Solar-Blind UV LED Marker for Indoor and Outdoor Applications of Optical Wireless Power Transmission

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Introduction

Optical Wwireless Ppower Transmission (OWPT) is a technique to transmit electric power from one place to a remote place using laser and solar cell. OWPT can be used to transmit electric power to long distance with high power density, thanks to the small size and small divergence of the laser beam. However, these characteristics of laser beam also give challenge to the design of OWPT system where the laser beam must be steered to point directly to the receiver (target). In this case, special target recognition and beam steering method are needed.

Target recognition using camera and beam steering using Galvano mirror had been developed and OWPT to moving target had been demonstrated [1]. In ref. [2], this target recognition method was enhanced using infrared LED marker. However, in outdoor environment under direct sunlight, the detection of infrared LED marker was difficult.

Solar-blind Ultraviolet (UV) spectrum (100 nm – 280 nm) is spectrum of UV light which is not present at the sunlight that reaches the surface of earth because it is absorbed completely by the ozone layer in the atmosphere. It is expected that LED which has wavelength in this spectrum can be used for marker in OWPT system under direct sunlight and indoor condition.

System Design and Object Recognition

The target which is small toy car is equipped with 280 nm UV LED. The modified toy car and detection by the camera in dark condition can be seen from Fig. 1. The UV LED is detected as a glaring blue light. To enhance the detection of the UV LED, filter is put on the lens of the camera as can be seen from Fig. 2. The filter is bandpass filter which has the same central pass band as the central wavelength of the UV LED light; hence, only the light from the UV LED which will pass through the filter and be detected by the camera.



Fig. 1. Detected Object by Camera



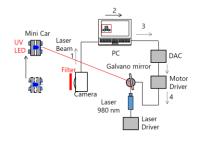


Fig. 2 Object Recognition and Beam Steering System.

Summary

OWPT system to moving target using solar-blind UV LED marker for target recognition has been designed and developed. UV LED with wavelength 280 nm is put on the target as marker and to enhance the detection of the UV LED, bandpass filter is put on the camera. Using this method, OWPT in indoor condition which is insensitive to the brightness of the environment and OWPT in outdoor condition under direct sunlight are possible to be demonstrated. The demonstration will be presented in the presentation.

References

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