

LIGHT SIMULATION IN URBAN SPACE

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Even today for the city planners there are in only rare cases digital urban models available in which with help of computer-simulation an attempt can be made to develop a light conception.

Therefore in the endoscopic urban space simulation I started to develop an analogues tool for the city planners, to give more emphasis to the light design in urban space (figure 1).

Figure 1 is showing an example of artificial light simulation in the scale of 1:100 with 12 V railroad model lamps. The exposure time for this slide comes to 1,5 hours with an 400 ASA Film. It must be said that the sensitivity of the film at such long exposure time has no more validity. Therefore the exposure time for the different models and films have to be found out every time. I separate the existing light into three cases in order to shorten the exposure time. These cases are: (1.) the basic brightness which is produced by the moon and the city illumination in the fare areas, (2.) the brightness of the lamp itself, and (3.) effects like a beam of light on the ground or the front of the buildings.

I produce the basic brightness with an underexposed shot. It is important to work here with an absolute diffuse light, in order to avoid any shadow.

The brightness of the lamp has been added in a second shot in a long-time exposure for about 7-10 minutes depending on the brightness and the position of the lamps.

Special effects like a strong light beam on the ground or on the front of buildings can be added in a third shot. Therefore I used a normal desk lamp with a special shield.

Figure 1



Figure 2

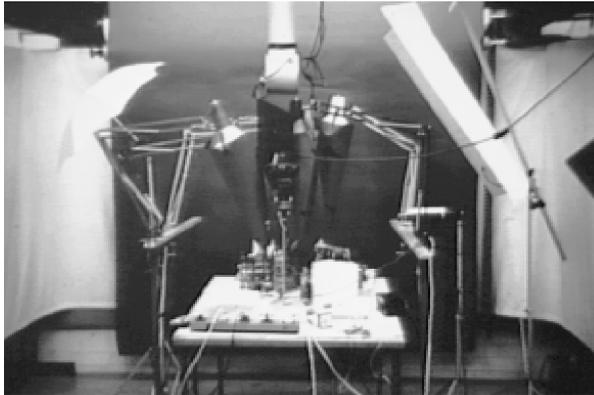


Figure 2 represents the experimental arrangement. Two examples for light simulation, produced with the method as explained it before is presented in figures 3 and 4. First a light situation with low intensity a consistent illumination contensity and a warm light colour. And an other variation with clear light beams on the ground. By copying the simulation pictures with a coloured filter you can change the light into different colours.

After making experiences with models in the scale of 1:100 I transformed this knowledge into the scale 1:200. First I had to find a useful model lamp which could be used in this scale. I decided to use Optical fibre as a lamp in the model (figure 5). The advantage of the optical fibre

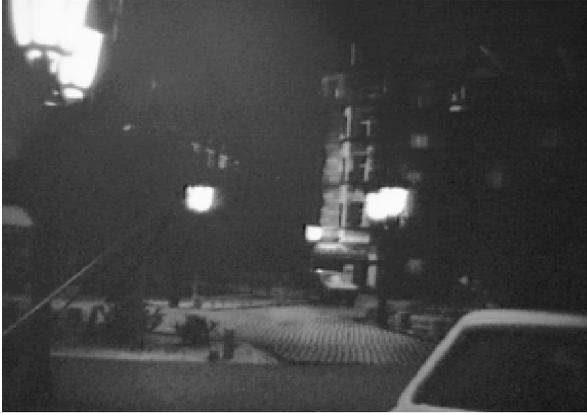


Figure 3



Figure 4

is that you can supply many lamps with one source (figure 6).

By adding some reflectors or changing shape I can produce a lot of different lamps. As long as light leaves the optical fibre at the end it is easy to build a lamp. At the moment light has to leave the side of the fibre it becomes more difficult, because light emission area increases. In the same moment the light intensity of the area is sinking extremely. To compensate the sinking light intensity I used the whole surface of the lamp for light emission.

After successful simulation experiences in scale 1:100 and 1:200 I tried to simulate the exact light amplification of existing lamps in the scale 1:50. For this I transformed the polar distribution curve of an

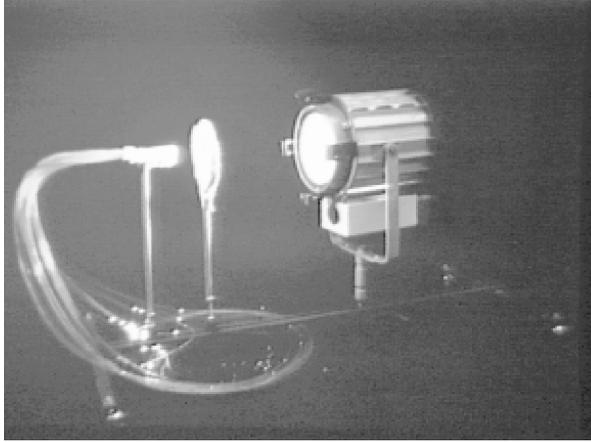


Figure 5

Figure 6



existing lamp with the help of different points onto the surface of an cylinder. Big points on the surface represent a high light intensity, small points low intensity (figure 7).

These points and the shape of the cylinder surface will be etched out of a copper foil on a photo chemical way. This kind of filter covers a halogen light and forms emitting light like the polar distribution curve the simulation of an symmetric polar distribution curve is presented in the figure 8.

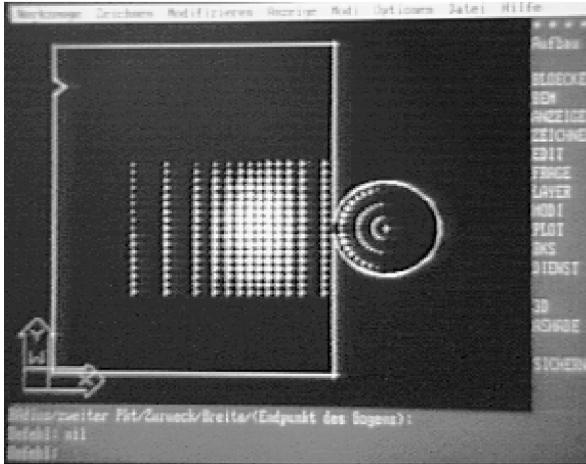


Figure 7



I would like to close with following comment. In order to simulate in the scale 1:100 and 1:200 the method with the railway model lamps and the optical fibre are surely the easiest way to get good results. I think that highly detailed simulation of small areas will be made in future also with the computer.

