thought achievable.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Other advantages of the present invention will be readily appreciated, as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, where in:

[0010] FIG. **1** shows a schematic of the inspection system of the present invention spatially locating the laser projector with the inspection surface;

[0011] FIG. **2** shows a schematic of the inspection system of the present invention with the laser projector projecting laser indicia to an area of interest upon the inspection surface; and

[0012] FIG. **3** shows a flow chart of the CNN process at the controller level of the inspection system.

DETAILED DESCRIPTION

[0013] Referring to FIG. **1**, a system of the present invention is generally shown at **10**. The system **10** includes an imager **12** and a laser projector **14**. The imager is made-up of one or more cameras **16**. The number of cameras **16** included in any system **10** is dependent upon an area of an inspection surface **18** upon which some work has been performed. It is desirable that a view of the entire inspection surface **18** is achieved by the cameras **16**, the purpose of which will become more evident hereinbelow. Therefore, the use of several cameras **16** are desirable to cover very large inspection surfaces **18** while fewer cameras **16** may be required for smaller inspection surfaces **18**. While the Figures of the present application represent two cameras **16** it should be understood a single camera **16**, or two, three, or more cameras **16** may be used as desired. In any event, the cameras present a full view of the inspection surface **18** so that no gaps in the view exist. In one embodiment, each camera **16** includes a camera controller **17**. However, it should be understood that a central controller that is electronically connected with each of the cameras **16** by way of hardwire or other wireless transmission is also within the scope of this invention.

[0014] The laser projector **14** is a conventional projector that includes a laser **20** and a cooperate first galvo mirror **22** and second galvo mirror **24**. A suitable laser projector **14** is IRIS 3D laser projector provided by Virtek Vision International, Inc. The laser projector **14** includes a laser sensor **26** for detecting a return laser beam as is explained further in U.S. Pat. No. 9,200,899 LASER PROJECTION SYSTEM AND METHOD the contents of which are included herein by reference. A laser controller **28** calculates location and direction of the laser projection based upon rotational orientation of the first galvo mirror **22** and second galvo mirror **24** in a known manner.

[0015] The laser controller **28** conducts a locating sequence to spatially locate the inspection surface **18** relative to the laser projector **14**. More specifically, the laser projector **14** is located within a three-dimensional coordinate system relative to the inspection surface **18** enabling the laser projector **14** to project laser indicia **30** (FIG. **2**) in the form of a boundary **31** (or boundary box) onto the inspection surface **18** at area of interest **32** also defined within the three-dimensional coordinate system.

[0016] To locate the laser projector **14** relative to the inspection surface **18**, reflective targets **34** are affixed to the inspection surface **18** at predetermined datums defined in the CAD data. As known to those of ordinary skill in the art, accurately locating the datums in a three-dimensional coordinate system enables accurate location of the inspection surface **18**. As such the laser projector **14** projects a laser beam **36** to the reflective targets **34** from which a return laser beam is reflected to the laser sensor **26**. Based upon the orientation of the galvo mirrors **22**, **24** locations of the targets **34** are calculated by the controller **28** in a known manner. The process of establishing correlation between the laser projector **14** in the inspection surface **18** is explained further in U.S. Pat. No. 9,200,899 LASER PROJECTION SYSTEM AND METHOD wherein alternative calibration methods are explained including projecting arbitrary laser spots into the work environment are included herein by reference. The system **10** may also rely on photogrammetry techniques using the cameras **16** or other cameras integrated with the laser projector **14** to identify location of the laser spots. In either embodiment, a location of the cameras relative to the laser projector is calibrated. Rapid methods for aligning the laser projector **14** with the inspection surface **18** is disclosed in U.S. Pat. No. 10,799,998 LASER PROJECTION WITH FLASH ALIGNMENT, the contents of which are also included hearing by reference.

[0017] Therefore, it should be understood to those of ordinary skill in the art that it is desirable to locate each camera **16** relative to the laser projector **14** within the three-dimensional coordinate system either by locating techniques explained herein above or affixing each camera **16** to the laser projector spaced by a known amount. Therefore, the cameras **16**, the laser projector **14** and the inspection surface **18** are all now located relative to each other within a common three-dimensional coordinate system. Once located, the controllers **17**, **28** may begin performing a locating sequence to identify an area of interest **32** on the inspection surface **18**.

[0018] The following is an explanation of a first of a sequence of assembly tasks that may include mating a component **36**, or a plurality of components **36** to an inspection surface **36** to form a fully assembled workpiece. In one embodiment, the laser projector **14** also projects laser indicia **30** that directs an operator through an assembly sequence by, for example, identifying the location upon the inspection surface **18** whereat the component **36** is to be assembled. Therefore, in one embodiment the laser indicia **30** may function as a template for directing an assembly task. Thus, the laser projector **14** serves dual purposes of directing an assembly operation as well as assisting machine inspection to verify proper assembly. The system **10** and method of the present invention is also contemplated for use to identify location of defects on the inspection surface **18** such as, for example, paint defects and other surface defects. In this embodiment, once a vision detection system identifies a defect, the laser projector **20** is signaled a location of the defect and projects a location identifying laser indicia to the defect.

[0019] Once the laser indicia **30** is projected onto the inspection surface **18**, the imager **12** begins its imaging sequence. Each camera **16** of the imager **12** includes an image sensor **38** such as, for example, a CCD or CMOS sensor that generates pixelated images. These pixelated images hereinafter described as current images are signaled to the camera controller **17**. In one embodiment, the camera controller **17** implements machine learning algorithms that are trained by way of stored images. The stored images include a database of pixilated images of the laser indicia **30** that is continuously updated with current images that are dissimilar to those stored images already populating the database. Therefore, the training is continuously updated by enhancing a database of stored images with current images to improve the inspection accuracy. To facilitate training the camera controller **17**, the camera controller **17** identifies when a current image does not properly correspond to its machine learning model and signals the current image to a remote processor **42** as will be explained further herein below.

[0020] Again, referring to FIG. **2**, the laser controller **28** both locates an area of interest **32** and identifies the area of interest by projecting the boundary **31** onto the inspection surface **18**. Thus, a predetermined area of the boundary **31** is generated by the laser beam **34** generating a circumscribing laser pattern onto the inspection surface **18**. It should be understood that the component **36** is necessarily located within the boundary **31**. This step of the machine inspection procedure is directed by way of a General Dimensional and Tolerance (GD&T) scheme record of CAD data and not by tracking placement of the component **36**. Thus, while the CAD data is not necessary for the inspection process, the CAD data is used to assist identification of the location of the areas of interest **32** on the inspection surface **18**.

[0021] Machine Learning by way of CNN architectures have been thought to be adequate for industrial inspection to verify if a component **36** has been installed in a correct position, i.e., within specified GD&T tolerance. Most of these CNN architectures are trained and evaluated to detect normal objects such as people, cars, trees, and animals. These CNN architectures are feasible when object size within the image the architecture is trained on is large enough to have good features to detect. However, if the object is small, or the image size is large including many small objects within the image, the majority of existing CNN architectures fail. To avoid increasing architecture complexity or adding additional training data to cover small object sizes, none of which are practicable, the system **10** of the present invention is trained to focus only on an area within the boundary **31** within a larger worksurface or inspection surface **18**. It is desirable that the areas be as small as possible relative to the object being inspected.

[0022] As best represented in FIG. **2**, the laser projector **14** projects the boundary **31** onto the inspection surface **18** at a location that is within a field of view of any of the cameras **16**. The laser controller **28** is programmed to direct the laser projector **14**, or laser projectors **14** as a process may require, to identify multiple areas of interest **32** by projecting a boundary **31** to each area of interest **32**. The CNN architecture of the controller **38** is trained to detect the boundary **31** within the current image generated by the imager **12** and signaled to the camera controller **17**. Once the CNN architecture identifies the boundary **31** generated by the laser beam **34**, the camera controller **17** extracts only that portion of the image where the boundary **31** is detected. By performing this extraction process, the CNN algorithm need only be run on that portion of the image within the boundary **31** where the component **36** is expected to exist.

[0023] Therefore, the CNN model does not need to be trained to analyze large images that require tabulation of large volumes of pixels generated by the image sensor **38**. By the laser projector **14** directing the camera controller **17** to the area of interest **32** with the laser generated boundary **31**, the CNN model is easily trained on a small number of pixels within the current image of the inspection surface **18** as defined by the boundary **31**. Therefore, the computational complexity is substantially reduced over images of an entire inspection surface generated by large size imaging systems. Due to the precise nature of a laser projected boundary **31** enabling the creation of a localized image limited to a precisely defined area of interest **32**, the CNN computation is anticipated to also be highly accurate.

[0024] In one embodiment, image processing is conducted in two steps. First, a background image is generated of the inspection surface **18** by the imager **12** prior to projection of the boundary **31** by the laser projector **14**. Next, the laser projector **14** scans the boundary **31** onto the area of interest **32**. While the boundary **31** is projected onto the area of interest **32**, the imager generates a current image of the inspection surface **18** from which the laser boundary **31** is clearly delineated by subtracting pixels generated in the background image from pixels generated in the current image. Thus, by way of pixel subtraction between the two images, the camera controller **17** is capable of identifying with a high degree of accuracy the laser boundary **31**. The location at which the pixels are detected being significantly changed between the background image and the current image enables the controller **17** to select the area within the laser boundary **31** for CNN inspection. Thus, only those pixels generated on the current image are analyzed because the pixels of the background image are subtracted and therefore not analyzed. This process increases accuracy of identifying the area of interest.

[0025] By way of laser projection assisted artificial intelligence, the CNN algorithm and model selected for the analysis by the camera controller **17** includes the following features: [0026] Object Classification: Does the object exist or not exist within the boundary **31**. [0027] Object Measurement: Does the object of correct size, and placed in the correct location? [0028] Template Matching: Does the object match a given template?

[0029] Features of the artificial intelligence model are selected depending on a given application. Specifically, it is desirable to train the CNN algorithm to analyze only that portion of the image of the inspection surface **18** that includes objects that are of interest while ignoring objects not of interest. This is achievable by projecting the laser scanned boundary **31** without requiring highly complex and expensive imaging systems. The attempts to analyze an image of a whole inspection surface that requires unneeded algorithm complexity and computing power is now eliminated.

[0030] Once the area of interest **32** has been identified from the boundary **31** scanned by the laser projector **14** the laser controller **28** modifies the scanning pattern of the laser beam **34** to more closely identify where the component **36** is expected to be placed by scanning a template **40** onto the inspection surface **18**. The size and shape of the template **40** is established by predetermined tolerances related to placement of the component **40** on the inspection surface **18**. Thus, the laser projected template **40** may be used to identify proper placement of the component **36** up on the inspection surface **18**. In one embodiment, the laser projected template **40** may circumscribe a plurality of components **36**. Thus, the camera controller **17** is able to evaluate pixels received from the camera sensors **38** when generating the current image to confirm components **36** exist within the area of interest **32**. Once the current image is generated, the CNN process is begun by using the trained models received from the remote processor **42** focusing the analysis on the area of interest **30** as defined by the laser generated indicia **30**.

[0031] As described above, a database that stores pixelated images from which the machine learning model is built is located on the processor **42** that is separate from the controllers **17**, **28** that manage the machine inspection of the inspection surface **18**. Using a remote processor **42** reduces the burden of memory space and processing on the controllers **17**, **28** that run the CNN algorithm. However, it should be understood that the database on the processor **42** is continuously updated using appropriate learning mechanisms to include additional images showing alternative dispositions of the component **36** when placed on the inspection surface **18**. The processor **42** signals the controllers **17**, **28** the updated training algorithms enabling the CNN algorithm and models operating the controllers **17**, **28** to improve proficiency in identifying disposition of the area of interest **32** within the boundary box **31**. Thus, the system **10** may now focus on inspection of merely the area of interest **32** without the burden of imaging the entire inspection surface **18**.

[0032] Referring to FIG. **3**, and as represented above, the boundary **31** is recognized by way of the current image **44** generated by the imager **12** limiting inspection to the area disposed within the boundary **31**. Thus, the imager **12** detects both the existence of a component **36** within the boundary **31** defined by the laser beam and the boundary **31** itself. As is known to those of skill in the art, CNN is a feed-forward neural network. One type of feed forward network is known as a Residual Network or RESNET often requiring at least one hundred and sometime over one thousand processing layers to achieve desired accuracy when CNN is used for visual identification. The power of a CNN comes from a special kind of layer called the convolutional layer. Convolutional neural networks contain many convolutional layers stacked on top of each other, each one being capable of recognizing more sophisticated shapes, and in some instance continually narrowing scope of pixels from a camera image. The projected boundary **31** of the present invention eliminates most of these layers by reducing the broad view low resolution data and focusing only on those convolution layers relevant to the area of interest **32** disposed within the boundary **31**. Therefore, where dozens of layers may be required for large image analysis, the invention of the present application requires only thirty or less convolution layers resulting in reduced complexity of the CNN algorithm and requiring less time to complete analysis of an image.

[0033] Subsequently, the CNN algorithm includes analysis of the boundary **31** to measure the component **36** using the training that is updated when the current image is integrated with the stored images disposed on the processor **42**. Furthermore, the laser projector **14** traces the template **40** identifying anticipated location of the component **36** within the boundary **31** providing additional accuracy for identifying a location for machine inspection.

[0034] Calibration of the imager **12** relative to the laser projector **14** and to the inspection surface **18** is relevant for obtaining desired accuracy of the machine inspection. As a result of calibration, the controllers **17**, **28** calculate relative location of the laser projector **14** or plurality projectors **14**, the imager **12** and a work surface **18** within a common three-dimensional coordinate system. In addition, calibration of the imager **12** and each of the associated cameras **16** include laser sensor **26** and camera sensor **38** parameters relative to desired image resolution so that pixels contained in an image of the inspection surface **18** provide necessary accuracy. Parameters of the camera lens included with each camera **16** are also established during system **10** calibration. Specifically, focal length in pixels, and optical center of pixels, and other distortion parameters that depend upon device model are necessarily established during calibration.

[0035] The location of the imager **12** and each associated camera **16** is determined in a three-dimensional coordinate system using image capturing process converting three-dimensional calibration to a two-dimensional image system from which the image controller **17** conducts its measurement analysis. Therefore, the image capturing process removes the depth dimension for CNN analysis. To achieve this end, exact positioning of the imager **12** within the three-dimensional coordinate system is determined using conventional metrology techniques. Actual size of the component **36** being measured is also determined at this time.

[0036] Alternative methods may be used to identify the location of each of the cameras **16** within the common coordinate system relative to the inspection surface. One method includes collecting measurements of, for example, the targets **34** placed at known positions within the coordinate system as explained above. April tags or coded targets that include checkerboard or other patterns placed in known coordinates may also be used to identify location of the cameras **16** when an image is generated and signaled to the camera controller **17**. Alternatively, the cameras **16** and the laser projector **14** independently identify each location within the common coordinate system by measuring coded targets placed at predetermined geometrically relevant locations in a known manner. Once a sufficient number of targets has been measured, the controllers **17**, **28** use a system of equations to identify camera **16** parameters of the imager **12** within the common coordinate system.

[0037] The laser projector **14** projecting laser spots to known coordinates may also be used to locate the laser projector **12** within the common coordinate system. Locating these spots with the imager **12** enables the controller **28** to build a 2D/3D point correspondence believed necessary to perform calibration of the cameras **16** defining the imager **12**. This method of calibration is particularly useful when a plurality of cameras **16** are utilized to cover an expansive inspection surface **18** so long as the laser projector **14** is able to project a laser spot or laser pattern within a field of view of each of the cameras **16**. Otherwise, full coverage of the inspection surface **18** may be achieved by integrating a plurality of laser projectors **14**, each ultimately being registered or located relative to the imager **12**.

[0038] As explained above, the CAD data is used when locating the area of interest **32** and the inspection surface **18** so that the laser projector **14** is able to accurately project the laser indicia **30**, and more specifically the boundary box **31** onto the inspection surface. Once the inspection surface **18** has been registered within the common 3D coordinate system, the CAD data is used to direct the laser where to project the indicia. However, once each of the common 3D coordinate system had been registered, the machine inspection is conducted independently of CAD data, reliance of which would slow down the inspection process. Referring again to FIG. **3**, the imager **12** generates a pixelated current image of the inspection surface **18** and focuses on the area of interest **32** as directed by the laser generated boundary **31**. In one embodiment, the camera controller(s) **17** administers the CNN algorithm implementing the training achieved from the stored images on the processor **42**. In this non limiting example, the training is updated periodically when the current image is signaled by at least one of the controllers **17** to the processor **42** and is compared with a database of first stored images **44** providing an indication that the component **36** is disposed in either the design position or not within the design position within the boundary **31**. Continuous processing using the CNN algorithm provides increasingly narrow analysis of the current image as trained by the second stored images and third stored images ultimately providing a determination that the component is disposed at a correct location within the boundary **31**. The CNN algorithm continuously narrows analysis of the stored images by way of the CNN training with the current image to determine if the current image is accepted by the imaged pixels being within predetermined parameters or not accepted by the imaged pixels being outside predetermined parameters.

[0039] The AI model is continually improved relative to accuracy of the comparative analysis through machine learning by updating the database disposed in the processor **42**. Therefore, when current images are generated by the imager **12** that do not correspond sufficiently with any of the stored images, the processor **42** updates the CNN database providing improved accuracy to the machine inspection performed by the system **10**. For example, when a current image does not match any of the stored images, the current image is classified as identifying an accepted disposition or a not accepted disposition. Disposition is determined by conformance to a preestablished tolerance. These steps are optimized by way of the reduced inspection area that is limited to an area of interest **32** as defined by the laser projected indicia **30**, and more specifically, the laser projected boundary **31**.

[0040] The invention has been described in an illustrative manner; many modifications and variations of the present invention are possible. Is therefore to be understood within the specification the reference numerals are merely for convenience and are not to be in any way limiting, and that the invention may be practiced otherwise then is specifically described.

Therefore, the invention can be practiced otherwise then is specifically described within the scope of the stated claims following the aforementioned disclosed embodiment.

Claims

1. A system identifying an area of interest of an inspection surface, comprising: a controller including a machine learning model including a neural network being trained by stored images defining an area of interest on the inspection surface; a laser projector for projecting laser indicia onto the inspection surface and being spatially located relative to said inspection surface thereby enabling said laser projector to project the laser indicia onto the area of interest; an imager including an image sensor system for generating a current image of the inspection surface and signaling said current image to said controller; and said machine learning model directing inspection to the area of interest of the current image as identified by the laser indicia and said machine learning model implementing said neural network to inspect the current image of the area of interest as defined by the laser indicia thereby enabling localized inspection of the inspection surface.
2. The system set forth in claim 1, wherein said neural network comprises a Convolutional Neural Network ("CNN") for executing said machine learning model trained from stored images of said area of interest as defined by said laser indicia.
3. The system set forth in claim 2, further including a processor for generating and updating said CNN based upon addition of current images to said stored images populating said processor. The system set forth in claim 2, wherein said processor is electronically interconnected with said controller for signaling said processor said current images defined by said laser indicia.
4. The system set forth in claim 1, wherein said location of said laser indicia is established by Computer Aided Design data defining said inspection surface.
5. The system set forth in claim 4, wherein said laser indicia projected onto the inspection surface identifying said area of interest defines a periphery of said area of interest.
6. The system set forth in claim 5, wherein said imager includes a plurality of cameras each including an imaging sensor.
7. The system set forth in claim 6, wherein each of said imaging sensors define pixels for generated pixelated images of said area of interest defined by said laser indicia.
8. The system set forth in claim 7, wherein said stored images populating said controller and said processor are defined as pixelated images for training said CNN.
9. The system set forth in claim 8, wherein said CNN provides inspection analysis based upon image data comprising pixels of said laser indicia between said current image and said store image.
10. The system set forth in claim 1, wherein said laser projector includes a laser controller for calculating spatial location of said laser projector from laser light reflected from targets disposed upon said inspection surface.
11. A method of identifying an area of interest for performing machine inspection of a surface, comprising the steps of: training a controller having a neural network with inspection criteria of an inspection surface; projecting laser indicia onto the inspection surface defining an area of interest on the inspection surface for performing machine inspection; imaging the inspection surface thereby generating a current image of the inspection surface; and said laser indicia defining the area of interest directing the neural network to a location on the inspection surface for performing machine inspection.
12. The method set forth in claim 11, wherein said step of projecting laser indicia is further defined by projecting a boundary around said area of interest thereby directing said neural network to a location where to perform machine inspection.
13. The method set forth in claim 11, further including a step of locating said laser projector relative to said inspection surface within a common three-dimensional coordinate system.

14. The method set forth in claim 13, wherein said step of training said neural network is further defined by training said neural network with prior images of said area of interest on said inspection surface.
15. The method set forth in claim 14, wherein said step of training said neural network is further defined by combining current images of said area of interest with prior images of said area of interest.
16. The method set forth in claim 1, wherein said step of imaging said inspection surface if further defined by imaging said inspection surface with a plurality of cameras.
17. The method set forth in claim 1, wherein said neural network is further defined as a Convolutional Neural Network.
18. The method set forth in claim 1, further including a step of said imager identifying whether a component mated to said inspection surface is disposed within said laser projected boundary.
19. The method set forth in claim 1, further including a step of providing Computer Aided Design (CAD) for directing said laser projector to a location of said area of interest on said inspection surface thereby enabling said laser projector to project laser indicia at said area of interest.
20. The method set forth in claim 19, wherein said step of directing said laser projector to a location of said area of interest on said inspection surface is further defined by locating said projector relative to the inspection surface within a common three-dimensional coordinate system.