Optical Wireless Power Transmission to Multiple Moving Objects Using Computer Vision

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Introduction

Optical wireless power transmission (OWPT) can be used to transmit high power to long distance by using laser as the light source. In this case, target recognition and beam steering system are needed to recognize and direct the laser beam to the target. In this research, we use CMOS camera and galvo mirrors to recognize and direct the laser beam. CMOS camera is used to recognize the target by using color recognition method which is one of the recognition methods of Computer Vision while Galvano mirror is used to direct the laser. By using this method, we have already demonstrated the OWPT to one-dimensional and two-dimensional single moving object [1-2].

Since the speed of our galvo mirrors is 8.3°/ms [1], it is possible to transmit power to multiple objects by using single set of galvo mirrors and single laser. In this case, the new challenge in our research is about how to recognize more than one target using one camera.

Object Recognition Method

The beam steering system to multiple moving object can be seen from Fig. 1. In this case, we still use CMOS camera and galvo mirror to recognize targets and steer the beam. Since we use color filtering method to recognize the target, we use different color markers to mark the targets as illustrated in Fig. 2.

We modify the color filtering method which was previously used to recognize moving targets in [1-2]. In order to recognize more than one target, we use periodic color filtering method. In this case, first, we set the multiple colors which will be recognized as the targets by the camera. Furthermore, the recognized target color set to change periodically from one color to another every several frames which are captured by the camera. By using this method, for every several frames, the camera will recognize different targets. In other words, the target of OWPT will change periodically for every several frames.
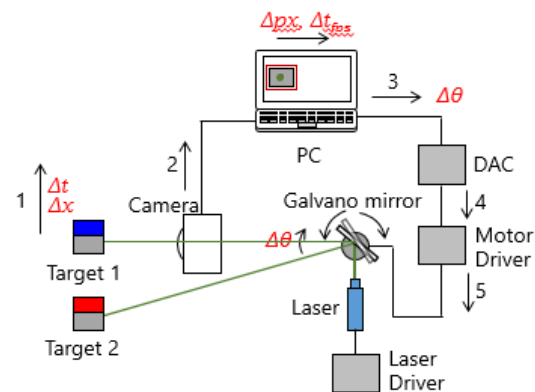

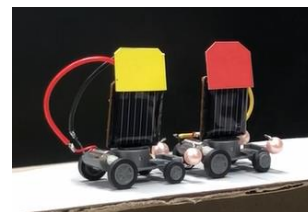Fig. 1 Object Recognition and Beam Steering System

Fig. 2 Multiple Targets with Different Color Markers

Summary

We have demonstrated OWPT to multiple moving objects by using color filtering which is one of computer vision methods to recognize the targets. We set the object recognition program to recognize different colors every several frames which are captured by camera. Hence, the targets of OWPT will change periodically every several frames. The next step of our research is about how to transmit power to two-dimensional moving multiple objects.

References

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