DYNAMIC ARCHITECTURAL ELECTRIC LIGHTING A NEW CONCEPT IN ARCHITECTURAL ELECTRIC LIGHTING

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Abstract. *It is presented a dynamic architectural lighting method and installation, which can be used in architectural outdoor lighting and ensure a variable lighting of an objective (building, statue, artesian fountain etc.). The variable lighting is achieved by changing the following photometrical characteristics:*

- *the illuminance level;the position,*
- *the form and the size of the isolux curves on objective's surface;*
- *the illuminance angle;*
- *the light spectrum.*

Introduction

For the architectural lighting, a static method is known, a certain method assuring an illuminance but also a spectrum of light constant in time [1]. The luminaries used are generally projectors equipped with electric incandescent or metallic vapor lamps and are supplied with the constant voltage of the system.

The color of the light given by the projectors is the color given by the electric lamp, which has been used, or another color; in this particular case color filters are used.

The disadvantage of this method is given by the fact that this way there can't be realized dynamic light effects.

Man feels the psychological natural need of dynamism and information.

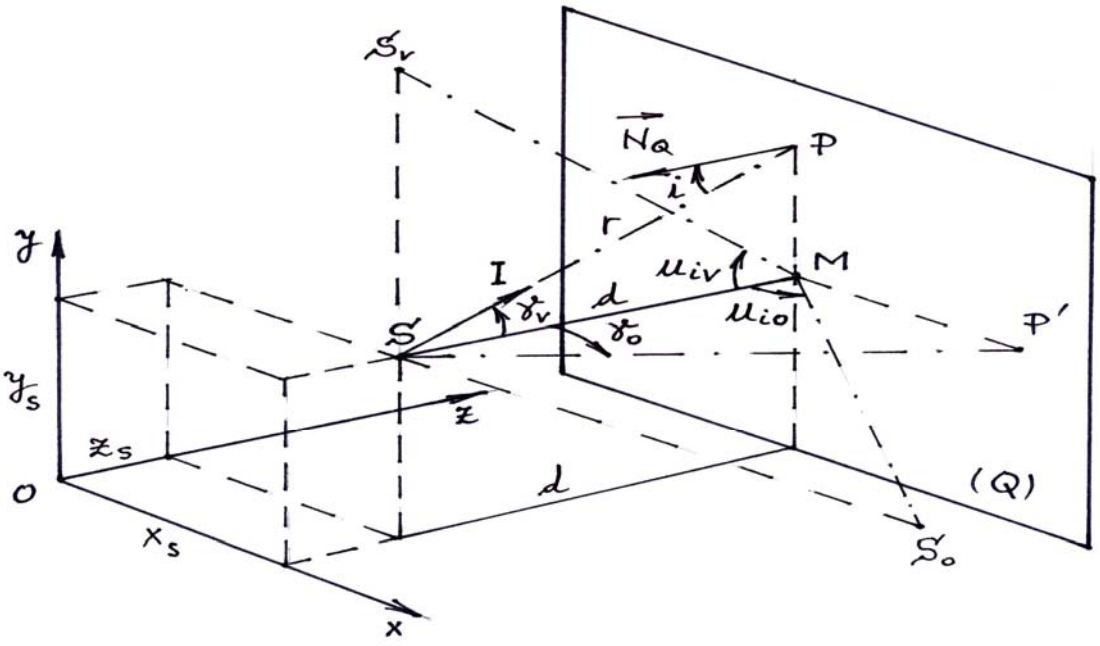

Fig. 1. The main scheme explaining the method

The architectural dynamic lighting method comes to accomplish this request.
The variable lighting creates different "faces" (aspects) of the same surface of an architectural objective, offering this way much more information about the shape and the building details of the objective than the static method.
Besides the effects, the dynamic method also offers extra information on the objective.
Choosing the static method or the dynamic method differs from case to case and depends on the objective and the beneficiary.
For certain objectives it is enough a static lighting.

Dynamic architectural lighting method [3]

We are given an example of using the method in the case of the architectural outdoor lighting of the buildings, regarding the figures 1 and 2, which represents:
- figure 1 – the main scheme explaining the method;
- figure 2 – the main block scheme, which accomplishes the procedure of the dynamic lighting.
E the illuminance produced by a source of light *S*, considered as being punctiform, in a point *P* on the surface *(Q)* situated at a distance r from the source, may be calculated using the following relation: $E = (I\alpha\beta \times \cos i) / r^2$ [2], where:
- $I\alpha\beta$ is the lighting intensity of the source *S* considered in the direction of the illuminated point *P*, taking into account the height angle α and the azimuth angle β of the photometric figure of the source.
- *i* is the incident angle of the illuminating intensity $I\alpha\beta$ on the illuminated surface *(Q)* in the point *P*, where the lighting is made.
- *r* is the distance from the source S to the point *P*.
According to the method, the dynamic lighting is realized by the following sub methods:

1. The changing of the illuminance level *E*, which is realized by the changing of the lighting intensity $I\alpha\beta$, which is realized at its turn by the changing of the electric power of an electric incandescent lamp.

2.. The changing of the position of the isolux curves obtained by the changing of the positional coordinates x_s and y_s of the source, considered in a reference system, having the center in *O*, and the octagonal axes noted *x*, *y*, and *z*.

3. The changing of the shape of the isolux curves on the surface *(Q)*, realized by the following process:
- in the initial position, the photometrical axis of the source is considered perpendicular on the surface *(Q)*; in this situation the isolux curves have the shape of circles.
- the source rotates with the angles γ_v or y_0 from the perpendicular on the surface; the shape of the isolux curves becomes elliptical, the ellipses suffering changes at the same time as the angles y_v and y_0.

4. The changing of the magnitude of the isolux curves on the surface *(Q)* realized through the change of the coordinate of z_s position of the source.

5. The changing of the illuminance angle of a certain area on the *Q* surface, realized through the following procedure:
- in the initial posi tion, the source is considered to be in the *S* point and the photometric axis perpendicular on the *Q* surface; in this situation the illuminance angle has the value *0*.
- the source moves in the point S_v or S_0, the illuminance angle changes as the point towards which the source moves, changes.

6. The changing of the light spectrum of the source realized by the successive automatic change of certain color filters from the photometric axis of the source, between the source and the objective.
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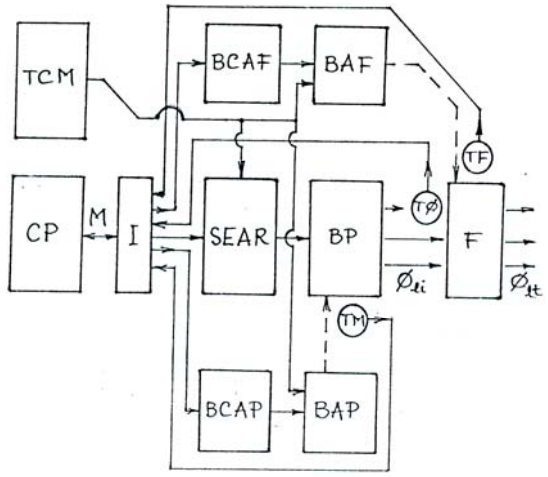

Fig. 2. The main block scheme for the procedure of the dynamic lighting.

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For the use of the proposed method it is used a main block scheme that realizes the dynamic lighting, having as a component a process computer *CP,* with role of command and control; among these and the ordered blocks is situated an interface *I* of adjustment and protection.

A bi-directional bus of signals *M* makes the connection between the computer and the interface *I*. A block of projectors with incandescent lamps *BP* is connected with a *SEAR* adjustable electrical voltage source commanded by the computer *CP* and which allows the variation of the illuminance level *E*. The value of the lighting flux of the projectors is controlled by the help of the transducer of the flux *TΦ*, which send to the computer *CP* the control signals of the flux.

On the direction of the lighting flux Φ_{li} there is a block of color filters, *F*. The color filters *F* are changeable automatically, being turned on by a block of functioning the filters *BAF*, commanded by a main block *BCAF*, which receives a control signal from the computer *CP*. The filters *F* used at a certain moment are controlled by the help of a transducer of filters *T*F that transmits control signals to the computer *CP*. The lighting flux transmitted by the filter to the objective is Φ_{lt}.

For the movement or the turning the projectors they are operated by a main block of functioning of the projectors *BAP*, commanded by a main block of command *BCAP*, who receives a command signals from the computer *C*P.

The movement executed by the projectors is controlled with the help of the transducers of movement *TM*, transmitting to the computer *CP* control signals of the movement.

The block scheme, also presents the possibility of a manual command with the help of the command board, *TCM.*

References

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[2] BIANCHI, C. et al. *Sisteme de iluminat interior şi exterior.* Bucureşti: Editura Matrix Rom, 2001.

[3] CANTEMIR, L.; CHIRILĂ, P. *Metodă şi instalaţie de iluminare arhitecturală dinamică.* Cerere de brevet de invenţie nr. A/00789, din 2002-06-10, O.S.I.M. Bucureşti.