

A METHOD AND APPARATUS FOR ILLUMINATING OBJECTS

The invention relates to a method and apparatus for illuminating objects such as monuments (churches, castles, structures, etc.), stages, or natural sites, for example.

It is already known to illuminate monuments by beams of colored lights with the color, brightness, and direction of the beams being varied at a greater or lesser speed.

Nevertheless, it is difficult or impossible, with presently known means, to illuminate a surface such as façade (of a structure, a church, etc. ...) with continuous or time-varying polychromatic light beams enabling a large number of architectural features or elements such as columns, windows, balconies, statutes, etc. to be emphasized, framed, and colored at will with very great accuracy, and optionally to project still or animated decoration on plane or non-plane surfaces of a building, a stage, etc.

An object of the invention is to satisfy this requirement.

To this end, the invention provides a method of illuminating an object, characterized in that it consists in taking at least one image of the object, processing said image, wherein the processing includes coloring the image, and in projecting the processed image onto the object, causing the outlines and dimensions of the projected image to coincide with the corresponding outlines and dimensions of the object.

When the image processing consists merely in coloring certain portions of an object such as a building, projecting the processed image on the building makes it possible to illuminate it while also decorating it, e.g. by coloring colonnades blue, statutes white for people and in colors for clothes or accessories, doorframes in red, windows in yellow, etc. ..., with accuracy such that for the spectator the impression is identical to that which would be obtained by painting those portions of the building.

Including colored decoration, e.g. a fresco, in the treated image, gives the impression, when the treated image is projected on the object, of a fresco painted directly on the object.

In a first embodiment of the invention, the method consists in taking at least one still or moving image of the object, in digitizing the image, in processing it digitally, in exposing still or motion-picture film with the processed image, in developing the film to obtain the processed image on transparent film, and in projecting it on the object.

In a variant the method consists in taking at least one video image of the object, in digitizing it, in processing it digitally, and in projecting the processed image on the object by means of a video projector or of laser beam illumination apparatus.

The invention also provides apparatus for illuminating an object, in particular by performing the method described above, the apparatus being characterized in that it comprises camera means for taking at least one

image of the object, means for processing said image, and means for projecting the processed image on the object.

The camera means may be of the type having a video output, e.g. a CCD camera, in which case the projection
5 means are of the type having a video input, such as, for example, a video projector or a laser illumination apparatus.

In a variant, the camera means can be a photographic camera for taking still or moving images, in which case
10 the processor means comprise means for digitizing the image, for digitally processing the image, and for exposing still or motion-picture film, in which case the projection means are constituted by one or several conventional optical projectors.

15 The invention will be better understood and other characteristics, details, advantages thereof will appear more clearly on reading the following description given by way of example and made with reference to the accompanying drawing, in which :

20 - Figure 1 is a diagram showing how images are taken of and projected back onto objects such as a building ; and

- Figure 2 is a flow chart of the main steps in the method of the invention.

25 Figure 1 shows, diagrammatically, a building 10 that is to be illuminated in special manner on the occasion of some event, e.g. a commemoration, a festival, a son et lumière spectacle, etc.

For this purpose, the invention provides taking at
30 least one image of a portion of a building that is to be illuminated by means of a camera 12 such as a still or

motion-picture camera, e.g. a CCD video camera, that is located relative to the building 10 at a location P such that the image of the building 10 picked up by the lens 14 of the camera 12 occupies as large a portion as possible of the photosensitive surface on which the image is formed (photographic film or CCD sensor matrix).

This image of the building 10, after appropriate processing performed by means of a data processing system 16, is projected back onto the building 10 at night or in the dark, by means of at least one projector located at the above-mentioned location P, which projector may be a conventional (slide) projector, or a video projector, or laser illumination apparatus, depending on the type of image that is to be projected.

The main steps in the method of the invention as shown diagrammatically in Figure 2 comprise a first step 18 of taking an image of the building 10, followed by a development step 20 when the image is taken by means of a conventional type of camera that exposes black and white or color photographic film, after which the photographic image is digitized as marked at 22 by means of a scanner, and loaded into the memory of the data processing system 16, e.g. a microcomputer or a minicomputer fitted with appropriate graphics processing software.

When the image of the building 10 is taken by means of a CCD video camera or the like, the resulting image is digitized and then loaded into the data processing system to be processed therein in the desired manner, as indicated by 24 in Figure 2.

By way of example, the processing performed on the image of the building 10 can comprise coloring and :

color balancing ; changes to the color and to the brightness of certain portions or certain architectural features in the image ; inclusions of image elements ; out-of-focus effects ; retouching ; etc. For example,
5 window frames may be colored yellow, columns blue, statutes white, balconies red, roofs green, etc. It is also possible to add moiré, marbling, or similar effects to certain portions of the image.

In a variant, image processing may also be performed
10 by hand (painting, retouching, etc. ...).

The image that results from the processing 16 can be applied by means of an appropriate interface to the input of a video projector, or of laser beam illumination apparatus, as indicated at 28, for projection on the
15 building 10 from the above-specified location P, or else, if a conventional projector of the slide projector type is used, the data processing system can be connected to a photographic imager enabling a photographic film to be exposed with the processed image, as indicated at 30,
20 which film can then be developed to provide a positive image on transparent film which is subsequently projected on the building 10 from the location P, preferably using the same lens 14 as that which was used for taking the image, or a lens that is identical thereto.

25 It is thus possible, with very great accuracy, to superpose visible elements of the building and corresponding elements of the processed image as projected onto the building.

For projecting an image on a building with a good
30 light intensity, good colors and a good saturation thereof, it is necessary to use a projector having a high

luminous power, with high power projection lamps, typically of 5000 W to 7000 W or 10 000 W, which produce a large quantity of heat in operation.

As shown diagrammatically in Figure 1, when the object surface to be illuminated is large, it is shared into adjacent zones each having a determined maximum area (e.g. of about 400 m² and images are projected on each zone of the surface, by means of a number of projectors equal to the number of the zones to be illuminated, which permits to obtain together a good reproduction of colors, a good brightness and a high contrast.

The distance between the projectors and the object to be illuminated and the size of the said zones of the object surface are generally a compromise between the features of the lenses, of the ground and of the projection lamps. Typically, the distance may be several tens of meters, e.g. 30 m - 40 m.

Naturally, this decorative illumination of the building 10 can vary over time, e.g. by changing the colors, the saturation thereof, the light intensity, etc. It is possible to project different decorative illuminations by cross-fading effects, images of the building can be taken from different angles and the processed images can be projected successively or simultaneously from the same angles and locations as were used for taking the images, e.g. to illuminate in different manners and from different angles the façade and the side wall of a building, and multiple special effects can be performed as are well known to the person skilled in the techniques of illumination by spotlights and laser beams.

It is also possible to use a cinema projector to project a cinema film in the above-described manner on the object, e.g. a film on which processed images of the object and/or synthetic images have been exposed, with
5 the film subsequently being developed. The initial images may be photographic stills, motion pictures, or videos.

By way of example, it is specified that it is possible to use equipment sold under the name "KODAK PREMIER" for digitizing, processing, and exposing a
10 photographic film (operations 22, 26, and 30 in Figure 2), said equipment including a reader for negative, reversible, black and white, or color film, and for lithographic film, accepting formats from 35 mm to 20x25 cm², a workstation for performing the abovespecified
15 image processing, and an imager enabling film to be exposed to any format from 35 mm to 20x25 cm², at a resolution of 40 pixels/mm.

A processed image or images reproduced on film can be projected by means of a commercially available
20 projector using a high power lamp (several hundreds of watts to several thousands of watts).

In general, the invention makes it possible to provide polychromatic decorative illumination of buildings, of structures, of monuments, of sculpture, of
25 stages, etc. ..., or of natural elements such as rocks, cliffs, etc., and also to reconstitute paintings, frescoes, or animated scenes on ruins, on walls of buildings, on rocks, etc.



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CLAIMS

1 - A method of illuminating an object, characterized in that it consists in taking at least one image of the object, processing said image, wherein the processing includes coloring the image and in projecting the processed image onto the object, causing the outlines and dimensions of the projected image to coincide with the corresponding outlines and dimensions of the object.

2 - A method according to claim 1, characterized in that the processing of the image includes retouching, adding, and omitting image elements.

3 - A method according to claim 1 or 2, characterized in that it also consists in varying the brightness and color characteristics of the image as processed and projected on the object.

4 - A method according to any preceding claim, characterized in that it consists in taking at least one video image of the object (10), in processing it digitally, and in projecting the processed image onto the object by means of a video projector or of laser beam illumination apparatus.

5 - A method according to any one of claims 1 to 3, characterized in that it consists in taking at least one still photographic image of the object (10), in digitizing said image, in processing it digitally, in exposing a photographic film with the processed image, in





developing the film to obtain a processed image on a transparent film, and in projecting it onto the object (10).

5 6 - A method according to claim 5, characterized in that the same lens (14) or two identical lenses are used to take an image of the object (10) and to project the processed image onto the object (10), and in that the processed image is projected from the same location (P)
10 as that from which the image of the object (10) was taken.

 7 - A method according to any one of claims 1 to 3, characterized in that it consists in exposing a
15 motionpicture film with processed images of the object, in developing the film, and in projecting the film onto the object.

 8 - A method according to any one of the preceding
20 claims, characterized in that, for illuminating an object of large size, the surface of the object to be illuminated is shared into adjacent parts having a determined maximum area and processed images are projected on the different parts of the object by means
25 of different projectors.

 9 - Apparatus for illuminating an object, in particular by performing a method as described in any preceding claim, the apparatus being characterized in
30 that it comprises camera means (12) for taking at least one image of the object (10), means (16) for processing

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said image by coloring it, and means for projecting the processed image onto the object (10).

10 - Apparatus according to claim 9, characterized
5 in that it comprises a camera (12) for taking at least one image of the object (10) on still or motion-picture film, means for digitizing the photographic image, for processing the digitized image digitally, and for exposing the processed image on photographic film, and
10 optical means for projecting onto the object (10) a positive of the processed image as provided on transparent film.

11 - Apparatus according to claim 9 or 10,
15 characterized in that the camera means (12) are of the type having a video output, e.g. a CCD camera.

12 - Apparatus according to any one of claims 9 to 11, characterized in that the projection means are a
20 cinema projector or of the type having a video input, e.g. a video projector or laser illumination apparatus.



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