CLAIMS

1. A method for training an ~~in-ground~~ airfield ground lighting inspection system comprising:

moving a housing having an image acquisition means attached thereto to capture image streams of a plurality of lights of an in-ground airfield ground lighting system, each image stream comprising successive images of a light;

using a location sensor to detect location information of the image acquisition means capturing the image streams; and

processing the image streams to detect and associate a plurality of points in a specified arrangement in an image with an item to be checked, wherein the associating is performed by storing operator selection of a plurality of points in a first image and a subsequent at least one randomly selected image from an image stream of a light of the airfield ground lighting system;

wherein for the images in the image stream after the first image and subsequent image, locations of the points of the item to be checked are determined by:

detecting locations of scene points for the images of the image stream, wherein the scene points are the location of the points comprising the item to be checked relative to a three dimensional frame of reference of the light,

projecting said scene points into the images of the image stream from the identified reference location for that scene point and from the location information of the image acquisition means,

processing the images of the image stream to detect location of the points comprising the item to be checked,

comparing the location of the projected scene point in the images with the location of the detected points in the images and calculating the proximity therebetween, and

verifying presence of a point in the item to be checked where the calculated proximity exceeds a threshold value.

2. The method for training an airfield ground lighting inspection system according to claim 1 wherein the operator specifies location, orientation and region of the plurality of points in the first image and subsequent image selected from the image stream.

3. The method for training an airfield ground lighting inspection system according to claim 2 wherein location in three dimensional space of the image acquisition means is determined from the analysis of a point from ~~a~~ the first image and the at least one subsequent image from the image stream and ~~positional~~ location information of the image acquisition means.

4. The method for training an airfield ground lighting inspection system according to claim 3 wherein a reference location for the one or more points of the item of the light being checked of the images of the image stream are determined from the depiction of those one or more points in the first image and subsequent image.

5. The method for training an airfield ground lighting inspection system according to claim 4 wherein the reference location is determined by epipolar geometry.

~~6. The method for training an airfield ground lighting inspection system according to claim 1 wherein for the images in the imagestream after the first image and subsequent image, locations of the points of the item to be checked are determined by:~~

~~detecting locations of scene points for the images of the image stream, wherein the scene points are the location of the points comprising the item to be checked relative to a three dimensional frame of reference of the light,~~

~~projecting said scene points into the images of the image stream from the identified reference location for that scene point and from the positional information of the image acquisition means,~~

~~processing the images of the image stream to detect location of the points comprising the item to be checked,~~

~~comparing the location of the projected scene point in the images with the location of the detected points in the images and calculating the proximity therebetween,~~

~~verifying presence of a point in the item to be checked where the calculated proximity exceeds a threshold value.~~

6~~7~~. The method for training an airfield ground lighting inspection system according to claim 1 wherein determination of the existence of points in an image is made using a discriminative classifier.

8~~7~~. An ~~in ground~~ airfield ground lighting inspection system comprising:

a housing having an image acquisition means attached thereto configured for capturing a plurality of image streams of the plurality of lights of an ~~in ground~~ airfield ground lighting system upon movement of the housing across the lights of the ~~in ground~~ airfield ground lighting system; wherein each image stream comprises successive images of a light;

a location sensor for detecting location information for the image acquisition means capturing the plurality of images ~~comprising~~ of the image streams;

an image processor coupled to the image acquisition means and the location sensor for processing the image stream of a light of the airfield ground lighting system by:

(a) associating characteristics of a plurality of points in an image with an item to be checked in the image of the light to be checked;~~, and~~

(b) extracting of the points from the images of an image stream; wherein said extraction is by ~~–~~analysing a plurality of randomly selected pairs of images from the images of the image stream to determine a plurality of tentative reference locations, one for each of the pairs of images for each extracted point relative to a three dimensional coordinate frame of the light;

(c) assessing the tentative reference locations determined for each extracted point, to determine a reference location for each extracted point;

(d) projecting each extracted point into the images of the image stream based upon the determined reference location of said each extracted point and location information of the image acquisition means for each image;

(e) analysing the images of the image stream by comparing the location in the images of the extracted points and the corresponding projected points and calculating the proximity therebetween;

(f) verifying existence in an image of the point of item to be checked in the light being checked by comparing the calculated proximity against a threshold value;

(g) repeating steps (b) to (f) to determine existence of each point in the plurality of points associated with an item to be checked; and

(h) determining the state of the item to be checked based upon analysis of verified points.

~~9~~8. The airfield ground lighting inspection system of claim ~~8~~ 7 wherein associating of the plurality of points in an image with an item of the light depicted in that image to be checked is performed according to the method of claims 1-6.

~~10~~9. The airfield ground lighting inspection system according to claim ~~8~~ 7 wherein the system is configured to verify any one or more of the presence of a crack; the absence of any one or more of a bolt, a nut, a ring, and an inset light; the orientation of any one or more of a bolt, a nut, a ring, an inset light and a crack; and predetermined markings identifying the light at a predetermined location on said light.

~~11~~10. The airfield ground lighting inspection system according to claim ~~8~~ 7 wherein the images are acquired under ambient lighting conditions.

~~12~~11. The airfield ground lighting inspection system according to claim ~~8~~ 7 wherein an additional illumination means is attached to the movable housing for lighting the lights for image acquisition.

~~13~~12. The airfield ground lighting inspection system according to claim ~~8~~ 7 wherein a tentative reference location for a point in each pair of images analysed is determined using the ~~positional~~ location information of the image acquisition means for that pair of images and ~~the~~ a verified detected location of ~~that~~ said point in the pair of images.

~~14~~13. An airfield ground lighting inspection system comprising:

a movable housing having an image acquisition means attached thereto configured for capturing a plurality of image streams of a plurality of lights comprising an ~~in ground~~ airfield ground lighting system upon movement of the housing across the airfield;

a location sensor for detecting location information for the image acquisition means capturing the plurality of images ~~comprising~~ of the image streams;

an image processor coupled to the image acquisition means and the location sensor for processing the image stream of a light of the airfield ground lighting system by:

(a) associating characteristics of a plurality of points in an image with an item to be checked in the image of the light to be checked;

(b) extracting the points from the images of the image stream, wherein said extraction is by analysing a plurality of randomly selected pairs of sample images from the images of the image stream to determine a plurality of tentative reference locations, one for each of the pairs of images for each extracted point relative to a three dimensional co-ordinate frame of the light to be checked;

(c) verifying each extracted point to determine a reference location thereof by comparing a projected location of that point based upon analysis of the plurality of randomly selected pairs of images from the image stream with an extracted location of that point;

(d) projecting each extracted point into the images of the image stream based upon the determined reference location of each extracted point and location information of the image acquisition means for each image; and

(e) determining the state of the light of the image stream by processing the verified extracted points comprising an item to be checked.

~~15~~14. The airfield ground lighting inspection system according to claim ~~14~~ 13 wherein the points extracted in an image of the image stream are extracted using an algorithm selected from the histogram of oriented gradient algorithm and normalised gradient analysis algorithm.

~~16~~15. The airfield ground lighting inspection system of claim ~~14~~ 13 wherein associating of the plurality of points in an image with an item of the light depicted in that image to be checked is performed according to the method of claims 1-6.

~~17~~16. The airfield ground lighting inspection system according to claim ~~14~~ 13 wherein items to be checked include predetermined markings at predetermined locations.

~~18~~17. The airfield ground lighting inspection system according to claim ~~14~~ 13 wherein the images are acquired under ambient lighting conditions.

~~19~~18. The airfield ground lighting inspection system according to claim ~~14~~ 13 wherein an additional illumination means is attached to the movable housing for lighting the lights for image acquisition.

~~20~~19. The airfield ground lighting inspection system according to claim ~~14~~ 13 wherein the system is configured to verify any one or more of the presence of a crack; the absence of any one or more of a bolt, a nut, a ring, and an inset light; the orientation of any one or more of a bolt, a nut, a ring, an inset light and a crack; and predetermined markings identifying the light at a predetermined location on said light.