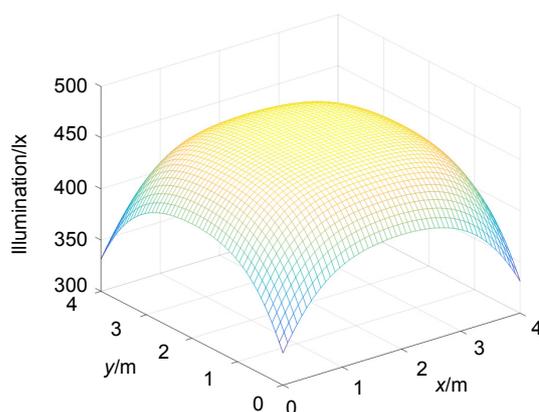


An annular light source layout model for both lighting and communication reliability

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The light distribution map of the model with a single-LED array and light belts

Overview: Indoor visible light communication technology is a new wireless data transmission method based on white light LED. With the rapid development of wireless transmission and the increasing tension of the current wireless spectrum resources, the research of visible light communication has become a research hotspot in the field of communication. The light source LED should take the dual functions of lighting and communication into consideration at the same time. In order to effectively ensure uniformity of lighting and the reliability of communication, a reasonable layout of the light source is needed to get a simple and beautiful layout structure and can effectively avoid the shadow effect and improve the uniformity of lighting and the reliability of communication. At present, there are many literatures on indoor illumination and visible light communication reliability at domestic and foreign, but most of them are based on the traditional array layout model that has the weaknesses of large illumination variance and uneven illumination distribution. In order to avoid these problems in traditional array layout model, a 4 m×4 m×3 m indoor model is adopted as the real space transport model to calculate the indoor illumination distribution and communication reliability, and a ring light source layout model with a single-LED array and lamp belts is designed based on the principle of illumination compensation. Through the numerical analyses of the minimum illumination and the uniformity of illumination under different layout parameters, it is concluded that the entire receiving plane illumination is between 300 lx~470 lx when the distance between the inner lamps of the 6 × 6 LED array is 0.3 m and the number of surrounding lamp beads with distance of 0.05 m is 316. Under this layout model, the maximum and minimum illuminations of the system are about 465.1 lx and 331.4 lx, respectively. Furthermore, the mean light intensity is about 437.0751 lx, and the uniformity of about 93.9% can be achieved. Compared with the traditional 4-LED array layout model, the illumination uniformity is increased by 4.54%. At the same time, the average BER of the annular light source model is about 2.8716×10^{-7} that is lower than that of the 4-LED array layout model. Therefore, the annular light source layout model designed in this paper can not only meet the uniformity of indoor illumination distribution but also ensure the reliability of communication, thus providing an effective layout method for indoor visible light communication.

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