Enhancement of Beam Steering System Speed towards Optical Wireless Power Transmission for Mobile Object

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A corner cube is placed in the center of the solar panel and the reflected light from the corner cube on the solar panel is detected by a 4-element diode through a lens to track a small air plane [1]. A beam tracking steering system for object movement using camera and OpenCV to control the goniometer stage has been tried in the previous [2]. The goniometer stage has ability to drive the position in micro-radian angle and the tracking speed still limited by 3 degrees/secs.

In this paper, the tracking method using CMOS camera and OpenCV tested to control the galvano mirror in expectation of enhancing tracking speed.

The CMOS camera is used as image sensor to detect the position of object movement. An image processing program is built by Python and OpenCV to calculate information data from pixel to angle value. The combination of tracker color filter and specific color filter methods are used to track the object position properly. The information is sent to the galvano mirror controller through Digital Analog Converter (DAC). Furthermore, the galvano mirror direct the beam to the object position to transmit the power. The beam steering system using the galvano mirror is described in Fig. 1.

The Table 1 shows that the beam steering system delayed can be reached 0.083 sec. in average. This delay comes from calculation time in the image processing program.

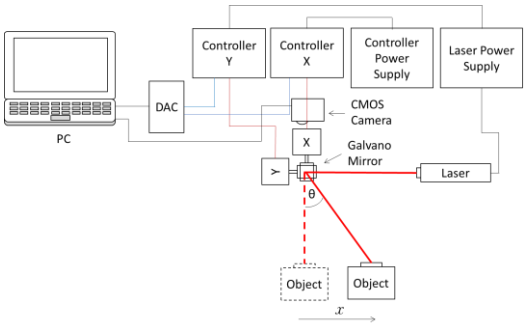

Fig. 1 Beam steering system using the galvano mirror

Table. 1 Object speed and system delay comparison

Obj. Speed [cm/s]	System Delay [s]
4370.00	0.024
874.00	0.092
437.00	0.132
291.33	0.096
218.50	0.092
174.80	0.06
Average	0.083

Refferences

[1] N. Kawashima, K. Takeda, and K. Yabe, *Chinese Opt. Lett.*, vol. 5, pp. 109–110, 2007.

[2] H. Adinanta, H. Kato, and T. Maruyama, *78th Annu. Meet. Japan Soc. Appl. Phys. Lect. Meet. Lect. Present.*, no. 2017, pp. 03–310, 2017.